PC ADVISOR

BEST CLOUD STORAGE SERVICES

13 TESTED

GET UP TO 100GB OF STORAGE FOR FREE

Access your documents, photos, music and more from anywhere

FASTEST-EVER LAPTOPS

TESTED

Ultimate gaming power on the move

ISSUE 240 JULY 2015

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LEARN TO CODE

Which languages to learn in 2015

Broadband without the landline fee

How to save **£17** a month

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JIM MARTIN

Cloud storage services

Why you should be storing your data online

How would you like 100GB (or more) of free online storage? What's the catch, you ask. Well the good news is that cloud storage services are becoming ever more popular and all that storage is there for the taking. The snag is that each service offers a relatively small amount of free storage unless you pay a monthly- or yearly fee. One exception is the New Zealand-based Mega, which will give you 50GB for free, and that should be enough for all your photos and documents.

The benefit of storing your files online is that you can get to them from any computer with an internet connection. That's particularly convenient for work, but there are many other advantages too, such as the fact your precious documents, photos and videos are about as safe as they can be from theft and destruction. We've tested out 13 cloud storage services this month (starting on page 72), from the big names to the not-so-well-known ones, which have different features to offer.

Time was when you'd need a hulking tower PC to play the latest games in all their glory. These days, laptops are just as powerful (if not more powerful) than many of their desktop counterparts so if you need the ultimate performance in a portable package, turn to page 62. If you don't fancy our winner's opinion dividing colour, it's also available in black with very similar specifications.

If you have ADSL broadband from BT, TalkTalk or another provider, you probably resent paying the £17 per month line rental fee - especially if you don't use your landline phone much. We outline some of the alternatives on page 86, including cable and satellite, but don't expect to save much money: it turns out that most are just as expensive.

Last year the government declared it was the Year of Code, and I for one applaud the initiative. The momentum hasn't been lost and – if anything – is gaining. Coding isn't for everyone, but it's much more varied than you might imagine. You could create your own app, build a website or even learn to program so-called embedded systems. We've researched the most popular languages to learn right now and explain all you need to know to start coding on page 90.

One question we get asked more than any other is: what's the difference between 4G and LTE? So this month on page 94 we've explained this phone jargon so you're better equipped to choose your next phone. And as ever, we've got all the latest phones, including the much-anticipated Samsung Galaxy S6 and S6 Edge.

ISSUE 241 ON SALE 17 JUNE 2015

Correction: In last month's gaming PC group test, we stated that the Scan 3XS Gamer cost £899 inc VAT. The correct price is £849 inc VAT. As a result, we have updated its overall score to four stars.

PCA CONTENTS

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Recover deleted files from hard drives and memory cards
WORTH £105
DISC+
FULL PROGRAM 120 DAYS OF OF UPDATES

MAGIX Music Maker 2015 Silver — FULL PROGRAM WORTH £20
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PC ADVISOR 8 FULL WINDOWS PROGRAMS
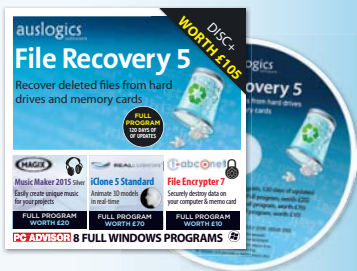
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CHRIS
MARTIN

WINDOWS 10:

Microsoft wants Windows 10 on one billion devices in three years

Microsoft is setting a lofty goal for Windows 10 adoption as it tries to get app developers onboard.

Terry Myerson, Microsoft's executive vice president of operating systems, said at the company's Build conference that the goal is to get Windows 10 on 1 billion devices within the next two or three years. "Our goal for Windows 10 is to build the most attractive developer platform ever," he explained.

Microsoft is counting on a mass upgrade of its existing base of 1.5 million users to Windows 10. Unlike the separate app stores that currently exist for Windows 8 for PCs and tablet and Windows 8 for phone, Windows 10 will run across phones, tablets, PCs and Xbox consoles, with a single storefront in which developers can sell their apps. Myerson demonstrated how developers can tweak their apps to work with various screen sizes. For instance, *USA Today* will offer an Xbox One app, filtering its existing mobile news app to show video feeds.

Myerson also said the Windows Store will offer carrier billing on all devices – not just smartphones – with 90 mobile operators. Developers will get access to new business models that the Windows Store hasn't supported in the past, such as subscriptions and affiliate referrals.

Why this matters: Microsoft introduced its app store with Windows 8, but so far it's struggled to capture the interest of developers. Between free upgrades to Windows 10 in the first year for Windows 7 and 8 users, and a unified OS for all screen sizes, Microsoft is hoping it can finally attract enough users, and therefore enough developers, to allow its app ecosystem to thrive.

1 Billion
Windows 10 Devices

Windows Store
Universal Windows Platform

Web | .NET & Win32 | Android Java/C++ | iOS Objective C

Microsoft steps to 'Edge' with new browser name

Microsoft has named its new browser Microsoft Edge (ME) after using the 'Project Spartan' codename for the past four months.

Edge will be the successor to Internet Explorer (IE), particularly IE11, and will be the default browser in Windows 10 on all devices, from PCs to smartphones. IE11, however, will continue to be packaged with the new operating system.

"Microsoft Edge is the browser built for Windows 10," said Windows design chief Joe Belfiore near the end of a long keynote address that opened Build, the company's developer conference.

In hindsight, the name choice was obvious: the new browser's rendering engine had earlier also been dubbed 'Edge'. That engine will be one of two bundled with Windows 10. (The 18-year-old Trident engine will continue to power IE11.)

Edge has a minimalist user interface (UI) somewhat reminiscent of Google's Chrome, integrates Microsoft's Cortana personal assistant, and offers annotation tools for page markup and later retrieval or sharing. Belfiore also showed off the browser's reworked new tab page, which stressed not only the usual frequently-visited sites but also will put a heavy emphasis on Windows Store app discovery for users.

Even more interesting, Belfiore revealed that Edge would out-of-the-box support add-ons crafted for Google's Chrome and Mozilla's Firefox if they were built using HTML and JavaScript only. Chrome extensions will also work with Edge, but will require code tweaks.

Microsoft will update Project Spartan to Edge in a future build of Windows 10 preview. The final release date has yet to be set – currently it remains "this summer," although Microsoft said what it showed on stage today was "pretty close" to the end result.

BUILD 2015

Developers can port iOS and Android apps to Windows 10

A longtime concern about Windows Phone has been a shortage of apps in the Windows Store, but Microsoft has taken a big step to change things.

Developers of iOS and Android apps will be able to bring their apps and games to Windows 10, the company announced at its Build developer conference.

Four new software development toolkits will allow developers to bring their code for iOS, Android, the web, .NET and Win32 to the Windows Store with "minimal code modifications", Microsoft promised.

Developers will start with a code base, such as Android or iOS, and integrate that with the Universal Windows Platform capability, then distribute the new app through the Windows Store.

The four new toolkits will enable code already built on websites, with .NET and Win32, with Android Java/C++ and with iOS Objective C, Microsoft's Terry Myerson, vice-president of operating systems, said in a blog.

In one example, Adobe will bring its Photoshop Elements and Premiere Elements apps to the Windows Store by using the new toolkit for Win32 apps,

Myerson said. Today, there are 16 million Win32 apps, and Microsoft is looking forward to having them grow their distribution by coming to the Windows Store, he added.

In another example, the Candy Crush Saga game was ported to Windows Phone with "very few code modifications" to its original Objective C code with the Objective C toolkit, he said. The Universal Windows Platform will also enable apps to become holograms.

Having the capability to convert iOS and Android apps to Windows Phone could help Microsoft. Android runs on about 81 percent of smartphones, while Windows Phone runs on nearly 3 percent and iOS nearly 15 percent, according to IDC and other analysts.

Microsoft HoloLens gets real with robotics, surgery, architecture

At the 2015 Build conference, Microsoft showed off several new demos for its headset. While previous demos had focused on fun ideas such as a virtual Mars walk and a living-room-sized version of Minecraft, the presentation emphasised real-world applications for businesses and education.

For instance, Microsoft revealed how architects could use HoloLens to interact with 3D models, laid out virtually in front of them on a table. They might also be able to examine aspects of a building site at full scale, with virtual beams and walls rendered before their eyes.

Another demo demonstrated how medical students could learn about the human body without having to cut open a body. The headset showed a 3D model,

which users could separate into different parts and blow up for closer examination. With everyone wearing a HoloLens, students and teachers could all interact with the same model, so it's easy to imagine virtual surgery as the next step.

Not all the presentations were so serious. Microsoft also showed off a robot whose controls appeared in the virtual space above the robot's head. Users

could then create a movement pattern for the robot by tapping on the ground.

There's still no word on when Microsoft will release HoloLens, how much it'll cost or the tech specs inside it. The company has only said that it plans to launch the headset within the "Windows 10 timeframe". In lieu of release details, Microsoft did announce several partners, including Autodesk, Unity and the Walt Disney Company.

While the technology behind HoloLens is certainly impressive, Microsoft needs to prove that the product truly is a big leap forward for computing, and not just a cool tech demo. That was clearly the emphasis at Build, as the tech giant tried to convince developers to take the technology seriously.

Roku updates players and unveils new-look Roku 2

Roku has upped its game in the media streaming market with new features for its Roku player and a new version of the mid-range Roku 2. New features include search and My Feed to better compete with the likes of the Google Chromecast, Apple TV and Amazon Fire TV.

The Roku 2 now looks identical to the top-of-the-range Roku 3 and for good reason – it has the same powerful specifications. It costs £69 and the reason it's more affordable than its bigger brother is that it's supplied with a basic remote control rather than one with a gyro and a headphone socket.
MORE: tinyurl.com/kj8hm5j

Google takes on Apple Watch with software update

Google has announced an Android Wear update codenamed 'Diamond'. It will be available for smartwatches from LG (pictured), Motorola, Samsung, Sony and Asus. New features include easier to use with always-on apps, gestures and Wi-Fi support. It was thought Google might announce iPhone support too but didn't mention it. However, our colleagues in the US have been told by a source with knowledge of Google's plans that the Android Wear app for iPhone is awaiting approval from Apple.
MORE: tinyurl.com/pcmrs7L

Intel sales sag under PC slowdown

Businesses bought fewer PCs than expected last quarter, the chipmaker said

The PC business enjoyed a revival last year as companies replaced older systems running Windows XP. Those upgrades are mostly done now, and the slower market has hit Intel's financial results.

The chipmaker reported first-quarter revenue of $12.8bn in April, flat from the same quarter last year and a bit lower than financial analysts had been expecting, according to a poll by Thomson Reuters.

Intel blamed lower than expected sales of business PCs, but said the decline was offset by strong sales of servers and other data centre products. The company had already cut its forecast for the quarter in March.

Its profit for the quarter, ended March 28, was $2.0 billion, or $0.41 per share, both up slightly from last year and in line with expectations.

Intel is battling at least two problems at the moment: a gradual decline in the PC business and an inability to make much headway against chip-design company ARM in smartphones.

Intel used to break out the financial results from its division that sells smartphone and tablet chips; last year that group lost $4.2 billion.

It made a change last quarter and no longer breaks out those numbers, so it's hard to see how its low-power Atom chips are selling. Instead, Intel lumps them together with the group that makes laptop and desktop PC chips. That combined division, called the Client Computing Group, reported revenue of $7.4 billion for the last quarter, down 8 percent year over year, Intel said.
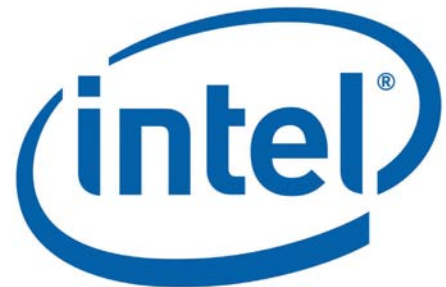
Its Data Center Group, which sells Xeon server processors, did better. Revenue there was $3.7 billion, up 19 percent from last year. Its smaller Internet of Things division also did well.

The PC business hasn't been this bad for a while. Shipments tumbled to a six-year low last quarter, according to research firm IDC. Another research firm, Gartner, predicts a single-digit percentage decline for the full year.

BT Cloud offers Chromecast support

Cast your content from the cloud to the Chromecast

BT has launched a new version of its cloud service, simply called BT Cloud, with new features including Google Chromecast support.

Competition in the cloud market is tough with countless brands offering in essence the same thing. BT is hoping to drum up some interest with a revamped service with Google's Chromecast the headline addition.

Andrew Kirkpatrick, general manager for connected home at BT, said: "This new version of BT Cloud marks our second anniversary and we've listened to what our customers have been telling us to make BT Cloud even better. Now they can share photos and videos on a big screen thanks to Chromecast compatibility and we've also introduced a collections functionality that lets you organise your content from all your devices in one place more simply."

When the Chromecast first launched, BT quite rightly focused on getting the BT Sport app to work with it, but the new BT Cloud brings some handy feature to use with the HDMI dongle media streamer. Customers can now watch films that are stored in the cloud on the big screen by casting them to the Chromecast.

The app also now allows you to create folders of content available across all devices and there are visual and usability improvements such as an updated folder structure and new grouping of content by date.

All BT Broadband and Infinity customers get BT Cloud storage for free with either 5- or 50GB depending on which broadband package they are on. Additional space is available at £3 per month for 50GB and £9 per month for 500GB.

iPad meets its match

Why Scottish Tablet is better than the iPad mini

NEIL BENNETT

I am a long-time iPad user. My first was 2010's original iPad, and I'm currently typing this on a third-generation iPad mini – plumping for the smaller size as I can stick it in my jacket pocket and leave behind my bag. But a Scottish friend (hi Laura) introduced me to a tablet that's even better – so here I'll explain why Scottish tablet is better than Apple's.

Design

The iPad mini is a beautiful piece of product design – every detail is perfectly polished. It's 7.9in Retina Display makes everything look glorious – and it's practical too, as you can happily type on it.

The iPad mini is available in three 'finishes'. Silver and Gold backs are paired with a white front, Space Grey with a black front. Mine spends all of its time in a flip-top case, which meant I'd forgotten whether it was Silver or Gold (turns out it's Silver, as I'm not an Essex pimp).

The Scottish tablet is available in one colour – light brown with almost-white sugary bits – but arrives having already been cut into easy-to-pop-in-your-mouth morsels. You can't beat that design.

Thickness

For most tablets, thinness is seen as a virtue. The iPad mini is only 7.5mm thick – though seeing as you almost certainly will be using it inside a case (my favourites is the EverythingTablet Flip Case and Stand), that it's slightly thinner than Samsung's Galaxy Tab S is an irrelevance.

Scottish Tablet is much thicker – but thicker means more sugary goodness. Another point to the Scots.

Software

Upgraded to iOS 8.3, the iPad mini comes with the usual mail, browsing, messaging and day-to-day life tools, plus Apple's office suite thrown in for free

Scottish Tablet never crashes, but you might half an hour after you eat a piece as your sugar levels return to normal. This can be avoided by eating more Scottish Tablet.

Robustness

Scottish Tablet breaks more easily than the iPad mini when dropped, but – unlike Apple's tablet – breaking it doesn't make it unusable.

Battery life

Apple quotes a battery life of 10 hours for the iPad mini, but our tests put it at more like 6. A full charge takes about an afternoon (or overnight).

Scottish Tablet never runs out of power and, therefore, never needs charging. It's also capable of transferring its energy to you though the mere act of eating it (unless you eat so much you induce a sugar coma).

Reliability

With regular upgrade cycles, you could find yourself buying a new iPad mini every year if you want to always have the latest model. If that's not a concern, we'd expect the iPad mini to last your three years before app and iOS upgrades mean you have to retire it.

A Scottish Tablet is lucky to last five minutes if one of the *PC Advisor* team is around – we polished off a box in two days.

Health

The Apple Watch is the company's hugely hyped health tracker and communications device for those too lazy to pull their phones out their pockets. But it syncs with the iPhone not the iPad.

Scottish Tablet is possibly the least heathy thing you can eat outside of lard.

Price

The iPad mini costs £320 for the 16GB model, Wi-Fi-only model you won't buy (it exists only to be bought as a gift and as anchoring pricing for the rest of the range). The cheapest one you'll shell out for is £400 for the 64GB model – or £500 to pop a SIM in.

A box of Scottish tablet is £6, even in Edinburgh airport. So you can buy 66 boxes for the price of your basic iPad – though this does come with the danger of heart failure if you eat it all, even over a month.

The winner

Scottish Tablet is a clear winner in all ways except one – you can use the iPad mini to look up recipes to make Scottish Tablet. Perhaps the makers of Scottish Tablet should look to this for version 2.0 of its product. ⊠
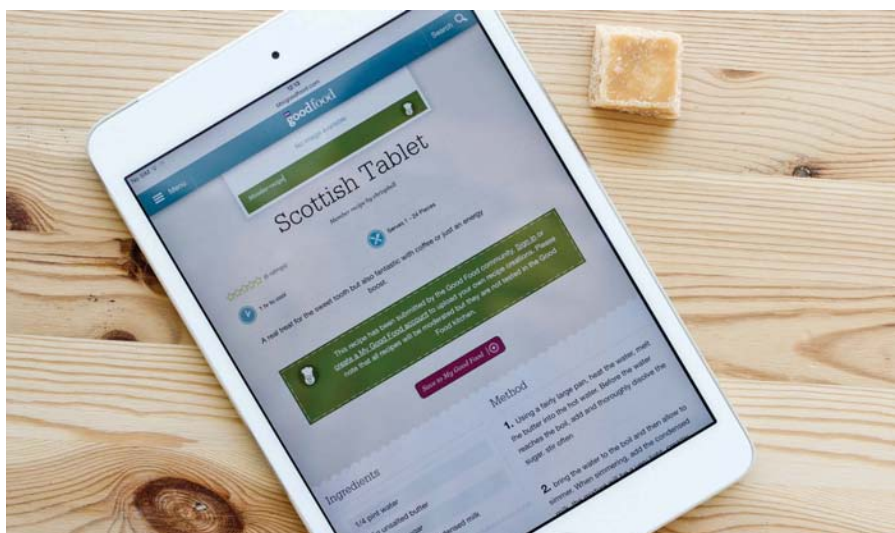
Don't panic

Why Netflix won't terminate your account for using a VPN (probably)

CHRIS MARTIN

Recently there has been a lot of media attention on Netflix's term and conditions around using a VPN and its right to terminate your account if you're caught out. But here's why Netflix won't ban you for pretending to be American.

An eagle-eyed Reddit user discovered that hidden in the depths of the Netflix terms and conditions lived some words that meant the streaming giant could cut you off from a wealth of film and TV content if you were found to be using a VPN (virtual private network).

Using a VPN such as Hola means pretending you're in another country to access the content available there. It's used in the UK as the US version of Netflix has a lot more content on offer. Here's what Netflix's terms and conditions state:

"You may view a movie or TV show through the Netflix service primarily within the country in which you have established your account and only in geographic locations where we offer our service and have licensed such movie or TV programme. The content that may be available to watch will vary by geographic location. Netflix will use technologies to verify your geographic location. We may terminate or restrict your use of our service, without compensation or notice if you are, or if we suspect that you are (i) in violation of any of these Terms of Use or (ii) engaged in illegal or improper use of the service."

There's some debate as to whether or not this is actually a recent addition to the terms but that's somewhat irrelevant for this article. I don't think it's likely that Netflix will actually kick anyone off its service for using a VPN, despite having the power to do so. If you consider the situation from Netflix's point of view, the firm has customers paying a decent monthly fee for the service and, with a decent percentage of them using VPN service to access content in other regions, terminating their accounts means cutting revenue and therefore profit.

The only caveat is if the content providers get unhappy due to the licensing restrictions. However, Netflix is highly unlikely to be reporting back to its partners and informing them of users doing this. Under pressure Netflix may crack down on popular services such as Hola and may even terminate a few accounts so it can make a statement, but I would expect it to do the bare minimum and only if it has to avoid losing revenue.

If you're worried about your account being terminated, then simply don't use VPN services and you'll be fine. But I don't think that there's anything to panic about at the moment. ⊠

Internet of Things isn't a thing

We will know that the IoT is established only when people no longer refer to the Internet of Things

April 9 saw everyone here at *PC Advisor* celebrate Internet of Things day. What, you didn't know? Internet of Things day is a time when people the world over gather together to celebrate a technical phenomenon through the medium of shared press releases and hastily cobbled together news stories.

Of course I jest. IoT Day is no more of a thing than is 'International Louie Louie Day' (April 11) or 'World Laughter Day' (the first Sunday in May). These things are made up to generate press coverage, and most often hoovered up and regurgitated by churnalists who spend their days throwing words into the never satisfied furnace that is the internet.

There is at least some substance and activity behind IoT day. More than 20 events took place around the world, albeit mostly commercial events run by media companies, with sponsors rather than spontaneous gatherings of IoT enthusiasts. But setting aside the imperative to sell products, the very idea of an IoT day misses the point. If the Internet of Things matters, it matters in the absence of people noticing.

IoT: happening all over the place

I firmly believe in the IoT concept: our homes are becoming smarter, our tech more wearable. I can adjust my home's heating from anywhere in the world, and listen to my daughter not sleep wherever I have a web connection. I know exactly how many steps I have taken and how much sleep I have had, and pretty soon I will be able to combine that data with the contents of my fridge to make a good call on the right evening meal to eat. It's happening – quicker than we think.

All of our devices can talk to us and each other to create a network in which we live easier and more fulfilling lives. And watch only good television. The Internet of Things very definitely is a thing. But no-one thinks of it as such.

No-one in the world wakes up in the morning thinking about buying an 'Internet of Things' device. If all of this connected tech works, it works because we don't notice it doing so. The smart heating system in my home is great because it is convenient, makes the house more comfortable, and saves me money. Not because it is a web-connected IoT system.

We will know that the IoT has reached fruition when regular punters have a network of smart home-, wearable- and mobile tech that talks to itself and makes life easier. When people use products that feel familiar. News stories using the phrase 'Internet of Things' are pretty much irrelevant. Hilariously so when printed on paper. ⊠

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8.1
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Microsoft
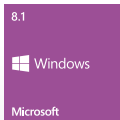
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8.1
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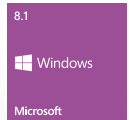
Scan G20 Value System
Gaming PC

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8.1
Windows
Microsoft

Scan G30i Value System
Gaming PC

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- 2GB NVIDIA GeForce GTX 960 SSC ACX
- 1TB SATA 6Gb/sec hard drive
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The combination of quad-core Intel® Core™ i5 4460 processor and NVIDIA GeForce GTX 960 SSC ACX graphics card ensures that the G30i can play any game you throw at it.

8.1
Windows
Microsoft
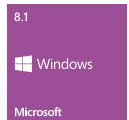
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OPTIONS
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AVAILABLE

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- 1TB Seagate HDD
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- 3 Year Premium Warranty

£1049 Inc VAT

The 3XS Gamer 20i is a super-fast gaming PC thanks to its combination of quad-core Intel Core i7 4790 CPU running at 3.6GHz with added Hyper-Threading plus a 4GB NVIDIA GeForce GTX 970 graphics card. These components are installed in an Asus Z97-K motherboard along with a 1TB hard disk.

8.1
Windows
Microsoft

OPTIONS
CUSTOM
AVAILABLE

Scan 3XS Z97 Vengeance Gaming PC

- Intel® Core™ i7 4790K processor overclocked up to 4.7GHz
- 8GB Corsair DDR3 2133MHz memory
- 4GB NVIDIA GeForce GTX 980 SC
- 250GB Samsung 850 SSD & 2TB HDD
- Windows 8.1
- 3 Year Premium Warranty

£1549 Inc VAT

This high-end gaming system includes a water-cooled Intel Core i7 4790K CPU overclocked up to 4.7GHz plus a 4GB NVIDIA GeForce GTX 980 graphics card, 8GB of 2133MHz Corsair Vengeance Pro DDR3, 250GB SSD for lightning quick gaming loading and a 2TB hard disk.

8.1
Windows
Microsoft

OPTIONS
CUSTOM
AVAILABLE
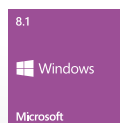
3XS Graphite LG157 Gaming Laptop

- Intel® Core™ i7 4720HQ processor
- 8GB Corsair DDR3 1600MHz memory
- 2GB NVIDIA GeForce GTX 960M
- 15.6in 1,920 x 1,080 screen
- 1TB SATA 6Gb/sec hard drive
- Windows 8.1

£939 Inc VAT

The LG157 is a 15.6" mid-range gaming laptop that includes a NVIDIA GeForce GTX 960M graphics card plus an Intel Core i7 4720HQ CPU, up to 16GB of RAM and multiple hard disks and SSDs. The LG157 is ready for next-day delivery and is protected by a 2 Year Premium Warranty.

8.1
Windows
Microsoft

OPTIONS
CUSTOM
AVAILABLE

3XS Graphite LG1720 Gaming Laptop

- Intel® Core™ i7 4720HQ processor
- 8GB Corsair DDR3 1600MHz memory
- 3GB NVIDIA GeForce GTX 970M
- 17.3in 1,920 x 1,080 screen
- 1TB SATA 6Gb/sec hard drive
- Windows 8.1

£1149 Inc VAT

The LG1720 is a 17.3" high-end gaming laptop that includes a choice of powerful NVIDIA GeForce GTX 970M or 980M graphics card, ensuring silky smooth frame rates in all games. The LG1720 is ready for next-day delivery and has a 2 Year Warranty.

8.1
Windows
Microsoft

Scan Computers recommends Windows.

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Our 3XS Custom Series is a range of computers designed to offer the best performance for a variety of applications, with a particular focus on games. We build Custom Series PCs to order, so we can configure and tailor make an individual PC just the way you want it. We can also overclock the processor, so you get a faster PC without a substantial increase in price. All 3XS Custom Series PCs are covered by a three year warranty as standard with the first year on-site.

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3XS SYSTEMS

Moore's Law at 50: the past and future

The 'law', which has provided a guideline to make cheaper, smaller and faster computers, endures even after 50 years, writes Agam Shah
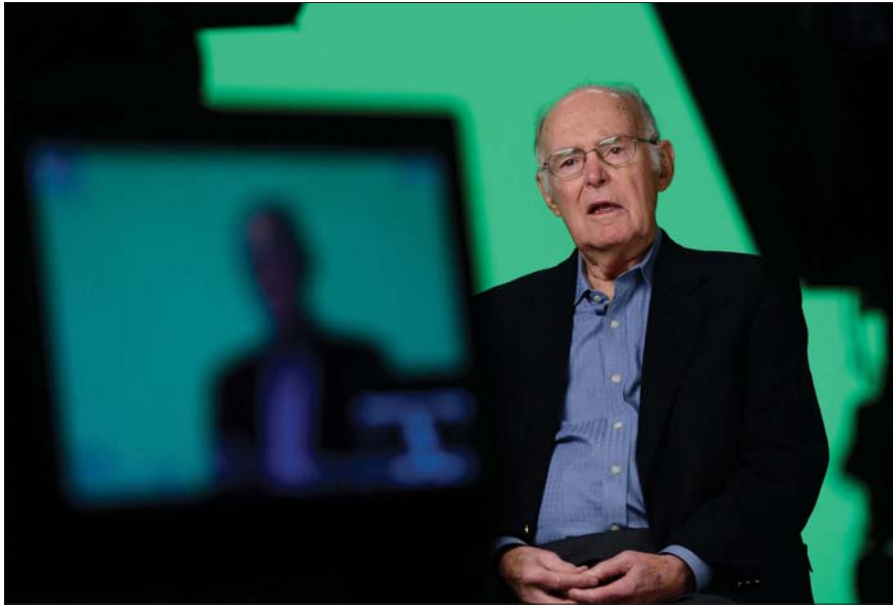
When you're strapping on the latest smartwatch or ogling an iPhone, you probably aren't thinking of Moore's Law, which for 50 years has been used as a blueprint to make computers smaller, cheaper and faster.

Without Moore's Law it's possible that new types of computers such as Microsoft's HoloLens, a holographic wearable with which users can interact with floating images, would not have been developed. For decades, Moore's Law has been a guiding star for the development of modern electronics, though in recent years its relevance has been subject to debate.

Moore's Law isn't a scientific theory, but a set of observations and predictions made by Intel cofounder Gordon Moore in an article first published in *Electronics Magazine* on April 19, 1965, which were subsequently modified. His core prediction states that the density of transistors, or the number of transistors on a given die area, would double every two years, which leads to double the performance. Loosely translated, that means in 18- to 24 months you could buy a computer that is significantly faster than what you have today with the same amount of money.

The tech industry originally interpreted this to mean that making chips would get cheaper with scaling: as transistor density doubles, chips shrink in size, processing speeds up, and the cost per processor declines. For the past five decades, the tech world has based product plans and

manufacturing strategies around this concept, leading to smaller, cheaper and faster devices. Manufacturing advances have also made chips power-efficient, helping squeeze more battery life out of devices.

Without Moore's Law, "I don't think we could have a smartphone in the palm of our hand," said Randhir Thakur, executive vice-president and general manager of the Silicon Systems Group at Applied Materials.

But engineers have predicted that Moore's Law will die in the next decade because of physical and economic challenges. Conventional computers could be replaced by quantum computers and systems with brain-like, or neural, chips, which function differently than current processors. Silicon could also be replaced by chips made using new materials, such as graphene or carbon nanotubes.

Intel applied Moore's observations first to memory products, with the benefit being lower cost per bit. Then it applied Moore's Law to integrated circuits, and Intel's first chip in 1971, the 4004, had 2,300 transistors. Intel's latest chips have billions of transistors, are 3,500 times faster, and 90,000 times more power efficient.

Since then, Moore's Law has been flexible enough to adapt to changes in computing. It was the force behind supercharging computer performance in the 1990s, and

lowering power consumption in the last decade, said Mark Bohr, senior fellow at Intel.

"The type of performance we had on desktops 15 years ago is matched by laptops and smartphones today," Bohr explained.

Moore's Law is being used as a guiding principle in the development of wearables, Internet of Things devices and even robots that can recognize objects and make decisions. It also affects a diverse range of products such as cars and home appliances, which are relying more on integrated circuits for functionality, Bohr said.

But engineers agree that Moore's Law could be on its last legs as chips scale down to atomic scale, and even Intel is having a tough time keeping pace. Gordon Moore has revisited Moore's Law over the past 50 years and at multiple times expressed doubts about its longevity. In a recent interview with *IEEE Spectrum*, Moore said keeping up was getting "more and more difficult."

Intel's innovations have kept Moore's Law chugging along, with the most recent technology advance being FinFET, in which transistors are placed on top of each other so more features can be packed on chips. Intel has spent billions of dollars establishing new factories, and innovations such as strained silicon, high-k metal gate and FinFET have helped give Moore's Law a long lease on life.

"Because Intel works hard on it, new, computing-hungry applications are emerging every day," said Xian-He Sun, professor of
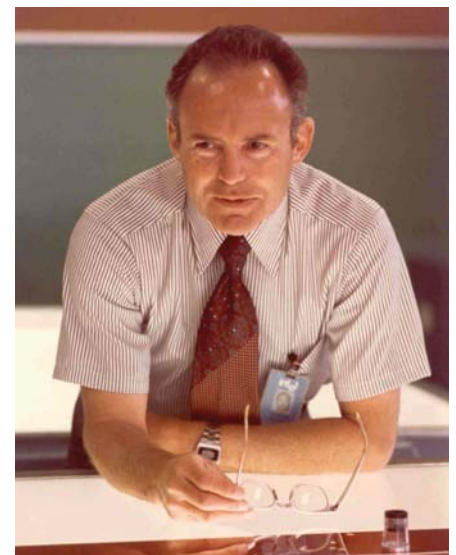
computer science at the Illinois Institute of Technology in Chicago.

But it is becoming difficult to etch an increasing number of features on ever-smaller chips, which are increasingly susceptible to a wide range of errors and defects. More attention is required in designing and making chips, and additional processes and personnel need to be put in place to prevent errors.

In addition, with research under way into new materials and technologies, silicon may be on its way out, a change that could fundamentally transform Moore's Law. There's a lot of interest in a family of so-called III-V materials – compounds based on elements from the third and fifth columns of the periodic chart – such as gallium arsenide or indium gallium arsenide.

"Moore's Law is morphing into something that is about new materials," said Alex Lidow, a semiconductor industry veteran and CEO of Efficient Power Conversion (EPC).

EPC is making a possible silicon replacement, gallium nitride (GaN), which is a better conductor of electrons, giving it performance and power-efficiency advantages over silicon, Lidow said. GaN is already being used for power conversion and wireless communications, and could make its way to digital chips someday, though Lidow couldn't provide a timeline.

"For the first time in 60 years there are valid candidates where it's about superior material rather than smaller feature size," Lidow explained.

The economics of manufacturing smaller and faster chips are also tumbling. It's getting more expensive to make advanced factories, and the returns on making those chips are diminishing. Important tools like EUV (extreme ultraviolet) lithography, which transfers circuit patterns onto substrates, would make it possible to shrink chips to even smaller sizes but aren't yet available.

"The semiconductor has always faced challenges, which have been speed

bumps. Now we're going up against a wall," argued Jim McGregor, principal analyst at Tirias Research.

Experts can't predict where Moore's Law will be years from now, but it will eventually fall as the physics and economics of making smaller chips no longer make practical sense. Nevertheless, the legacy of Moore's Law will live on as a model for bringing down the price of components, which leads to cheaper devices and computers, McGregor said.

Moore's 1965 article ushered in an era of ever-increasing technological change. "We've taken servers the size of a room down to a mobile chip. It's amazing what we've done in that period of time," McGregor added. ⊠

How Intel could prolong Moore's Law with new materials, transistors

Intel could start using new materials and a new transistor structure in upcoming chips, says Agam Shah

As questions persist about the longevity of Moore's Law, an analyst has predicted some specific ways that Intel will keep it going for at least the next few years.

Intel can continue to pack smaller transistors on its chips by using exotic materials and a new transistor design described by David Kanter, an analyst at Linley Group, in an article he published recently.

Intel currently manufactures chips using a 14-nanometer process, and is preparing its move to 10nm later this year or early next. The number refers approximately to the smallest circuit dimensions etched on each chip, and smaller circuits mean faster chips and less power use.

The new techniques could allow Intel to ensure the continuation of Moore's Law, which recently turned 50, until at least the 7nm process, which Kanter estimates will come into production in 2017 or 2018.

As mentioned in the previous article, Moore's Law predicts that transistor density will double approximately every two years, allowing chips to get progressively faster and cheaper. But with transistors reaching atomic scale, electricity leakage and power management become more challenging.

Intel has introduced technologies such as strained silicon, high-k metal gate and FinFET
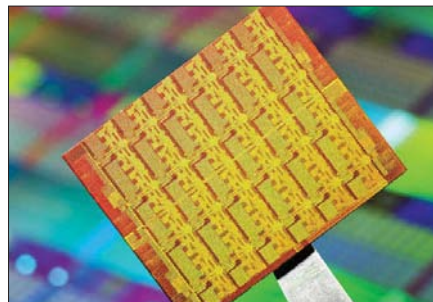
– in which transistors are built upward in a 3D fashion instead of laying flat – to keep Moore's Law going.

In the coming years, Kanter predicts it will combine silicon with materials such as strained germanium, or indium-gallium-arsenide, which is part of a family III-V materials based on elements from the third and fifth columns of the periodic table.

The III-V materials are being considered as eventual successors to silicon because they are better conductors of electrons. Initially, the materials are expected to be used alongside silicon. Intel is already using alternatives such as hafnium in its chips.

Also likely for future chips is a new transistor and gate structure based on quantum-well FETs (QWFETs), which Intel has been researching for a little under a decade. Here, electrons are sandwiched between III-V materials and gates on each side, ensuring

the electrons move in the right direction. The behaviour of the charge becomes tightly controlled by the combination of the geometry and materials, and as a result transistors perform better.

Intel declined to comment on Kanter's study. But the company has talked about the viability of QWFETs and III-V materials, and the feasibility of building chips based on the new transistor structure.

Kanter said that the new technologies are the best options available for cramming still more transistors onto chips.

Other required technologies, such as EUV (extreme ultraviolet) lithography, are not yet available from tool makers. Intel has instead taken to techniques like triple-patterning to make sure it can create chips with fewer defects. It ran into trouble with its 14nm process, which led to a delay in the shipment of chips for PC, mobile and servers.

Kanter said he published his predictions in part because he feels its the job of industry analysts to make specific, insightful forecasts, rather than vague guesses. "Simply saying that a new process technology will be better is vacuous," he said.

"In reality, it will take months or years for Intel and the rest of the industry to reveal their plans for 10- and 7nm," he wrote. "In the mean time, this speculation should lead to some interesting discussions." ⊠

Microsoft's Lumia deal, one year on

A year later, Microsoft's Nokia deal isn't a clear winner, says Mikael Ricknäs

MICROSOFT LUMIA 640 XL LTE

It was a marriage of convenience for two industry giants whose past successes weren't helping them win in the red-hot smartphone market. One year later, it's hard to say that Microsoft's acquisition of Nokia's device business has produced the results its backers envisioned.

In the wake of the $7.2 billion acquisition, Lumia smartphones and the Windows Phone OS are still running into many of the same market roadblocks.

But Microsoft isn't throwing in the towel, and has high hopes that its phone business will get a major boost from Windows 10, which is meant to create an environment where users can move easily between desktops, tablets and their smartphones.

That Microsoft's smartphone adventure is a work in progress was highlighted recently, when CEO Satya Nadella said during the quarterly earnings call that device-related costs have to be cut more, ahead of the arrival of Windows 10. However, Nadella also revealed that Microsoft sold more Lumias in the quarter than it did a year ago.

There has been speculation that Nadella was never a fan of the deal, brokered by his predecessor Steve Ballmer. But it seems the new CEO is giving it a go, betting, at least for now, that the acquisition can fulfil its goals: to make Microsoft a credible player in the mobile OS and smartphone device markets, able to give major players like Apple, Google and Samsung a run for their money.

Yet Nadella has his work cut out for him. Microsoft still isn't selling enough devices; not enough large manufacturers are backing its operating system; and Windows Phone apps are an afterthought to most developers.

On the hardware side, Microsoft frantically focused on launching affordable smartphones, including Lumia models 430, 535, 640 and 640XL, all of which cost between £50 and £170 without a contract.

The strategy makes sense on paper because the low-end segment is growing faster than other parts of the smartphone market. Also, consumers in emerging markets – the target audience for these devices – aren't as wedded to smartphone brands, user interfaces and ecosystems as their counterparts in the US and Western Europe. But the competition in this segment is fierce and Microsoft is up against a multitude of Android-based smartphones.

In the wake of Microsoft's $7.2 billion acquisition, Lumia smartphones and the Windows Phone OS are still running into many of the same market roadblocks

Windows Phone's market share sits below 3 percent, despite the low-end Lumia push, growing enterprise interest in the operating system and adoption by a number of small smartphone vendors. To secure the future of the OS, Microsoft needs to increase the share to at least 10 percent, according to Ben Wood, chief of research at CCS Insight.

"In our forecasts, we don't see anywhere near that level in the next three years, which underlines the scale of the challenge Microsoft faces," Wood argued.

Complicating matters is the decline in shipments of the Nokia feature phones Microsoft also acquired.

To significantly boost Windows Phone sales, Microsoft needs to sign big partners that can sell millions of devices per quarter. Getting them onboard is one of many things Windows 10 is expected to help with, and there is some positive momentum.

The operating system will feature an updated user interface and a host of improved applications, such as the new Spartan browser. It also provides more integration between PCs and smartphones, including the ability to see notifications across different devices.

Chinese vendor Xiaomi recently announced that some users of its Android-based smartphones will be able to test Windows Phone 10 by installing it on their phones. Getting Xiaomi onboard would be a big win for Microsoft. The company has become one of the world's biggest smartphone manufacturers, even though it doesn't sell its products in Europe or the US.

Microsoft has struggled to get the biggest smartphone vendors to back the OS. For example, Samsung has only launched two Windows Phone devices in the past two

MICROSOFT LUMIA 535

SAMSUNG ATIV S

years, and it didn't give them anywhere near as much marketing support it gives its Android smartphones. Samsung declined to comment on its plans for Windows 10.

One smaller vendor backing Windows Phone is Florida-based Blu Products, and while its CEO Samuel Ohev-Zion is very critical of the Nokia acquisition, he has high hopes for Windows 10 and its expected ability to attract more users and developers.

The deal overvalued Nokia's assets, he said, because it has become much easier to develop smartphones. And not getting the valuable Nokia brand as part of the acquisition was a big mistake, he added. Microsoft has been using its own brand on Lumia smartphones since October.

Windows 10, on the other hand, is going to be groundbreaking, Ohev-Zion predicts. The biggest turnoff with the current version of the operating system is that users aren't familiar with the interface and don't understand how it works. But that will change with Windows 10, because the experience on PCs and smartphones becomes more similar, he argued.

Microsoft is also doing the right things from a software development perspective, according Ohev-Zion. With Windows 10, developers will be able to build so-called universal apps for PCs, tablets, the Xbox game console and smartphones. That will help open up the platform to a much larger developer audience, he said.

The launch of Windows 10 is expected to be followed by the arrival of Microsoft's first high-end

smartphones. The company will make sure it has products in this market segment, but making a dent is very difficult, thanks to Apple's and Samsung's dominance, according to Christophe Francois, vice president of strategy and business development at telecom operator Orange.

"You have to be persistent, and invest quite a lot to establish a strong foothold. But it's clear that with Microsoft's ambitions, it's something it has to do," explained Francois.

Orange has seen products such as the Lumia 635 and the Lumia 530 – both of which use the Nokia brand – sell well, and help increase Windows Phone's market share among its subscribers significantly. To build on that, Microsoft has to work to improve its own brand, according to Francois.

In Finland, many families won't be celebrating the deal's one-year anniversary, following the thousands of jobs Microsoft cut in Nokia's operations. At the time, the Finnish finance minister Antti Rinne said that Microsoft had betrayed Finland.

There was some expectation the deal would be more of a joint venture, but it has most definitely been a Microsoft takeover, according to Wood.

However, some of these workers may be able to get jobs next year when Nokia will once again be able to produce smartphones. The company is said to be planning a comeback using Android. For now, though, Nokia is denying it currently has any plans to manufacture or sell consumer handsets.

Meanwhile, for Microsoft, the next 12 months will determine whether the Nokia deal goes down in corporate history as a success or a failure. ⊠

Google makes mobile websites more app-like

Chrome push notifications are coming, with eBay and Facebook soon taking advantage of the feature. Mikael Ricknäs reports

Google has taken a big step in its efforts to make mobile websites act more like native applications on Android smartphones, by adding notifications to its browser.

One of the most convincing arguments for building an application instead of a website has been the ability to send notifications to users. Google is hoping to narrow that advantage by adding the feature to version 42 of its Chrome browser for Android.

As a result, Android developers no longer have to decide between the engagement potential of a native app and the reach of a mobile website, Google said in a blog post.

For users, the notifications will look and act as those sent from applications. They still show up in the notification tray, but a click takes users to a website instead of an app. Users still have to opt in before a website can send them any messages.

Over the coming weeks, early adopters such as eBay, Facebook and Pinterest will start sending notifications, according to the search giant.

What notifications offer was a major theme at a recent event organised by the Online News Association in London. While they offer the opportunity to engage more closely with users, they are also the easiest way to get them to uninstall an app if not done right. It's important to be upfront with how many notifications will be sent and what they will cover, and then stick to that, speakers at the event said.

Companies such as Roost and Mobify are providing services that aim to make it easier for developers to integrate push notifications with their sites. The former allows companies so use its dashboard, its APIs and its WordPress plug-in to send notifications to Chrome users on Windows, Mac, and now Android, it said in a blog post.

This upgrade is part of a larger effort by Google to make mobile-optimised websites look more like installed apps when using Chrome. The upgraded version also lets developers add a pop-up banner that users can click on to add the site to their home screen. Other changes include full offline support, and access to device capabilities such as the camera and geolocation, according to Google. These new features will continue to improve and evolve over time, removing the difficult choice for developers between the reach of the mobile web and the engagement of native apps, it said. ⊠
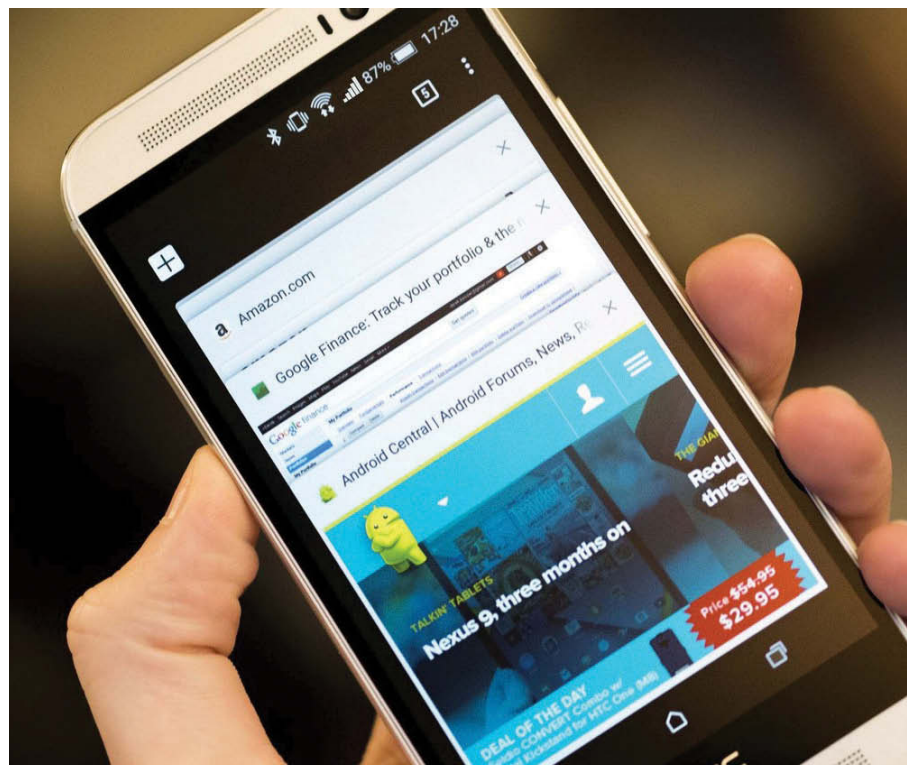
LG G4: initial thoughts

The LG G4 wins on flexibility, loses on design, says Mikael Ricknäs
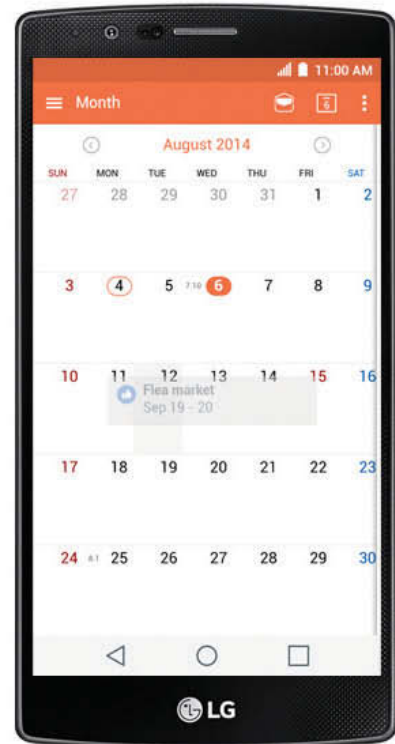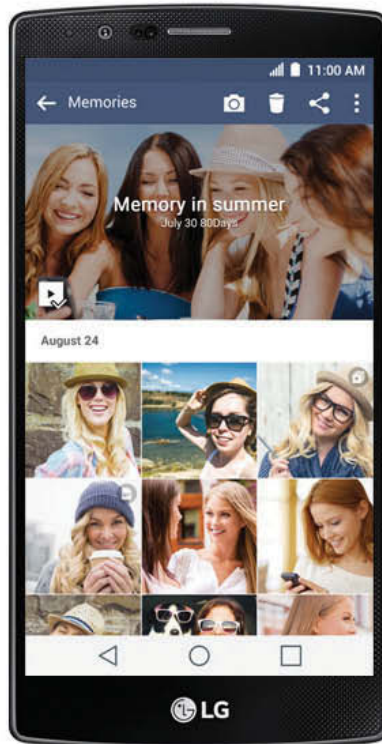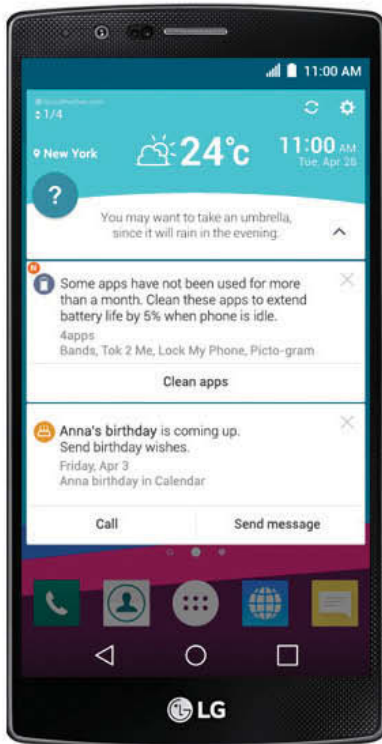
LG Electronics' G4 is a high-end smartphone with a removable battery and a microSD card slot, though its design falls short when compared with other expensive devices.

Last year, LG had a hit with the G3, thanks to its high-resolution screen and aggressive pricing, but the company may have trouble replicating that success with the G4, announced recently.

The phone has a 5.5in, 2560x1440-pixel screen and a Qualcomm Snapdragon 808 processor, which isn't as powerful as the Snapdragon 810. LG believes the Snapdragon 808 offers a better balance between performance and power efficiency. The G4 feels fast enough, so the company might be on to something, and the screen looks impressive.

However, a high-end smartphone today needs good specs and a premium design so consumers feel they have gotten their money's worth.

The G4's design is hit-and-miss. Its leather back looks good, especially in black, brown and red, but the material on the side disappoints when compared with competing products. Still, the leather gives the phone a pleasant texture, and makes it less slippery

than smartphones with glass or metal backs. For users who don't want a leather smartphone, an alternative model uses a mixture of ceramics and polycarbonate, but it unfortunately looks cheap. Another disappointment: the G4 is bigger and heavier than the G3.

What LG does get right is the big, replaceable 3000mAh battery, and the

REMOVABLE BATTERY AND MICROSD CARD SLOT

option to add storage using a microSD card slot. However, it wouldn't have hurt to offer a model with 64GB of integrated storage, along with the existing 32GB version.

LG is also giving consumers more choice when using the 16Mp main camera, such as the option to save photos in a RAW format, in addition to JPEG. A new manual mode lets users control the focus, shutter speed, ISO and white balance. It remains to be seen whether these features will attract a significant number of buyers, but it's a step in the right direction.

The smartphone started its global rollout in South Korea, and at the time of writing was expected to go on sale in Europe and the US at the end of May. In the UK, the G4 will cost £500 or £525 without a contract.

Overall, the G4 is a solid, incremental upgrade over the G3, but, like other expensive Android smartphones, it will face intense competition from new mid-range models, which have improved a lot, and from last year's discounted high-end smartphones, such as LG's own G3. As a result, buyers weighing their options may balk at paying more than £400 for a phone or at signing an expensive contract, especially if a great camera isn't a must. ⊠

Samsung working on wearables and VR headset for business

Enterprise wearables will be important but face some obstacles. Agam Shah reports

Samsung Electronics wants to make work fun and productive with its wearable devices and virtual-reality headset, and it thinks those devices will become more important in enterprises.

The tech giant is currently selling smartwatches and the Gear VR headset mostly to consumers, but it is exploring the use of wearables in business with some companies. It's also working with developers to write applications, which are important for smartwatches, and also developing content, a key driver for headsets.

Businesses are interested in smartwatches for alerts and immediate access to critical information, while VR headsets are drawing attention as a potentially powerful way to present multimedia content, explained Eric McCarty, vice president of mobile marketing, at a Samsung event in New York.

But both types of devices may also present challenges. For smartwatches, those could be security and weaving them into BYOD programs. Samsung may integrate a security layer if it develops an enterprise-focused wearable, much like it has in its Galaxy smartphones and tablets with the Knox platform, McCarty revealed.

For a VR headset, the challenges relate to the development and delivery of new content, which will be unique for different businesses and industries.

Samsung proposed some business uses for smartwatches and said there has been interest from the finance and hospitality industries. Day traders, for example, could use smartwatches to get alerts on stock prices or make trades on a timely basis. Field service workers could get job alerts while on the road.

In restaurants, smartwatches could be a more efficient way to send service notifications to staff. These could be received from a server or ordering system via a Bluetooth or 3G connection. Samsung sells its Gear S smartwatch with 3G connectivity, so the devices don't necessarily have to be an extension of the smartphone.

The Gear VR headset could be used for training videos in enterprises, or by estate agents to give virtual tours of homes. There's also an active interest in VR headsets for entertainment on planes, McCarty revealed. The most interest in headsets is coming from the automotive industry.

But the use of Gear VR is only as good as its multimedia content, which is unique to each company. There are questions around who will develop it and how that content will be deployed.

It will take years of experimentation to figure out how wearables fit in the enterprise, said Bob O'Donnell, principal analyst at Technalysis Research.

Wearables will be useful for those who prefer hands-free computing. A electricity worker fixing a line on a pole may find it convenient to access information through a wearable rather than a smartphone or tablet.

"You have to have a pretty robust and rugged device. Consumer-grade stuff isn't really going to cut it," O'Donnell argued.

Beyond reminders and alerts, wearables could also be accessories for office workers. Wearables could replace card keys and even serve as pointers while making a presentation.

Device makers may even design custom wearables for companies. Those will be higher priced, small volume and specialised devices, according to O'Donnell. ◻

EE Wi-Fi Calling solves poor mobile signal

Wi-Fi Calling means you can make calls and send texts without a mobile signal.
Chris Martin **explains how to get it and which phones are compatible**

I f you struggle with poor reception at home your options are limited. One is to get hold of a signal booster box, but these aren't always freely available. However, EE has introduced a new service called Wi-Fi Calling, which allows you to route calls through your router and the internet to solve the problem with no additional hardware.

What is Wi-Fi Calling?
Although Three and O2 offer similar services (InTouch and TuGo, respectively), these require apps and therefore keep calls and texts separate from your regular ones. The same is true of Skype and WhatsApp. EE's new Wi-Fi Calling is different – it's built into the phone and allows you to make calls and send text messages even when there is no mobile signal. This means if you're on the London Underground or you live in an area with poor network coverage, you can still carry on using your phone like normal.

Which EE customers are eligible for Wi-Fi Calling?
It's currently available to those who pay monthly, and small business customers. Corporate 4G clients will be able to sign up for the service in the summer.

Which smartphones work with EE Wi-Fi Calling?
At the time of writing, the Lumia 640, Galaxy S6 and Galaxy S6 Edge were the only devices with the feature. More models will, of course, be added to this list. For example, EE has committed to bringing Wi-Fi Calling to the Samsung Galaxy S5 and has confirmed that some iPhones are compatible.

You'll need to purchase your handset from EE to have the correct software. Putting an EE SIM in your existing unlocked phone won't automatically add the feature.

Can you get EE Wi-Fi Calling on an iPhone?
If you've upgraded your EE iPhone to iOS 8.3 the new software includes Wi-Fi Calling. It's compatible with iPhone 6, 6 Plus, 5s and 5c. To get started, go to Settings > Phone > WiFi Calls and switch on 'Allow WiFi Calls'. EE will then give you provision within a day.

Note: If you've installed iOS 8.3 but still can't the Wi-Fi Calling option, try updating the Carrier settings on your phone – it should be 19.1. Head to Settings > General > About.

How do you use EE Wi-Fi Calling?
Your phone from EE should come with a sticker on the box explaining what to do, but you can text 'wifi calling' to 150 to set it up. You might also need to head into the settings of the dialler app to switch it on. You'll get a new symbol at the top of your phone, but you may not even know you're using Wi-Fi Calling.

Once you're set up, you simply use your phone as normal – the calls and texts come out of your allowance and don't appear on your bill any different. There's no need to use anything apart from the regular dialler and messages app. Ring or call someone as per usual and if there's no mobile signal, the phone will use a Wi-Fi connection instead.

Note that the other person doesn't need Wi-Fi Calling for it to work as only your end of the communication requires Wi-Fi. A quick ping test will check if the connection is good enough to handle the call but, for now, the call will drop if you lose the Wi-Fi connection. The service doesn't yet have the ability to switch from Wi-Fi to mobile network. ⊠

Snapdragon 820 chip could be made by Samsung
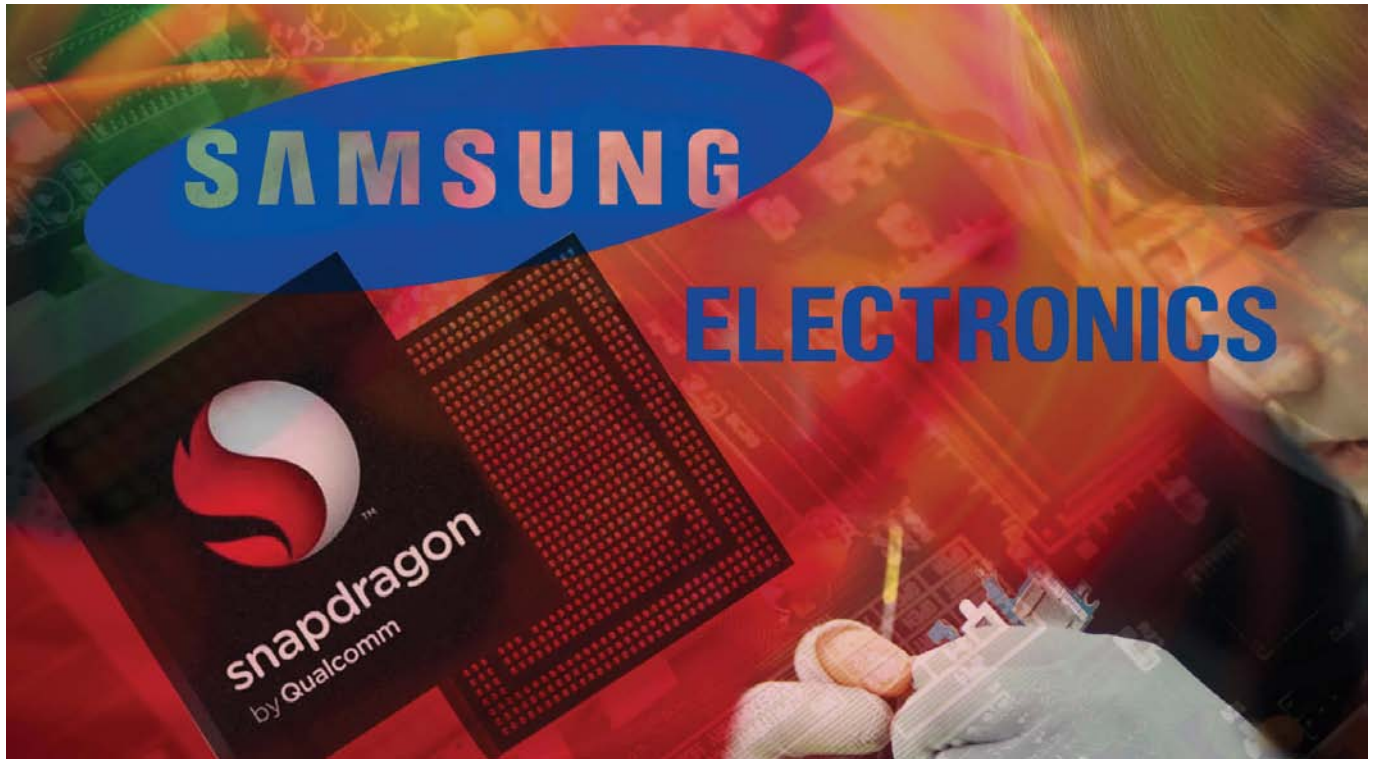
Qualcomm is looking to fast-track Snapdragon 820 with help from Samsung, reports Agam Shah

A plan by Qualcomm to get Samsung Electronics to make its Snapdragon 820 chip could lead to faster smartphones, offering longer battery life by early next year.

The chip company will get its top-line device manufactured in factories belonging to Samsung, according to a news report by Re/code. The South Korean company will make the Snapdragon 820 chip using the 14-nanometer process, which will also be used to make Apple's next A9 chip.

The Snapdragon 820 chip was announced in March and is expected to start shipping later this year. Qualcomm hasn't shared information about where it will be manufactured, but Samsung's 14nm process will provide big performance and power advantages over current Snapdragon chips.

The move to 14nm process means that users may be able to buy smartphones with Qualcomm's latest chips quicker than expected, said Jim McGregor, principal analyst at Tirias Research.

An advanced manufacturing process will help pack more features on a smaller chip. Qualcomm will be able to integrate more multimedia and wireless features on the chip.

Identify users

Snapdragon 820 will have the ability to recognise users and learn about users' habits over time. The chip has already been shown to identify users in real-time, and adapts many features from Zeroth, a machine learning hardware and software platform developed by Qualcomm.

The Snapdragon 820 will succeed the Snapdragon 810 chip, which had issues and was dropped by Samsung from its Galaxy S6 smartphone. That hurt Qualcomm's revenue projections, and Samsung instead turned to its homegrown Exynos chip for the flagship smartphone. However, the Snapdragon 810 has appeared in flagship smartphones like HTC's One M9 and Sony's Xperia Z4, and is also expected to be in LG's G4 handset (see page 19).

Qualcomm wants to quickly move to the Snapdragon 820, and Samsung is one of the few options to get the chip manufactured, analysts said. The Snapdragon 810 chip was made by Taiwan Semiconductor Manufacturing Co. (TSMC) on the 20nm process, but the foundry company isn't ready for the 14nm process.

Moreover, Samsung is investing a lot in its factories, so there won't a shortage of Snapdragon 820 chips, according to McGregor. Qualcomm in the past has had to deal with shortage in chip supplies due to manufacturing issues at TSMC.

Qualcomm could also win back some key smartphone contracts. The Snapdragon 820 could make its way into Samsung's next Galaxy flagship smartphone, argued Patrick Moorhead, principal analyst at Moor Insights and Strategy.

The Snapdragon 820 redefines high-end chips, and it will be difficult for off-the-shelf designs like Exynos to be competitive in terms of features, Moorhead added. ⊠
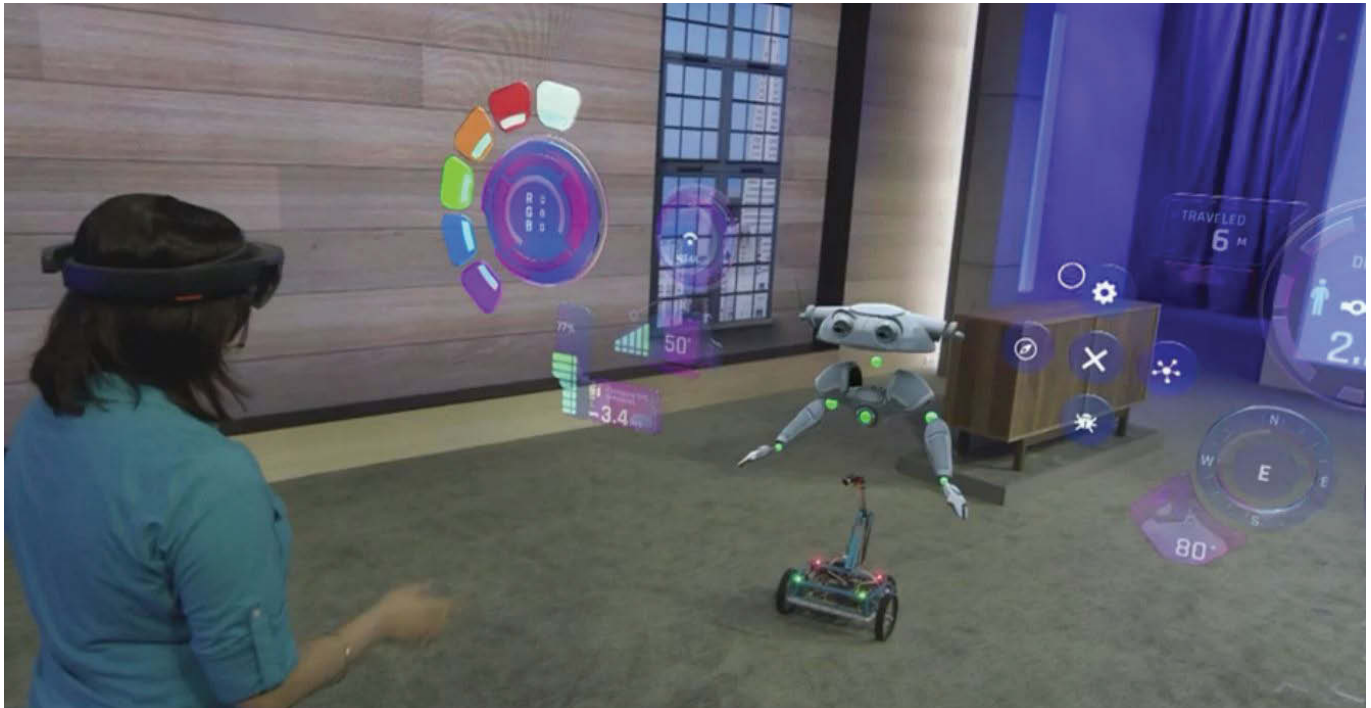
Microsoft's reveals future of its HoloLens headset

Microsoft claims that its HoloLens could help makers simulate Raspberry Pi 2 robots or gadgets in real life environments. Agam Shah reports

Microsoft says its HoloLens head-mounted computer can bring robots and gadgets based on Raspberry Pi 2 to life as they are being developed.

HoloLens is an augmented-reality headset that allows users to interact with 3D objects that show up as floating images, much like holographic projections. By blending computer-generated images with a user's view of the real world, Microsoft wants to change the way we interact with the environment.

Microsoft also believes that the HoloLens can bring a new level of interactivity to enthusiasts making gadgets, robots or appliances using developer boards such as the Raspberry Pi 2. It could, for example, help makers envision how a gadget would look or how a robot would behave.

The headset could also change the way makers test products with boards such as the Raspberry Pi 2. With it, developers could gather sensor data and virtually control gadgets and robots in real-time, which is a critical part of testing and prototyping before a final product is released.

HoloLens could change the way physical things are developed, especially for makers,

who'll get to see first-hand what they are developing, said Alex Kipman, technology fellow in the operating systems group at Microsoft, during a speech at the Build conference in San Francisco recently.

In an on-stage demonstration at Build, HoloLens overlaid a holographic robot named B15 on top of a physical one made using Raspberry Pi 2. The HoloLens also displayed a control panel showing how far the robot travelled, its remaining battery life and wireless connection, its temperature, and other variables. The headset was able to pull the data from the robot in real-time, and users could control the robot through a holographic interface by waving their hands.

Another feature is the ability to recognise objects and environments. The HoloLens demonstrated at Build could scan points in 3D space and visualise the robot's movement path, which helped it pass navigation commands to B15. That was particularly helpful as the robot didn't have the sensors to understand the room's environment. Boards such as the Raspberry Pi 2 don't have weather, light or movement sensors built in, but they can be added through expansion ports.

As environments change and there are unforeseen obstacles, HoloLens could help robots change path. That is important when working with bigger robots in the automotive field and other areas, according to Microsoft.

HoloLens already runs Windows 10, and the developer board would need to support that OS. Raspberry Pi 2, Intel's Galileo and Microsoft's Sharks Cove are among the few that will run Windows 10.

Every Windows 10 device has APIs for developers to work with sensors, Microsoft says. The company has been incorporating a universal sensor driver set so Windows 10 can exploit a slew of environmental, biometric, proximity and motion sensors on devices.

The holographic robot, control panel and robot movement path overlays demonstrated were Windows 10 applications and part of the Windows Holographic developer platform. Hardware hackers are known for tweaking circuit boards, not writing applications, so they may need to pick up some more software development skills.

Microsoft hasn't announced the shipment date or price for HoloLens. ⊠

CHRIS
MARTIN

Microsoft Surface 3

Tablet

The new Surface tablet from Microsoft comes with full Windows 8.1 and Intel's latest Atom x7 processor. The screen is smaller at 10.8in, so it's also lighter than the Pro model, weighing in at 622g. You can choose up to 128GB of storage and 4GB of RAM plus 4G LTE connectivity if you like.
£419 inc VAT (Type Cover and pen sold separately)
microsoft.com/en-gb

LG G4

Smartphone

A little later than its flagship rivals, the LG G4 is here and leather-bound, although a polycarbonate ceramic model is also an option. It's the first phone we've seen with a Snapdragon 808 processor and has a new IPS Quantum display with a quad HD resolution. It also has a new 16Mp camera with an f/1.8 aperture.

£500 inc VAT
lg.com/uk

Kobo Glo HD
E-reader

Kobo's new e-reader aims to be the highest resolution on the market at the lowest price, and it does undercut the Kindle Voyage. With 1072x1448 pixels on a 6in screen, the Glo HD is 300ppi and has a touchscreen and built-in ComfortLight. It weighs 180g, is 9.2mm thick and has space for 3,000 books.
£109 inc VAT
kobo.com

Denon AH-GC20s Global Cruiser
Headphones

Denon's latest pair of cans are aimed at those on the go, with active noise cancelling and Bluetooth connectivity. The headphones have AptX codec support and can pair with two devices simultaneously. A cable is also included in case you want to plug in the traditional way.
£249 inc VAT
denon.co.uk

Acer Aspire R11
Laptop/tablet hybrid

The onslaught of convertible devices continues and Acer has gone for a 360-degree hinge design for its R11. Folding the screen all the way around means four different modes are available. Inside the plastic shell is an 11.6in screen, an Intel Pentium or Celeron chip, and up to 1TB of storage.
£299 inc VAT
acer.co.uk

Razer Nabu X
Activity tracker
The Nabu X is a simple smartband with three customisable-colour LEDs and a cylindrical vibration motor for discreet notifications. The sensor is detachable from the band and is IP67 waterproof. You can shake hands with other Nabu wearers to exchange info and play multiplayer games.
£44 inc VAT
razerzone.com/gb-en

Acer Iconia One 8
Tablet
The tablet market has slowed down significantly but Acer has a new one to tempt those on a budget. The Iconia One 8 is cheap and cheerful and runs Android 5.0 Lollipop. You'll get an 8in IPS screen, an Intel Atom processor and expandable storage.
£139 inc VAT
acer.co.uk

Acer Aspire Switch 10 E
Tablet/laptop hybrid
This updated hybrid Aspire Switch 10 has an 'E' in the name. That means it's plastic but there is a model with a Gorilla Glass rear cover. There is a removable keyboard dock and a 10.1in IPS screen. It also features an Intel Atom chip and dual cameras.
£279 inc VAT
acer.co.uk

Huawei P8
Smartphone
To take on the likes of Samsung, HTC and Apple, Huawei has introduced the P8 which is 6.4mm of metal slenderness. It comes with a 5.2in full-HD screen, Kirin octa-core processor, dual-SIM card slots and a 13Mp rear camera with 'no bump'.
€499 (£357)
huaweidevice.co.uk

£1,099 inc VAT

Contact
■ dell.co.uk

Specifications
13.3in (3200x2000) IPS 16:9 screen; 2.4GHz Intel Core i7-5500U 5th-generation Broadwell chip; 8GB RAM; 256GB SSD; 2x USB 3.0; Mini-DisplayPort; headset jack; SDXC; Noble lock slot; webcam; 52Wh lithium-polymer battery, non-removable, 6 hours 12 minutes tested battery life; 304x200x15mm; 1.3kg

Build: ★★★★½
Features: ★★★★☆
Performance: ★★★★½
Value: ★★★☆☆

★★★★☆

LAPTOP

Dell XPS 13 9343

The XPS 13 9343 follows a long line of similarly named laptops. The last time this reviewer tested the XPS 13 was in 2009, when the Dell Studio XPS 13 was a well executed 13in notebook with an SSD. Over the intervening six years, the Apple ultraportable Air became the template for 13in notebooks, while the new XPS has shed its 2.2kg puppy fat to become a 1.3kg Ultrabook. And the once 34mm-thick brick is now little more than 17mm, tapering to 15mm at the front.

Dell has raised its game in construction technology, and the XPS 13 now takes precision-machined alloy for both top and bottom sections. Carbon-fibre composite is not new for a Dell notebook, but here we see it applied right across the middle section, making up a top deck area in nicely figured woven material, finished with a smooth rubbery coat that feels more organic to the touch.

Ports and physical connectivity options are minimal. There's a USB 3.0 port on each flank; then DC charge inlet, Mini DisplayPort and headset jack on the left. An SDXC card slot, and what looks like a Kensington lock slot (but Dell calls a Noble lock slot) lie to the right. We understand the proprietary terms are now interchangeable.

Prising open the lid to get going could be easier, since there's no sufficiently sized cutout in the body to push in your thumb or finger to separate lid from lower. Once you have broken in, you find an all-black deck and screen. With the display switched on, only a very small edge remains black. In fact, the bezel is 5mm along the top, and 5.4mm wide on the sides.

At time of writing, Dell UK is offering four different models with either Intel Core i5-5200U (2.2GHz), Core i7-5500U (2.4GHz) or Core i7-5600U (2.6GHz) processors. Each of these chips has integrated Intel HD Graphics 5500, with 300- to 900MHz clock speed. Note that all these ultra-low power mobile chips are dual-core only.

Memory is fixed at 8GB, with no option at present for more or less. And since it's soldered to the motherboard, it's 8GB for life. That ought to be enough for typical users of an ultraportable laptop, unless you run more memory-intensive programs such as creative graphics.

Storage can be any size you like, so long as you like either 256- or 512GB. Our sample had a 256GB M.2 drive from Samsung, albeit still only SATA-connected so some way behind the state of the art.

The keyboard and trackpad both worked mostly well, excepting an issue with the apostrophe/double-quote key. This would sometimes fail to print a character, or else double print when pressed harder to make any mark at all. The trackpad was better than those found on many Windows laptops. The touchscreen worked as a touchscreen, with usual flex and wobbles in use.

Performance

Simple synthetic benchmark tests quickly established the Dell XPS 13 to be a fast mover. In fact perhaps too fast, given the limited cooling strategies available to the design team with such a thin chassis.

Whether it was the integrated graphics working overtime to drive a higher number of pixels or the thermal envelope of the chip in too tight a space, we don't know, but the XPS 13's single fan was inclined to rev into audibility for no apparent reason. And that's with the laptop set to its default Dell power saving mode in Windows Power Options.

One doesn't expect to report any good news when it comes to Windows gaming on an ultraportable. But applying Intel's new tech, the Dell XPS 13 may be the first ultraportable where we can be satisfied that gaming is possible, and beyond the usual the lowest res/lowest detail caveat, too.

Batman: Arkham City game showed that framerates of 40fps were possible, and at High detail, playing at 1280x720 resolution. Moving up gradually to 1366x768, we averaged 35- and 39fps at High and Medium detail settings. So we ratcheted the resolution even higher, to 1600x900 and then 1920x1080, where we recorded scores of 31- and then 23fps (Medium detail).

In key respects, the 3200x1800 display passed our screen tests with flying colours. Measured with a Datacolor colorimeter, it could stretch to 99 percent of the sRGB colour gamut, and 75 percent of Adobe RGB. Colour accuracy was very good, with Delta E values between 0.62 and 5.62, averaging 3.47, in a 48-colour test.

Contrast ratio was also exemplary for a notebook screen, reaching 710:1 at full brightness. The full brightness may be a little limited for some tastes and environments though – we couldn't get any higher than 225cd/m². That's bright enough for us, but some like to use their laptop outside or in very high light levels where this display might get a little swamped by ambient light.

The internal flash storage proved averagely quick for its type, hitting sequential reads and writes of 493- and 238MB/s respectively. Single-threaded 4kB random reads and writes amounted to 21- and 46MB/s, while peak IOPS was found with 32-thread reads at 88,900 IOPS.

Battery life was not bad, if well short of Dell's 11-hour claim. We ran our MPEG-4 HD film over Wi-Fi with the screen set to 120cd/m², where we recorded six hours 12 minutes.

Verdict

The XPS 13 9343 stands as a shining beacon in the world of Windows laptops that outdoes the competition in key respects such as screen quality and near-borderless display. ⊠ **Andrew Harrison**

Specifications
15.6in (1366x768) TN gloss touchscreen; 2.4GHz Intel Core i7-5500U (2C, 4T); Intel HD Graphics 5500; 8GB 1600MHz DDR3 RAM; 750GB 2.5in SATA HDD; gigabit ethernet; 802.11b/g/n single-band (Qualcomm AR946x); Bluetooth 4.0; tray-load DVD ± RW drive; 1x USB 3.0, 2x USB 2.0; HDMI; Kensington lock slot; SDHC card slot; stereo speakers; 0.3Mp webcam; built-in mic; 3.5 mm headset jack; UK tiled, black with white italic san-serif caps; 104x73mm, buttonless trackpad; 38Wh lithium-ion, non-removable; 45W wall adaptor; 380x260x27.5mm; 2618g

Build: ★★★☆☆
Features: ★★★½☆
Performance: ★★★½☆
Value: ★★★☆☆

★★★☆☆

LAPTOP/TABLET HYBRID
Asus Transformer Book Flip TP550LA-CJ127H

Asus may have been swept along by Microsoft's dream that people want laptops that can be bent back into huge and clunky tablets. That's what the arrival of the new Asus TP550LA-CJ127H seems to be telling us. It's a 15.6in lump of laptop that can transform itself in a trice into a touchscreen tablet, albeit one that still weighs 2.6kg.

Lift the heavy tablet lid of the TP550L and you find an all-plastic laptop that is trying to pass itself with having metal construction. The silver-painted plastic top deck borrows cues from high-quality products, keeping the extraneous buttons-and-lights count low.

There's a large tiled keyboard in black with white italic-capital typography, and a number keypad to the right to help fill the width of the chassis. This keyboard works accurately and we found it would allow fast, accurate typing.

Below is an Apple-style buttonless trackpad that tracks mouse pointing by finger accurately enough, although its mechanical click does make a resonate plastic quack from the flexing case.

On the right of the laptop/ tablet is a tray-load optical drive, able to read and write to DVDs and CDs, but not Blu-ray. Two USB 2.0 ports dwell here, but if you need high-speed connectivity you'll need to turn to the left side to find a solitary USB 3.0 port. This sits between an SD card slot and HDMI port, with trap-door gigabit ethernet port and 3.5mm headphone jack completing the port array. Note that the card slot is specified up to SDHC cards only, meaning a maximum 32GB capacity.

Surprisingly the main power button is at the front of this line, alongside a volume rocker button. The positioning of these makes more sense when the screen has been wrapped around the back and you're trying to use the TP550L in its tablet mode, but they're handily placed for laptop use too, once you've remembered where they are.

The display is a low-resolution shiny gloss panel with nothing in the way of reflection-reducing coating. Here the two-in-one aspect reveals the double duty as personal mirror under most lighting conditions.

Confounding its usability much further though, is Asus' choice of low-grade TN technology panel. Besides its poor colour reproduction and lousy contrast ratio (just 62 percent sRGB, and 80:1 contrast ratio, in our lab tests) it has abominably narrow viewing angles. That's bad enough news for a laptop; but an effective deal breaker for any device with tablet pretensions where you'll be routinely viewing from different sides.

Used as a laptop touchscreen, it wobbles in a disconcerting fashion whenever you tap with your finger, eventually settling down after a few seconds' oscillation.

The Asus TP550L is powered by a 2.4GHz Intel Core i7; not the usual quad-core that the label 'Core i7' may evince but a simpler dual-core processor. For memory, there are two 4GB modules for a total of 8GB, and storage is courtesy of a 750GB hard disk, a traditional 2.5in SATA type.

For wireless connectivity there's the usual Bluetooth 4.0, and an Atheros AR946x Wi-Fi card that looked to be 11n-capable and single 2.4GHz band only from our tests.

Performance

With its dual-core Intel processor, good usable speed is not in doubt. We recorded Geekbench 3 results of 3112- and 6375 points for single- and multi-core mode operation.

Cinebench 11.5 scored the Asus Transformer with 1.42- and 3.29 points, while v15 of the benchmark showed 122- and 304 points.

When measured with real-world tests in the PCMark 7 benchmark test, the result was a more middling 3136 points. The new Dell XPS 13 (opposite) has the same Intel 5500U processor and scored 5090 points in this test, demonstrating the importance of fast storage over slow hard disks.

In the PCMark 8 suite, the Home test returned 2575 points (3082 points when accelerated by GPU), and 2873 points in the Work module (3881 accelerated). The Dell was behind here, with 2219 points (Home) and 2472 points (Work).

Some limited gaming is possible from the on-board Intel graphics. We saw an average of 34fps playing the Batman: Arkham City benchmark level at full 1366x768-pixel screen resolution and High detail. Tomb Raider 2013 showed 34fps with Normal detail, tumbling to 20fps when we switched to High detail.

The 38Wh lithium-ion battery pack is not user removable, and here enabled the TP550L to run for five hours 33 minutes in our standard battery test using a looped HD film played over Wi-Fi.

Verdict

The two-in-one computer, in this form, is a mobile computer that is a jack of few trades and master of none. There may be some application for a wobbly screened 15in tablet cum laptop weighing the wrong side of 2.6kg, but we struggle to think of it. It's doomed as a tablet in no small part by its low-grade and low-resolution TN display, and as a regular laptop is bested by non-touchscreen models at half the price with better specifications. ☒ **Andrew Harrison**

£179 inc VAT

Contact
- hp.com/uk

Specifications

11.6in (1366x768, 135ppi) TN matt anti-glare display; 2.16GHz Intel Celeron N2830 processor; Intel HD Graphics; 2GB 1333MHz DDR3 RAM; 32GB SanDisk eMMC drive; 802.11b/g/n 1x1 MIMO (Realtek RTL8723BE); Bluetooth 4.0; 1x USB 3.0, 1x USB 2.0; HDMI; Kensington lock slot; SD card slot; stereo speakers; 0.9Mp webcam; dual-array, built-in mic; 3.5 mm headset jack; UK tiled keyboard, white with black type, san-serif caps; 95x56mm, buttonless multi-touch trackpad; 37Wh lithium-ion, non-removable battery; 45W mains adaptor with IEC C5; 300x205x20mm; 1257g

Build: ★★★½☆
Features: ★★★½☆
Performance: ★★★½☆
Value: ★★★★½

★★★★☆

LAPTOP
HP Stream 11

HP has taken the budget Windows laptop sector by storm with the Stream 11, a compact 11.6in laptop that's priced to sell for just £179.

It has Windows 8.1 with Bing already installed, which requires the hardware maker only to agree not to switch the default internet search engine away from Microsoft's Bing service, before the product is packed and shipped. Most PC makers otherwise accept sponsorship deals from Google or Yahoo to change the default search engine, in a bid to claw back some profit above the thin margins the Windows PC industry has let itself work with.

This doesn't mean the Stream 11 is free of bloatware, though. HP is still using its laptop as a platform to sell you other services, such as its own Snapfish photo-printing service, while also including TripAdvisor, Amazon, Dropbox, Netflix and McAfee, whose software and web shortcuts litter the desktop and programs folder.

HP makes the Stream available in a choice of two wild colours. Our sample was in Orchid Magenta, a lurid pink with a colour gradient on the top deck that slides from baby pink to purple. There's also a version in Horizon Blue.

Build quality is basic but without fault. The Stream feels plasticky, and that's because it is, but perhaps because of the junior colour scheme it doesn't seem too cheap, merely toy-like.

On the left side is an SD card slot and a Kensington lock slot, the latter to help you lash the laptop down to secure your investment from casual theft. The card slot will be of especial value here since HP fits a tiny 32GB internal storage drive, from which around 20GB is available after the Windows OS and other software has been accounted for. That 20GB will quickly prove too small; but on the other hand we were impressed that Windows has been trimmed from its usual 20GB for a basic install, to less than 10GB.

You can pop in a 64GB SDCX card for under £20 though, to give you the storage breathing space you will need. There's also the option of using HP Connected Drive for £60 per year, or the time-limited demo of Dropbox, if you're comfortable offloading your personal files to other companies' servers.

On the right side are two USB ports, one each of 2.0 and 3.0, an audio headset jack, and HDMI to connect an external display. As with all modern laptops, there's still a webcam in the bezel, built-in mic (a dual array model is listed here) and tiny stereo speakers which sound out from under the front edge through small perforations in the casework. The sound volume was enough to hear the outline of a song, and should be fine with VoIP chats in quieter environments.

Inside the HP Stream 11 is a budget Intel processor, a dual-core Celeron N2840 running at 2.16GHz. This is backed by 2GB of memory, running at a slightly slower speed than most modern chips, 1333MHz instead of 1600MHz. For graphics, the CPU includes an integrated unit simply called Intel HD Graphics.

Storage relies on a 32GB SanDisk eMMC card, comparable to a regular SD card in performance, which is to say not particularly fast; and not as capable as a regular SATA SSD.

Wireless connectivity is available from a single-antenna Wi-Fi adaptor capable of joining 11n wireless networks. Bluetooth is present in its current 4.0 form.

Performance

The processor and memory provide raw performance roughly comparable to a two year-old smartphone. With a single-core score of 1022 points, and 1797 points for multi-core mode, its result is somewhere between an iPhone 5 and 5s, for instance.

In PCMark 7, the Stream 11 was awarded 2563 points, not a terrible result when compared to the Toshiba Satellite L10W-B-101, which runs the same main chip but scored only 1721 points. PCMark 8 could not be run as it would not install on this computer for unknown reasons.

In sequential reads and writes, it rose to 167- and 78MB/s respectively. More useful were its small-file transfer speeds, with single- and 32-thread 4kB write speeds both around 13MB/s. Those numbers easily trump the sub-1MB/s speeds of laptop hard disks.

Display quality was poor, but no worse than other budget Windows laptops; and slightly better in fact than the Toshiba cited above. The Stream had a low contrast ratio of just 80:1 and could cover 60 percent of the basic sRGB colour gamut (or 46 percent Adobe RGB). Like most TN-technology panels viewing angles were also seriously restricted, but in its favour it has a matt anti-glare finish so at least you won't be fighting through light reflections to see what's on-screen.

Battery life is important for almost any laptop, not least a 1.3kg compact sub-notebook you'll be more likely to carry around all day. And the HP Stream 11's unplugged runtime didn't prove too bad in our standard video run-down test, lasting for eight hours 45 minutes.

Verdict

The HP Stream 11 is a surprisingly useful laptop, attractively styled for anyone that likes bold colours. It's fast enough to surf and type, and is cool and silent. ⊠ **Andrew Harrison**

PC ADVISOR
RECOMMENDED

Specifications

Windows 8.1; 3.5GHz Intel Core i5 4690K (4.2GHz OC); SilentiumPC Fera 2 heatpipe cooler – HE1224; 8GB DDR3 1600MHz; 240GB Patriot Blaze SSD, 2TB HDD; 600W Aerocool Integrator; MSI Z97M-G43; AOC 23.6in I2476VWM IPS display; MSI nVidia GTX970 4GB; onboard; gigabit ethernet; 6x USB 3.0, 2x USB 2.0; HDMI DVI VGA 2; DVD-RW; Thermaltake Core 21; Gamdias Ares Keyboard and Mouse combo

Build:	★★★★★
Features:	★★★★☆
Performance:	★★★★☆
Value:	★★★☆☆

★★★★☆

GAMING PC

Yoyotech Warbird Gam3r

Yoyotech's Warbird Gam3r certainly stands out from the crowd, thanks to the distinctive cuboid shape of the Themaltake Core 21 micro-ATX system case. Finished in matt black, the front of the case features an all-mesh design, while both left and right side panels are almost entirely transparent, revealing the components inside.

The width of the case allows the MSI Z97M-G43 micro-ATX motherboard to be installed horizontally, which offers the advantage of easy access from either side, but at the expense of an unobstructed top-down view of the components. It also partitions off the lower portion of the case, where the power supply and storage drives are located. Yoyotech has selected a 600W Aerocool Integrator PSU and provides a 240GB Patriot Blaze SSD, paired with a 2TB Seagate hard drive. Featuring an Intel Z97 Express chipset, the motherboard offers full support for overclocking as well as an M.2 socket for future high-performance SSD upgrades, but offers less expansion room due to its limited physical size, featuring a total of four PCI-E slots, two of which at the x16 type and two at x1.

Based on the highly popular the Intel Core i5 4690K, here overclocked from 3.5- to 4.2GHz, the Warbird Gam3r offers good computing performance for its price range, achieving a score of 5315 points in the PC Mark 8 2.0 Home test. We've seen slightly better numbers from this processor, but only when the overclock has been pushed further – something which you're also likely to be able

to achieve on this system. One disappointment is that, at this price, the Warbird Gam3r comes with just 8GB of RAM as standard.

The processor is cooled directly by a large SilentiumPC Fera 2 HE1224 heatpipe cooler which takes up a large proportion of the interior space, flanked by and MSI-branded nVidia GeForce GTX 970 with 4GB of memory. This graphics card has been factory overclocked and, working in tandem with the main CPU, delivers some blistering gaming performance results. It's not uncommon for a £999 gaming PC to come with a slower GTX 960 installed, but the GTX 970 is considerably more powerful, allowing you to play your favourite games with higher quality settings. In our toughest test, Sniper Elite V2, with all quality settings maxed out at 1080p, the Warbird Gam3r achieved 49.1fps.

The PC comes bundled with an attractive-looking 23.6in AOC i2476Vwm IPS monitor, which offers a good balance of quality and performance at a reasonable price. Despite its generally higher picture quality, IPS might not be the first choice for gamers, but here the 'm' in the model name denotes the multimedia version of the monitor which has a slightly lowered response time of 5ms to add a bit of clarity to fast-moving graphics.

Also included is the Gamdias Ares keyboard and Ourea optical mouse combo set. Both are laden with gaming features such as LED backlights, programmable macros.

We were very impressed with the Warbird Gam3r, both in terms of build quality and performance. We were less impressed, however, with the warranty which offers only one year parts and labour (up to three years labour-only). We believe an overclocked PC, containing moving parts and components pushed to the limit, requires something longer such as the Yoyotech Gold three-year warranty, which is available at extra cost.

Verdict

The Yoyotech Warbird Gam3r delivers a lot of performance and features for your money, outperforming many others at this price it comes in an attractive compact gaming case and is bundled with gaming-focused peripherals, but the standard warranty is disappointing. ⊠ **Paul Monckton**

Specifications
13.3in (1440x900) LED-backlit glossy widescreen display; OS X Yosemite; 128-/256GB PCIe-based flash storage; 1.6GHz dual-core Intel Core i5 (Turbo Boost up to 2.7GHz) with 3MB shared L3 cache; 4GB of 1600MHz LPDDR3 onboard memory; Intel HD Graphics 6000; 802.11ac Wi-Fi networking; 4 IEEE 802.11a/b/g/n compatible; Bluetooth 4.0; 2x USB 3.0; 1x Thunderbolt 2; MagSafe 2; SDXC card slot; 3-17x325x227mm; 1.35kg

Build: ★★★★½
Features: ★★★★☆
Performance: ★★★★☆
Value: ★★★★☆

★★★★☆

LAPTOP
Apple MacBook Air

Little has changed in the design of the Apple MacBook Air, launched in its current form in late 2010 with its sharper wedge-shaped unibody case, and now refreshed into its new early-2015 form this spring.

There are still two screen sizes from which to choose, 11.6- and 13.3in, and following the example set by the last generation, the MacBook Air specification in every other aspect is identical between models.

But wait, is it really? In fact this time around there is an important internal difference that puts clear space between the two sizes of Air models in performance terms. In short, the 13in notebook has a flash drive that is three times faster than the best the Windows world can deliver. The 11in meanwhile remains only 50 percent faster than Windows laptops.

Let's focus first on where they overlap. All MacBook Air notebooks are based on the same platform taking identical processor, graphics, memory and wireless adaptors. They also share the same port and connector layout, namely two USB 3.0, one each side; MagSafe 2 power connector; 3.5mm headset jack; and SDXC card slot.

In addition, all MacBook Air (Early 2015) models now feature Thunderbolt 2, a single port here specified to 20Gb/s in place of the original standard's 2x 10Gb/s.

The processor du jour is from the fifth-generation of the Intel Core i5 series – codenamed Broadwell – which comprises what the chip maker calls a 'tick' update. That is, a shrink of the microarchitecture from the 22nm of the preceding Haswell and Ivy Bridge series, to the new record-breaking die size of 14nm.

As standard 2015's MacBook Air series takes a 1.6GHz Intel Core i5-5250U dual-core processor, able to automatically overclock to 2.7GHz on demand through Intel

Turbo Boost technology. Optionally you can configure any model with a 2.2GHz Intel Core i7-5650U (3.2GHz Turbo) dual-core processor, for an additional £130.

Memory is the same as last season, with 4GB DDR3 RAM clocked at 1600MHz, configurable at time of purchase only to 8GB, for an extra £80. Note that Apple has maintained the same low-power memory chips, even though Broadwell processors can take advantage of slightly faster 1867MHz memory.

Storage
For the 13in Air, Apple has provided the same upgrade as the 13in MacBook Pro with Retina display, by doubling the number of PCIe data lanes from two to four. In our tests this allowed a two-fold increase in maximum sequential read speed over the last version, with a top speed now exceeding 1500MB/s.

For small file transfers, we measured 4kB random reads and writes at 36- and 87MB/s; and using data sized from 4- to 1024kB we saw incredibly high averaged figures of 450- and 503MB/s. Highest sequential write speeds approached 700MB/s, averaging 685MB/s for 2- to 10MB data, while sequential read speeds averaged 1512MB/s.

The speed of the processor in the MacBook Air range has been bumped from 1.4- to 1.6GHz: not a huge improvement, but potentially more significant than the MacBook Pro's increase from 2.4- to 2.6GHz because in lower-specified machines processing power is more likely to become the performance bottleneck. As in the new Pro, these are Intel's new fifth-gen Broadwell chips, so they should be more power-efficient too – although it's hard to get too excited about Apple managing to keep battery life at the same (admittedly excellent) level rather than improving it.

We tested the standard issue MacBook Air with its 1.6GHz Core i5 processor. As an indication of raw processor and memory speed, the Geekbench 3 benchmark test scored the 13in MacBook Air with 2912 points in single-core mode, and 5821 points multi-core. That puts it 4.9- and 7.8 percent faster than the outgoing mid-2014 model with its 1.4GHz Haswell-generation processor (2777- and 5400 points).

In Cinebench 11.5, the new Air scored 1.18- and 2.80 points for single- and multi-core mode operation, putting it 4.4- and 8.9 percent ahead of 2014's standard MacBook Air. But it was Cinebench 15 that showed a higher return on the Broadwell dividend, moving from 97- to 110 points single-core; and from 239- to 260 points for both cores. That's a 13.4- and 8.8 percent improvements respectively for the two modes of operation.

Any increase in performance is likely from the small uplift in processor clock frequency though, rather than optimisations to the processor pipeline, for instance, as we'd experience in a 'tock' update in Intel's leapfrogging design cycle.

In fact, with the change from 1.4- to 1.6GHz in baseline processor clock, we have a 14.3 percent increase in cycles per second – but benchmark score increases ranged only from 4.4- to 13.4 percent. Remember, the process shrink of Broadwell is more about reducing wasted heat by increasing processor efficiency.

This year's MacBook Air gains an Intel HD Graphics 6000 integrated GPU, replacing 2014's HD Graphics 5000. The stronger graphics setup lead us to expect this year's Airs to be better gaming machines, indeed, according to iFixit's calculations, we expected 20- to 25 percent better gaming performance than the Intel HD

Graphics 5000. Now we have spent some time with a review sample, we are able to confirm our own findings.

The Intel HD Graphics 6000 in the 2015 MacBook Air is an integrated GPU, piggybacked on the Core i5 -5250U main processor. This has a 50 percent higher baseline clock speed (300MHz versus the 200MHz of HD Graphics 5000); and a fractionally lower peak clock of 950MHz, when compared to the 1000GHz of the last chip. Execution units have also been increased in the '6000 graphics, up to 48 from last year's 40.

As it turns out, we didn't see much difference in graphics performance from the previous model, when running our usual Mac action game tests. Using the Batman: Arkham City benchmark test, both last year's and the new 2015 MacBook Air averaged 29 frames per second (1280x800, Medium detail); and 24fps when set to High detail.

In the Tomb Raider 2013 game, at the same resolution and with Normal detail selected, the 2014 Air averaged 22fps while the 2015 Air played at 21fps. Moving up to the laptop's native resolution of 1440x900 pixels, at Normal detail the new MacBook Air averaged 18fps against 19fps for last year's model.

So not only is there no net improvement apparent here with the new graphics chipset, but we see a tiny loss in gaming performance. It's possible that the performance shortfall in the early 2015 model may be a result of the different operating system – 10.10 Yosemite now against last year's 10.9 Mavericks. Or Apple may be applying new GPU power-saving schemes to reduce heat and battery drain.

Turning to other graphics benchmarks, Unigine Heaven returned effectively the same results between machines (19.3fps for 2014; 19.9fps for 2015, at 1280x800, Medium), while the OpenGL tests in Cinebench did show a small benefit for the new MacBook Air. In Cinebench 11.5, framerate moved up from 23.5- to 25.8fps, while Cinebench 15 returned the only appreciable change in framerate, a notable jump from 18.8- to 26.3fps.

Still not Retina
The Airs still aren't Retina-class: like the mid-2014 13in MacBook Air, the early-2015 Air has a 13.3in LED-backlit glossy widescreen display with a resolution of 1440x900 pixels and a pixel density of roughly 128ppi (pixels per inch).

That's pretty low on the sharpness scale by today's standards (for comparison, the 13in Retina MacBook Pro has a pixel density of 227ppi), and those who are used to Retina or better displays may find the Air a touch fuzzy, although it certainly isn't a bad screen. We do think Apple will add a Retina display option to the Air line-up at some point in the near future, but we don't get that upgrade here.

The 13.3in LCD screen of the MacBook Air has the same core specification listed as the last few models – a 1440x900-pixel display with gloss surface, based on twisted-nematic (TN) technology.

This type of screen has poor off-axis viewability and restricted colour gamut, but is chosen for its low cost and reduced power requirement when compared to the higher-performance IPS technology used on iPhone, iPad and MacBook Pro with Retina display.

We didn't have the mid-2014 model of MacBook Air to compare alongside to spot any subjective visual differences, but from memory the new Air screen did not look conspicuously any better or worse.

We ran some basic tests to see if its lab measurements had changed, and discovered a reduced contrast ratio of 400:1, compared to the decent 680:1 contrast ratio that we measured for the mid-2014 version of the 13in MacBook Air.

Colour gamut was also reported with a lower figure, now 41 percent sRGB and 31 percent AdobeRGB, where last year's Air measured at 63 and 47 percent respectively. Colour accuracy was reported as better though, with an average Delta E figure of 5.88 that's below the 8.39 Delta E of last year's model.

The differences could be explained by the use of a display from a different manufacturer, rather than a decline in component quality. This particular model featured a LP133WP1-TJA7 display made by LG, although we don't have on file the type used in the mid-2014 sample we last tested.

Battery economy is where the new 14nm-based processor should really pay its way, although our video rundown test did showed little difference here.

Our cross-platform laptop battery test uses a looped MPEG-4 film, played over Wi-Fi from a NAS drive, with screen set to 120cd/m2. The mid-2014 MacBook Air survived for 12 hours, 38 minutes in this test, but the early 2015 counterpart played for 12 hours, 49 minutes.

Exceeding 12 hours remains a laudable achievement, a battery runtime that comfortably exceeds almost every notebook computer on sale today, although we were anticipating even more.

It would be easy to dismiss the MacBook Air update because of the lack of change in this most visible of departments. The early-2015 Air has the same chassis as the previous generation, with the same (extremely high) build quality and the same (stunning) looks.

The Air doesn't even get the one physical change we got in the updated 13in Pro, the Force Touch haptic touchpad. The keyboard is unchanged, too.

Verdict
There are a few solid upgrades here: performance should get a boost from the faster, more power-efficient Broadwell chips, graphics are improved and the flash storage is quicker, too. But the MacBook Air misses out on the more arresting design updates seen on other MacBooks.
⊠ Andrew Harrison

Specifications
13in (2560x1600, 227ppi)
IPS display with reflection-reducing coating; 2.7GHz Intel Core i5-5257U; OS X 10.10.3 Yosemite; Intel Iris Graphics 6100; 8GB 1867MHz LP DDR3 RAM; 128GB PCIe 2.0-attached SSD; 802.11ac 3x3:3 Wi-Fi; Bluetooth 4.0; 2x Thunderbolt 2, 2x USB 3.0; SDCX card slot; UK tiled backlit keyboard; MagSafe 2 power connector; 60W mains adaptor; dual mics; 0.9Mp FaceTime webcam; 3.5mm headset jack with Toslink optical digital output; Force Touch multi-touch keyboard with taptic feedback; 74.9Wh non-removable lithium-polymer battery; 313x219x17.7mm; 1579g

Build: ★★★★½
Features: ★★★★½
Performance: ★★★★½
Value: ★★★★½

★★★★½

LAPTOP

Apple MacBook Pro with Retina display

PC ADVISOR
GOLD

Do not be deceived by outward appearances. You can choose any two examples of an Apple MacBook Pro with Retina display from 2012, 2013 or 2014, put them next to each other, and you will not find any material difference between them. Inwardly, though, they are more than subtly different animals.

The physical design is basically the same. It keeps its lightweight Unibody chassis milled from solid aluminium, and we have the same port line-up on its sides, featuring two high-speed Thunderbolt 2 ports on the left, located between the MagSafe 2 power connector and a USB 3.0 port.

On the right side is another USB 3.0 port, an HDMI port, and SDXC card slot. There has been no change to the HDMI specification used here, which follows HDMI 1.4 and allows an external display up to 'UHD' (3840x2160 pixels) or '4K' (4096x2160 pixels), but only at low refresh rates of 30- or 24Hz.

For connecting the current highest resolution display you will still need to use one of the Thunderbolt 2 ports, and ensure the screen works with DisplayPort 1.2 to enjoy 60Hz refresh rates.

The one physical difference between the new 13in Pro and its predecessor is the trackpad. Like the 12in MacBook, the 13in Pro gets the Force Touch trackpad, which is sensitive to varying degrees of touch pressure: you can set it to respond to harder/deeper presses to activate different features.

It also provides what is known as haptic or taptic feedback, a tangible, tactile response that in theory allows you to 'feel' what you are interacting with (rather than just the flat surface of the touch pad).

That's the theory, anyway, and Apple is likely to open up the API for this feature to developers, leading to more ambitious implementations of Force Touch functionality in the future. But at the moment the haptic element is limited to the simulation of a mechanical click when no such click is actually happening.

The new trackpad has a two-stage click operation – a standard light click felt when gently pressing, comparable to the standard mechanical click of the previous buttonless trackpad; and a harder-feeling click that's felt by pressing down a little deeper.

Apple calls the harder click a "Force Click", but really this just means a normal click only harder. The Force Click can be set to do different things in different applications, but by default it generally acts as a sort of 'look up' button - bringing up a definition of the word you Force Clicked on, for instance, or a relevant Wikipedia article summary.

Despite appearances, both the standard and Force Clicks are virtual. The trackpad surface is essentially immobile, and relies on strain gauges attached to the underside to sense light flexing. When the small ARM Cortex-M computer behind the trackpad senses your intent through

the measured strain, possibly using additional data such as the 'footprint' size of your fingerpad, it will actuate a small click effect using electromagnets to create a brief impulsive shock.

From System Preferences/ Trackpad you can switch on or off the secondary deep click from the entry marked 'Force Click and haptic feedback'. You can also adjust the strength of impulse on standard clicks from the 'Click pressure' slider, selecting Light, Medium or Firm.

To our touch, the latter Firm setting feels closest to the real click of the previous mechanical switch trackpads, while the Light setting especially is very delicate, yet still works consistently and provides the essential but gentle haptic feedback.

Beyond this, the trackpad is capable of sensing and responding to different degrees of pressure. Again, the applications for this are currently somewhat limited. In Apple Maps, varying the pressure when you click on the zoom in/zoom out buttons varies the speed of the zoom accordingly; and you can likewise vary the speed of rewind or fast-forward in QuickTime.

We said you can tinker with the click settings to a degree. But conspicuous by its absence in these OS X settings is the three-finger drag gesture, used for moving files, folders and open windows around the screen. Like the Drag and Drag Lock options that let you click on an item and move it while still holding the click, the three-finger drag

option has now been relegated to a setting deep within the Accessibility options of System Preferences.

The screen is largely unchanged – it's still a 13.3in LED-backlit display with a Retina-class resolution of 2560x1600 pixels and a pixel density of 227 pixels per inch (ppi). There have, however, been some tweaks.

We put the IPS display through a simple test to see if it may have been revised. While the manufacturer seems to be the same (unknown, but designated '610'), the model number has changed from A020 or A019, to A029.

Last time we measured the 13in Retina display of the MacBook Pro in June 2014, it had 91 percent coverage of sRGB, and 68 percent Adobe RGB. Today these figures have improved, to 97- and 73 percent respectively.

Contrast ratio is a trickier test but this also seemed to have improved slightly, with a maximum of 880:1 against last year's 800:1.

The dual-core processor in this MacBook is from Intel's fifth generation of Core Series chips, and is marked by a process shrink in the silicon lithography, from 22nm used in the previous fourth generation (aka Haswell) down to 14nm. In general, a reduction in the die size will confer the advantage of reduced power consumption.

Last year, the choice of processor clock in the 13in model was between 2.6- or 2.8GHz after the mid-year refresh. Today we are offered 2.7GHz as the starting point, or 2.9GHz in the 'best' model.

Besides the crucial process shrink in Broadwell, the maximum memory speed has risen slightly, from 1600- to 1867MHz, and the 13in MacBook is fitted with 1867MHz low-power DDR3 RAM, once again soldered to the logic board.

In our tests of raw processor and memory speed, we found this 2.7GHz MacBook reported Geekbench 3 results of 3326 points in single-core mode and 7100 points in multi-core mode. We don't have Geekbench figures for the comparable entry-level mid-2014 model with 2.6GHz processor, but the 'best' 13in MacBook Pro with 2.8GHz Intel Core i5 of last year was measured with 3307- and 7086 points respectively.

In other words, today's entry-level 13in MacBook is fractionally faster than last year's top model (0.2-0.5 percent), despite a 100MHz slower clock speed.

The sole graphics processor of this MacBook is integrated into the Intel Core i5 chip, and have also been upgraded as part of the Broadwell refresh.

Dubbed Intel Iris Graphics 6100, it replaces Iris Graphics 5100, and differs with an increased number of execution units (48 instead of 40) even if its maximum clock speed has been reined in slightly, from 1200- to 1100MHz. It is this graphics solution that also holds back decent 4K output through HDMI, with the integrated GPU stuck at v1.4 rather than the required HDMI 2.0.

Graphics performance

We put the MacBook Pro to the test in a range of demanding Mac games. We found that Batman: Arkham City would now play a little more fluently at 1280x800-pixel resolution and Medium detail setting, at an average rate of 35fps. Last year's entry model recorded 32fps with the same settings, suggesting around 9 percent improvement here.

Using the Tomb Raider 2013 test, at the same settings as above the new MacBook played at 20.4fps – not sufficient for smooth gameplay, but better at least than the 14.2fps of last year's best 2.8GHz model

However, by selecting legacy OpenGL mode, playable framerates were available. Last year's 2.8GHz MacBook averaged 32.1fps here; this year's 2.7GHz MacBook – 36.6fps. That's a larger delta, which resolves as a 14 percent increase.

A major breakthrough was made with the 2013 generation of Mac computers when Apple started fitting solid-state drives to most models that connected more directly to the PCI Express bus, rather than via the Serial ATA bus. At a stroke, the top sequential transfer speeds moved from the circa-500MB/s level that was cramping the entire PC industry, with a 50 percent hike to around 750MB/s.

Two years later and Windows PCs are still stuck behind the SATA controller, but Apple hasn't complacently stayed with this lead. It's now made a clearer gap by doubling those breakneck speeds its flash drives already enjoyed.

This has been achieved through the simple expediency of using more PCIe data lanes, moving from two to four PCIe 2.0 channels. Note that contrary to some press reports, Apple still seems to be using the v2.0 standard and not the latest v3.0 of PCIe that is now emerging.

In our tests we saw average sequential read speeds of 1500MB/s, and 661MB/s for sequential writes. Put another way, with a read speed that can be expressed as 1.5GB/s, the entire contents of a full DVD could be read in little over three seconds. Or around six seconds for a dual-layer disc, assuming they had been committed to the MacBook's internal flash drive first.

Meanwhile, single-threaded 4kB files could be randomly read or written at 37- and 99MB/s respectively. Last year's model reported speeds of 23- and 69MB/s in the same test. That's a healthy boost by 60- and 43 percent.

Averaged across files sized from 4- to 1024kB, the new MacBook returned figures of 765- and 531MB/s (2014's: 201- and 366MB/s). Which means it can wield the tricky little files with the same lightning speed as last year's model could hit in its maximum sequential performance.

This year's 13in MacBook Pro with Retina display has a marginally larger battery than before, moving from 71.8 watt-hour (Wh) to 74.9Wh. That simple 4.3 percent increase in capacity cannot alone account for the dramatic change in battery life that we measured.

In our standard battery runtime test – looping an MPEG-4 HD film in QuickTime, streamed over Wi-Fi from a nearby NAS and router, with screen set precisely to 120cd/m^2 – last year's entry-level 13in MacBook Pro lasted for 10 hours, seven minutes.

We were astounded to find the 2015 model survived our overnight test… and was still playing its film the following morning. The battery finally expired and Mac went to sleep at 17 hours, five minutes after the test started. It's a runtime figure that beggars belief, and we intend to try variations of this test to ensure we were not misled.

Verdict

The world's finest 13in notebook is now unassailable, especially given that it's kept the same sub-£1000 price point as its predecessor. ⊠ **Andrew Harrison**

Specifications

3.5GHz Intel Core i5 4690K (4.5GHz OC) Raijintek; Themis 16GB DDR3; 1600MHz Kingston SSDNow; 240GB SSD; FSP 500W Asus Z97-P; Windows 8.1; 24in (1920x1080) Asus VS247HR; HDMI; D-Sub; DVI-D MSI GTX 970; 4GB Core; 1140MHz Boost; 1270MHz onboard; gigabit ethernet; 6x USB 3.0 + 2x USB 2.0; HDMI; DVI; VGA; 2x ps/2 ports LG DVD-RW; Corsair Spec 03 Devastator Keyboard and mouse

Build: ★★★★½
Features: ★★★½☆
Performance: ★★★★½
Value: ★★★½☆

★★★★☆

GAMING PC

Wired2Fire Diablo Reactor

The Diablo Reactor from Wired2Fire, is a mid-range gaming PC packed with high-performance components and with an overclocked Intel Core i5 4690K processor.

Housed in a Corsair Spec 03 system case, the Diablo Reactor has rugged, industrial-looking features that are sure to attract wide appeal. Its imposing front grille fronts a red LED-lit intake fan, concealed behind a matt black mesh, while the transparent side panel gives you a good view of the internal components.

Contrasting the matt black-on-black of the exterior, the first thing you'll notice when looking inside is the large Rajintek Themis CPU heatpipe cooler, with its large red and white fan assembly. With the Core i5 processor overclocked from 3.5GHz up to an ambitious 4.5GHz, the cooler certainly has its work cut out, but it managed to keep the processor to a maximum of 86 degrees under full load, working in consort with the two bright white illuminated 120mm front case fans and an additional 120mm fan at the rear.

Storage comes in the form of a capacious 240GB SSDNow solid-state drive, which ensures short boot times and quick game loading. However, with no supplementary hard drive included, that 240GB of storage space starts to look rather less impressive; even a small collection of games could see this SSD filling up rather quickly. We appreciate the desire to keep the price below the psychologically significant £1,000 price point, but the relatively small cost of an additional hard drive would be well worth it and there's plenty of room for expansion upgrades inside the case, above an LG DVD-RW combo drive.

Internal components

At the heart of the system sits an Asus Z97-P ATX form factor motherboard, featuring Intel's Premium Z97 Express chipset with full official support for overclocking and a fully featured UEFI BIOS for advanced performance tweaking and graphical fan speed control. It also supports Intel RAID and M.2 storage devices as future upgrades. Four USB 3.0 ports are provided at the rear of the case, along with a pair of USB 2.0. Two more USB 3.0 connectors are wired through to the front panel of the case.

A generous 16GB of 1600MHz RAM is included which, combined with the overclocked processor and SSD storage, helps the Diablo Reactor to achieve some of the best performance scores we've seen from a gaming PC in this price range. With a PCMark 8 2.0

Home score of 5576 points, it outpaces even Dino PC's Dark Spark GTX 960, which features a faster processor overclock to 4.6GHz.

Gaming performance is also superb, thanks to an overclocked MSI-branded nVidia GeForce GTX 970 graphics card with 4GB of RAM. If you can afford one, this card delivers much better framerates than the GeForce GTX 960 found in some competing systems – enough to allow you to configure noticeably higher quality settings in your games.

The Diablo Reactor is supplied with a 24in Asus VS247HR monitor – a basic entry-level model, but with a fast 2ms response time ideal for gaming. Also included is a Cooler Master Storm Devastator gaming keyboard and mouse set, featuring cool LED backlighting and angular stylings which match the design of the system case.

Verdict

The Wired2Fire Diablo Reactor is an excellent performer at a reasonable price, featuring one of the highest overclocked processor speeds we've seen at this level and a fast, overclocked graphics card. The omission of a hard drive is regrettable, but remedied at minimal cost and all required peripherals are included. ⊠ **Paul Monckton**

£299 inc VAT

Contact
■ samsung.com/uk

Specifications

Android 4.4.4 KitKat; 5in (1280x720, 294ppi) Super AMOLED screen; Qualcomm Snapdragon 410, 1.2GHz quad-core processor; Adreno 306 GPU; 2GB RAM; 16GB internal storage; microSD card slot (up to 64GB); 13Mp rear camera with LED flash; 5Mp front camera; Wi-Fi 802.11 b/g/n (dual-band); Bluetooth 4.0 LE; non-removable 2300mAh battery; 139x70x6.7mm; 123g

Build: ★★★★☆
Features: ★★★★☆
Performance: ★★★☆☆
Value: ★★★☆☆

★★★★☆

SMARTPHONE
Samsung Galaxy A5

We're big fans of the new Galaxy S6 (page 40), but if you can't afford one (much less the pricier S6 Edge, page 41), then the mid-range Galaxy A5 should be on your shortlist.

It's the latest model in Samsung's Alpha range and is a smart-looking mid-priced phone. It comes in black, silver, gold and white. The 5 refers to the screen size – five inches – and it weighs a feather-like 123g.

In the hand, it feels remarkably svelte, and that's mainly because it's just 6.7mm thick. These figures are slightly lower than those for the iPhone 6, which is 129g and 6.9mm.

It may have a plastic rear cover, but the chamfered aluminium band around the sides and smooth glass front make it feel more like a premium phone. Plus, the absence of any flex means build quality is right up there with the best.

Turn it on and you'll immediately notice the vibrant colours of the Super AMOLED display, which also has excellent viewing angles. You also get a 13Mp camera at the rear, complete with LED flash and a 5Mp front-mounted 'selfie' camera.

Inside, it's clear that there have been some compromises. The Snapdragon 410 processor isn't going to top any benchmark charts, and the phone runs the older version of Android: KitKat instead of the latest Lollipop.

Set into the metal band are two removable trays whose design is so similar to the iPhone that at a glance you could mistake the A5 for a bigger version of the iPhone 5.

The bottom edge is home to the Micro-USB charge and sync port as well as a headphone jack. On the left-hand side is a volume rocker, and opposite on the right is a power button – the same setup as the iPhone 6. On top is only a tiny hole for the microphone.

The screen has a 1280x720 resolution, which is acceptable on, say, the latest version of the Motorola Moto G, but at almost £300 SIM-free from online retailers it's not as easy to swallow.

Don't get us wrong: the A5 has a great-quality AMOLED screen with some nice features including extreme power saving, but if you're prone to notice individual pixels, the A5 is obviously lower resolution

than the Galaxy S6. And, for that matter, the S5.

There's 16GB of internal storage, 2GB of RAM and a microSD slot for adding up to 64GB of extra storage.

You don't get 802.11ac Wi-Fi, but the 802.11n radio works on both 2.4- and 5GHz. There's also Bluetooth 4.0, NFC, GPS and ANT+.

And when compared to the Galaxy S5, there's no fingerprint scanner, IR blaster or heart-rate sensor. Few people will miss these extras, but it's worth noting.

There were no surprises in our benchmarks, with the Snapdragon 410 performing just as it does in the £109 Motorola Moto E. The Geekbench scores of 483 and 1476 for the single- and multicore tests respectively were within the margin of error.

Somewhat strangely, the Adreno 306 GPU in the A5 produced slower framerates than the 2015 Moto E, which uses an identical chip. On the A5 we saw 3.9fps in Manhattan and 9.2fps in T-Rex, while the Moto E managed 6 and 13fps respectively. None are great results, of course, but both phones will play casual games well enough.

Battery life is comparable with other similar size phones. With a 2300mAh cell on board, Samsung says you'll get eight hours of 3G web browsing and 12 hours of video playback. There's also an Ultra Power Saving mode that you get with Samsung's flagship phones. This turns the display to greyscale, disables mobile data when the screen is off and restricts which apps you can use in order to extend standby time to 1.2 days when you have 10 percent power remaining.

It's a little odd that Samsung didn't use the Galaxy S5's rear camera in the A5. The S5 has a 16:9 16Mp sensor, whereas the A5 has a 13Mp 4:3 sensor. By default, it's set to a 9.6Mp 16:9 setting, meaning you're effectively cropping off the top and bottom of each photo.

You'd think there would be little difference in quality between the

cameras, but you'd be wrong. The S5's photos are visibly better than the A5's and there's a noticeable lack of detail when you zoom in to make the A5's photos the same size at the S5's at 100 percent.

Of course, we're being picky here and the A5 still has a great camera when compared to many phones: it captures more detail than an 8Mp iPhone 6 and is leagues better than the 5Mp Moto G. Exposures are accurate, colours realistic and the lens is sharp right to the corners.

Photo quality from the 5Mp front camera is good. Detail levels are better than phones with fewer pixels, so the A5 is a good choice if you take a lot of selfies.

Video, which tops out at 1920x1080 at 30fps from the rear camera, is sharp and detailed but there's no optical stabilisation, and this makes handheld footage shakier than we'd like.

Verdict

The Galaxy A5 is a stylish, thin and lightweight phone with good cameras. However, its processor isn't particularly powerful and also happens to be found in the Moto E which costs only £109. The Moto E is also a 4G phone and if you're not fussed about its slightly smaller, lower resolution screen and mediocre cameras it's a much better value choice. ⊠ **Jim Martin**

£599 inc VAT

Contact
- samsung.com/uk

Specifications

Android 5.0 Lollipop; Exynos 7420 octa-core (1.5GHz A-53 & 2.1GHz A-57) processor; 3GB LPDDR4 RAM; 32GB/64GB/128GB storage (no microSD support); Mali-T760 GPU; 5.1in (1440x2560, 577ppi) Super AMOLED screen; 16Mp rear camera with LED flash, smart OIS, real-time HDR and IR Detect white balance; up to 4K video recording at 30fps; 5Mp front camera; 4G Cat 6 LTE; nano-SIM; dual-SIM as standard: no; 802.11a/b/g/n/ac, dual-band; Bluetooth 4.1; GPS, GLONASS; NFC; USB OTG; fingerprint scanner; 2550mAh non-removable battery with Qi and PMA wireless charging; 143.4x70.5x6.8mm; 138g

Build: ★★★★½
Features: ★★★★½
Performance: ★★★★½
Value: ★★★★☆

★★★★½

SMARTPHONE

Samsung Galaxy S6

The Galaxy S6 is the company's best-looking smartphone yet, with Samsung tackling key concerns such as build quality and software. Sure, it's lost a couple of features, but it's gained much more and, right now, is the best Android phone on the UK market.

Samsung has long been criticised for copying Apple's designs, and with the S6 you can understand where some of those claims might have come from. Indeed, Samsung has picked on all the things we hate about the iPhone, and produced a handset that will anger many S-series fans, removing the waterproofing protection and the ability to add in removable storage and replace the battery.

In other respects the two are alike, in the same way are all premium smartphones. More so when viewed side-on, with similarly rounded edges, button- and port positioning. For example, on the right side you'll find a power button and SIM slot, at the top left are volume buttons, and on the bottom a headphone jack, charging port and speaker grill.

The S6 is, however, larger and thicker than the iPhone 6. Although Samsung quotes 6.8mm against Apple's 6.9mm, in our lab we measured 7.1mm. And taking into account the protruding rear camera, it's actually 8.7mm. At 138g, it's also 9g heavier than the iPhone 6.

Samsung has caught up with the iPhone 6 with its fingerprint scanner, and we're so glad it did. Now it works: first time; every time. Built into the home button as before, the S6 now uses touch- rather than swipe-style recognition, just like Apple's TouchID. It's easy to set up, and simple enough to use that you will actually want to do so. The fingerprint scanner will become more useful later this year when Samsung Pay comes to the UK, too.

But we've saved the best until last here: the biggest difference between the Galaxy S6 and iPhone 6 is the Samsung's gorgeous, super-high-resolution Quad-HD screen. With 2560x1440 pixels stretched across a 5.1in screen, the Samsung has a crazy pixel density of 577ppi. It's simply stunning, and games, videos and pictures look amazing.

Samsung uses Super AMOLED screen technology in its mobile devices, which omits a backlight and therefore places less of a strain on the battery. That's not to say this screen is dull – at 600cd/m² it's an improvement over the S5 and easy to see even in bright daylight.

Something that's instantly obvious when you pick up the Galaxy S6 is just how fast it is, with the only lag we could find occurring when trying to use the multi-tasking screen or swiping in the Flipboard pane to the left of the home screen. Everything else is fluid and achieved in an instant.

Samsung has opted for its own octa-core Exynos 7420 processor. This is a 14nm, 64-bit chip built with two quad-core (1.5GHz Cortex-A53 and 2.1GHz Cortex A-57) sets. A Mali-T760 GPU is integrated, and there's 3GB of LPDDR4 RAM.

Storage-wise you get a choice: 32-, 64- or 128GB, plus unlimited storage for standard-size photos and video via Google Photos, and 100GB of free OneDrive space. After installing a handful of benchmarking apps on our 32GB review sample we had just over 22GB free.

Inside the phone is a 2550mAh battery, slightly smaller than the 2600mAh battery inside the Galaxy S6 Edge. However, in our Geekbench 3.0 battery life tests it performed better. The S6 managed six hours 53 minutes in this test, with a battery life score of 4136.

Connectivity options are strong, with everything you'd expect: dual-band 802.11ac Wi-Fi, Bluetooth 4.1, NFC, an IR blaster and a Download Booster that can pair the power of 4G Cat 6 LTE with Wi-Fi for downloads over 30MB. The Galaxy S6 takes a single nano-SIM.

As a cameraphone, the Samsung is excellent. There is a 16Mp camera with LED flash at the rear, but it now supports smart optical image stabilisation, automatic real-time HDR and IR Detect White Balance. There are all the manual controls and camera presets you would ever have need for, and we particularly like the fact a double-tap of the home button can launch the camera in a fraction of a second.

Video is supported up to 4K, although set to full-HD by default. This makes sense since it would otherwise eat through your storage. The S6 also has slow- and fast-motion video modes.

At the front of the phone is a 5Mp selfie camera.

So much of the Samsung Galaxy S6's software was hyped up before its launch. Most importantly, TouchWiz was said to be stripped right back, and not as laggy with less bloat preinstalled.

There are fewer apps preinstalled on the S6, but you still get a lot. These include Samsung's own apps, social apps for Instagram, Facebook and Messenger, and several tools.

The most notable changes TouchWiz makes to the Android 5.0 Lollipop OS are in the Settings menu and drop-down notification bar. Both are easy to find your way around and customisable, allowing you to choose which settings or toggles you want to access most often and place those at the top of the window.

Verdict

Samsung's Galaxy S6 is the best Android phone of 2015 so far. It's fast, well built, has a gorgeous screen and the software isn't overly intrusive. ⊠ **Marie Brewis**

PC ADVISOR
RECOMMENDED

£760 inc VAT

Contact
■ samsung.com/uk

Specifications

Android 5.0 Lollipop; 5.1in (2560x1440) Quad HD SuperAMOLED dual edge display; Exynos Octa-core processor; 64/128GB storage; 3GB RAM; 802.11a/b/g/n/ac; Bluetooth 4.0; NFC; GPS; GLONASS; Beidou; 16Mp rear camera with OIS; 5Mp front camera; heart rate monitor; fingerprint scanner; 142.1x70.1x7.2mm; 132g

Build: ★★★★☆
Features: ★★★★½
Performance: ★★★★☆
Value: ★★★½☆

★★★★☆

SMARTPHONE

Samsung Galaxy S6 Edge

Samsung's new flagship smartphone for 2015 comes in two models, the Galaxy S6 (reviewed opposite) and the Galaxy S6 Edge. The two devices look similar, although the latter has a curved screen that wraps around both sides of the phone.

We've been criticising Samsung for putting out premium phones with a plastic build for a long time and this is the first time it has opted for a metal frame around the edge. The front and back use Gorilla Glass 4, which makes the S6 feel like the premium phone it should be.

Although the curved sides make the phone looks great, there are down sides. We're pleased about the metal frame of the phone, but the sides are a little sharp and make the device less pleasant to hold than the regular S6 – this isn't helped (on either model) by the completely flat back. We also found a sharp edge on the metal below the home button as it sits a little higher than the flat surface where the buttons preside.

When it comes to hardware, the Galaxy S6 Edge is identical to the regular model apart from the screen. They are both 5.1in and Quad HD, though the Edge has the dual-edge feature, which is the main thing to talk about.

For starters, the display looks amazing with the usual SuperAMOLED technology and the curved sides give it a bezel-free look. The upgrade to Quad HD (1440x2560) means an incredibly crisp image. A pixel density of 577ppi is the highest we've ever seen on a smartphone.

Because the display is curved on both sides, you can decide whether apps are displayed down the left- or right-hand side. You can also get information via various feeds, though these appear only when the screen is off – you'll need to make a two-way swipe to view them.

Among the features being touted by Samsung is People Edge, which gives you easy access to your contacts when you swipe in from the side. You can have up to five favourite contacts each with a unique colour.

As expected, Samsung has opted for its own Exynos 7420 which is also octa-core (quad-core 1.5GHz Cortex-A53 and quad-core

2.1GHz Cortex-A57). There's 3GB of RAM and a Mali-T760 GPU. Performance seemed exemplary during our hands-on time and continued during our thorough testing period. The phone rarely lags with the only issue we noticed was swiping in and out of the Flipboard part of the homescreen.

Only two versions are available – 64- and 128GB. There's no microSD card slot for adding more storage, which is disappointing.

Wireless connectivity hardware remains strong with dual-band 11ac Wi-Fi, Bluetooth 4.1 with atpX, NFC and an IR blaster. There's also Cat 6 4G LTE support.

The fingerprint scanner is still embedded inside the home button and Samsung has changed it so you only need to touch it rather than swipe. It's so much better than before making it genuinely useful rather than a bit of a pain.

Battery size has dropped compared to the Galaxy S5 from 2800- to 2600mAh. However, Samsung has added wireless charging with WPC and PMA standards. There's been some confusion so to clarify; a wireless charger is not included in the box.

Our battery benchmark test using Geekbench 3 resulted in total time of six hours 41 minutes of heavy use; with a score of 4011.

The main camera remains at 16Mp, but there are improvements elsewhere. These include new auto real-time high dynamic range (HDR), Smart Optical Image Stabilization (OIS) and IR detect white balance. You can also now Quick launch the camera in just 0.7 seconds, according to Samsung, by double-tapping the home button. The camera isn't just quick at firing up either, the auto focus is fast and you can take a series of photos with almost no interruption.

On the video side, the S6 Edge can shoot at up to UHD (3840x2160) – commonly known as 4K. There

is OIS and you can shoot video in Slow- or Fast motion modes.

At the front is a 5Mp snapper for selfies and the results are impressive. Samsung has enabled the heart rate monitor on the back of the phone, so you tap it to take your selfie. It can even record video in up to Quad HD resolution to match the screen (2560x1440).

The S6 Edge is running on Android 5.0 Lollipop with Samsung's own TouchWiz user interface. The software is slick and easy to use with Samsung using its own notification bar rather than Lollipop's, but going for Google's card-style recent apps menu. From here you can use Samsung's Multi-Window feature to use two apps on the screen at the same time – only compatible apps will display the icon.

Flipboard still sits to the left of the main homescreen for your newsfeed but can be switched off if you don't like it, and you can choose from different grids if you want to fit more icons and widgets on screen. There's also a new Themes part of the settings menu, which will let you change the look of the interface. There are only three but plenty more are available to download.

Verdict

The Samsung Galaxy S6 Edge is a beautiful smartphone. However, the dual edge display isn't worth the extra money compared to the regular Galaxy S6. ⊠ **Chris Martin**
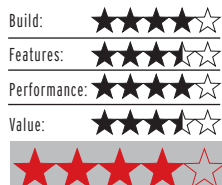
Specifications
Android 5.0 Lollipop; 5in (720x1280, 294ppi) IPS screen; Qualcomm Snapdragon 400; 1.2GHz quad-core processor; Adreno 305 GPU; 1GB RAM; 8GB internal storage; microSD card slot (up to 32GB); 8Mp rear camera with LED flash; 2Mp front camera; Wi-Fi 802.11 b/g/n; Bluetooth 4.0 LE; non-removable 2390mAh battery; 142x71x11mm; 155g

Build: ★★★★☆
Features: ★★★½☆
Performance: ★★★★☆
Value: ★★★½☆

★★★★☆

SMARTPHONE
Motorola Moto G 4G

The third Moto G is the best budget smartphone you can buy in the UK. This new version is in essence the same phone with a couple of tweaks, so why is it so bad, and why have we marked it down on value?

Given that this Moto G and its predecessor are in essence the same phone (though one has 4G and one is dual-SIM), we've taken a slightly different tack to usual with our review. In each of the key criteria on which we judge a smartphone we'll compare it to the new Moto E 4G.

Motorola is desperate to confuse us with its Moto E and G line-ups. In this review we're comparing the latest Moto G to the very latest Moto E, but it's worth trying to get your head around the differences between the earlier models, all of which are still available to buy.
Mk 1 Moto G: 3G connectivity, single-SIM, 4.5in HD screen, 8GB storage, £128 at Amazon
Mk 2 Moto G: 4G connectivity, single-SIM, 4.5in HD screen, 8GB storage, £117 at Amazon
Mk 3 Moto G: 3G connectivity, dual-SIM, 5in HD screen, 8GB storage, £140 at Amazon
Mk 4 Moto G: 4G connectivity, single-SIM, 5in HD screen, 8GB storage, £149 at Amazon

The Moto E is the second-generation E from Motorola. It offers several upgrades over the original Moto E, including 4G connectivity, a faster processor and double the amount of storage (now matching the Moto G at 8GB). The original 3G version of the Moto E will set you back £70 at Amazon, while right now you can pick up the 4G version for £89 at Amazon.

The new Moto E 4G and G 4G are incredibly similar in their design. Both are chunky, with curved rears that fit well in the hand. There's just 10g between them, with the Moto E weighing in at 145g and the G 155g.

As before, you can change the rear shell on the new Moto E and new G, but with the new E 4G, you can also change the grippy band that runs around its edge, allowing you to mix-and-match colours.

The Moto E is a little fatter at 12.3mm (against 11mm), but the G is taller and wider at 71x142mm against the E's 66.8x129.9mm. That's not surprising, since it houses a larger 5in screen. This display is also higher in resolution, with 720x1280 pixels offering a density of 294ppi. The Moto E's screen is a qHD panel, just 540x960, but stretched over a smaller 4.5in panel not too far behind at 245ppi. Both are splashproof IPS displays with tough Gorilla Glass 3; bright, clear, with realistic colours and good viewing angles.

Turn over the phones and only the Moto G has an LED flash. This is important not only for low-light photography, but also if you want to use the phone as a torch.

Whereas the new Moto E has lost one of the two metal bars that sit top and bottom on the front to conceal the speaker, the new G 4G retains both and offers very good stereo sound.

One category the new Moto G 4G does not win is performance. Motorola's £89 budget Moto E is faster in all of our benchmarks.

It's not difficult to see why when you look at the spec sheets. While both phones have 1GB of RAM and 8GB of storage (plus up to 32GB via microSD), the Moto E has the faster '410' variant of the Qualcomm Snapdragon processor when compared to the Moto G's '400'. Both are quad-core chips clocked at 1.2GHz. It also has the Adreno 306 in place of the Moto G's Adreno 305.

The Moto E was the clear winner in our benchmarks, scoring 464- and 1463 points in the single- and multi-core components of Geekbench 3, 13- and 6fps in GFXBench 3 T-Rex and Manhattan, and 1301ms in SunSpider. By comparison, those figures for the Moto G: 345- and 1182 points in Geekbench, 11- and 4.2fps in T-Rex and Manhattan, and 1968ms in SunSpider.

The 2015 Moto E update added a front camera to Motorola's cheapest smartphone. It's only a VGA camera and it's rubbish, but it allows you to use the Moto E for video chat (probably not selfies). The Moto G improves on this with a 2Mp camera but, although there is a difference in clarity here, it's still only 2Mp.

Round the back, the Moto G pairs the aforementioned LED flash with an 8Mp camera and f/2.0 aperture, while the Moto E has a 5Mp version with an f/2.2 aperture. They support the same features, including a 4x digital zoom, burst mode, auto HDR, tap to focus, quick capture and slo-mo video. Both support HD (720p) video recording, but we'd really like to see 1080p from the Moto G 4G.

When it comes to connectivity these handsets are on a par, both featuring 4G LTE, Bluetooth 4.0 LE, 802.11b/g/n Wi-Fi and GPS.

Interestingly these phones are fitted with the same 2390mAh non-removable battery. Motorola promises all-day battery life for each and, given that it has a slightly larger, higher-resolution screen, but less powerful hardware, we'd be surprised if battery life wasn't similar for the Moto E and G.

We ran the new Moto G through the Geekbench 3.0 battery life test – it recorded seven hours 35 minutes.

Both Moto E and G run a vanilla version of Android 5.0 Lollipop out of the box (with guaranteed upgrades to Android M), along with Motorola's usual preinstalled software. This includes Motorola Assist, Alert and Migrate.

Verdict

If you're looking for a cheap 4G smartphone, then the Moto E 4G is the best deal right now. If you would rather have a cheap dual-SIM phone with 3G connectivity, then the Mk 3 Moto G is your best bet. But the new Moto G 4G's improvements are not enough for us to turn a blind eye to its higher price and slower hardware. ⊠ **Marie Brewis**

Contact
■ alcatelonetouch.com/uk

Specifications
5in (1080x1920, 441ppi)
IPS display; Android 4.4
KitKat; 2GHz Octa-core
MediaTek CPU; Mali-
450MP4 GPU; 2GB RAM;
16/32GB internal storage;
13Mp rear camera, AF
with LED Flash; 2Mp front
camera; Video recording
at up to 1080p; dual-band
Wi-Fi 802.11a/b/g/n;
Bluetooth 4.0 LE; A-GPS;
Micro-USB (SlimPort);
Micro-SIM (dual-SIM);
2500mAh non-
removable battery;
69x140x7.9mm; 125g

Build: ★★★★☆
Features: ★★★½☆
Performance: ★★★½☆
Value: ★★★★☆

★★★★☆

SMARTPHONE
Alcatel OneTouch Idol X+

Alcatel OneTouch is an emerging brand in the mobile industry, and the Idol range is the company's top-tier of devices.

The Idol X+ is a typical looking mid-range phone. It's attractive but can hardly be described as a showstopper. It's plain at the front but the brushed-metal-style edges give a premium style despite being plastic underneath. The drilled holes for the speakers are neat and we like the way the dual-SIM card slots – on opposite sides of the device – have magnetic flaps, even if they are a bit difficult to get the hang of.

Meanwhile the rear cover, available in different colours, has a striking spun finish. Don't be fooled into thinking this is metal though, it feels distinctly plastic and comes off a little with minimum effort despite there being no need to remove it.

It feels nice in the hand with its slender 7.9mm profile and 125g weight – similar to that of its rivals.

The phone offers a 5in IPS screen with a Full-HD resolution (1080x1920). This is protected by Gorilla Glass 2 and has an oleophobic coating to ward off fingerprints. It works pretty well and the display is decent, matching rivals with an impressive 441ppi, good brightness and viewing angles.

In the engine room is an octa-core processor, so there are more cores than you would perhaps expect to find at this price – the Honor 6 also offers this feature. The chip is a MediaTek MT6592, which is 2GHz and has 2GB of RAM.

More cores might sound better but our benchmark results show that it doesn't automatically mean superior performance. It recorded 2711 in Geekbench 3, 1366ms in SunSpider and 12fps in GFXBench T-Rex. It couldn't run our GFXBench Manhattan test, though.

Benchmark results don't always translate into performance from a user's perspective but in this case it did, although we experienced some annoying lag such as jerky animations when moving around homescreen panels.

On the storage front, you can get either 16- or 32GB models. Although there's space for two SIM card slots, Alcatel OneTouch hasn't found room to include a microSD card slot.

The dual-SIM card slots is a key feature here and this is one of the nicest dual-SIM phones we've reviewed. If you're only going to use one SIM card, the lack of a microSD card slot is a shame.

When it comes to connectivity, you get 802.11n Wi-Fi, Bluetooth 4.0 and GPS but there's no NFC, IR blaster or 4G LTE support.

Audio is a feature that Alcatel OneTouch makes a big deal of on its website for the Idol X+. Those down-facing speakers are better than your typical poor quality output but aren't up to the standards of premium phones.

The Idol X+ is also supplied with some JBL in-ear headphones which are a lot better than the usual cheap rubbish that are supplied with a phone. When headphones are plugged in, you can choose from different sound effect profiles such as electronic, pop-rock and soul.

The 2500mAh battery is non-removable. During our testing we found that the Idol X+ will last a day of varied use comfortably enough but not so much so that you won't need to charge it every night.

We were impressed with how quickly the camera app launches and you can also shoot very quickly too – the autofocus is the slowest element here. The app is easy to use and as with almost any phone, it shoots cropped to get widescreen so you'll need to select full-screen in the settings to get all 13Mp. The results are decent with a good amount of

detail. There are various shooting modes including HDR, panorama and filter. You can also manually adjust the ISO and exposure in the settings menu if you want. Video can be shot at a pretty standard 1080p with optional electronic image stabilisation.

The front-facing camera, at 2Mp, is less impressive but will suffice for the odd selfie and video call should you need to call upon it.

The Idol X+ is an Android 4.4.2 KitKat powered phone. We're not massively taken with the default lock- and home screen wallpapers but you can, of course, choose your own. You get some basic info such as the time and weather and can still access the notification bar.

The Idol X+ is one of a number of phones that goes against the modern way of Android having onscreen navigation buttons. Instead, there are touch-sensitive buttons that sit below the display.

Last but not least in the area of software is the amount of preinstalled apps. The usual set of Google apps and built-in essentials such as a gallery, calculator, camera and others is to be expected. However, Alcatel OneTouch adds a lot more on top, including Facebook, Deezer, Evernote and WhatsApp.

Verdict
The Alcatel OneTouch Idol X+ is one of the best dual-SIM phones we've reviewed and a good choice for the price. ⊠ **Chris Martin**

£199 inc VAT

Contact
■ kingzonez1.com

Specifications

5.5in HD (1280x720, 267ppi) multi-touch JDI IPS screen with Gorilla Glass 3; Android 4.4.4 KitKat with KOS V1.2 UI, with future upgrade to Lollipop; 1.7GHz MediaTek MTK6752 64-bit octa-core (8x A53) processor; 2GB RAM; 16GB storage; microSD (up to 64GB); Mali-T760 graphics; dual-SIM (dual standby) - 1x full-size 3G SIM, 1x 4G LTE Micro-SIM; 13Mp Sony rear camera with LED flash, f2.0, 28mm, 1080p video; 8Mp front camera, six layers of sapphire lens, anti-glare, anti-reflection; fingerprint scanner; dual-band 802.11a/b/g/n/ac Wi-Fi; GPS; GLONASS; NFC; OTG; Bluetooth 4.0; 3500mAh removable battery; 153.5x76x7.5mm; 169g

Build:	★★★★☆
Features:	★★★★☆
Performance:	★★★★⯪
Value:	★★★★⯪
	★★★★☆

SMARTPHONE
Kingzone Z1

It's not often we're blown away by a mid-range smartphone. Supplied to us by Coolicool.com, the Z1 has an awful lot going for it. At less than £200, it's faster than the Samsung Galaxy Note 4 and iPhone 6 Plus. It's also well-built, supports dual-SIM and 4G connectivity, has decent cameras, features some useful gestures, and it even has stereo speakers and a fingerprint scanner.

The Kingzone Z1 is supplied in the UK via Coolicool.com – a Chinese site. You have two options: you can buy it from the European warehouse for £199.91 and you won't be liable for import duty; or you can buy it from the Chinese warehouse for £132.59, but you will be liable for import duty if it's picked up by Customs (of course, you are liable whether or not you're caught out).

For a mid-range phone, the Z1 is very good-looking. It's built around a metal frame that ensures a sturdy, premium feel, and although the rear cover is plastic the up side is the fact it's removable and reveals an also-removable battery. It's got a grippy, textured finish that feels good in the hands.

There's a huge 5.5in screen on the front of the Z1, which makes this a phablet. Incredibly slim bezels and a 7.5mm frame mean it's still comfortable to hold in a single hand. It's also reasonably light for a phablet at 169g – by comparison the 7.1mm iPhone 6 Plus and 8.5mm Samsung Galaxy Note 4 weigh 172g and 176g respectively.

A key difference here, of course, is the resolution. The Kingzone has an HD resolution of 1280x720 pixels, which means it has a density of 276ppi. That's not at all unusual at this price, but it does mean it isn't as sharp as the 401- and 515ppi screens found on the iPhone 6 Plus and Galaxy Note 4.

Nevertheless, the JDI IPS panel is reasonably bright, with realistic colours and strong viewing angles. It's also of a good size for enjoying games and media, or whatever you want to do on your phone, including browsing web pages and e-books.

And that's where one of our favourite features comes in: the rear-mounted fingerprint scanner. This is a swipe- rather than touch-based scanner, and shares the same

problems as those found on Samsung phones prior to the S6's release. As a fingerprint scanner it's a pain to use, and we gave up trying to get it to register our digits. But used as a scrolling control or a dedicated capture button for the selfie camera it's a very welcome addition to this phablet, and makes one-handed use so much easier.

Stereo speakers are found on the bottom edge of the handset. On the right edge is a power button, while separate volume controls are on the left. This positioning can make them difficult to access when using the supplied (to us, at least) flip cover, which features a window for the time and date, automatically wakes or sends to sleep the screen, and allows you to answer calls without flipping open the case. Also in the box is a standard silicone rear cover.

At the top is a Micro-USB charging port and a 3.5mm headphone jack. A pair of earphones are supplied in the box, along with a Micro-USB cable and, very usefully, an OTG adaptor. The latter allows you to connect the Z1 to other USB devices, such as storage devices.

The phone uses a 64-bit MediaTek MTK6752 octa-core chip clocked at 1.7GHz. This is paired with Mali-T760 graphics, 2GB of RAM and 16GB of storage (a microSD slot lets you add another 64GB).

Performance is amazing for a £200 phone. In Geekbench 3.0 we recorded a staggering 3689 points in the multi-core component, making the Kingzone Z1 faster than both the iPhone 6 Plus (2917) and Samsung Galaxy Note 4 (3272). It fared better than the Note 4 in SunSpider, too, with 963ms against its 1367ms, while the iPhone 6 Plus performed spectacularly with 369ms.

The Kingzone Z1 recorded five hours 45 minutes with a battery score of 3074 points. By comparison the S6 saw six hours 53 minutes and 4136 points, while the latest Moto G managed seven hours 35 minutes but scored just 2024 points.

In real-life usage we found that the Kingzone Z1 lasted for several days in standby mode, and even with heavy use the 3500mAh

removable battery should easily get you through the day.

Everything you need is covered on the connectivity front. There's GPS and GLONASS, NFC, 4G LTE (although it's supported by only one of the dual-SIM slots, the other maxes out at 3G), dual-band 802.11a/b/g/n/ac Wi-Fi, USB OTG support and Bluetooth 4.0.

The 13Mp Sony camera is a pretty good camera, with an f2.0 aperture, 28mm lens and LED flash. We were pleased with our test shots, which show reasonably good detail and largely realistic colours. You can apply filters at the composition stage, and you'll find various modes such as multi-angle shot, panorama, motion track and live photo.

The 8Mp selfie camera at the front takes a good picture, but beyond real-time application of filters and the ability to smooth wrinkles and whiten your face there is little in the way of manual control.

The Kingzone Z1 runs Android 4.4.4 KitKat with Kingzone's KOS 1.2 UI. The app icons are squares with rounded edges, but in other respects it will be incredibly familiar to KitKat users. The Z1 will get a wireless upgrade to Android Lollipop, too.

Verdict

For a £200 phone, the Z1 is a very decent proposition. It has a nice build, some pleasing connectivity features, and faster performance than phones that cost three times the price. ⊠ **Marie Brewis**

£90 inc VAT

Contact
- bluboo.com.cn

Specifications
5.5in quarter-HD (960x540, 200ppi) IPS screen; Android 4.4.4 KitKat (with OTA upgrade to Lollipop coming); 1.3GHz MediaTek MTK6732 SOC (1.3MHz ARM Cortex A-53 quad-core CPU + Mali-T760 MP2 dual-core GPU); 1GB RAM; 8GB storage; Micro-SIM; dual-SIM dual-standby or single-SIM + microSD; 5Mp front camera; 13Mp rear camera, dual-LED flash, 1080p video at 30fps; swipe fingerprint scanner; Bluetooth 4.0; 802.11b/g/n Wi-Fi, single-band; GPS; A-GPS; HotKnot; OTG; FM radio; smart case; removable 3000mAh battery; 77x158.7x8.8mm; 167g

Build: ★★★☆☆
Features: ★★★★☆
Performance: ★★★★☆
Value: ★★★★☆

★★★★☆

SMARTPHONE
Bluboo X6

The Bluboo X6 is a 4G LTE Android KitKat phablet with a fingerprint scanner that costs just £90 from Geekbuying. Shipped from China you should also take into account import duty.

The Bluboo X6 looks good for a budget phone. It ships with a smart case not too dissimilar to the LG G3's Quick Circle case, with a silicone rear cover and a front flap that has a circular window through which you can see a clock face.

The plastic build keeps down the weight, and at 167g the X6 is light for an 8.8mm-thick phablet. The rear cover is thin but clips on tight. It's removable, too, giving access to an also-removable 3000mAh battery and dual-SIM slots. One of these doubles as a microSD slot, although Bluboo doesn't specify how much storage it can accommodate (many budget phones allow 32GB).

Available in blue or white, the rear cover features a chequered design that aids grip in the hand. With a 5.5in screen and an 8.8mm-thick body this is a large phone, although its slim bezels to the screen's left and right make it just about manageable in a single hand.

Around the edges you'll find two speaker grilles at the bottom, a volume rocker and power switch on the right side, and a Micro-USB charging port and 3.5mm headphone jack on top. A 13Mp camera is on the rear, surrounded by a pink anodised aluminium ring and supported by a dual-LED flash.

At the front is a 2.5D Arc screen, which means it is curved at the edges. This has a nice effect, but it doesn't lie flush to the case. The top and bottom bezels are larger, with a physical home button at the bottom that builds in a fingerprint sensor.

The screen itself is an IPS panel. While colours are realistic and it's usefully bright, a quarter-HD resolution of 960x540 is pushed almost to its limit on a 5.5in screen. The X6 has a pixel density of 200ppi, which isn't horrendous but it's not as sharp as we'd like. For web browsing it's fine, but for viewing media you might prefer an HD display. The large panel is useful in this regard, mind.

When you're paying £90 for a smartphone, you can't expect blistering performance. However, in many of our benchmarks the Bluboo impressed us. Its performance is due to the phone's MediaTek MTK6732 SOC, which integrates a 1.3MHz ARM Cortex A-53 quad-core CPU and Mali-T760 MP2 dual-core GPU, plus 1GB of RAM.

In Geekbench 3.0 we measured 654 points in the single-core test, and 1940 points multi-core. Other 5.5in phablets we've tested such as the ZTE Blade S6 Plus are faster, but in the real world performance is adequate, but it'll take a second to launch most apps, though.

Performance was also good in GFXBench 3.0, which tests the graphics performance. The Bluboo recorded 25fps in T-Rex, and 13fps in Manhattan.

In our Geekbench 3.0 battery test, the Bluboo recorded 2946 points, and seven hours 22 minutes. To put that into perspective, its time recording is on par with the 2015 Moto G, but its point score falls just below the Kingzone Z1, another Chinese 5.5in phablet (opposite).

Storage-wise you get 8GB built in, with around 6GB available, and if you don't need the second SIM slot you can insert a microSD card. This is Android, too, so expect to be able to make use of all manner of third-party cloud storage services - Google Drive is preinstalled for you.

When you're buying a phone from China you should always check the frequency bands to ensure it will be supported by your UK mobile operator. The Bluboo X6 supports GSM 850/900/1800/1900MHz, WCDMA 900/1900/2100MHz, and Cat 4 FDD-LTE B1/B3/B7/B20.

Other connectivity specs include Bluetooth 4.0, single-band 802.11b/g/n Wi-Fi, GPS and A-GPS, and USB OTG. While there's no NFC there is HotKnot, which is MediaTek's alternative.

If you're not using the second SIM slot as a microSD slot, you can take advantage of dual-standby dual-SIM functionality.

For photography, there's a 13Mp camera at the rear and an impressive 8Mp at the front. It's not all about the megapixels, but we were impressed with the photos and test video we captured on the X6 (it'll record 1080p at 30fps). A dual-LED flash is also useful for improving low-light performance.

The X6 runs a slightly customised version of Android KitKat, and it's not one we're particularly keen on. The key difference between vanilla KitKat and what we have here is the X6's use of themes. Four are installed on the Bluboo X6, and not one of them is what we'd consider normal. The default theme, for example, switches the Google Play icon to a red tile with rounded corners and a white house icon; the only thing giving away its purpose is the legend below. The themes will change the wallpaper and icons, but you can also separately customise the wallpaper and lock screen, but not through the Settings menu. Themes and wallpaper customisations are instead made through the Theme manager, which is found in the App menu.

Verdict

For a cheap phablet the Bluboo X6 has a lot going for it. It's reasonably fast compared to its similarly priced rivals, it supports 4G and dual-SIM functionality, and the large screen is useful for browsing the web and viewing media. ⊠ Marie Brewis

Specifications
Android 4.4 Kitkat; 4.5in FWVGA (480x854, 217ppi) IPS display; MediaTek MT6582M 1.3GHz CPU; Mali-400MP4 GPU; 8GB storage; 1GB RAM; microSD up to 32GB; 8Mp autofocus BSI sensor flash camera; 5Mp front camera; Bluetooth 4.0; 802.11b/g/n; Micro-USB 2.0, 3.5mm mini-jack; GSM 850/900/1800/1900MHz; WCDMA 900/2100MHz; 3G; EDGE; GPRS; GSM; GPS; A-GPS; dual-SIM; USB cable; 1650mAh lithium-ion battery; 134x65x8mm; 118g

Build: ★★★★☆
Features: ★★★★☆
Performance: ★★★★☆
Value: ★★★★★

★★★★☆

SMARTPHONE
Prestigio Grace X3

A well-specified dual-SIM Android smartphone for just £82 – the Prestigio Grace X3 will be ideal for the bargain-hunter who doesn't mind compromising on style or display resolution.

With a 4.5in 480x854 IPS display the Grace X3 is no HD device, but it is no slouch either. A 1.3GHz quad-core processor is paired with 1GB of RAM to look after performance. You get a customised version of Android 4.4, and 8GB of onboard storage, as well as a memory card extension slot. And there's a 1650mAh battery plus a 5Mp forward-facing and 8Mp autofocus camera.

These are all reasonable, if not outstanding, specifications and features. But it's the dual-SIM capability that sets the Grace X3 apart at this price. There is, clearly, a trade-off for these features at such a low price.

Available in blue or white, the Grace X3 is lightweight and compact. It is much bulkier than you'd expect for a 4.5in device, but it's still well balanced, lightweight and small enough to use one-handed.

The bezels at the top and bottom of the Grace X3's display are bigger than you might expect but the front is mainly glass. The wider than average sides have a metallic finish, and the back is a textured plastic.

Pulling off that textured back panel gives access to the removable battery, both SIM card slots and an expandable memory card slot. The back panel feels extremely thin and flimsy when it is off the phone. Overall, though, it feels like a device that is built to last, if not one that is particularly beautiful.

The 4.5in FWVGA (480x854) IPS display gives a middle-of-the-road pixel density of 217ppi. But that relatively low resolution isn't offensive. Photos look nice without blowing you away. The colour palette is a little bland, but nothing that would cause you to complain.

The Grace X3 has a quad-core MediaTek MT6582M CPU clocked at 1.3GHz and paired with 1GB of RAM. This translates to a good level of performance, and in use it was a responsive handset.

The Mali-400MP4 GPU's graphical performance is less impressive. It's far from terrible,

but it probably wouldn't serve as a gaming rig.

Our Geekbench 3 testing returned average scores of 1180 points in the multicore and 364 in the single-core test, putting the Grace X3 in a similar bracket to the Motorola Moto G or the original Nexus 7 tablet. Excellent performers, but nothing like as powerful as the big-beast Android flagships.

There's just 8GB of onboard storage, but on the test device only 4.99GB of that could be seen and used, and out of the box only 4.55GB was free. That's the bad news. The good news is that you can add 32GB via the SD card slot. It's still paltry by today's flagship standards but, unless you are a photography maven or want to cart around your entire music collection, it should be enough.

Neither of the Grace X3's two cameras is likely to inspire you to fill up that storage. The main camera is an 8Mp with autofocus, flash and BSI sensor. Around the front is a 5Mp camera for selfies. Prestigio says the BSI sensor should make low-level photography better. Images are okay, but no more than that.

The Grace X3 comes with Android 4.4 KitKat, and has full access to Google Play and all other features of

recent Android. It is Prestigio's own version of Android, though, which may explain some of that storage hogging. The most noticeable difference to standard Android is that fonts and icons are slightly different. And Prestigio includes a special clock – designed, we think, to make the phone feel prestigious (geddit?). So that's nice.

More important are the myriad apps that were installed as soon as it arrived. All take up space. If I want additional apps, then I will install them. It is the hidden price of a cheap smartphone.

The Grace X3's 1650mAh lithium-ion cell feels small for a device with a quad-core chip, but the display is relatively low-spec. In heavy use we comfortably got through a day of solid smartphone usage without needing to recharge.

Verdict
For a dual-SIM phone the Prestigio Grace X3 is staggeringly well priced. It has a mediocre display and plasticky lightweight-build quality but performance is decent and so is battery life. Storage is an issue, and we could live without the bloatware. But for the price, this is an amazing deal. ⊠ **Matt Egan**

Specifications
Android 4.4 KitKat; 4.7in (720x1280, 312ppi) IPS display; MediaTek MT6582M 1.3GHz CPU; Mali-400MP2 GPU; 8GB internal storage (4.99GB available); 1GB RAM, microSD card up to 32GB; 13Mp autofocus camera with BSI sensor and LED flash; 5Mp front camera; Bluetooth 4.0; 802.11b/g/n, Micro-USB 2.0, 3.5mm mini-jack; WCDMA 900/2100MHz, GSM 850/900/1800/1900MHz; 3G; EDGE; GPRS; GSM; GPS; A-GPS; FM; dual-SIM; 1800mAh lithium-ion battery; 137x68x8mm; 137g

Build: ★★★★☆
Features: ★★★★☆
Performance: ★★★★☆
Value: ★★★★☆

★★★★☆

SMARTPHONE
Prestigio Grace X5

The Prestigio Grace X5 is an inexpensive dual-SIM Android smartphone with a 5in display. For just £105 you get a quad-core processor and 1GB of RAM, as well as Android 4.4 KitKat.

On the face of it it's a very good deal indeed, but in truth the Grace X5 is no-one's idea of a high-end, stylish device. It is, however, by no means poorly constructed. From a distance, it even looks a little like an iPhone 6. A little.

It is a long and tall device, available in black or white. While 8mm isn't as thin as it gets in this type of phone, the Grace X5 is no brick. And the edges are rounded and smooth, which makes it feel thinner than it is.

The front comprises only glass, with thin bezels framing either side of the display. The bezels at the top and bottom are wider, but not offensively so. Above the display is the front-facing camera aperture and speaker. Down the bottom are the three Android touchpoints. The sides are a metallic-look silver plastic, again rounded for comfort, where the on/off button is located.

The detachable back panel is a thin plastic sheet with a textured finish. It comes away and fits back on with ease, offering access to detachable battery, two SIM slots and the SD card slot. However, it is so thin that, although the Grace X5 feels robust as a whole, the back panel feels dangerously flimsy.

The overall effect is of solid build and less-than-hideous style and design. The Grace X5 feels comfortable in the hand and over the course of a week or so in use never gave the impression of being too delicate to be a sidekick. The white back did pick up some dirty smudge marks, but they wiped off.

Here we are happy with our lot. The 4.7in IPS display's 720x1280 resolution makes for a decent if not great pixel density of 312ppi. The icons have some pixellation at the edges, photos look nice not fabulous, and the colour palette is a little bland. But the Grace X5's display is better than you could expect at this price; it wouldn't have looked out of place on a 2013 flagship.

The Grace X5 is built around a quad-core MediaTek MT6582M CPU,

clocked at 1.3GHz. Graphics are handled by a Mali-400MP2 GPU, and both are powered by 1GB of RAM. This is a reasonable, middle-of-the-road spec that feels better than it ought on a £100 phone.

In use the Grace X5 feels responsive and fast. I doubt that anyone using it would feel unhappy with the performance, unless they were trying to play particularly intensive games or something similarly inappropriate.

In Geekbench 3 testing it returned average scores of 1080 points in the multicore and 372 points in the single-core test. Our graphical benchmarks showed it will run games, just not the most graphically intensive.

The Grace X5 has the usual pair of cameras – a 5Mp selfie with a flash at the front, and a 13Mp around the back with a BSI sensor, autofocus and LED flash. It's not a bad smartphone camera.

The advertised 8GB of onboard storage isn't great but it gets worse. As with the Grace X3 we could access only 4.99GB of that 8GB. You can add 32GB via the SD card slot, but that is an extra cost, can undermine performance, and still leaves you with only 37GB. It's more forgivable in the cheaper Grace X3 (opposite) than the X5.

Connectivity is a better story. You get Bluetooth 4.0, IEEE 802.11b/g/n Wi-Fi and a Micro USB 2.0 connector. There is a 3.5mm mini-jack for audio.

Network bands include GSM 850/900/ 1800/1900MHz and WCDMA 900/2100MHz, and you get 3G, EDGE, GPRS and GSM. Sensors include GPS and A-GPS. And you can install two SIMs to operate across two countries or use the same handset for work and play.

Like the Grace X3, the X5 comes with Android

4.4 KitKat, Prestigio's own version of Android, which may account for some of the heavy storage hit. A shed load of apps were installed as soon as the X5 arrived – bloatware is the hidden price of a cheap smartphone, and for many it will be a price too far.

The 1800mAh lithium-ion cell comfortably got the X5 through a day of solid smartphone usage without a recharge.

Verdict
As ever with smartphones, you need to consider how much you can afford and what your requirements are. If you need a dual-SIM smartphone with a 5in display, the Prestigio Grace X5 is great value. It isn't the best built or the most stylish, and the display is merely mid-range. But if you don't want to be spending much more than £100, then you really can't go wrong. ⊠ **Matt Egan**

£170 inc VAT

Contact
■ microsoft.com/uk

Specifications
ARM Cortex M4 MCU CPU; 64MB onboard storage; Bluetooth 4.0; GPS; three-axis accelerometer, gyrometer; ambient light sensor; skin temperature sensor; UV monitor; optical heart sensor; 0.2in (11x33mm) touch-enabled TFT full-colour (320x106) display; 19mm wide and 9mm thick; 60g

Build: ★★★☆☆
Features: ★★★★½
Performance: ★★★★☆
Value: ★★★½☆

★★★★½☆
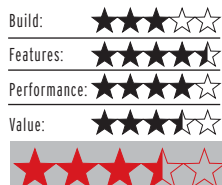
ACTIVITY TRACKER
Microsoft Band

It's like Microsoft has made a physical metaphor for itself. The Microsoft Band is a well-built wearable. It does useful stuff. It does useful stuff well. But only the Microsoft Band's mum could love it.

The Band is Microsoft's activity tracker with smartwatch capabilities. Rather than a direct rival to the likes of the Apple Watch and the best Android Wear devices, the Microsoft Band is like a Fitbit with benefits. As well as being a full-featured pedometer, health monitor and activity tracker, it works with just about any smartphone and allows you to preview texts and emails. And it is a digital watch.

As such the Microsoft Band may be a true rival to the Apple Watch and its rivals. After all, it is unclear whether people want to have a smartphone on their wrist. It is impressive that you can take photos and make calls from a watch, but it is not necessarily desirable, so it is at least possible that the Microsoft Band offers the perfect blend of convenience and portability on a device that can be worn with your existing watch.

Of course, that requires for the Microsoft Band to be good and good value. And while the Band has great functionality, it is also ugly and clunky – if not without charm.

Say what you like about Apple (and personally I feel the Apple Watch is something of a joke that has gone too far), but the company would never release a product like the Band.

For a start, it is big. Big and chunky. The band is 19mm wide and 9mm thick, and weighs 60g. That

is a lot of device to wrap around your wrist. The strap of my actual wristwatch is only around half as thick at its chunkiest part.

What's more the Band is basically rigid while the back of the display is 5cm of straight-edged, rock-hard computer. Microsoft has created the Band in three different wrist sizes. I expect everyone will find one that fits. But even when it fits it doesn't fit, if you see what I mean. The straight edge rubbed against the bony bit of the top of my wrist, and moved around whenever I exercised, even with the strap pulled tight.

And the way the display fits is odd. It is a thin letterbox of a screen, with information displayed in landscape. So you have to bend your arm (and neck) one way or the other to see it. After experimenting with the Band on the top of my wrist and then underneath, and in both orientations, I ended up with the buttons pointing back toward me. But it is a far from perfect experience.

So much for the user experience, it is also fair to say that the Microsoft Band does not scream 'desirable gadget'. It's entirely unscientific, but not one person who saw my Band had positive things to say about it on style grounds alone.

It looks like what it is: a big, chunky activity tracker. The display is a tiny sliver surrounded by big thick bezels, set into shiny black plastic that is all function and no style.

On the plus side, it is well constructed and robust. Made of thermal plastic elastomer, it is both waterproof and sweat-resistant, and designed for extreme temperatures. I put it through multiple workouts in a variety of environments, and it never blinked.

The Band has an 11mm by 33mm touch-enabled TFT full-colour display. Once you've worked out how to access it, the screen displays bright and clear, and the touchscreen is responsive.

Microsoft has made the interface super-simple, so that tiny display is perfectly adequate, even when you're on the move and with sweat running into your fat piggy eyes (your experience may be different to mine). The viewing angle is good. You can adjust the brightness to conserve battery life, and the Low setting worked perfectly well.

The display resolution is 320x106. The pixel density is high enough to not discern pixels – not least because there are no photos or video to view on it.

A haptic vibration motor tells you when you have done a mile or received an email. And there is a microphone in case you are the kind of maniac who likes to talk to your wrist.

The Microsoft Band is built around an ARM Cortex M4 MCU processor. There is 64MB of internal storage, although you won't be saving photos or media files to it. It charges and connects via a USB-enabled cradle.

There's an optical heart-rate sensor, three-axis accelerometer and gyrometer. You can use GPS to track your runs, walks and cycles, and an ambient light sensor, skin temperature sensor, UV sensor and capacitive sensor combine to measure performance in all kinds of activities. The heart-rate sensor is continuous, so it's better than some.

The GPS was very accurate with running and cycling, and the pedometer more accurate than most at calculating distance.

It connects to your smartphone via Bluetooth 4.0, and is compatible with Windows Phone, iPhone and Android (from 4.3 upward). I tried it with all three and it paired fine.

General performance was zippy with no discernible lag. And the sensors worked well, in general.

But here's the rub. For the record, you get two 100mAh rechargeable lithium-ion batteries. And Microsoft says they should give 48 hours of battery life. That wasn't my experience. Yes, I was using it a lot, connected via Bluetooth, measuring a lot of activity. But I have never managed to get it through two days, even when the display is set to low. And when it goes, it goes.

On the positive side, the Band charges really quickly via the supplied charging cradle cable, although you have to supply your own USB plug. If you want to use the sleep functionality too, you may be in for a struggle.

In principle there's a compelling feature set: daily physical activity and sleep tracking, and 24-hour heart-rate tracking and health monitoring. You also have built-in GPS and guided workouts.

You can preview incoming calls, texts, social media updates, emails and calendar entries. And, if you

are the sort to use Microsoft's Cortana, you can take notes and set reminders with it.

I expect the main reason for using the Microsoft Band will be an activity tracker with benefits. And for this purpose I am more than happy with the gadget. By default it measures your steps each day, so you can set your target and walk off those pounds (or kilos – the Band can measure in both). It was as accurate as the Fitbits and Jawbones I've used. One potentially unique issue is that when I was out pushing a pram, steps simply didn't register. At all. Presumably this is because my wrist wasn't moving. Reader: I have a six-week-old daughter, pram pushing is a big part of my life right now.

When you fancy more frenetic activity, you can just select running, cycling or weight training, hit the Action button and head off, and your activity is captured. You get helpful distance updates as you go.

While the GPS tracked distance in the outside world pretty accurately, the pedometer was less reliable on a treadmill, measuring three miles for a run the treadmill counted as more than five. This is not unusual or surprising, but mildly disappointing.

The Band as an activity tracker can set and measure your workout, involving both cardio and weights. Given that these devices are psychological prompts to make you do more, this can only be a good thing. And by measuring your heart rate the Band is likely to have a more-accurate-than-some measure of the calories you burn.

I really like the Band as a smartwatch. I found that being able to preview emails and texts meant I looked at my phone far less often. If I could add in WhatsApp and Facebook updates I could leave my phone in my pocket indefinitely.

Being given a vibrating nudge that I have a meeting in 10 minutes helps me too. As does being able to look at my calendar without pulling out my phone.

I don't want to be able to respond to emails and texts via a wristwatch. You can send templated texts from the Band, but for me just being able to triage and ignore until later most emails, texts and calls is a time – and relationship – saver.

The Band's way of extending access to notifications on my phone offers useful functionality without compromising my smartphone's excellence as an input device. And that's more useful to me than a full-featured smartwatch.

Verdict

The Microsoft Band is the most Microsoft product imaginable. It does useful stuff and mostly does it well. But it is ugly and uncomfortable. No-one is ever going to point at a Microsoft Band and say ''I want one of those''. Which is a shame, because despite issues with battery life and distance measurement, I like it. Whether it is enough to make people pay £169 when they can buy an Android Wear watch for an extra £100 is the key question. I suspect they won't. ⊠ **Matt Egan**

Specifications

Media streamer; dual-core processor; 1GB RAM; 8GB storage; dual-band Wi-Fi with MIMO; remote included; HDMI extender included; Support for Dolby Digital Plus, 5.1 surround sound and passthrough for 7.1; 720p or 1080p up to 60fps 84.9x25x11.5mm; 25g

Build: ★★★★☆
Features: ★★★★☆
Performance: ★★★★☆
Value: ★★★★★

★★★★☆

MEDIA STREAMER

Amazon Fire TV Stick

Back in our March 2015 issue, we reviewed the Fire TV. That's the set-top-box version of the Stick, and is very similar to the new Google Nexus Player (opposite) and almost the spitting image of the Apple TV. The Fire TV Stick is a cheaper media streamer for those who can make do without the microphone built into the remote control and can plug directly into an HDMI port on your TV, so may be a better choice for anyone who doesn't want a series of black boxes below their TV.

Unlike the slightly cheaper Chromecast, you get a remote control with the Fire TV Stick. The Stick might plug into your TV's HDMI port with no problems, but a short extension cable is included for situations where a direct connection isn't possible. On our Panasonic TV, other HDMI cables blocked access to the Stick's microUSB power input, and its rear end protruded from the TV's bezel.

A USB cable and power supply is included too – you'll probably have to use both since most TV USB ports won't provide enough power for the Fire TV Stick. You'll get a warning to tell you if that's the case as the Stick can boot up even from an underpowered port.

The remote is similar to the one bundled with its big brother, but has no microphone. It communicates via Bluetooth, so you don't need line of sight to the Stick for it to work: handy since it will be tucked away behind your screen.

You can buy the Voice Remote separately if you want to (it's £25), or install the free app on your Android or iPhone. As well as enabling voice search, the app also lets you enter search terms via your phone's keyboard: much quicker and easier than faffing around with the directional pad on the remote control.

It will come as no surprise that Amazon's own Prime Instant Video takes centre stage, which is fair enough. But the Stick gives you access to a variety of other services as well, including main rival Netflix.

There's also YouTube, BBC iPlayer and Demand 5 (apps which are free to download and install to the 8GB of internal storage). Beyond this, though, there's not much

of interest unless you have a big collection of your own videos that you want to stream using the Plex app. Some might appreciate Vimeo, Vevo, Dailymotion and STV Player, but it's a shame there's not yet All 4 or ITV Player apps.

If, for some reason, you feel the need to listen to music on your TV, you can get Spotify, Amazon Music, Ministry of Sound Radio, Muzu.TV and Musixmatch apps.

If you didn't know, it would be impossible to tell whether you were controlling a Fire TV or Fire TV Stick since their interfaces are basically identical. Down the left-hand side is the main menu, and the content you see on the right-hand side relates to the section currently selected in the main menu.

At the top of the list – below Search and Home – is Prime Video. Your recent list is prominently displayed along with 'recently added' shows and movies, plus featured shows (usually Amazon's own or exclusives).

Our biggest complaint concerns not the content itself, but the fact you can't filter out pay-per-view shows. This means you'll have to keep your eyes peeled for the little 'Prime' logo on a video's thumbnail to see if it's included in your subscription. A fair chunk is, but some movies and TV programmes have to be bought or rented. When you do pay for something like this, it appears in its own Video Library section.

Considering that you can filter out paid-for content in the Prime Instant Video iOS app, it's maddening you can't on Amazon's own hardware.

The good news is that the beefy hardware inside the Fire TV Stick – a dual-core CPU, 1GB RAM and dual-band 802.11n MIMO Wi-Fi – means it's very responsive and can always keep up with even the most fervent of button pushers. On top of this, the software predicts (or tries to) what

you're going to watch so playback is almost instantaneous.

The Stick also supports Dolby Digital Plus (and passthrough up to 7.1 channels) so if you have a suitably equipped surround-sound system, you'll get decent audio where the content has it. Just bear in mind that there are no other connectors on the Stick: if you want to route audio out of it, you'll either need a TV with the appropriate audio outputs for HDMI devices, or to plug it directly into an AV receiver which passes the video signal to your television.

If you own a compatible tablet (or a Fire Phone) you can use it as a second screen while you watch Prime videos to get 'X-ray' information such as which actors are in a particular scene, other films or TV shows they've been in and more.

Like the Apple TV, the Fire TV Stick will provide an eye-catching slideshow of your personal photos: Amazon offers 5GB of free storage and an app to automatically back up your phone's camera roll, so photos will appear on your TV without you lifting a finger. It's a nice touch, and certainly worth having the extra app if you do buy a Fire TV.

It seems that TV and movies aren't enough for media streamers these days, and the Fire TV Stick lets you play casual games just like its big brother, the Fire TV. You can play most with the remote control, and it also works with Amazon's £35 Bluetooth Gamepad if you want more of a console experience.

The games available aren't exactly blockbusters, but the ability to download Hill Climb Racing, Tetris and Sonic the Hedgehog certainly add an extra dimension.

Verdict

Thanks to its internals and nice interface, the Fire TV Stick is a great gadget for watching Prime Instant Video, Netflix, iPlayer and Demand 5. ⊠ **Jim Martin**

Build: ★★★★☆
Features: ★★★☆☆
Performance: ★★★½☆
Value: ★★★½☆

★★★½☆

MEDIA STREAMER
Google Nexus Player

The Nexus Player is the search giant's set-top media streamer. Being a Google device, it's no surprise that it's a portal to Google Play Movies and TV where you can rent or buy films, TV episodes and box sets. You can also use Google Play Music and – as you'd expect – YouTube (because it's owned by Google).

What Google doesn't have is a streaming service to rival Netflix or Amazon Prime Instant Video. It has Google Music, but no subscription service for video. It's much more expensive to use a pay-per-view service, so you're better off signing up for Netflix and renting the odd new movie from Google Play.

The default home screen also has links to a massively slimmed-down Google Play store where you can install some apps and games: the Nexus Player wants to be your go-to device for casual gaming, just like Amazon's Fire TV or Roku 3.

You can play games using the included remote, or spend an extra £35 on the Bluetooth game controller. That's the same price as Amazon's, to save you checking. Games are divided into three categories: TV Remote, Casual for Gamepad and Action for Gamepad.

It isn't hard to guess what you'll find in each category, but at the moment the selection is pretty limited – just like the Fire TV. You don't need a gamepad to play some action games, though. Fire up Asphalt 8 without a gamepad paired and it will give you a diagram showing how to drive with the standard remote. It's the same with Rayman Fiesta, which is why you'll see them in the TV Remote category with 15 others, including the excellent Badland (which is free).

Action games include Star Wars: KOTOR and Soul Calibur, which are surprisingly expensive at over £6 and £8 respectively. Game progress is synched to your Google account, so you can play on an phone or tablet and then continue where you left off on the Nexus Player.

Apps from the Play store include Netflix, VLC, TED, Bloomberg TV, Plex, Dailymotion and others, but there's nothing UK-specific so you can't directly watch iPlayer, 4oD or other catch-up services. There's also no Amazon Prime Instant Video

app, and we wouldn't be surprised if there never will be.

The Nexus Player has an ace up its sleeve, though: Google Cast. Unlike Amazon's box which uses a Fire Tablet as a second screen for IMDB-style info and remote control, you can use an Android phone, tablet, Chromebook or laptop to 'cast' content to your TV via the Nexus Player.

You can use one of many apps and tap the Cast symbol to connect to the Nexus Player. This even works on iPhones and iPads. Fire up the iPlayer app, press the Cast button and you can start watching a show on your TV even though there's no iPlayer app as such.

The stream doesn't come from your phone: it's directly from the internet to the Nexus Player, so you can turn off your iPhone or switch to another app.

Unlike the Chromecast, which in essence has no interface, the Nexus Player is the first device to run Android TV – an operating system designed to be operated from your sofa.

It's intuitive and has lots of design cues from Android Lollipop. System menus, icons, animations and even the onscreen keyboard are all blown-up versions from a tablet or phone, and it looks great.

To make searching easier without a keyboard, the remote has a built-in microphone that lets you speak to search (just like the Fire TV).

Voice search extends to all the Google services, but it doesn't work in third-party apps including Netflix. You won't see Netflix results when searching from the home screen,

for example, and pressing the microphone button in Netflix merely launches the onscreen keyboard.

On the home screen is a carousel of recommended content based on your YouTube subscriptions, browsing history, Google Play library and other factors. It would be nice to also have a 'recent' list so you can quickly go back to something you were watching or playing, but either there's a bug or the feature doesn't exist yet.

There's not all that much to say about the Nexus Player itself, other than it's made by Asus, making this another partnership with Google. The streamer is circular and underneath is a cutout at the rear for the three connectors: power, HDMI and Micro-USB. There's no HDMI cable in the box, so make sure you have one ready.

Inside the 'puck' is a 1.8GHz Quad-core Intel Atom processor, 1GB of RAM, 8GB storage and an Imagination PowerVR Series 6 GPU. There's no wired ethernet port, nor an optical S/PDIF which you get with the Fire and Apple TVs, but there is at least the latest 802.11ac Wi-Fi radio and Bluetooth 4.1.

Generally, Android TV zips along on the hardware, but there's the tell-tale glitches of immature software which we're sure will be ironed out in software updates.

Verdict

The Nexus Player is a decent media streamer, but it's only truly good if you're pairing it with an Android phone or tablet in order to stream a much wider selection of content.
⊠ Jim Martin

Specifications
1.41in LCD colour display; Windows Vista, 7 or 8; Mac OS X 10.6 or later; Video resolutions: 0.3Mp lens; 640x480 (high quality only when used with a microSD card); 320x240 (default resolution) or 160x120 for lower quality but smaller files. 128MB internal memory; microSD; Micro-USB 2.0 cable (included); built-in rechargeable lithium-ion battery; 25x55x55mm

Build: ★★★★☆
Features: ★★★★☆
Performance: ★★★★☆
Value: ★★★★☆

★★★★☆

ACTION CAMERA

VTech Kidizoom Action Cam

Who doesn't enjoy those GoPro videos of crazy extreme sports action? Sadly, we're as unlikely to be jumping out of planes, biking along cliff ridges and paragliding off ski slopes as we are able to cough up the £200 to £400 for the camera. And if we can afford a GoPro, we doubt we'd entrust it to a bunch of reckless or clumsy kids rushing off to the park, skateboard under arm.

But most parents would love to attach an action camera to their children's bike, scooter or helmet and see what fun looks like from the perspective of their child.

The VTech Kidizoom Action Cam retails for a more palatable £49, and comes with a waterproof case and mounts for their bike or skateboard.

Of course, the GoPro is a far superior camera when you check the tech specs. The top-of-the-range Hero4 Black (opposite), for example, offers ultra high-resolution, high framerate, 4K video, 12Mp (4000x3000) photos, built-in Wi-Fi and Bluetooth, plus remote running via a smartphone app.

The Action Cam is a much-cheaper but able action camcorder for the rest of us. Indeed, VTech should badge one without the Kidizoom name for adults, too.

The camera's 1.41in screen is small but means children can play back their videos and photos straightaway. (By the way, a GoPro requires a £60 extra for a playback screen.) Videos and photos can also be deleted straight from the camera.

We agree with VTech's recommendation that the screen be set to auto off when the camera is mounted for sports, as you don't want little Jonny or Jane watching the screen and not what they're doing while flying downhill on a bike or skateboard.

The VTech Action Cam comes with three built-in games: Super Boarder, Mountain Bike, and Crazy Captain.

The Time Lapse Photo Recording function takes continuous photos at certain intervals. Photo resolution is 640x480, which translates as a rather puny 0.3Mp, however, the real draw of the Action Cam is its video. This can be set to either 640x480 (high quality only when used with a microSD card), 320x240 (default resolution) or 160x120 for lower quality but smaller files.

The maximum video length is 30 minutes per file, which should be fine for most activities. The estimated maximum length of a higher-quality 640x480 video is around 15 minutes.

The lightweight Action Cam comes with 128MB internal memory, and this is expandable with a microSD card (not included in the box, but available online for about £12 for 32GB). We recommend buying one or two before you venture down the park or off on holiday as without one you'll fit only about two-and-a-half minutes of 320x240-quality video. A 32GB

microSD card could hold as much as a couple of hours of 640x480 video. Even a 4GB card could maybe handle an hour's worth of the higher-quality footage. Photos are saved as JPEGs, and video as AVI.

With continuous video recording and playback the battery will last around two-and-a-half hours before requiring recharging. You recharge the Action Cam using the supplied Micro-USB cable, which you also use to transfer photos and videos from the camera to your computer.

Verdict

The VTech Kidizoom Action Cam is a great alternative to an expensive GoPro action-video camera (yes, even for adults who don't mind the kiddie styling), and perfect for children as it is pretty robust, small and lightweight. It comes with mounts for bike and helmet, plus a waterproof case, so the £49 cost isn't unreasonable as you shouldn't need anything else except a bike and sense of adventure. Video quality is fine, although the standalone still photo resolution (0.3Mp) is basic to put it lightly. Strap it on to a bike, scooter, helmet or skateboard and relive the thrills and spills of your child as they hurtle headlong through hedges and into walls, crash to the ground, and sometimes get round the park without grazing a knee or bumping an elbow. ⊠ Simon Jary

Specifications
12Mp action camera; Max video resolution: 3840x2160 at 30fps; Records MP4 file (H.264) with AAC audio; Max video bitrate: 60Mb/s; Built-in Wi-Fi and Bluetooth; microSD up to 64GB; Micro HDMI output; mini USB; 1160mAh (4.4Wh) battery; 59x41x30mm; 89g (152g with housing)

Build: ★★★★½
Features: ★★★★½
Performance: ★★★★½
Value: ★★★★☆

★★★★½

ACTION CAMERA

GoPro Hero4 Black

GoPro is in the enviable position of being synonymous with action cameras. The diminutive devices are used widely on TV, as well as by professional and amateur sportsmen and women. The latest model can capture 4K video, but is it worth the high price?

For existing Hero3 owners, the Hero4 looks very similar. It's not identical, though. The battery now slides in from the bottom, and old batteries can't be used. That's a pain if you already have a few, but the other change is more welcome: the old Wi-Fi button on the side is now a HiLight button that you can press just after a significant moment. This makes it much easier to find that video gold when you return.

The button also makes it much easier to use the menus. It's context sensitive, so unlike the feverish button pressing (and cursing) you had to do previously, pressing the side button while in video mode will give you all the options relating to video. It's still not totally intuitive, but a step in the right direction.

At the front, the LEDs have been moved next to the tiny LCD display (which still isn't backlit) possibly in an attempt to avoid them being visible in video shot at night. There are also flashing LEDs on the top and rear faces to let you know the camera is recording.

It may sound like a minor point, but the loud beep sequences when turning on and off the Hero, plus starting and stopping recording, are amazingly useful. Until you've tested a rival that lacks these cues you don't quite realise how essential they are. It's all too easy to miss a moment without those beeps.

A small cover on the right-hand side covers the microSD, mini-USB and micro-HDMI ports. This doesn't make the camera waterproof: you still need the included housing for underwater shots. As ever, you get a 'skeleton' back door for better audio recording when you don't need complete waterproofing.

Like the Hero3, there's no minijack port for attaching a mic, but you can buy an optional GoPro Micro-USB adaptor cable for around £20 which gives you the necessary 3.5mm port. You'll need to make a hole in the side of the waterproof housing to connect a mic, or use a different housing when mounting the camera.

You get a couple of adhesive mounts in the box, but note that there's no Wi-Fi remote as you got with the Hero3 Black edition. The old remote will work with the new camera, but there's a new version of the remote, which has the extra HiLight button. You can also buy the optional LCD BackPac, because the Hero4 black doesn't have the integrated LCD touchscreen of the Hero4 Silver. Alternatively, the proprietary connector on the rear also works with the Battery BacPac.

The reason to pay more for the Hero4 Black is, of course, because it can shoot 4K video at 30fps (or 25 if you're in PAL mode). This means smooth footage compared to the 15fps 4K mode of the Hero3+.

It will also capture 120fps in 1080p, 240fps in 720p and there are lots of other resolutions and modes to choose, including super-wide angle, wide angle, medium and narrow. It will depend on what you're shooting – and the chosen resolution and framerate – as to whether all angles are available or not.

As well as high framerates for slo-mo sequences, the Hero4 Black also does time-lapse, offering various modes up to 4K. At lower resolutions, you can record video and capture photos for time-lapse videos at the same time. Intervals vary from five- to 60 seconds.

Experienced GoProers will understand the ProTune capture mode, which allows you to get even better quality in the final video when editing with the free GoPro Studio software. With it, you get manual control over colour, ISO limit, exposure and other parameters.

Video quality is excellent. You'll need a UHD screen to see the full detail the Hero4 is able to capture, but even on a 1080p TV or PC monitor, there's a noticeable improvement over footage captured at 1080p.

Audio is respectable when the camera isn't in the waterproof case, but it's muffled when it is.

There may be no screen on the Hero4 Black, but if you have an Android, Windows Phone or iPhone the GoPro app solves that niggle as you can see a live, low-res feed on your phone. You can start and stop recording, take photos, tag highlights and change settings including resolution, framerate, field of view, and more.

Battery life is decent if you're recording at 1080p without Wi-Fi: you'll get about 90 minutes between charges. Recording at 4K severely reduces recording time – roughly 40 minutes in our tests. Recharging takes about an hour, so it's worth buying at least one spare battery and a car charger for on-the-move recharging.

Verdict

The Hero4 Black is a fantastic action camera that shoots great quality footage. It's expensive, but you get a lot for your money. ⊠ **Jim Martin**

PC ADVISOR
GOLD

Specifications
12Mp action camera; max video resolution: 1920x1080 at 30fps; records MOV file with AAC audio; built-in Wi-Fi; HDMI output, with support for FPV; 1050mAh battery; 59x21.4x41.5mm; 75g

Build: ★★★★☆
Features: ★★★★☆
Performance: ★★★★☆
Value: ★★★★★

★★★★☆

ACTION CAMERA
Keecoo WiFi Sports Camera

When you think of action cameras, one brand springs to mind: GoPro. It dominates the market, but there's plenty of choice if your budget doesn't stretch to several hundred pounds. Unless you look closely, it's hard to tell the difference between the Keecoo and a GoPro Hero 3 or Hero 4 (page 53), especially when in their waterproof housings. Even the packaging looks the same.

The only real difference is that, annoyingly, the Keecoo doesn't have a Micro-USB port for charging. Instead, it has a slightly smaller proprietary USB connector, which means you'll have to be careful not to lose the cable provided.

Around the back is one more key difference: there's no accessory port, so you can't use any GoPro mounts – including gimbals – which require this connector. Because the Keecoo's dimensions are basically the same, you can still use it in a gimbal or mount which doesn't need to connect to that port.

In the box you get a range of accessories and mounts, including a bar mount and a couple of adhesive mounts for flat and curved surfaces. The quality of these is noticeably worse than proper GoPro accessories, but you'd expect that at this price. You can, of course, use genuine GoPro accessories with the Keecoo.

The camera is capable of shooting 1080p at 30fps, as well as 720p at 60fps. The wide-angle lens has a 170-degree field of view and it can take 12Mp photos.

Wi-Fi is built in, and you can use a rudimentary app – available for iOS and Android – to remotely view the video feed, check your composition, start and stop recording and even review videos. The latter feature

didn't work well on our test phone – a second-generation Moto G – playing the video for a few seconds, but then pausing and catching up a few seconds later. It's best to use a card reader and transfer videos to your computer anyway, so this is by no means a deal breaker.

MicroSD cards up to 32GB are supported, and it's worth buying a well-known brand's Class 10 (or above) card to ensure video is recorded reliably.

The battery is bigger than you might expect at 1050mAh, and this gives up to two-and-a-half hours of recording at 1080p. Spare batteries cost around £5, and it's well worth having at least one spare so you can carry on recording when the first runs out.

There's a choice of colours: black, silver and gold. This is just for the front plate: the sides and back are black on all models.

While the Keecoo looks identical to a GoPro, there are some noticeable differences in usability. For one, the LCD display isn't nearly as easy to decipher. The menu font is an odd choice, and hard to read. However, once you've got the hang of using the three buttons to control it, you'll be able to set options quickly and easily.

One missing option is the ability to flip the video 180 degrees, which is useful when the camera is mounted upside down. This means you'll have to rotate footage in a video editor afterward. Another annoyance is that it takes almost 10 seconds to turn on the camera and be ready to record.

When shooting with a GoPro, you rely on the loud beeps for confirmation of starting and stopping recording. The Keecoo's

quiet beep is barely audible when you're not using the waterproof housing, and totally inaudible when you are. Red LEDs flash at the top and bottom to indicate recording, but there's nothing front or back.

Video quality, arguably the most important aspect of any action camera, is very good for the price. The AIT 8427 chipset does a decent job, and the lens is quite sharp, too. Despite the reasonable 16Mb/s data rate, heavy compression means there's a lack of detail in textures, but overall, you won't be disappointed with the clarity you get for the money.

Colours are accurate – perhaps a little too saturated for some tastes – and changes in exposure are fast and not too distracting. Note that unlike some rivals, there are no image adjustments available through the menus: you can't change the metering, white balance or exposure correction.

The other bad news is that audio is poor. Even without the housing, audio is quiet and sounds muffled – no surprise given that it's recorded at 32kb/s and at 16kHz. In the waterproof case, it's even worse.

At 75g, the Keecoo should make a good budget option for anyone wanting to attach a better-quality camera to their quadcopter, and it even supports video output while recording, so you can use it for FPV.

Verdict
At a little over £60, the Keecoo WiFi Sports Camera is good value. It may not have the image quality of the latest GoPro, but it has Wi-Fi, supports FPV and has a long-lasting battery. It's just a shame it doesn't have a standard Micro-USB port and better-quality audio. ⊠ **Jim Martin**

Specifications
Forged aircraft-grade aluminium case; Optical Heart Rate monitor; Gorilla Glass 3 touch screen display; water-resistant up to 5ATM; Battery life up to 4 days; Includes silicone strap and magnetic charger; 33x43x10mm; 51g

Build: ★★★½☆
Features: ★★★★☆
Performance: ★★★★☆
Value: ★★★½☆

★★★½☆

ACTIVITY TRACKER
Basis Peak

Even though it looks like a smartwatch, Basis defines the Peak as a fitness and sleep tracker. The body is made from aircraft-grade aluminium and it comes in two variations; matt black or brushed metal and white. If you want to add more colour to your Peak, Basis supplies additional straps in a variety of colours.

Its unassuming look masks some impressive technology inside the device. It comes with an optical heart-rate sensor that constantly monitors your heart rate without the need for a chest strap. It also has a 3-axis accelerometer, as well as sensors that measure galvanic skin response and skin temperature, giving you an accurate view of your calories burned, heart rate, and so on.

Peak uses an optical blood flow engine that shines light into your bloodstream below the surface of your skin. That light is then reflected back and measured using an optical sensor that detects changes in light as your blood ebbs and flows. The data is combined with an algorithm that measures your heart rate.

It has an EInk display, which is a much smaller drain on the battery and performs better than its counterparts in direct sunlight. The tracker uses touchscreen input as opposed to physical buttons. You can navigate through the Peak's operating system by swiping in different directions. The display is protected by Corning Gorilla Glass 3, which means you don't have to worry about damaging the screen when exercising.

Three types of activity are tracked automatically: walking, running and cycling. The device's BodyIQ software gives you a comprehensive view of your current exercise, including your heart rate, duration of the activity and steps taken. This information is available to view at a glance on your band, with a swipe up or down on the centre section for different metrics – such as calories burned or steps per minute.

The good thing about the Basis Peak is that it doesn't need to be connected to your smartphone to be able to track your activities. It doesn't have built-in GPS though, so can't track your overall distance.

During our testing, we found that while the heart-rate monitor gave us an accurate reading during exercise, it failed to keep a constant reading. While this may be fine for most people, it means that gaps appear on the graph when viewing your workout data on the smartphone app. While this was fixed by tightening the fitness band's grip on our wrist, it became uncomfortable to wear after a while and had to be loosened again.

While many fitness bands offer sleep tracking, it's usually measured solely on movement – that's not the case with the Peak. As well as detecting movement, it uses your heart rate to determine the different stages of sleep that you go through. Another bonus of utilising the heart-rate monitor is that the sleep-tracking mode is automatic, so you don't have to worry about changing modes before you go to sleep.

We generally found that the sleep tracking was quite accurate, even when it came to detecting when we fell asleep and woke up. Another great part of the sleep tracking software is that it allows you a 30-minute grace period to get back to sleep if you wake up, whereas many other bands would count it as two naps instead of a sleep.

As we mentioned earlier, the Basis Peak is controlled via the touchscreen. Swipe left from the watch face to access your heart rate and swipe left again to see your activity summaries. Swiping down on the heart rate menu will give you an overview of your calories burned and steps taken for the day, and swiping down on the activity summary will give you a breakdown of all individual activities throughout the day. It's easy to use and once we'd been using it for a day or two, we were able to navigate around the bands menus seamlessly.

The Basis Peak app, available for both iPhone and Android, gives you an overview of your fitness and sleep activity. Once you connect the tracker to your smartphone via Bluetooth, the band will sync with the app to give you the latest fitness and sleep tracking data. During testing we found this slow at times, especially when you haven't synched with the app for a while.

The activity feed is where you get an overview of your recent activities, broken down on a day-to-day basis. It'll display the overall steps taken, calories burned and average heart rate, as well as each activity undertaken, both fitness- and sleep-wise, for each day you wear the Basis Peak. Tapping on a fitness activity will open the Charting menu, which displays more in-depth statistics in the form of a bar graph.

Even though the Basis Peak is marketed as a fitness and sleep tracker and not a smartwatch, it does bring some smartwatch-esque features to the table, namely notifications. The device won't display every annoying Facebook request and spam email though, it'll give you only the most urgent notifications: calls, texts and calendar events.

Unfortunately, the initial setup of the notifications isn't clear. We expected notifications to be displayed on the Basis Peak once we connected it to our phone, but instead we had to manually enable each type of notification we wanted to receive in the app's settings menu.

As for battery life, the Basis Peak should last for four days on a single charge. Charging is done via a Micro-USB cable that plugs into a magnetic dock, which the tracker snaps into when placed near it.

Verdict
If you're looking for a comprehensive fitness and sleep tracker, then the Basis Peak is a good – if slightly expensive – option to. ⊠ **Lewis Painter**

Specifications
Qualcomm Snapdragon 400 1.2GHz; 512MB RAM; 4GB Storage; Android Wear; OLED 1.5in display, 228ppi; 9 Axis Sensor/Bio Sensor; Bluetooth 4.0; built-in microphone; IP55 water resistance; 51x39.9x9.4mm; 50g

Build: ★★★★☆
Features: ★★★½☆
Performance: ★★★½☆
Value: ★★★☆☆

★★★★½☆

SMARTWATCH

Asus ZenWatch

The ZenWatch is Asus's first venture into the smartwatch market, and we were hoping for big things. Though it may not be as stylish as other smartwatches such as the Moto 360, it does a good job of standing out against similar Android Wear smartwatches.

It has a large face, measuring in at 51x40mm with a 1.5in screen, but is a lot thinner than its rivals at 9.7mm. Polished stainless steel adorns the majority of the watch, with a slight hint of rose gold on the sides, a colour that's complemented by the accompanying brown leather strap.

The ZenWatch has fewer buttons than its competitors, and while this may be more aesthetically pleasing, it throws up a lot of issues when it comes to navigating the UI. Its one and only button can be used to turn on and off the watch, but it's underneath the watch, well out of reach when being worn.

The OLED (320x320) display is pretty standard for Android Wear smartwatches. While the resolution is fine for day-to-day use, the pixels are visible onscreen.

The Asus ZenWatch has an 'always-on' mode that keeps the display turned on, even when not being used. In an attempt to salvage battery life, after a few seconds of inactivity your watch face will be replaced with a slightly pixellated version that looks like it's displayed on an e-Paper display.

When you raise your wrist, the display switches back to its full colour display and is ready to use automatically. The responsiveness of the smartwatch was something that we were pretty surprised with, as many aren't great at detecting the movement of raising your wrist. There is a down side to it being so sensitive though, as we found that the display can be activated when moving naturally.

Inside, you'll find a 1.2GHz Qualcomm Snapdragon 400 processor, complete with 512MB of RAM and 4GB of storage. There's also a microphone for audio prompts – a lifesaver for a device with a lack of navigational buttons.

It also comes with a host of sensors including a 9-axis accelerometer, compass and gyroscope, along with a barometer, all of which come in handy with regards to fitness tracking and navigation apps.

There's even a sensor that can track your heart rate at various stages of exercise. The issue is that it requires two fingers, gently pushing both sides of the display, which can be tricky. The Asus ZenWatch is water- and dust resistance with an IP55 rating.

Android Wear

Android Wear is Google's operating system for wearables. The main issue is that it is still in its early days, which in turn hinders the enjoyment of using a smartwatch.

It adds a whole host of features such as notifications, navigation, Google Now, music control, step tracking and messaging. Third-party apps are also available, as well as notifications that have custom actions, such as being able to dictate a reply to a WhatsApp message for example – something that's strangely not possible when viewing a text message on the ZenWatch.

Asus has made some tweaks to the stock Android Wear OS in a bid to make the device stand out from the crowd. It offers smart features such as unlocking your smartphone when in proximity, toggling a flashlight on the device (a brightly coloured screen) and the ability to send a preset SOS message to a person in an emergency. It also has its own Asus ZenWatch app for watch management, though this doesn't really do much that you can't do on the watch.

As we mentioned earlier, the ZenWatch has only one button. This means that you'll have to rely on audio prompts and a disappointing touchscreen to navigate the smartwatch. We found scrolling between menus a frustrating experience as, on many occasions, the Asus thought that we had selected something that we wanted to scroll past, and would open it. The left- to right swipe is meant to take you back to the clock face, and while it does, there were many occasions where the gesture wasn't recognised.

The saving grace is voice recognition, which we found to be surprisingly accurate. We've been disappointed in the past by other voice-recognition technologies we've tested, which have felt awkward to use. That definitely wasn't the case this time, although it should be noted that people do tend to feel a bit silly talking to a watch in public.

There's also a great selection of watch faces to choose from, ranging from traditional-looking designs to more unusual options that find unique ways of displaying the time, date and other crucial information. You also have the option to tweak many watch faces from the ZenWatch app, as well as having the option to download third-party watch faces from Google Play.

The Asus also has a unique feature – you're able to display your smartphone's camera viewfinder on your watch display. This gives you the opportunity to take your time when composing shots, become more creative and make sure your selfie is perfect before you take it.

The ZenWatch has a 22-hour battery life, though this shrinks dramatically if the display is in 'always-on' mode and you're receiving notifications all day. To charge the watch, you simply place it in the supplied cradle.

Verdict

The Asus ZenWatch is a good-looking smartwatch. The lack of buttons is an issue, especially with the touchscreen input being as frustrating as it is. It does, however, have impressive voice recognition. ⊠ **Lewis Painter**

Specifications

Dual 40mm full range drivers; 40x83mm passive radiator; Bluetooth 4.0; Aux-in; NFC; allows up to 8 Bluetooth connections at once; IPX4 water resistance; MaxxAudio technology; 209x54x51mm; 558g

Build: ★★★★½
Features: ★★★★☆
Performance: ★★★★☆
Value: ★★★★½

★★★★½

BLUETOOTH SPEAKER

Denon Envaya Mini

The Denon Envaya Mini is a Bluetooth speaker that can be used with a phone, tablet or laptop.

In terms of design, it's gorgeous. Peaking through its metal black grille is a vivid shade of blue that offers a dash of colour to an otherwise completely black speaker. The circular grille effect is a nice addition, making the Envaya Mini a very visually distinctive Bluetooth speaker – and that's without noticing the Denon logo across the middle of the grille. It also comes with a very soft, luxurious carry case that contributes to the very premium look and feel of the speaker.

It's a very solid device, with rubberised feet at either end that protrude slightly, further than the speaker itself. These offer extra grip, which comes in handy when the speaker is being used at high volume with a lot of bass – nobody wants their speaker to slowly vibrate off the table.

We were surprised when we held it for the first time, as it measures in at a rather compact 209x54x51mm, but weighs 558g. That's not a bad thing, though; as we mentioned earlier it feels like a very solid speaker and the weight adds to that.

The Envaya Mini has physical button control, which is great to see when so many mid-range Bluetooth speaker manufacturers are implementing rather frustrating touch capacitive buttons instead. There are volume controls, as well as a pause/play button and a battery indicator button, which lights up a small LED with different colours depending on the level of battery life. While that's okay for most people, we'd like to see a specific battery percentage, be it via audio prompt or your smartphone, much like the UE Boom.

It's also got an integrated microphone with noise cancelling capabilities, enabling speakerphone functionality. When we tested this, we had no complaints from the recipient about the clarity of the call and we could hear them clearly.

The only real down side is that you can't use the volume controls to change tracks, a feature that's popular in Bluetooth speakers. There are certain situations where having

the ability to completely control the music from the speaker is beneficial, and for a speaker that ticks most boxes, it's slightly disappointing.

There are two connections: Bluetooth 4.0 and Aux-in. It also has NFC capabilities for one touch pairing – tap your NFC-compatible phone on the speaker's NFC logo and you're ready to go.

The setup process for Bluetooth requires you to hold down the play/pause button for a few seconds before it appears on your devices list on your phone's Bluetooth menu.

The device's range is impressive, too. Whereas some speakers start to stutter after only 5m of distance, we could step outside the room and still have music playing.

One particular feature that caught our eye is the ability to connect to more than one device at once. This isn't a new feature as we've used speakers that support two connections at once, but Denon decided to take it one step further and allow up to eight simultaneous connections. This means that one person can pause their music and let a friend take over, without any awkward crossover period with no music playing.

Audio quality

Audio is where the Envaya Mini excels above and beyond our expectations. Bluetooth speakers around the £100 mark have a tendency to be either extremely bassy with disappointing sound clarity, or they'll have great clarity but a severe lack of bass. That's not the case with the Envaya Mini, which boasts dual 40mm full range drivers with a 40x83mm passive radiator, which produces both crisp sound and impressive bass.

Why does it sound so much better than other speakers in its category? There are various factors at work that help to produce the great sound quality, with one being the fact that Denon has used larger drivers than most small Bluetooth speakers, paired with a large passive

bass radiator for a good balance of clarity and bass.

Another contributing factor is the amount of technology onboard the Envaya Mini. It includes advanced MaxxAudio technology, which is studio-quality sound processing technology that won a technical Grammy award. It also has other advanced signal-processing technologies that intelligently provide the best possible performance.

The audio is room filling, which is impressive for a speaker of this size. Don't mistake that for blaringly loud – there's a difference between the two. The Envaya Mini isn't the loudest Bluetooth speaker we've ever used, but it doesn't have to be – it's more than just sheer volume and bass, it's an audio experience.

There's only one issue with the Envaya Mini, and it's not a huge problem, but one we noticed during our testing. Like most Bluetooth speakers, the Envaya Mini's drivers face in one direction, which produces an audio 'sweet spot' where the audio sounds fantastic. However, if you're not directly in this sweet spot, the experience, while still good, isn't as great as it could be. We'd have loved to see some kind of 360-degree speaker setup similar to the UE Boom to help tackle this issue.

Denon claims that the Envaya Mini should generate around 10 hours of playback on a single charge. While results will vary depending on volume and other factors, we couldn't get the Envaya Mini to reach its claimed 10-hour battery life – it usually gave up around the six- to seven-hour mark. It's easy enough to charge though, using a standard Micro-USB cable that many people have laying around.

Verdict

For a £99 Bluetooth speaker, the Envaya Mini blows away similarly priced alternatives, and does a great job of filling a room with clear, crisp sound. ⊠ Lewis Painter

BLUETOOTH SPEAKER
Lumsing B9

PC ADVISOR
RECOMMENDED

£19 inc VAT

Contact
■ lumsing.com

Specifications
Stereo Bluetooth speaker; 2x 3W nominal power rating; 2x full-range drivers; 1x 60x30mm bass radiator; Bluetooth 3.0 + EDR; 3.5mm Aux-in; microSD card slot; NFC; USB cable; 3.5mm audio cable; 177x50x70mm; 300g

Build: ★★★★☆
Features: ★★★⯪☆
Performance: ★★★★☆
Value: ★★★★⯪
★★★★⯪

The NFC-enabled Lumsing Bluetooth Speaker will surprise you, especially after you see the £19 price tag. While this speaker uses low-cost budget components, the audio quality is pleasant. That, coupled with its compact form-factor and 25-hour claimed battery life, makes it an ideal companion for those spontaneous trips to the beach.

It has Bluetooth 3.0 + EDR, which means it'll connect to any recent Bluetooth-compatible PC, laptop, tablet or phone.

For those of you that shy away from Bluetooth there are several other ways to connect. It has an Aux-in connection for use with an audio cable with a 3.5mm jack and a 55cm cable is included with the speaker. There are benefits to using the physical connection opposed to Bluetooth with the main one being no further audio compression. When you use Bluetooth to play music, the audio stream undergoes lossy compression, reducing overall sound quality.

We noticed an unusual loss of volume when using the Aux-in connection with an iPhone's headphone jack. While the speaker is loud when using Bluetooth, the volume was almost cut in half when using a physical connection – and that's with the phone's volume up full. It's not necessarily a dealbreaker, but definitely something to keep in mind if you intend on using it as a wired device.

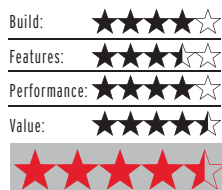It also has a microSD card slot that's simple to use – slot in the card and the speaker will automatically change modes, giving you an audio prompt as it does so. During testing we used an SD card with 5 songs, each a different file type to see what's supported. To our surprise, we noticed that the only file format that is supported is MP3.

The speaker itself has 2x 3W amps with 2x full range drivers at the front with a passive bass radiator at the rear, helping to deliver a more rounded audio experience. While it uses a Class D chip (which is very efficient in terms of the battery power it sips) the audio quality was impressive overall, even at high volume – something that seems to catch many budget speakers out.

The mid range is impressive, making it great for spoken word and singing. The bass radiator on the back of the speaker helps to deliver low range audio, getting rid of the tinny effect that some speakers have. It held its own and sounded great against a variety of genres of music, from Jazz to Dubstep.

Verdict
The Lumsing B9 is a good speaker for a great price. It has a variety of connection options and is simple to use. ⊠ **Lewis Painter**

POWER BANK
EasyAcc PowerBank PB18000

PC ADVISOR
RECOMMENDED

£23 inc VAT

Contact
■ easyacc.com

Specifications
18000mAh lithium-ion power bank; 1x 10W (2A, 5V) Micro-USB input (charges in 9 hours); 1x 10.5W (2.1A, 5V) USB output, 1x 5W (1A, 5V) USB output, operate simultaneously at full-speed; LED flashlight; 2x Micro-USB cables (20cm, 60cm) supplied; 159x63x24mm; 359g; 12-month warranty

Build: ★★★⯪☆
Features: ★★★⯪☆
Performance: ★★★★☆
Value: ★★★★★
★★★★☆

If you need enough portable power to keep your phone or tablet going several days away from the mains, EasyAcc's PowerBank PB18000 is one of the best-value portable chargers we've found.

It has one USB output rated at 10.5W and another at 5W. Both are universal ports and can be used with any device that charges via USB, but EasyAcc recommends that iPad users make use of the faster port, while Samsung Galaxy Tab owners use the slower one. Despite its 5W rating, this latter port is able to smart-charge Samsung's tablets, turbo boosting from its standard 1A to 1.3A or even 2A. EasyAcc doesn't specify whether this port can smart-charge other devices, too.

We like the fact that EasyAcc supplies two Micro-USB cables, one short at 20cm and the other offering a bit more wiggle room at 60cm.

Battery efficiency is a key concern for power banks. If not otherwise stated, as is the case with this EasyAcc, you can usually expect around 70 percent efficiency. This sounds low, but it takes into account the loss of energy gobbled up by voltage conversion and the heat generated. With an efficiency of around 70 percent you can expect roughly 12600mAh to be available to power your USB devices. Exactly how many times that will charge your phone or tablet depends on the capacity of its own battery; an iPhone 6, for example, has an 1810mAh battery and would get around seven full charges from this power bank. Android phones typically have larger-capacity batteries, so would manage fewer charges.

The EasyAcc doesn't support auto-on, and when plugging in your phone or tablet you must press the button on its side to begin charging. Although the company says that to prevent wastage it supports auto-off when your battery is full. However, if the EasyAcc were to accidentally turn on in your bag, it will automatically turn itself off if no devices are detected within 60 seconds.

A black slab with rounded edges, the EasyAcc PowerBank looks good. It's a perfect fit in the hand, with a rubbery-feeling matt finish that aids grip. Four LEDs on top show how much power remains, although with each representing a 25 percent chunk and so much power to hand it's impossible to get an accurate reading. There's also an LED flashlight at one end.

The EasyAcc PowerBank feels tough and sturdy, while its various protections for overcharging, short circuiting and the like, plus a 12-month warranty, are reassuring.

Verdict
The EasyAcc PowerBank PB18000 is the best-value high-capacity power bank we've seen. ⊠ **Marie Brewis**

Specifications

Windows XP SP3 32-bit/ Vista SP2/7 SP1 /8 (all 32/64-bit); 2GHz Core 2 Duo; 1.5GB memory; 2GB hard drive

ANTIVIRUS SOFTWARE

Bitdefender Internet Security 2015

Build: ★★★★☆
Features: ★★★★☆
Performance: ★★★★☆
Value: ★★★★☆

★★★★☆

Bitdefender is a highly rated internet security provider and the latest version of its Internet Security suite includes several new features to expand its coverage and ease of use. It includes many of the major modules you'd expect in an internet security suite with anti-virus software, anti-spyware, online protection – including internet banking – and tune-up.

Innovations in this edition include predefined profiles to adjust settings for specific uses, such as movies, work or games, a startup organiser and PC tune-up with a one-click optimiser. You don't get a two-way firewall, parental control, backup, online storage or device anti-theft, though these are available in the £60, Bitdefender Total Security.

The main control window is clean, with Modern-style tiles for the main and subsidiary functions. The three big tiles provide access to Protection, Privacy and Tools, while the four smaller ones are labelled Scan, Update, Safepay and Optimize. Each tile leads to a setting and report screen, breaking down the options within the modules of the suite.

The new one-click optimiser looks at junk files, Registry entries and privacy issues and can sort

them all in at least a couple of clicks. On our test system, it offered to recover 3.7GB of unnecessary files and sort out lots of Registry and privacy issues. It's an all-or-nothing approach, though, without the ability to select which issues to resolve.

The startup optimiser does a similar thing for programs that automatically run when Windows launches, but shows a lot more info, detailing all the apps that auto-start and the time it takes to start them, so you can select any you want to remove from the list.

Profiles, also new, limit the actions Bitdefender will take, so any impact on your system when watching a movie or playing a game is reduced.

Test results

Testing Bitdefender Internet Security's scan rate showed it examining 78,749 files in 28 minutes 24 seconds, a moderate rate of 45.7 files/s, though a re-run cut the number to 14,693 in three minutes 37 seconds, revealing a good degree of file marking. Bitdefender claims zero impact on performance, but we recorded a 21 percent increase in file-copy time when a scan was running in the background.

This isn't reflected in the results AV-Test (av-test.org)

produced, though. It recorded no slowdown at all when running through a number of typical tasks, including downloading software and visiting websites. This gave Bitdefender a score of 6.0/6.0 under Performance.

Bitdefender is exceptionally good at not warning or blocking legitimate software and gave only one false detection in the 525,920 samples AV-Test tested it with. This earned the software another 6.0/6.0 in the Usability section.

In perhaps the most important section of the tests, the software scored a perfect 100 percent in detecting established malware of the two months of the test. It dropped just half a percent to 99.5 percent when looking for zero-day threats, too, against a group average of 97 percent. So, with another 6.0/6.0 under its belt, it finished with an overall score of 18.0/18.0, the joint highest in the group.

Verdict

This is one of the best antivirus suites available, in terms of protection against malware. It's also very good at not throwing up false warnings, but there are other products offering more auxiliary modules for the money.
⊠ **Simon Williams**

Specifications
Colour Inkjet; max print resolution, 4800x1200dpi; quoted print speed, B=34ppm (20ppm ISO), C=30ppm (20ppm ISO); actual print speed, B=18.9ppm C=14.8ppm; USB 2.0, gigabit ethernet, wi-fi 802.11b/g/n; mobile device support; 5.6cm LCD screen; 250-sheet main input; 80-sheet secondary input; optional 250-sheet tray; auto duplex; Adobe PS3 and PCL5e/5c and PCL6 emulation; IPv6; cartridges cost B=£46 C=£52 x 3; print life (pages) B=4000 C=4000; 461x442x284mm; 11.4kg; 1-year warranty

Build: ★★★★½
Features: ★★★★½
Performance: ★★★★½
Value: ★★★★½

★★★★½

COLOUR INKJET
Epson WorkForce Pro WF-5190DW

While the humble inkjet remained the printer of choice for most users throughout the first two decades of home computing, the past 10 years have seen an explosion of small chic lasers that fit beautifully on to even a modest worktop. Delivering astonishing speed at high quality levels, these lasers have established themselves as text churners par excellence. But, just as lasers have intruded upon inkjet territory, so the inkjets have tried to grab fertile land once the exclusive preserve of their office-friendly cousins.

The Epson WorkForce Pro WF-5190DW is only the latest attempt by an inkjet to be more of a laser printer than lasers have ever been. As such, it promises superior speed and quality, low running costs, and high-end business features. And all of this is laced with an ecological bent that seems to cast lasers back into the dark ages. So can it possibly live up to such a billing?

The Epson is substantial without seeming imposing, and business-like without seeming cold. Its pleasing curves and light creamy grey exterior make it a natural fit for small- and medium-sized offices, while the control panel is more enjoyable and easier to navigate than the rather spartan interfaces we're used to with business lasers.

Paper handling is beefy. Not only do you have a robust 250-sheet front-mounted tray, but there's an additional 80-sheet tray located to the rear. And if 330 sheets isn't enough for you, an optional second 250-sheet tray will push such capabilities up to 580 in total.

The 150-sheet output can't match that, and wasn't always successful at capturing the finished prints. But this remains a capable outlet, and its duty cycle is an impressive 35,000 pages per month. There are some higher-end models that can push paper handling further still, but for all but the most formidable print jobs, the Epson should pack sufficient punch.

The WF-5190DW is nothing if not full-featured, and its connectivity options are vast. There's a wired ethernet interface that can hit full Gigabit capacity, but the Epson also comes with Wi-Fi 802.11/b/g/n and USB 2.0. Cloud and mobile device support is also built in, making this a wonderfully well-connected device.

That, then, is very inkjet. But what isn't so inkjet is its ability to cater for Adobe PS3, PCL5e/5c and PCL6 emulation. Other business features include the meaty security options, IPv6, and the ability to start jobs printing upon entry of a PIN – allowing you to keep confidential office documents away from prying eyes. Network managers can even download the Epson Net Config package, and start remotely setting up their fleet of Epsons.

Printing technology
'PrecisionCore' replaces the traditional piezo heads with ones crafted from hi-tech thin film piezos – these one-micron-thick pumps can generate astonishing precision at high speed. In practice, the printer came very close to its recommended speed figure of 20ppm, generating crisp text in 18.9ppm.

The output is pleasingly sharp, with beautifully defined lettering. High-end lasers will perhaps deliver slightly more clarity, but the WF-5190DW is very close, and outshines other inkjets, and most middle-range lasers. It can also handle auto-duplexing, although it did fall to 10.7ppm here – not, perhaps, fast enough to make auto-duplex an automatic option for big workloads.

One area in which lasers have often lagged behind their inkjet counterparts is in colour printing – particularly photos. Yet here, the WF-5190DW manages to retain all the brilliance of inkjets past and present. Inks are gloriously rendered, with spectacular colour washing across every image. For businesses looking to mix fine text with spectacular photos, it's been hard to find a model that can handle both areas with aplomb. This Epson, though, fits the bill.

Running costs are beautifully low on this model – not as low as Epson would have you believe, but low nonetheless. The high-capacity cartridges work out as 1.1p for mono and 3.9p for colour. The colour, in particular, is finely-priced, and outstrips most other models. It's economical for text too, although 1.1p is by no means the lowest we've seen – a number of other models go to 1p and below. The WF-5190DW is also a cheap printer in terms of power output, though, generating just 25W in action – the HP OfficeJet Pro X551dw (tinyurl.com/czo5p65), in contrast, can hit four times that.

Verdict
The Epson WorkForce Pro WF-5190DW offers superb performance. The running costs are good, and the energy usage economical. The really good news, though, is that it's available for £200, which makes it look like one of the bargains of the decade. ⊠ **Robin Morris**

PC ADVISOR GOLD

Specifications
Four-colour (CMYK) A4 laser printer; print resolution, 300dpi; scanner resolution, 1200dpi; fax resolution, 300dpi; mono/colour, 18ppm; 1x USB 2.0, gigabit ethernet, 802.11n Wi-Fi, Apple AirPrint; 150-sheet input tray, single page manual feed; 420x417x322mm; 16.3kg

Build:	★★★★☆
Features:	★★★★☆
Performance:	★★★★☆
Value:	★★★★☆
	★★★★☆

COLOUR LASER PRINTER

HP Colour LaserJet Pro MFP M277dw

Colour laser printers used to be enormously expensive, and were generally only found in larger businesses that were prepared to pay for the speed and quality provided by laser technology. However, costs have fallen dramatically in recent years and, at just £258, HP's new LaserJet Pro MFP M277dw is affordable enough even for small businesses and self-employed individuals who work from home.

It's also relatively compact by the standards of traditional office laser printers, measuring just 420mm wide, 322mm high and 417mm deep. That's not much larger than an ordinary inkjet printer, although it does weigh a hefty 16.3kg, so you'll need a sturdy desk or table to rest it on.

Despite its compact design, the M277dw manages to cram in an impressive range of features, including a 600dpi laser printer, 1200dpi scanner and copier, and 300dpi fax machine. There's a 150-sheet paper tray in the base of the unit, along with a manual input slot that allows you to insert individual envelopes or sheets of photo paper. It supports automatic duplex (double-sided) printing, and there's a 50-sheet automatic document feeder stacked on the top, so the M277dw provides most of the features that small business users are likely to need.

You don't have to spend much time setting it up either, as the M277dw arrives 'fully loaded' – with the four-toner coloured toner cartridges already installed – so all you have to do is install the printer software from the CD-ROM in the box. There's a USB interface for a direct connection to a PC or Mac, as well as both ethernet and 802.11n Wi-Fi for connecting to your home or office network. It supports Apple's AirPrint for iOS devices, and there's an HP ePrint app available for Android users, too. Even the touch-sensitive control panel works well, responding quickly and smoothly to a flick of your finger as you scroll through the various menu options.

You can, of course, get a similar range of features from many low-cost inkjet printers, but the real advantage of laser technology is its speed and quality. HP quotes a speed of 18 pages per minute for both mono and colour printing, but our tests produced results of 15ppm for mono and 13ppm for colour. Even so, that's still faster than most inkjet printers that we've seen in this price range.

Text quality is excellent, with smooth, finely detailed text that most inkjet printers will struggle to match. Colour graphics are very good too, so the M277dw will be a good choice for reports and presentations work. Our only minor complaint is that photo output was a little disappointing. It took only one minute to print a full A4 photo, but our test prints were rather dark and dull when using plain office paper, and we've seen better results when using inkjet printers with plain paper. If you want to print high quality photos for marketing brochures or presentations, then you'll need to use more expensive photo-paper, which works out at about 7p per sheet.

Printing costs aren't too bad, although it's much cheaper to buy the cartridges from third-party online retailers rather than direct from HP itself. If you use HP's high-yield XL toner cartridges, you'll find that mono printing works out at about 2.2p per page, while colour printing comes to 9p per page. That's in line with many inkjet printers, although the greater speed and superior text quality of the M277dw gives it an edge over most of its inkjet rivals for office use.

Verdict

If you're looking for a high-quality photo printer, then inkjet printers still have the edge there. However, the M277dw provides excellent text quality and business graphics, and will make a good workhorse printer for smaller offices that need to produce high quality business documents. ⊠ **Cliff Joseph**

GAMING LAPTOPS

These days you don't need a behemoth of a machine to play the most demanding games. Andrew Harrison has selected six gaming laptops that have more than enough power to play the latest titles

When it comes to high-end Windows gaming, we've cracked that. It's a doddle to find a powerful PC system that will play the most arduous of action titles, all day long and at the highest detail on high-resolution displays.

Today's challenge is now to squeeze that kind of performance into something quiet and portable, a gaming laptop that can be toted as easily as any other modern notebook PC. We've come close with workstation-class gaming behemoths, but they weighed well in excess of 3kg, required a mains brick that brought that mass closer to 5kg, and sounded like a salon hair dryer once the on-board cooling kicked in.

Thankfully the two heavyweights in computing silicon, Intel and nVidia, have come to understand that the demand is now for power efficiency – to make central and graphics processors that carefully sip precious power rather than guzzle it, making their chips run cooler in confined spaces and without the need for huge fans or liquid cooling systems.

Graphics

If you're looking for a laptop that can take on modern games, the graphics processor is the most influential component, the part that controls whether your game runs at 5- or 50fps (frames per second). But it does need back up. This means a capable main system processor, enough system RAM to keep applications stored in memory, sizeable and fast drives to store games and other files, a great screen to view the action on – and a good chassis to bear all these components.

Currently Intel and nVidia are in the ascendent for both listed processor duties, with AMD's CPUs and graphics processors lagging behind in performance and efficiency. That's what we found from the AMD graphics contender in this group, and at this time you'll be hard pressed to find many gaming notebooks with AMD chips, especially CPUs but GPUs are also, for the moment at least, in distinct second place.

From Intel, the fourth-generation Core series processors (codename: Haswell) are well suited to the CPU task, while this year's Broadwell series should be even more power efficient while getting the same amount of work done.

At present though, only dual-core versions of Broadwell chips are available; the fifth-generation Core i7 quad-core processors are overdue and remain missing in action. But as we found from the dual-core machine in this group, quad-core chips are by no means a necessity for playing games.

For graphics processors, nVidia's 800 and 900 Series have made breakthroughs in power efficiency, allowing performance that compares with recent desktop cards but cool enough to slip into the confines of a laptop.

Laptop screens have also improved, with screen resolutions now settling at full-HD, 1920x1080 pixels, and using better technology than the basic TN type found on cheap portables. Look out for IPS panels that offer wide and consistent viewing from all angles, better contrast ratio and wider colour gamuts. Don't be misled by boasts about screen brightness – contrast ratio, especially at lower brightness settings,

is far more important than dazzling your eyes with 300cd/m² figures. It's also easier to find screens now with more practical anti-glare finishes, reversing the trend of high-gloss reflective panels that were once unavoidable from most brands. And you can usually ignore the trend for greater-than-HD resolution, since the Windows operating system and the graphics processors both struggle with UHD or 4K sized screens. For most gamers, 1920x1080 is a happy compromise between glorious onscreen detail and playable framerates.

For storage, a solid-state drive will greatly improve the user experience when it comes to booting a PC, launching programs and opening and saving files. It won't make your games run faster, although it may reduce any short pauses between levels. Nevertheless an SSD is always recommended, with the option of a second, traditional capacious hard disk inside to keep your games stored.

Some gamers like to use headphones or headsets, especially in multi-player settings, but if you don't anticipate spending your time donning ear defenders you should still find that modern gaming laptops run quieter today. Which means you may get to appreciate the built-in stereo speakers.

Some sport brand badges to suggest bespoke audio systems – we've seen B&O, Dynaudio, Harman, Klipsch and Onkyo put their names to tinny laptop speakers recently – although in our experience, to date these are more window dressing, with some of the best sounding laptops bearing no fancy badges.

Battery life is perhaps less a concern for a desktop-replacement type of gaming laptop, although that's more a historical resignation caused by the long-standing difficulty in combining fast graphics with svelte and mains-dodging laptops.

As we discovered with one model in the following group at least, you can have a powerful gaming machine and stunning battery life, even if the unplugged runtime will dwindle more rapidly once low-power integrated graphics have switched over to hungrier gaming graphics.

ALIENWARE 13

£1,100 inc VAT • alienware.co.uk

Build	★★★★½
Features	★★★★☆
Performance	★★★★☆
Value	★★★★☆
Overall	★★★★½

PC ADVISOR
RECOMMENDED

Alienware set the trend for gaming notebooks that look like sci-fi film props, and in the Alienware 13 it has built a high-performance machine that successfully juggles user comfort with a talent for playing the fastest action titles.

At 27mm thick, it's now far removed from the slimmest slivers in gaming notebooks, but its 328x235mm footprint makes it the smallest on test, home to a 13.3in full-HD PLS screen.

The casework bears the trademark Alienware stealth-bomber look, with angled edges and lopped-off corners, fashioned almost entirely from gunmetal-painted plastic, but incredibly tough feeling nonetheless. The lid back features the classic alien grey emblem, ready to glow from almond eyes that reflect the colour set on the multi-colour keyboard light. Also here is a tri-wing detail, which similarly lights from within along two vertices.

The underside is minimalist, with huge air intakes filled by perforated metal grilles that cover two internal cooling fans and a large heat pipe construction. Under test we found the 13 to run effectively silently in normal use, the fans revving up to clear audibility only after the nVidia graphics engine is engaged for gaming. Annoyingly though, those fans would continue to whoosh long after gameplay had stopped.

We found an issue with the keyboard action, also found on other brands' laptops recently that may be using the same OEM, where some keys would not reliably type – the single-quote key the worst offender. Often it would not print on a single pressing, and then when tried again would print two ' ' each time. Dodgy key problems aside, the keyboard design is a crowning glory for the Alienware 13. The lights are divided into four quadrants and can be customised in colour and mixed to taste, from a palette of 20 colours.

Three USB 3.0 ports – two right, one left – take care of high-speed peripherals, and the inclusion of built-in gigabit ethernet on the smaller chassis will be a boon for those that prefer the best possible network connections. Internally, the Alienware has a two-stream 11ac wireless adaptor, which provides an impressive software stack that lets you sift through the fine details of your network connectivity, both wired and wireless. Unusually for the modern notebook, Alienware omits the standard SD memory card slot.

There's currently a choice of two processors, both dual-core – either 2014's Core i5-4210U (Haswell 22nm, 1.7GHz clock speed) or this year's Core i7-5500U (Broadwell 14nm, 2.4GHz). And for GPU, you can choose between an nVidia GeForce GTX 860M from last year's line-up, or a brand new GTX 960M; both options supplied with 2GB GDDR5 video memory.

Our sample had a mix of both, with the latest Intel Broadwell CPU and last-generation GTX 860M graphics, a combination we couldn't put a price to, but the top-spec model on Dell's website with Broadwell and '960M graphics is priced at £1,232.

Two 4GB memory modules provide 8GB total and can be accessed through a bottom hatch for upgrade, along with the storage drive. A 2.5in size cavity is available, although our sample had a tiddly M.2 card from LiteOn, using a SATA Revision 3.0 bus. There does not seem to be an option for the three-times faster PCIe attachment that is finally being offered for Windows laptops.

Performance

The Alienware 13 is the only gaming laptop in this group to not use a quad-core processor. While serious gamers have traditionally sought the fastest components of all description to shore up their machine's performance, it is more debatable how important it is to have the quickest quad-core on the case. Raw processor and memory performance fell behind the quad-core crowd, with single-core performance just short of the latter group, while multi-core tests returned point scores around half that of the four cores.

Gaming performance was in a realm that would have been undreamt of for a modest 13in notebook just two years ago. Tomb Raider 2013, for example hit 110fps average in our casual gaming test at 720p and High detail, settling at 64fps at screen native full-HD resolution. We found we could raise quality right up to game max with Ultimate settings and still see an average of 31fps, albeit with short-term minima at 23fps.

From Batman: Arkham City the Bat skies were the limit – edged up to highest settings with Extreme detail the Alienware 13 still averaged an easy 46fps. Only when stretched by our top Metro: Last Light benchmark did the little Alienware meets its maker, staying fluid enough at High detail with 48fps average, but turning to silent-film rates of 15fps at Very High with additional effects engaged.

If those smooth framerates are not already high enough, or you hanker over connecting larger, higher-resolution displays, there's unique option of the Alienware Graphics Amplifier. This is an external break-out box for the desktop, the size of a large shoebox, which houses the single PCIe graphics card of your choice. It connects through a proprietary multi-lane PCIe umbilical cable, taking over from the internal Intel or nVidia graphics cards inside the notebook.

Alienware fits a usefully sized 52Wh lithium-polymer battery to the 13, not user replaceable as is common among even gaming laptops today. That's only a few percent larger than the 48Wh types found the MSI and Toshiba gaming laptops, yet with the help of the smaller screen and 14nm dual-core Broadwell processor, the Alienware 13 lasted a staggering 10 hours 20 minutes in our standard looped video over Wi-Fi benchmark test.

VERDICT: The Alienware 13 is a compact yet very powerful laptop, suited to playing all modern Windows games. It's been well designed and equipped to be a premium yet still portable powerhouse.

AORUS X7 PRO

£2,100 inc VAT • aorus.com

Build	★★★★☆
Features	★★★★½
Performance	★★★☆☆
Value	★★★★☆
Overall	★★★★½

Aorus – Gigabyte's premium gaming laptop division – has been busy lately. Like much of the Windows PC world, Gigabyte is beholden to its component suppliers to come up with new innovations. And in this case, it's its chosen graphics processor supplier of nVidia that's been rushing through so many updates to its mobile graphics chips.

The first version of Gigabyte's Aorus X7 laptop used a pair of nVidia GeForce GTX 765M in scalable-link interface (SLI) mode. Then the Aorus X7 V2 was launched last summer with two nVidia GeForce 860M processors. And now, to keep up with nVidia's update schedule comes the Aorus X7 Pro, which has also been described as an X7 V3.

In the new X7 Pro, the main change since the X7 v2 is to the graphics processors, although our sample of the X7 Pro also featured a slightly different storage configuration. Instead of three 128GB mSATA SSDs, this model included two 256GB mSATA drives, again arranged in a RAID 0 array.

Such a configuration allows incredibly fast access times – in our tests we saw sequential read speeds up to 781MB/s and writes even faster at 785MB/s. This setup still returned decent numbers for 4kB random reads and writes too, at 27.3- and 78.3MB/s respectively. So here there is a performance hit, ultimately slower than a single non-RAIDed SSD, but still well ahead of HDD performance.

With a queue depth of 32, the results were 443MB/s random 4kB reads and 514MB/s random 4kB writes. The latter result suggests a very quick IOPS figure of 132,000 IOPS.

Performance

We put the X7 Pro through the usual benchmarks to see how it performed. Geekbench informed us of some speedy number crunching; namely 3670 points with a single processor core, and 13,124 points in multi-processor mode with eight virtual cores running.

In PCMark 7 it earned 6474 points, very close to the 6304 points of the X7 v2. PCMark 8 scores were also beaten, rising from 3983 to 4051 points in the Home test without hardware acceleration. Engaging the dual GPUs brought the score up to 4809 points. In the PCMark 8 Work test, scores rose from 3464- to 4463 points; and then to a mammoth 5144 points with hardware acceleration engaged.

Cinebench scores were impressive. Version 11.5 of the benchmark reported 1.63 points single-core and 6.52 points multi-core mode; and OpenGL video rendering played at 67fps. Version 15 Cinebench returned 142- and 590 points respectively for single- and multi-mode, while its video clip played at 144fps, the fastest result we've seen.

But running gaming graphics rather than workstation graphics is the reason for which this laptop was built. Where the previous model played Tomb Raider 2013 at 57fps average (1920x1080, High detail), the X7 Pro averaged instead 221fps. Given that incredibly high framerate, we nudged up the quality settings to Ultra (170fps) and finally Ultimate (110fps). In Batman: Arkham City, the Aorus could play at native screen full-HD resolution at 129fps (High detail), 122fps (Very High) and 107fps (Extreme).

Finally we put the X7 Pro through its paces with Metro: Last Light. Set again at native resolution and High detail (with all other effects left disabled) it averaged 171fps. And even at uppermost Very High detail setting, and other effects now engaged such as SSAA, 16x AF,

Motion Blur, and PhysX, it still played at a useful 48fps. With some glorious detail and fluidity, it must be said.

It's worth noting that the large increase in performance may be partly software as much as hardware driven. A software update was applied from nVidia which noted that optimisations had been made for certain games, including the three in our usual benchmark roster.

On the last X7 v2 example, we found the LCD to be a mixed bag – with reasonably wide viewing angles for a budget TN type, but an odd vertical grain pattern visible across the entire panel. It looks like the kind of visible lines you'd seen in quality velour paper, only turned 90 degrees. That proved to be the case again for this model, which seems to use the same Optronics twisted-nematic display.

In lab tests, it was measured with 95 percent sRGB coverage, and 70 percent Adobe RGB. The reported contrast ratio was better than the nastiest TN screens (80:1) but still only reached 330:1 (where an IPS panel would typically exceed 600:1).

Luminance uniformity was below average, up to around 20-30 percent darker across the display's top third, although our eyes are quite forgiving of even large looking deviations up to this point. Colour accuracy was good overall with an average Delta E value of only 0.97 using a 48-tone test.

The last Aorus X7 had disappointing battery life even by gaming laptop standards at just one hour 48 minutes. This sample lasted slightly longer, two hours 17 minutes, in the same test (streamed HD video over Wi-Fi, 120cd/m^2 display brightness).

We did find the Aorus X7 Pro annoyingly loud in general use. Cooling fans would spin up and keep switching speed (and hence audible pitch) regularly while the laptop was just idling at the desktop. And, of course, as soon as a game is loaded the fans are pegged at full volume all the time.

Gigabyte does include a useful software control panel that sits up the Windows Taskbar, from where you can engage Stealth Mode. This usefully reduces fan speed to more comfortable, almost inaudible levels, at 2100rpm. However this comes at the cost of hampering performance since the processor is running undervolted, and underclocked to 1.6GHz clock speed.

VERDICT: With the help of nVidia's recent push to make powerful mobile graphics processors that consume less energy, the X7 Pro turns in gaming performance once only available to desktop machines.

GIGABYTE P37X

£1,750 inc VAT • uk.gigabyte.com

Build	★★★☆☆
Features	★★★★☆
Performance	★★★☆☆
Value	★★★★☆
Overall	★★★★☆

Standing at the top of nVidia's latest GTX 900 Series of mobile graphics processors is the GeForce GTX 980M. Gigabyte has taken its huge 17in P37 as the vehicle to carry this mighty mobile graphics engine. Unlike its sub-brand of Aorus, which apes Alienware in style and design, the Gigabyte P37X is of more typical Windows laptop construction, pure plastic all the way, sober black all over. Corners are gently curved though, and the finish is more satin than total matt.

The industrial design is unremarkable, and without the Gigabyte name stencilled on the screen bezel there's nothing to indicate from which Taiwan factory this chassis originated. In its favour, it's not as brutally ugly and generic as the Clevo off-the-shelf chassis favoured by PC assemblers such as Schenker/XMG; but the point for some gamers for these gaming laptops is to focus the bill of materials on the essential GPU and CPU to get the job done. However, it does manage to stay reasonably trim, given the screen size. At 23.2mm, it's a couple of millimetres under an imperial inch, and its 2.9kg mass stays the right side of the shoulder-tilting three-kilo mark.

The P37 features a 17.3in IPS display, with 1920x1080-pixel resolution. While there are very good arguments for not increasing resolution beyond full-HD for Windows and/or gaming purposes, it does result in a lower pixel density on the stretched panel – around 127ppi, where a 13in has much sharper 166ppi, which does mean rougher looking screen graphics than is now becoming standard in a Retina-display world.

Ports

There's a fair line-up of ports and connectors, including three video outputs – two digital through Mini DisplayPort and HDMI, and the old analogue standby of VGA D-Sub. There are four USB ports, but only the two on the right are USB 3.0. We struggle to understand how a modern laptop costing close to two thousand pounds can get away with fitting cheap and obsolescent USB 2.0 ports.

The keyboard is standard fare tiled type, here with short-action keys that provide a good typing experience. Helping to fill the wide top deck is a number keypad to the right and a row of six programmable macro keys labelled G and G1-G5 on the left. A white LED backlight can be triggered from Fn+Spacebar. It has two brightness levels and like many others suffers from distracting light bleed around the side of the keys. Some flex in the keyboard area is evident when you press down in the centre of the top deck.

We found the ELAN trackpad to be 'sticky' in operation, with a tardy cursor that needed care steering. Another issue was flaky Wi-Fi connectivity, where the laptop would routinely disconnect from our test router and require a restart to see any available networks.

The underside has an array of stickers, screws and venting grilles, with one hatch in the centre to give easy access to the system memory.

Operating noise levels were variable, with fans sometimes revving up while the laptop was idling at the desktop. Under gaming load fan noise was relatively loud but no worse than most of the breed.

On main processor duty is the popular Haswell-generation quad-core from Intel, the Core i7-4720HQ clocked at 2.6GHz and with another gigahertz of clock speed available in Turbo mode. There's 16GB of 1600MHz memory on two SO-DIMM cards.

For internal drives, Gigabyte offers the useful facility of a fast flash drive as C drive, and a large capacity 2.5in hard disk for 1000GB of bulk storage.

The boot drive consists of two 128GB mSATA SSDs, configured in RAID 0 to work around the SATA speed ceiling. This gives a total capacity of 256GB (238GB, as reported by Windows). In our tests, we measured up to 832- and 654MB/s for sequential reads and writes, while 4kB random reads and writes also stormed through, indicating peak input/output operations per second at a blistering 132, 000 IOPS with queued 4kB random writes.

The nVidia GeForce GTX 980M established itself as able to render all of our games tests with consummate ease. And with a huge 8GB of video memory included, this GPU should be capable of driving external high-resolution displays with ease, too.

Even with Batman: Arkham City set to maximum detail settings at screen native full-HD resolution it averaged 91fps. Tomb Raider 2013 in full-HD and High quality zipped along at 221fps, falling to a 77fps average only after setting it to the highest Ultimate rendering.

Our final test of Metro: Last Light also showed 100fps at High detail and a still playable 37fps at Very High with additional rendering effects engaged.

Gigabyte fits a high-quality LG/Philips display (LP173WF4-SPF1) based on AH-IPS technology to give good viewing angles, richer colour and better contrast ratio than found on budget TN panels.

In our tests, we measured up to 620:1 contrast ratio; and a colour gamut that could render 92 percent of the sRGB range and 71 percent Adobe RGB. Colour accuracy was good, with an average Delta E figure just over 1.0.

Unplugged runtimes on the biggest 17in laptops is rarely more than a couple of hours, despite the opportunity for fitting larger battery packs. But we were pleasantly surprised to find the P37X could run for over four hours (four hours two minutes) in our standard looped video test.

VERDICT: The Gigabyte P37X is built for gaming speed, based on a large 17in display chassis but in a thinner than traditional case. With the help of the best single-chip mobile graphics processor currently on the market it can play any game you want, up to very high rendering quality. It may not stand out in style, but it gets the job done, albeit at a high price.

MSI GS60 2QD-470UK

£1,299 inc VAT • msi.com

New advances in graphics processor technology have been followed with promises of thinner and lighter gaming laptops. But the MSI GS60 is the first high-performance notebook designed for gamers that delivers on that promise. At little more than 20mm thick and weighing just 2kg, it is far removed from the traditional brick-built machines that gamers have long had to heft around. And yet it still manages to pack the graphics horsepower needed to play today's action games smoothly at maximum details settings.

The chassis is all-metal, constructed from thin folded sheet aluminium, with a brushed grain and anodised into the deep blood finish of this ruddy model. Other colour variations are available, but their specs will be slightly different to those found here. The battery is integrated and not user replaceable, while further weight and space savings are made by leaving out any optical disc drive.

The keyboard is one of the better types we've tried, branded by SteelSeries. It has a good consistent action across the board, with medium travel and softly cushioned yet positive keys. We also appreciated the well-behaved trackpad, a large buttonless type with matt tactile surface.

Thanks to multi-colour keyboard backlighting there's plenty of scope for chromatic light show fun – you can select different colours across three zones, create up to four layers of presets, adjust brightness in four steps, and even set breathing and wave effects across the keys. Light bleed was an issue though, with more LED shining from the key edges than through the actual keys.

External displays can be connected via HDMI or Mini DisplayPort, and data ports run to three USB 3.0. Audio connectivity comprises separate 3.5mm mini-jacks for headphones and mic.

Sound by Dynaudio, the legend declares by the perforated stereo speaker grilles, although the Danish loudspeaker specialist hasn't made any game-changing sound improvements. Testing with music we heard the usual metallic tinny din found on most laptops, with an accent toward the lispy treble. You can tune out some of the excesses with the installed Creative Sound Blaster software.

The key component in the GS60 is the nVidia GeForce GTX 965M integrated graphics processor, here backed with 3GB of GDDR5 video memory. This was introduced earlier this year, one of nVidia's latest Maxwell architecture GPUs based on a 28nm process.

For main processor, the MSI uses the popular Intel mobile quad-core chip from last year's Haswell series, the Core i7-4720HQ, specified at 2.6GHz and with Turbo boost to 3.6GHz. There was 16GB of 1600MHz in our sample, using two 8GB SO-DIMM cards.

Storage is split into two, with a 128GB SSD and 1TB hard disk. The former flash drive is a Toshiba M.2 type, but using the older SATA Revision 3.0 standard, which kept top speeds in check at 500MB/s.

Performance

The MSI GS60 puts its Intel Core i7-4720HQ quad-core processor to good use, turning in benchmark scores that were slightly ahead of other gaming laptops we've tested using the same processor.

Geekbench 3 scored it with 3561 points in single-core mode, and 13,306 points multi-core, while Cinebench, both versions 11.5 and 15, gave it fractionally the best scores of all the laptops tested with

Build	★★★★☆
Features	★★★★☆
Performance	★★★★☆
Value	★★★★☆
Overall	★★★★☆

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the same '4720HQ – 1.58- and 141 points respectively for single-core operation; and 7.27- and 667 points for multi-core rendering.

For internal storage, it has one each of flash drive and hard-disk drive. The former boot drive is a Toshiba M.2 type but based on slower SATA Revision 3.0, which kept highest sequential speeds in the 500MB/s area. But crucially this drive excels with deeply threaded small-file random transactions, up to 97,000 IOPS, so should keep the computer feeling responsive within the limits of the OS.

The Samsung PLS display is a high-quality unit, with the highest reported colour gamut figures of all laptops in this group. It could meet 99 percent of the essential sRGB colour spectrum, and 75 percent of the more challenging Adobe RGB gamut.

Contrast ratio was relatively high at 610:1, ensuring shadow detail should be clearer in darker games, while overall colour accuracy was rated at with an average just over 1.0 Delta E.

MSI fits a small battery inside the GS60, rated at just 48Wh, and this gave the shortest run time of any gaming laptop in the group that was able to take advantage of nVidia Optimus graphics switching technology. It played our looped video for just two hours 49 minutes, while using its lower-power Intel graphics chipset.

The MSI GS60 passed all our gaming tests with flying colours, except the final torture test of Metro: Last Light at near flat-out settings. Faced with Batman: Arkham City it averaged framerate figures of 67fps at maximum Extreme settings at the screen's native 1920x1080 resolution; or if you want to see the frames fly drop to 1280x720 and High detail, where we measured 92fps.

Tomb Raider 2013 played fluently at 144fps at the same resolution and Normal detail, or 123fps at full-HD resolution and High detail. Stretching the GPU further, we tweaked up detail and saw framerates fall to 82fps (High), 59fps (Ultra) before settling at Ultimate rendering settings, where the MSI could still average 39fps.

In our first Metro: Last Light test at 1920x1080 resolution and basic High detail, it averaged a handy 64fps, which only fell to a less fluid 20fps in our highest test at Very High detail, with SSAA, 16x anti-aliasing filter, Normal motion blur and PhysX all engaged.

VERDICT: While still not especially petite by the standards of some 15in laptops, the MSI does manage to keep within the magic size and weight figures of 2kg and 20mm, making it the most totable gaming laptop in its category.

TOSHIBA QOSMIO X70-B-10T

£1,200 inc VAT • toshiba.co.uk

Toshiba has long been making large desktop-replacement style laptops suitable for enjoying Windows games. While the specifications will look good, we've historically seen compromises taken in build quality, but here Toshiba has included more metal components around the Qosmio's large 2.9kg chassis.

It's not a full metal jacket but the thin metal veneer that covers the lid back and top deck is welcome. A deep plastic underbelly has chamfered edges that blend almost seamlessly into an eye-catching anodised aluminium edge. This red trim encircles the notebook, giving a sporty black-and-red effect.

With such a large frame, measuring 412x268mm and 34mm thick, there's space for plenty of ports and connections. On the left there's a fully fledged Blu-ray drive that can write to erasable BD discs (BD-RE). That includes the latest BDXL format, which in its current top spec has three layers that can store 100GB on one disc.

Alongside the Blu-ray mechanism are two USB 2.0 ports, DC power inlet and Kensington lock slot. As with many higher-performance gaming laptops, the mains adaptor is a chunky brick, here rated at 120W. On the right are two USB 3.0 ports, plus gigabit ethernet and two display ports. There's an old analogue VGA connector for not sure what purpose in this digital video world; and HDMI that's billed as supporting Ultra HD 4K.

Inside the Qosmio X70-B is a new quad-core processor from Intel, although based on its fourth-generation 22nm technology of 2012, codenamed Haswell. It's clocked at 2.6GHz and has a short-term Turbo mode good for 3.6GHz bursts. This chip incorporates an Intel HD Graphics 4600 graphics processor, which drives the display when running from battery. On mains power, AMD's Enduro switching technology routes video through the main Radeon R9 M265X graphics engine, with its 4GB of dedicated GDDR5 memory.

The laptop itself is already running with its maximum memory allocation of 16GB, and for storage there is a new combination disk/flash drive known as an SSHD. This hybrid of solid-state and hard-disk drive carries the bulk of its data on a 1TB disk based on regular 2.5in SATA drives, while adding a limited 8GB of flash storage to help accelerate performance.

For wireless connectivity there's the now-standard Bluetooth 4.0 LE, and the most basic 11ac adaptor available in the form of an Intel Wireless-AC 3160 card. This single-stream solution can connect to 802.11ac wireless routers, albeit with only one stream rather than three, so misses out on any MIMO technology that aids range and throughput from multiple antennas.

To help promote the laptop's sound system, Toshiba has printed Harman Kardon's name behind the perforated speaker grill by the screen hinge, while cinema-sound specialist DTS gets a name check in marketing materials for its software-based audio signal processing. As with any pseudo-surround processing, results were clumsy and unnatural but the effect can be turned off.

As with just about all modern laptops, the keyboard takes the square tile form, although the keys themselves are less typically hard plastic with a semi-gloss finish that we found easy to type upon. The trackpad is not so accomplished, a large buttonless type with poor responsiveness to light finger touches.

Build	★★★½☆
Features	★★★½☆
Performance	★★★☆☆
Value	★★½☆☆
Overall	★★★☆☆

With its fast quad-core processor, the Qosmio ploughed easily through tests of raw processor and memory performance. PCMark 7 showed a good result of 5104 points, although the more recent PCMark 8 benchmark test gave poorer figures of 3424 points for the Home conventional, rising to 3881 points when using the GPU to accelerate some tasks with OpenCL assistance. The Work module of this benchmark showed even clearer gains with acceleration rising from 3312 to 4288 points.

Gaming performance

The AMD Radeon R9 265X graphics processor includes a healthy 5GB of fast GDDR5 video memory, although overall the laptop struggled with some games tests. We tried Batman: Arkham City at the screen's native 1920x1080-pixel resolution, and set to High detail it could average a useful 55fps, never falling below 32fps. Very High played at 48fps (27fps minimum) and even at the maximum Extreme setting still averaged 34fps (if with a 17fps minimum).

The Tomb Raider 2013 results were less emphatic, recording 42fps at native screen res and Normal detail, falling to 32fps and then just 23fps with High and Ultra settings.

Metro: Last Light has the scope to test performance further, but even just 1920x1080 and High returned unplayable framerates of 12fps, and a 5fps minimum. To reach a more usable setup we had to drop resolution down to 1366x768 and only Medium detail to experience an average of 25fps. Lowering our sights still further to 1280x720 and Medium detail only raised the rate of frames to 28fps, and still with a minimum that dropped to 10fps.

Toshiba fits a regular twisted-nematic (TN) display to this Qosmio, without any distracting touchscreen capability. It's marketed as TrueBrite, and even though it wasn't unusually bright at its maximum of 270cd/m^2, it had good colour accuracy for its budget technology type. We measured a peak deviation of 5.68 Delta E, and an average of just 1.57 Delta E across 48 tones.

In our standard video rundown test over Wi-Fi, the Qosmio lasted three hours 31 minutes from its removable 48Wh lithium-ion battery. So there is some scope for use away from the mains.

VERDICT: The Qosmio X70 in its 'B' form with Haswell processor is a powerful quad-core laptop with some gaming potential. But our tests suggest the AMD solution here is not as fast as older nVidia chips.

XMG A505

£1,205 inc VAT • mysn.co.uk

Build	★★★☆☆
Features	★★★½☆
Performance	★★★½☆
Value	★★★½☆
Overall	★★★½☆

If you can't find the exact gaming laptop you're looking for, in terms of internal component specification at least, you can always configure just what you need with the help of an empty case and a custom laptop builder. That's what Schenker Technologies offers in Germany, with a local office to serve your needs in the UK. And more specifically for gamers' needs, there's the company's sub-brand XMG, geared for gaming.

Like most custom laptops, the starting point is a barebones chassis provided by Taiwan case maker Clevo. Great design and style are not the company's forté, majoring instead on making solid and traditional chunky cases that channel the 1990s notebook PC. With the help of efficient modern silicon like recent Intel Core series chips and nVidia mobile GPUs, which require less cool air rammed across to prevent meltdown, the casework has finally come down in weight and size. So now we find a sub-2.5kg all-up weight for the Clevo N150SD case, relatively svelte at a little under 33mm fat.

The angular all-plastic case here carries a matt black finish on lid back and top deck, a virgin field to plant perennial greasy fingerprints, with the underside made from a textured ABS black plastic. Deep open grilles stretch right across the bottom plate, as do many screws for disassembling the laptop, while a single hatch is readily removed by releasing just two screws, to replace the fitted 62Wh lithium-ion battery pack.

An optical drive is fitted on the left side, along with three 3.5mm audio jacks to cover headphones, mic in, and Toslink digital audio output. On the right is a third USB 3.0 port, separate card readers for regular SD and microSD cards, plus ethernet and VGA ports.

To pipe digital video to a modern display there are HDMI and Mini DisplayPort on the back panel below the hinge, along with the DC power inlet and the fourth and final USB 3.0 port.

The keyboard features the usual 15in-style number keypad to the right, and the keys themselves are responsive and with slightly more travel than the low-profile keys we find on some modern laptops. Following others' lead, the XMG has a backlight keyboard, simple white LED with two brightness levels, although it had the worst case of unwanted light bleeding from around the keys we've seen.

Offset to the left like every other lopsided Windows laptops is a large trackpad, unusually with separate mechanical buttons for left- and right-click. These are reliable and predictable compared to half-baked buttonless designs, but do have somewhat long travel and are difficult to depress fully until you adapt your hand shape to allow your finger or thumb to dig downwards. Staged between these two buttons is a basic fingerprint scanner.

Components

The Intel and nVidia processors are locked for all A505 configurations, a Core i7-4720HQ and GeForce GTX 960M, the latter with 2GB of built-in GDDR5 video memory. Also fixed is the 15.6in 1920x1080 AHVA display from AU Optronics. In our tests we found the panel to have excellent colour coverage (96 percent sRGB) but more limited contrast with a ratio of 490:1, where the best IPS screens exceed 800:1. Colour accuracy was impressive at Delta E 6.1 maximum deviation, but with an average across 48 swatches below Delta E 1.0.

Raw speed from the processor and memory combination were right in line among its peers using the same CPU and 1600MHz memory – Cinebench 11.5 scored it with 1.55 points single-core and 6.97 points multi-core, for example. Similarly, the Geekbench 3 scores of 3255 and 12516 points were as expected for the specification.

Where the XMG didn't only excel but startled the lab tests was in its storage performance. With the help of a Samsung SSD featuring four lanes of PCIe 2.0 to connect to the data bus, the A505 returned the fastest storage results we've seen after the 2015 MacBook Pro. It wasn't up to the 1500MB/s we've seen from the latter but still sustained 1102MB/s sequential reads and 800MB/s write speeds.

The A505 also proved relatively frugal in battery terms, returning the second longest unplugged running time of the six in this group, only beaten by the absurdly enduring Alienware 13 and its 10-hour runtime. The chasm between them was vast though, with the XMG lasting for four hours 16 minutes in the same video rundown test.

Running a GeForce GTX 960M, one model below the '965M fitted to the MSI GS60 and three below the top '980M, the XMG nevertheless managed to demonstrate the sheer graphical power available from nVidia's new 900 Series mobile GPUs.

More for reference against general consumer notebooks, we ran the basic Tomb Raider 2013 test, which was dispatched with good three-figure framerates – 123fps at 720p and High detail, and 102fps at 1080p and Normal detail. The sweet spot for this game was the native full-HD resolution and Ultra detail (50fps); or you could try Ultimate detail and still expect a playable 32fps, albeit with a minimum that dropped to a less fluid 23fps.

Batman: Arkham City was fluent at all detail settings and full-HD resolution, right up to its maximum Extreme image quality setting, which averaged a solid 58fps.

Trade up to the visual spectacle that is Metro: Last Light and you should still find similar framerates at full-HD and High detail (57fps), although the push to Very High with extra effects finally slowed the A505 to an average of 17fps.

VERDICT: The XMG A505 is a versatile choice if you wish to define your gaming laptop experience. Finish quality and style are conspicuously behind the leaders here, although display image is good and the Intel/nVidia combination means the most challenging games play with ease.

Conclusion

The Toshiba Qosmio may have improved build quality over its predecessors, but it falls far short of others on test here. For reasons not limited to its lousy screen, slow gaming graphics and second-rate wireless connectivity, we wouldn't recommend this laptop.

For around the same £1,200 price, you can find the XMG A505, a far more accomplished gaming machine with decent screen and state-of-the-art storage inside. Construction quality could be better here too, and the generic Clevo chassis means a nondescript black slab. Customisation is king here, and going to Schenker may be the only way to build the exact machine you're seeking.

Aorus is the name on the fastest gaming notebook in this group, thanks to twin GPUs based on the 800 Series from nVidia. This comes at a price though, both finance and noise pollution, but if you have the space and the budget for this gaming giant, you will find a very well specified piece of hardware, even if its grainy TN screen is a letdown at the high asking price.

Balancing a better screen and the fastest single-chip mobile graphics you can buy right now is Gigabyte's second contender, the own-brand P37X. This model again has thermal issues, inasmuch as fans randomly whirr up under the strain of the machine sitting idle on the table, but it also delivers the best one-stop graphics performance from its GTX 980M through a much improved IPS display. Besides the thermal design though, we found recurring wireless breakdown issues that would prevent us from recommending the Gigabyte.
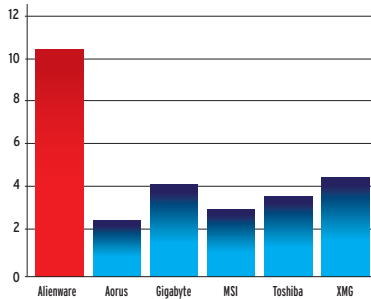
The Alienware 13 is a masterstroke of design by Windows laptops standards, with great if idiosyncratic design highlights, and the best overall performance you'll find.

The MSI GS60 is more typical gaming fare, mixing eye-catching colours, a 15in screen and quad-core Intel chip for impressive performance. It also has the classic rubbish battery life from gaming laptops past, but if you don't mind spending your time tethered to the mains, the GS60 should tick just about all of your gaming boxes. ⊠
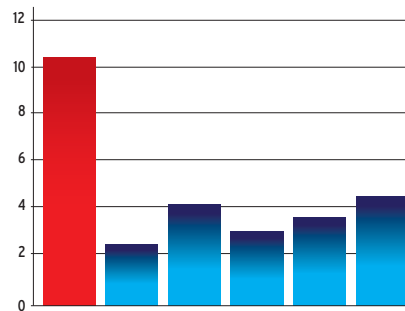
	ALIENWARE £1,100 inc VAT (£916 ex VAT) ★★★★½ PC ADVISOR RECOMMENDED	AORUS £2,100 inc VAT (£1,750 ex VAT) ★★★★☆	GIGABYTE £1,750 inc VAT (£1,458 ex VAT) ★★★★☆	
Model	13	X7 Pro v3	P37X	
Display	13.3in (1920x1080, 166ppi) PLS matt anti-glare	17.3in (1920x1080, 127ppi) TN matt anti-glare	17.3in (1920x1080, 127ppi) AH-IPS matt anti-glare	
Operating system	Windows 8.1	Windows 8.1	Windows 8.1	
Processor	2.4GHz Intel Core i7-5500U (3GHz Turbo)	2.4GHz Intel Core i7-4860HQ (3.6GHz Turbo)	2.6GHz Intel Core i7-4720HQ (3.6GHz Turbo)	
Graphics	nVidia GeForce GTX 860M, Intel HD Graphics 5500	2x nVidia GTX 870M SLI (6GB total)	nVidia GeForce GTX 980M (8GB GDDR5), Intel HD Graphics 4600	
Storage	256GB M.2 SATA SSD	2x 256GB mSATA SSD (RAID 0)	2x 128GB mSATA SSD, 1TB SATA HDD (7200rpm)	
Memory	8GB (2x 4GB) DDR3 (1600MHz)	16GB DDR3 (1867MHz)	16GB (2x 8GB) DDR3 (1600MHz)	
Ethernet	Gigabit ethernet	Gigabit ethernet	Gigabit ethernet	
Optical drive	None	None	DVD-RAM DL tray-load, swappable	
Video out	1x Mini DisplayPort 1.2, 1x HDMI 1.4	2x HDMI 1.4, 1x Mini DisplayPort 1.2, 1x VGA D-Sub	1x Mini DisplayPort 1.3, 1x HDMI 1.4, 1x VGA D-Sub	
Wi-Fi	802.11ac dual-band 2x2 (Qualcomm Killer Wireless-AC 1525)	802.11a/b/g/n/ac, 2x2 MIMO	802.11ac dual-band 2x2 (Intel Wireless-AC 7260)	
Bluetooth	Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.0	
Speakers	Stereo (Klipsch)	Stereo	Stereo	
Audio in/out	3.5mm headset jack, 3.5mm mic in	3.5mm headphone jack, 3.5mm mic in	3.5mm headphone jack with Toslink digital output, 3.5mm mic in	
USB	3x USB 3.0	3x USB 3.0, 2x USB 2.0	2x USB 3.0, 2x USB 2.0	
Card slot	None	SDXC	SD	
Webcam	2Mp	0.9Mp	0.9Mp	
Battery	52Wh lithium, non-removable	74.7Wh lithium-polymer, non-removable	78Wh lithium-ion, non-removable	
Dimensions	328x235x26.7mm	425x303x24.5mm	415x286x23.2mm	
Weight	1973g	3240g	2894g	
PERFORMANCE				
Battery	10 hours 20 minutes	2 hours 17 minutes	4 hours 2 minutes	
PCMark 7	5429	6474	6305	
PCMark 8 Home (conventional/accelerated)	2562/3217	4051/4809	3300/4049	
PCMark 8 Work (conventional/accelerated)	2922/4217	4463/5144	3478/5156	
Games score (fps)[1]	61,58/46, 89/64/47, 48/15	129/122/107, 321/221/170, 171/48	96/96/91, 221/153/116, 100/37	

[1]Games tested: Batman: Arkham City High, Very High, Extreme; Tomb Raider 2013 Normal, High, Ultra; Metro: Last Light High, Very High
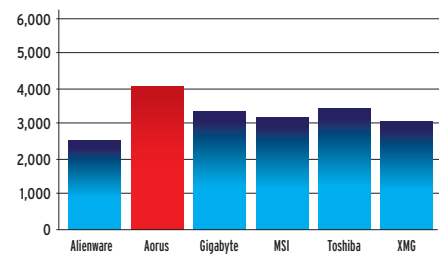
Battery life (hours)

(Alienware, Aorus, Gigabyte, MSI, Toshiba, XMG)

Battery life (hours)

(Alienware, Aorus, Gigabyte, MSI, Toshiba, XMG)

PCMark 8 Home conventional (points)

(Alienware, Aorus, Gigabyte, MSI, Toshiba, XMG)

MSI	TOSHIBA	XMG
£1,299 inc VAT (£1,082 ex VAT)	**£1,200 inc VAT (£1,000 ex VAT)**	**£1,205 inc VAT (1,004 ex VAT)**
★★★★☆ PC ADVISOR BEST BUY	★★★☆☆	★★★☆☆
GS60 2QD-470UK	**Qosmio X70-B-10T**	**A505**
15.6in (1920x1080, 141ppi) PLS matt anti-glare	17.3in (1920x1080, 127ppi) TN gloss glare	15.6in (1920x1080, 141ppi) AHVA matt anti-glare
Windows 8.1	Windows 8.1	Windows 8.1
2.6GHz Intel Core i7-4720HQ (3.6GHz Turbo)	2.6GHz Intel Core i7-4720HQ (3.6GHz Turbo)	2.6GHz Intel Core i7-4720HQ (3.6GHz Turbo)
nVidia GeForce GTX 965M (3GB GDDR5), Intel HD Graphics 4600	AMD Radeon R9 M265X (4GB GDDR5), Intel HD Graphics 4600	nVidia GeForce GTX 960M (2GB GDDR5), Intel HD Graphics 4600
128GB M.2 SATA SSD, 1TB SATA HDD (7200rpm)	1TB + 8GB Toshiba SSHD (5400rpm)	128GB M.2 PCIe SSD, 1TB 2.5in SATA HDD
16GB (2x 8GB) DDR3 (1600MHz)	16GB DDR3L (1600MHz)	8GB DDR3, Kingston HyperX (1866MHz)
Gigabit ethernet	Gigabit ethernet	Gigabit ethernet
None	BD-RE tray-load	DVD-RAM DL tray-load
1x Mini DisplayPort 1.2, 1x HDMI 1.4	1x HDMI 1.4, 1x VGA D-Sub	1x Mini DisplayPort 1.2, 1x HDMI 1.4, 1x VGA D-Sub
802.11ac dual-band 2x2 (Qualcomm Killer Wireless-AC 1525)	802.11a/b/g/n/ac, 1x1 MIMO (Intel Wireless-AC 3160)	802.11ac dual-band 2x2 (Intel Wireless-AC 7265)
Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.0
Stereo (Dynaudio)	Stereo	Stereo (Onkyo)
3.5mm headphone jack, 3.5mm mic in	3.5mm headphone jack	3.5mm headphone jack, 3.5mm mic in, 3.5mm Toslink digital output
3x USB 3.0	2x USB 3.0, 2x USB 2.0	4x USB 3.0
SDXC	SDXC	SDXC, microSDXC
2.1Mp	0.9Mp	2.1Mp
48Wh lithium-ion, non-removable	48Wh lithium-ion, removable	62Wh lithium-ion, removable (2 screws)
389x265x20.3mm	412x268x34mm	384x267x32.5mm
2042g	2930g	2473g
2 hours 49 minutes	3 hours 31 minutes	4 hours 16 minutes
5969	5104	5798
3175/3749	3424/3881	3014/ 3473
3435/3489	3312/4288	3388/ 4780
82/78/67, 123/82/59, 64/20	55/48/34, 42/32/23, 12/4	72/71/58, 102/70/50, 57/17

CLOUD STORAGE SERVICES

Cloud storage has become an integral part of our modern, mobile lives. Services such as Google Drive, Dropbox, OneDrive, iCloud and Box all vie to hold our data on their servers, but which one is the best for you? Martyn Casserly looks at the best cloud storage services and explains what they have to offer

With more and more people owning multiple computing devices – laptops, tablets and smartphones, the idea of your data being locked away in the belly of a desktop PC seems antiquated. Cloud storage has freed us from these restraints, ensuring that the files we need are available wherever and whenever we want them. Today you can sign up to a bewildering array of free services that offer to automatically upload your smartphone photos to the cloud, sync your documents across multiple devices, and enable you to work collaboratively on the web.

Sharing large files with friends is also made easier through online storage, as you no longer have to hope that the data we send won't bounce back due to limits imposed by email servers. Instead you just send a link to files stored within a cloud service and friends or colleagues, then have access immediately. In fact, if this is all you want to do, then there are the likes of WeTransfer and HighTail that specialise in this area rather than long-term storage.

It's surprising how much free cloud storage you can get these days. Signing up to free services from Google, Mega, Microsoft and a host of others will give you many gigabytes of space where you can store your photo library, important documents, or music.

To help you choose between the providers, we've handpicked what we consider to be the best cloud storage services and put them through their paces to see which ones are worthy of your data. Some focus on high security, others on cross platform availability, but most of them are excellent if you want to bolster you ailing hard drive or simply backup some files to an easily accessible folder in the cloud.

Choosing which service to use will depend on several factors – the variety of devices you use, the amount of space you need, and the level of security your data requires. As well as covering the most popular services to see just how much you can get for nothing, we also explain the extras some services offer which make it worth paying a small fee per month or year to keep you files online.

AMAZON CLOUD DRIVE ★★☆☆☆

### Price dependant on storage plan · amazon.co.uk

Not to be left out in the battle of the big players, Amazon has its own cloud storage solution to take on the likes of Google and Microsoft. The focus of Cloud Drive is simpler than its counterparts, in that there are no fancy plug-ins or web-based Office suites to add productivity to your data.

Instead, it's very much focused on being a place to store your documents, photos and videos. The desktop app is available on PC and Mac, and once downloaded it will take the form of a folder that sits quietly in the background waiting for you to drag files into it.

The free account offers 5GB of storage, but if this isn't enough you can pay a very reasonable £6 per year to add 20GB, with more space available up to a limit of 1TB for an annual payment of £320. In addition to the basic package Amazon also includes a music storage service – Cloud Player – which entitles you to keep 250 songs online for free. These files can be accessed on your mobile device (Android and iOS) via the Amazon MP3 app, with the option to stream or download them.

If you're an Amazon Prime member (£79.99 per year), then alongside the free next-day delivery on items, and Netflix-style streaming content on Amazon Prime Video, you now have unlimited storage for photos on the Cloud service.

The mobile experience with Cloud Drive is very basic, and is centred around photo and video syncing. iOS and Android users can download the Cloud Drive Photos app (this acts as the generic Cloud Drive app) and have their camera roll automatically sync to Amazon's servers when you have a Wi-Fi connection. Transfer time is reasonable, but if you use your smartphone camera often,
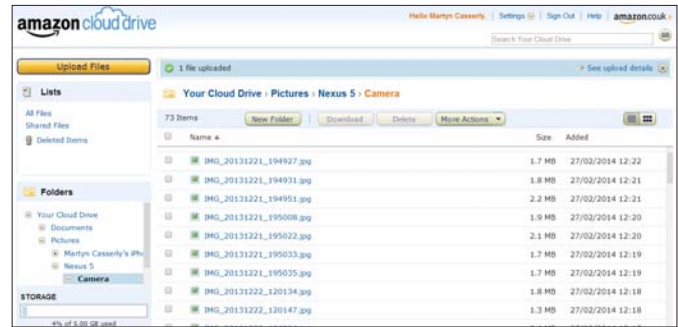
especially for videos, then the 5GB will need to be monitored and managed lest you run out of space.

A very curious choice is to not make documents available in the mobile apps. If you add Word, PDF, or XLS files to the Cloud Drive folder on your PC they will sync with the Cloud server, but won't appear on your smartphone or tablet. Amazon does word its description of the app's capabilities carefully, but you could miss this and then wonder why documents aren't available in the app. Of course you can navigate to the web portal via a browser, but when you consider the other options available that keep everything in one place, the document omission is a black mark against the service.

Addressing this in some way is a new service called Unlimited Everything. This works in the same way as traditional online storage, but with no set limits. Currently it's restricted to the US and costs $59.99 (£39) per year, but it could appear in the UK before long.

VERDICT: Cloud Drive is a confusing beast. On one hand, it's a useful way to back up your photos and videos online – which it does well – with additional storage being very cheap. But the lack of support for standard documents is bizarre and means we can't recommend it.

APPLE iCLOUD DRIVE ★★★½☆

### Price dependant on storage plan · icloud.com

In October 2014, Apple expanded its iCloud service, allowing you to store any document, even if it wasn't created in an Apple app, and access them from a PC (via iCloud for Windows or icloud.com) in addition to iOS and OS X devices. There's no app for Windows Phone, Android or Blackberry, though, so it's not the most ideal option for users of smartphones or tablets running anything other than iOS.

It's now possible to store any file in iCloud Drive, and apps such as Numbers and Pages now create their own folders in iCloud and default to storing their documents there. Photos taken on iOS devices can be backed up in iCloud Photo Library, and pictures and videos are synched across all devices that are logged into your iCloud account.

One particularly handy feature is that, in addition to synching your Safari bookmarks across devices, you can also see a list of open web pages on other iDevices. iCloud also allows you to have any purchases made on the iTunes store automatically download to your library no matter which device you used to buy it.

A recent addition to iCloud is iWork – Apple's Office suite – now available for free via the website. The three apps – Pages, Numbers, and Keynote – have clean interfaces, work well up to a point, and sync with the equivalent apps on your Mac or iOS device.

This means you can start work on your iPad, then continue without issue on your PC (files can be downloaded from iCloud.com in Microsoft Office formats). The functionality is a little basic, most likely so that it ties in with the iOS versions of the software, but syncing between devices and the cloud is fast and reliable.
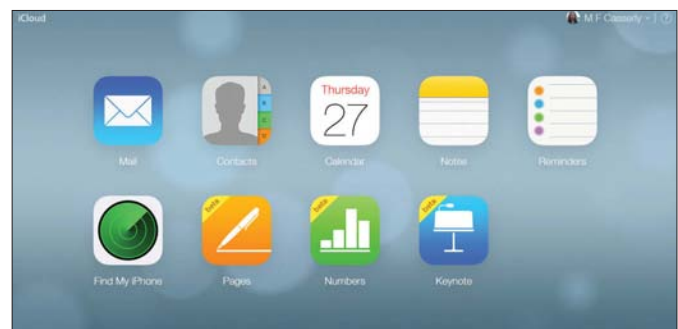
The 5GB of free storage offered initially seems generous, as purchases don't count against it. But when you start turning on all the options that make the service useful, such as backing up your device, then the space is immediately insufficient. You'll have to pay 79p per month for 20GB, £2.99 per month for 200GB, £6.99 per month for 500GB or £14.99 per month for 1TB.

While iCloud is secure, much of the data is encrypted at what Apple calls 'a minimum of 128-bit AES', with the more standard 256-bit reserved for Keychain Passwords. Apple also reserves the right to explore the contents of your files if it have cause to believe that it contains illegal or harmful material.

VERDICT: It's still relatively early days for iCloud Drive, and it's sure to become more useful as more apps begin to support it. However, it still lacks some of the great collaboration features that rivals including Dropbox offer. If you're an Apple user and are willing to pay at least 79p per month for the privilege then it's well worth taking advantage of iCloud Drive, but for those using other operating systems we'd suggest looking elsewhere.

BOX ★★★☆☆

### Price dependant on storage plan · box.com/en_GB

Sometimes mistaken for the similarly named Dropbox, Box has been around longer than its more famous counterpart, starting out in 2005. The possible reason for its less well-known stature is that for most of that time the company has focused on the business side of the market, building up an impressive enterprise reputation.

Box still offers solid personal storage options, however, with a generous 10GB of space for any new account. This isn't as rosy as it sounds though, due to the fact that Box limits the file size to 250MB. This is markedly lower than the 10GB limits of Google Drive, OneDrive and Dropbox. Of course 250MB is more than adequate for most documents and spreadsheets, but if large media files are part of your plan then this could be a problem.

Uploading a photo library won't be a problem for the vast majority of users, with the average top-resolution image from a smartphone generally being around 2- to 5MB, but video is the sticking point. The free account doesn't support versioning (being able to restore previous versions of a file) – that's a feature reserved for those paying a subscription.

Upgrading the Personal plan will cost you £7 per month, gleaning you 100GB of storage and a file size limit of 5GB, or you could switch to the Starter plan for £3.50 per month, which also offers 100GB, a slightly lower 2GB file size, but crucially 25 previous versions of any file.

Functionally, Box is very good. The interface in the mobile apps (available on iOS, Android, Windows and BlackBerry) is slick and well designed. There are plenty of options for creating, uploading and sorting files.
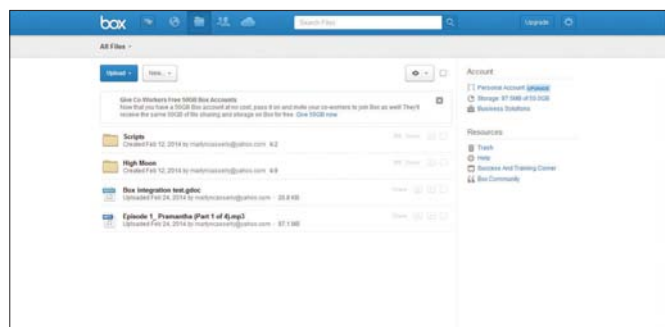
The web portal gives you the ability to create new documents in either Microsoft Office, Google Docs, or web-based formats, which you can then edit in Box via a free, downloadable plug-in.

All your files can be assigned tasks and comments easily from the main page, which could be very useful when you start collaborating with colleagues, another thing Box does very well.

Sharing and linking features are pretty standard, but again you'll have to upgrade if you want to allocate granular permissions. General security is the standard 256-bit encryption on the servers, with SSL for data in transit.

One of the real benefits of its enterprise background is the excellent range of apps that exist to increase Box's versatility. There are programs that allow you to link Office directly to Box, so all files are saved there – an FTP app, for example, lets you migrate older data on to the site – and a host of others are listed on the website.

VERDICT: There's a lot to like about Box. The service is fast, solid, and offering 10GB of storage space certainly catches the eye. It's just a shame that many of the best features – such as versioning – are only available to paying customers.
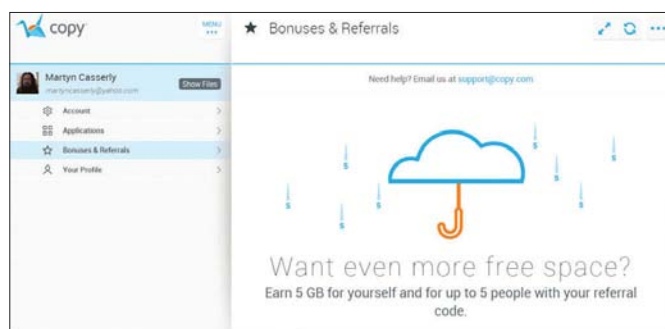
COPY ★★★★☆

Price dependant on storage plan · copy.com

Copy has been around for a little while now and is a simple-to-use alternative to the likes of Dropbox, OneDrive and Google Drive. The principles behind it are as you would expect from an online storage service. You can either access Copy via a web portal, download a desktop client for Windows, OS X or Linux, or use one of the mobile apps that are available for Windows Phone, iOS and Android. With these you can download or upload files, including synching the camera on your phone, Making them available on all your devices.

In line with Google and Microsoft, Copy starts with a decent 15GB of free space to new users, and this can be increased via a referrals system that rewards both you and any new user with an additional 5GB each (up to a maximum of 25GB extra space). The interface is somewhat barren, which is the norm these days, and with its thin lined, light blue hue, it's not hugely dissimilar in feel to Dropbox. If you use the desktop clients, then a folder is created on your PC, to which you drag files and Copy syncs them to the cloud. Files and folders can be shared with other users of the platform, or you can send direct links to any other friends or colleagues. All of this contains the ability to set different levels of control over the files so those you share them with can edit freely or be restricted to just read only status. As we say, all very familiar.

In operation the service works well, with decent speed, and no real issues. Copy also supports versioning, so previous copies of your files are retained after you make changes, and the whole service runs on 256-bit AES encryption that covers data in transit and on the copy servers.

While Copy is a stable and decent choice for consumer-level storage, the real focus of the service seems to be on the enterprise side of things. Barracuda, the company behind Copy, offers a range of compatible apps that extend the features, including digital signatures, full system backups, and on-site hardware to improve performance. Some of these business features are available in Copy, with the option of creating groups that you can administer with simple but powerful controls. There is also a granular level of access that can be deployed, plus the handy feature of users being able to split their copy storage into work and home, with company IT restrictions only being applied to the work section. Access privileges can be changed by clicking a drop-down menu, and if someone leaves a company, you can revoke their access entirely in a couple of minutes, or reinstate them should they return. The level of control is impressive and the menu systems are easy to master.

VERDICT: A decent alternative to Dropbox and OneDrive, Barracuda's Copy offers a generous amount of free space, but really it's the business services that make this service interesting.

DROPBOX ★★★★★

### Price dependant on storage plan · dropbox.com

Dropbox is one of the only online storage solutions to offer clients for Linux and Blackberry, alongside the usual Windows, OS X, Android and iOS standards. Plus, an official Windows Phone app was released in January 2015. This goes a long way to ensuring that your data can be with you, no matter what flavour of technology you use.

The basic, free account comes with a tiny – in comparison to rival services – 2GB of storage. For documents this is still huge, but if you want to store photos, music or video, it will disappear very fast. You can upgrade to the 1TB plan for around £7.99 per month, but Dropbox also offers 500MB of additional free storage for each friend you get to sign up to the service – with a limit of 16GB.

Other ways to bolster your account include linking it to Facebook, Twitter (both give you 125MB extra) or setting up a Mailbox account (currently offering a 1GB increase). You'll get 250MB just for taking a tour of the Dropbox basics, too. Enabling the camera upload feature will also gain you 3GB, and automatically backup your smartphone/tablet photos to the cloud.

All this space becomes a moot point unless the synching and storage works, but there are no worries there. Dropbox functions by creating a local folder on your device or PC that then syncs with an online version. This means you have all your data available whether you are on- or offline. Files appear quickly online once you place them in the Dropbox folder on your PC, and you also have the option of making select files available offline on your tablet or smartphone, with offline editing functionality among the best we've seen.

Folders and files can also be shared with friends either by sending them links (these work for non-Dropbox users), which allow them

PC ADVISOR
BEST BUY
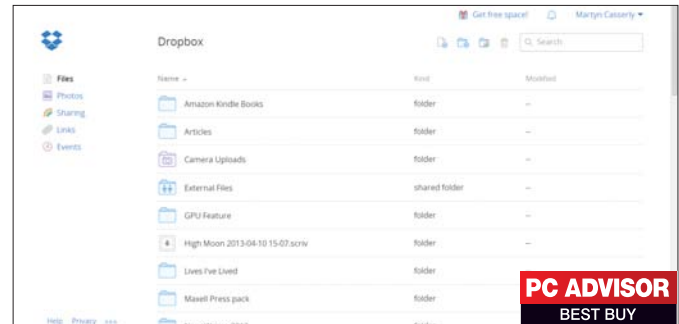
to view the data, or by sending a collaboration invite for the file. An important point to note about the collaboration option is that you can't set permissions, so files can be edited (and even deleted) by other users, as the name suggests. It's not a total disaster, though, as Dropbox backs up any changes to files for thirty days. So if you need an older version or want to undelete a file, it's still there.

If you choose to spend the £7.99 per month to get the Dropbox Pro account, you'll be able to enable viewer permissions. You'll also be able to set passwords and expirations for shared links if you have Dropbox Pro.

Security features include two-step authentication (always worth turning on) and all files held on the Dropbox servers are encrypted by AES 256-bit encryption, albeit employed from Dropbox's side rather than the user, with SSL for the data being uploaded and downloaded.

VERDICT: Dropbox is an excellent, cross-platform solution that remains a benchmark against which others must compete. It may lack a few of the whistles and bells of its rivals, but it's rock solid and compatible with so many applications.

GOOGLE DRIVE ★★★★☆

### Price dependant on storage plan · google.co.uk

In much the same way as OneDrive links into Microsoft products and iCloud to Apple, Google Drive is at the heart of the various online services that Google currently offers.

Free space is relatively generous with 15GB available when you setup your Google account – or link to an existing one. In fact, as Google unified its services under one login ID earlier this year, the chances are you already have a Drive account if you use Gmail, Google Calendar or even YouTube. The storage space is shared across all these services, so if you have large attachments on emails, then they will count in the 15GB, and enabling the automatic photo backup to Google+ from a smartphone acts the same way.

Google exempts any photos below 2048x2048 resolution, and videos shorter than 15 minutes, so you could always adjust the settings on your smartphone accordingly and get unlimited storage as they don't count towards the 15GB limit. Google Docs, Sheets, Slides, Presentations, Drawings and files that others have shared with you don't count either.

Unlike OneDrive and Dropbox, Google Drive doesn't have any way of adding storage through referrals or linking your account to social media. There have been plenty of promotions, such as 10GB for free when users downloaded Quick Office, and the search giant offers 100GB free for two years if you buy a Chromebook. Google Music – a separate service – lets you keep 50,000 songs in the cloud for free and not count against your storage.

Drive works in the same fashion as most cloud storage solutions, with a local folder on your PC linked to a duplicate cloud version.

PC ADVISOR
RECOMMENDED
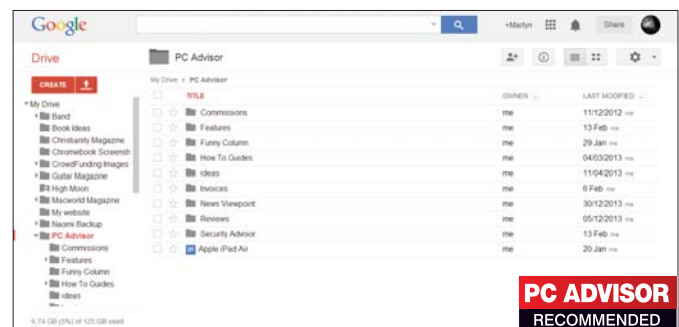
Versioning is supported, as is real-time collaboration on documents via the Google Docs app. Clients are available on PC and Mac, with mobile versions for Android and iOS, though not Windows Phone.

On the whole, the interface across the apps is smart and simple to navigate, with a basic file tree showing where your data is kept. You can choose specific files to be available offline on the mobile versions, and these can be edited – if they were created in Google Docs – then synched when you return online. For other formats (such as Word) you'll need to open them in another app – thus creating a duplicate copy.

Data stored on Drive is encrypted in 128-bit AES rather than the 256-bit employed by Box, OneDrive and Dropbox. Google asserts that it won't pry into the content of your Drive folder unless compelled by law enforcement agencies, and you can set up two-step verification on your account to add another layer of security.

VERDICT: With 15GB of free storage, Google Drive is one of the most generous of all the services in this test. If you live in the Google universe, then it really is an excellent storage option.

KNOWHOW CLOUD ★★★½☆

Price dependant on storage plan · knowhow.com

It's not unusual to go to the checkout at a computer retailer and be offered the chance to upgrade something on your machine. Usually this will be some kind of extended warranty or virus protection, but one that might seem somewhat surprising is online storage. Knowhow by the Currys/PC World group has a few decent features that could make it a useful addition to your trolley.

Under the retailer's branding beats the heart of the LiveDrive engine, itself a popular service in its own right. We've heard many good reports about the reliability of LiveDrive, so that's a good start, as keeping your data safe is the whole point of signing up to a service such as Knowhow.

There are two types of service – backup and storage. The first is as it sounds, automatically backing up the hard drive of your PC or Mac at intervals defined by the user in the control panel. These increase in hourly units, or if you prefer you can set a certain time of the day to run the task when you're not using the computer. Think of it as a mirrored version of your hard drive in the cloud.

The second element of the service is the Briefcase, which is a general online storage facility not linked to a specific PC. Here, via the web portal or your computer, you can upload and download files just as you would on Dropbox or OneDrive. These files can be accessed via your PC, phone or tablet, with apps being available for iOS, Android, and Windows Phone.

The storage space available is determined by which package you buy. There are several available, combining variations of device numbers, storage space, and how many years they last. It's a bit confusing to be honest, and should be simplified to make
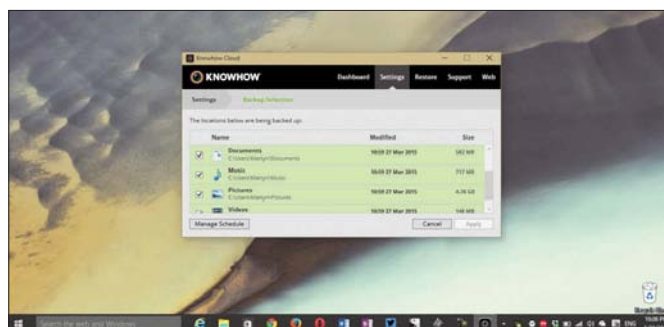
things clearer. The most tempting offering we found was for a 2TB allotment covering five devices and costing £30 per year.

Design wise, the interface is clean, simple to understand, and when you finish, the initial install the app immediately starts a backup of your system. We'd like to see the options of which folders you want in the cloud appearing first, but it's easy to rectify.

Security is obviously an important element in any online service. Knowhow Cloud encrypts data in transit using TLS to fend off any interceptions, and the Briefcase files are encrypted on the users machine as well. Files on the Knowhow servers are not stored in an encrypted form, but we've been assured that they remain secure behind several layers of protection and are unidentifiable to any snoopers. The servers are all based in the UK, which in some ways is encouraging – as it keeps the NSA at bay – but, of course, we have our very own GCHQ to worry about.

VERDICT: Knowhow Cloud is cleanly laid out and the backup features are genuinely useful. If you have a lot of data you want to store securely in the cloud, then it could be a good service, but for most people it seems pricey and may offer more storage than you need.

MEDIAFIRE ★★★½☆

Price dependant on storage plan · mediafire.com

Mediafire might be a new name to many, but the Texan company has been around for nearly 10 years. The early part of that time saw the site function mainly as a file sharing service with unlimited upload file sizes for users, but over time it has become a more standard online storage service. You can still share files by sending either public links to people, or sharing files and folders with other members, but can also post pictures, videos, and other files directly to Facebook, Twitter, Pinterest, Tumblr, Google+ or Blogger.

The free account comes with 10GB of space, but this can quickly be expanded by various easy tasks. Linking your Twitter and Facebook accounts will garner you 1GB for each, while the act of installing a desktop client for your Windows or OS X machine will give you another 2GB. The same is true for any mobile app you download, with smartly designed versions being available for Android and iOS. As is the norm, you'll also be rewarded for any friends you bring to the service through a referral, with Mediafire handing out 1GB per new account, up to a maximum of 32GB. All in all, you can boost the free account up to a very respectable 50GB of space, which is plenty for most people.

There are a few signs that the basic account is free. File sizes are limited to 200MB, which is something to consider if you were hoping to keep any kind of movie files on the service, plus you'll see ads when sharing or downloading any files from friends. These are hardly draconian measures, but if it does feel restrictive, you can move up to a Pro account which costs $4.99 per month (£3.30) for 1TB of space, up to 20GB file sizes, and no ads.
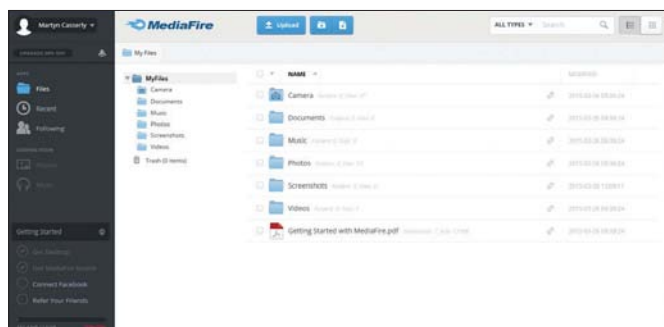
You can create folders, upload and download files, plus (if you want it to) your mobile device will automatically backup any pictures you take. If you install the desktop client a new folder will be created on your hard drive and you can just drag files to it like any other standard folder, except the Mediafile one will then sync automatically to the cloud drive. There are a few nice touches in the interface. Any media files can be played in the Mediafire browser, which means you don't have to download the file first.

Another smart feature in the desktop client is the ability to take a screenshot on your PC, annotate it, and share it with friends. While this might seem a little random, it could be very useful if you're collaborating with others on something and want to quickly show them what you're thinking. There are also new features on the way, with mentions of music and photo apps that will presumably have a focus on social media and sharing.

VERDICT: Mediafire is a solid, simple-to-use service that can be built up to a hefty 50GB of free storage if you have a few friends. It's nothing new, or indeed special, but that's not always a bad thing.

MEGA ★★★★½

Price dependant on storage plan · mega.co.nz

Mega is a New Zealand-based company that puts its security credentials front and centre. Unlike some of its rivals this service provides encryption in every part of the process. So anything you send to the cloud is encrypted locally, en route, and on the destination server. What's more Mega can't access your information. The upshot of this is that anything you store on Mega is unaccessible to anyone but you. To achieve this there are local clients for Windows, OS X and Linux, plus there are also secure browser plug-ins for Chrome and Firefox. The mobile world is also well covered with apps available for iOS, Android, Windows Phone and BlackBerry.

Of course, all of this is only useful if the service is affordable and offers a decent amount of storage, so it's heartening to see that the standard free package affords a whopping 50GB of space. This is enough for the vast majority of people, but you can always move up to a professional account which gives you either 500GB (€99, £70, per year), 2TB (€199, £142, per year), or 4TB (€299, £213, per year) and increased bandwidth with each package so you can share files back and forth with friends.

Sharing is easy with other members of Mega, behaving in much the same way as Google Drive and OneDrive, by allowing you to send an invitation to a friend and set the level of actions they can complete – view, edit, and so on. You can also send links to non-Mega users, but this involves also privately sending them an encryption key so they can access the files. While this is easy, it's a better option to have your friends on the service itself if you want to keep things secure, especially as this also opens up the ability to collaborate on files in real-time. Mega also has a few secure communications
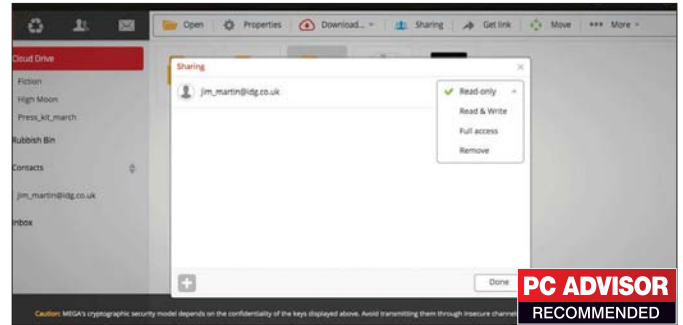
options, too. MegaChat is a Beta feature that lets you exchange audio and video calls with other members. These are encrypted end-to-end, making them more private than Skype or Google Hangouts. There is also a new feature, due to be released soon, which is a kind of encrypted email and IM messaging; so Mega could become a working environment for those who need to make adjustments while out in the field and want the data to remain private.

In use the site is well laid out, with a clean interface that doesn't throw up any surprises. Functions are clearly labelled, you have a decent amount of control over how your files are stored, and the mobile apps are equally straightforward. The only obvious omission, especially when you consider the space available, is that you can't use Mega as a scheduled backup for your system. Still, there are security issues that a service like that brings, and if you work mainly on one computer then the included ability to select which folders are mirrored in the cloud is certainly a good alternative.

VERDICT: With its generous free account, fast service, cross platform appeal, and highly secure nature, Mega is a very good choice for most people looking for an online storage solution.

MOZY ★★★½

Price dependant on storage plan · mozy.com

Mozy is an online backup and storage service that aims to give you peace of mind. The most obvious way of doing this is to ensure that your data is protected from prying eyes. This is accomplished by Mozy offering two types of encryption (256-bit AES or a 448-bit Blowfish key), which perform the essential part of encrypting your files while still on your computer, rather than sending them across the internet to the servers to do the job there. The upshot of this is that it is much harder for someone to hijack your information on route to the servers and find anything they can use.

Aside from the security aspect, Mozy is a pretty standard online storage package that allows users to select which folders from their hard disk they wish to store online, syncs automatically (once you download and install the client software), and allows you to access the files from other computers via a web portal or mobile app. Clients are available for Windows and OS X, while iOS and Android platforms are also supported.

Some useful features include 30-day versioning, where all instances of a file are kept for 30 days, so you can restore them to a point in time before mistakes were made or corruption might have affected them. There's also the ability to download all your stored files with one click, which could prove useful if you need to move to a new computer. Bear in mind though that there are some restrictions on the amount of hardware you can use. The lower tier packages are limited to backing up one PC, although you can access your files via the web on other machines. For a multi-computer setup, you'll need to move up to the £7.99 per month service, which supports three
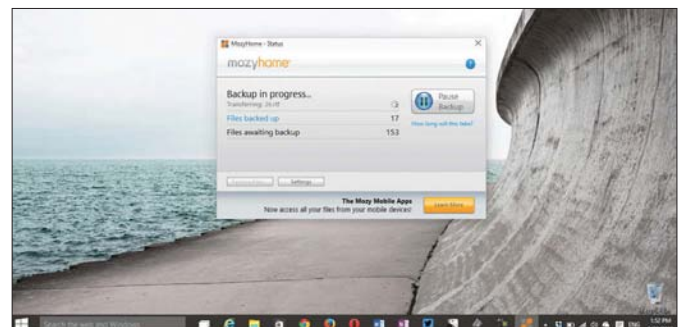
PCs and gives you 125GB of storage. The basic, free, package entitles you to a paltry, by modern standards, 2GB of space but this can be increased through the usual referral system where you invite friends to sign up. To be fair Dropbox offers the same small initial space, but it often has deals with phone manufacturers and other websites that can quickly add a few free GBs to your plan.

The interface is nothing special, but acceptable and stable. Once the Mozy Home and the Sync clients are set up you click and drag folders into the Mozy drive and it will store a copy in the cloud, plus you can adjust which folders are backed up, along with several other modifiers, all with relative ease. The mobile apps follow a similar pattern in the design stakes, with aesthetics giving way to functionality. Performance wasn't stellar though, and we'd hope that the mobile side of things would see an overhaul in the near future, otherwise Mozy could find itself left behind more optimised services.

VERDICT: If security is your prime focus, then Mozy has a lot to offer. The versioning support is good, local encryption is always our preferred method, and the one click restore option is a nice addition.

ONEDRIVE ★★★★☆

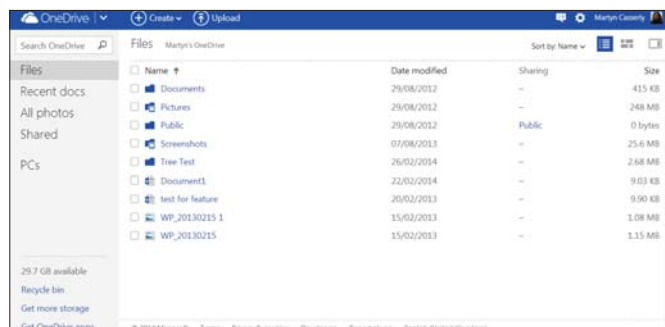### Price dependant on storage plan · onedrive.live.com

OneDrive is Microsoft's cloud storage service and it's an integral part of Windows and Windows Phone. Modern versions of Office, for example, default to saving files in OneDrive rather than your local hard drive. This makes total sense as it's much more convenient to be able to access documents, videos, music and photos from one place rather than trying to keep multiple copies in sync.

Much of the functionality in OneDrive (previously SkyDrive) is similar to Dropbox, and apps are available to Mac, Android and iOS users as well as Windows and Windows Phone. Microsoft has also introduced a referral incentive whereby users gain 500MB of storage for every friend that signs up to an account through them.

One deviation from the Dropbox model is that OneDrive offers 15GB like Google Drive, although the referral system is limited to 5GB. However, you gain a whopping 15GB of additional storage for free if you link OneDrive to your mobile phone's camera roll, enabling it to automatically back up your photos online. That means a free OneDrive account tops out at 35GB as opposed to the 18GB on Dropbox. For some people this will be a compelling reason to choose OneDrive over Dropbox. Don't forget that Office 365 users get 1TB of OneDrive storage as part of the monthly subscription fee.

The OneDrive interface is in keeping with Windows 8's Modern UI design. Lines are clean and you can select between the boxy style or a more traditional file tree. Folders and files can be created on the web, including Office and OneNote formats thanks to tight Office Online integration.

There's also a social element to the web version, as various popular social networks are available to be linked to your OneDrive account. This might not improve productivity, but it will make it easy to share files with colleagues. In doing this you can set permissions for each user ranging from read-only to complete editing ability, even if you're using the free version – unlike Dropbox, which requires Dropbox Pro.

There is also a feature that allows you to remotely access files on another PC via the OneDrive website. The target machine needs to be turned on and running OneDrive with the Fetch Files feature enabled, but the catch is that recent updates mean that PC can't be running Windows 8.1 – it must be on an earlier version.

If privacy is a major concern then it should be noted that Microsoft reserve the right to scan your files to look for what it would deem objectionable content. This could be copyrighted material or things of an explicit nature. Apple has a similar policy, making the two potentially more intrusive than their competitors.

VERDICT: The recent updates to OneDrive help make it a competitive option, especially now that 15GB free space is offered. Office integration is extremely useful but it's a shame that the Fetch Files feature seems to be on its way out.

SPIDEROAK ★★★½☆

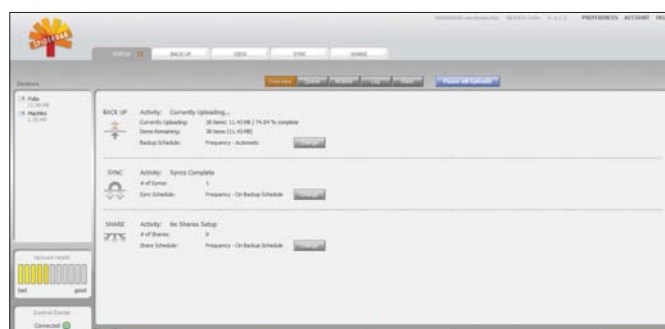### Price dependant on storage plan · spideroak.com

If privacy is a major concern then SpiderOak might be the cloud storage service for you. Most of the mainstream offerings such as Dropbox, Google Drive, OneDrive and Box all encrypt your data on their servers, but SpiderOak has a different approach.

Once you've set up your account and downloaded the desktop client (Windows, Mac, and Linux are available), you can transfer files to your local folder, which will then encrypt them before syncing them to SpiderOak. This might not sound that different, but it means that your data is readable only by you, as the key is local to your machine. SpiderOak calls this 'Zero-knowledge privacy' as the employees at the company can't access your data and, by extension, it should also mean any interested government parties would also find it extremely difficult.

Traditionally this would make accessing files from numerous machines more problematic, not to mention sharing with others, but the team has worked ways around that. SpiderOak Hive is the control centre of your storage. This app, which runs locally, is very similar to the Dropbox-style of folder on your desktop, although the interface has a little more detail.

This includes which your other devices have the desktop app installed, and gives you access to the file tree within their SpiderOak Hive folders. You can also choose local files to backup via a menu, and there are helpful stats to keep you up to date with the activity on your account.

Where rivals such as Google Drive and OneDrive are tightly integrated into wider productivity suites, SpiderOak is simply there to store your files securely. This means no Office-style apps, or online collaboration with colleagues. You can easily share items and send secure links to files from the SpiderOak Hive, although this involves setting up a Share ID (free and simple) as another way to protect your data. This obsession with security runs throughout the system, with strong warning messages appearing if you decide to let the app remained logged in all the time. Some may find this annoying, but you can override any of the warnings and it's never a bad thing to be reminded that convenience isn't always the bedfellow of safety.

A basic free account comes with 2GB of storage, which is one of the lowest of all the current services around. But this can be quickly increased by a referral system that gains you and a friend 1GB when they sign up to the service (up to a maximum of 10GB).
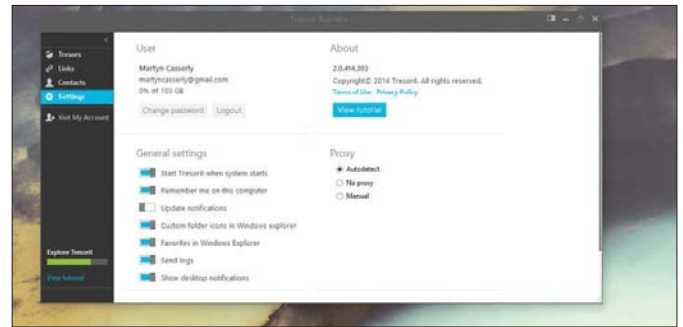
VERDICT: SpiderOak nails its colours very clearly to the mast with its focus on security and privacy. If these are the most important elements you require then it is clearly the best choice. It may lack the sophistication and integration of some rivals, but what it does it does very well.

TRESORIT ★★★★☆

Price dependant on storage plan · tresorit.com

There are several services that offer secure storage in the cloud – Mega and SpiderOak – but to our knowledge none of them have offered a cash incentive for hackers to actually break into them. None, that is, except for Tresorit. This Swiss company is so confident in its product that there is a standing reward of $50,000 for anyone who can overcome its security systems. So far, the company reports, 1000 hackers have been actively trying for around 500 days, but the system remains intact. So if your data is valuable, then you could do a lot worse than try out the Tresorit offering.

Obviously this level of security is probably a little much for photos of your holidays and this is reflected in the basic free package. You get 3GB of storage space, with a file size limit of 500MB, which can be used by up to three devices. There are also limits on the amount of people you can share files with (10) and encrypted links that you can create each month (10 again). That's not to say this isn't useful, as you can always keep your less important data on a service like OneDrive and reserve any sensitive information to Tresorit. Of course, the restrictions loosen up when you move to a paid package, with the Premium tariff (£8 per month) jumping up to 100GB, unlimited sharing, versioning support for previous instances of a document, and granular controls over user permissions on the files and folders you share.

One of the reasons that Tresorit is so secure comes down to the way files are encrypted. With a local client installed on either your Windows or OS X machine your data is encrypted locally, then sent, using TLS, to the Tresorit servers where it remain encrypted. You retain the decryption keys and not even the staff at Tresorit can access your files. To add a further level of security you can enable two-step verification, so even if someone steals your laptop or ID, they'll need your phone to access the data.

Business package customers, who pay £16 per month for 1TB of storage, also have the ability to destroy documents remotely, ban the ability to print, copy, or email documents, and set restrictions on how much a recipient can edit a file.

Tresorit hasn't skimped on the design elements of its UI though, with desktop clients, web portals, and mobile apps (Windows Phone, iOS, Android and BlackBerry) that look good, are simple to use and perform reliably. On the desktop client you can drag folders from other drives into the Tresorit app and it will encrypt and sync the files up to the cloud but leave them where they are on your machine. Alternatively you can save files directly to the My Tresors folder and it will be available through any Tresorit app.

VERDICT: The basic, free package is somewhat limited, but if you are looking for a very secure method of storing and sharing sensitive data with colleagues and friends, then the premium or business packages are an excellent choice.


Conclusion

If you were to set up the most basic accounts on each of the services we've reviewed you'd have over 125GB of free online storage, and even more if you included camera uploads and friend referrals.

All are not created equal though, and there are some that stand out as the best deals. Dropbox is still a very impressive service that is often bolstered by free storage expansion through deals with phone and service providers. The thing that really keeps it on top is the sheer availability it has in a number of apps and platforms around the web. If something is going to link to a cloud provider you can bet that Dropbox is most likely the first on the list. It's rock solid, focused, and universally known as a quality product.

Google Drive and OneDrive are both excellent options, especially if you use Chromebooks or Microsoft Office respectively, as the vast free storage rewards on offer are well worth having. The 1TB OneDrive storage for Office users really is impressive, and almost subsidises the cost of the software.

Mega really impressed us with its developed user interface, secure communications options, and generous allotment of 50GB of free space. The service is easy to use, gave us no problems, and will certainly be a resident app on our smartphones and PCs for the foreseeable future.

Lastly, Tresorit is another up-and-coming service that deserves a lot of attention. Security is a very important consideration these days and Tresorit manages to provide encryption in a way that doesn't interrupt a normal workflow and is easy to manage – especially in the paid versions. If you're a small business owner, or work in a team that needs to keep data confidential, then it really should be your next port of call. ⊠
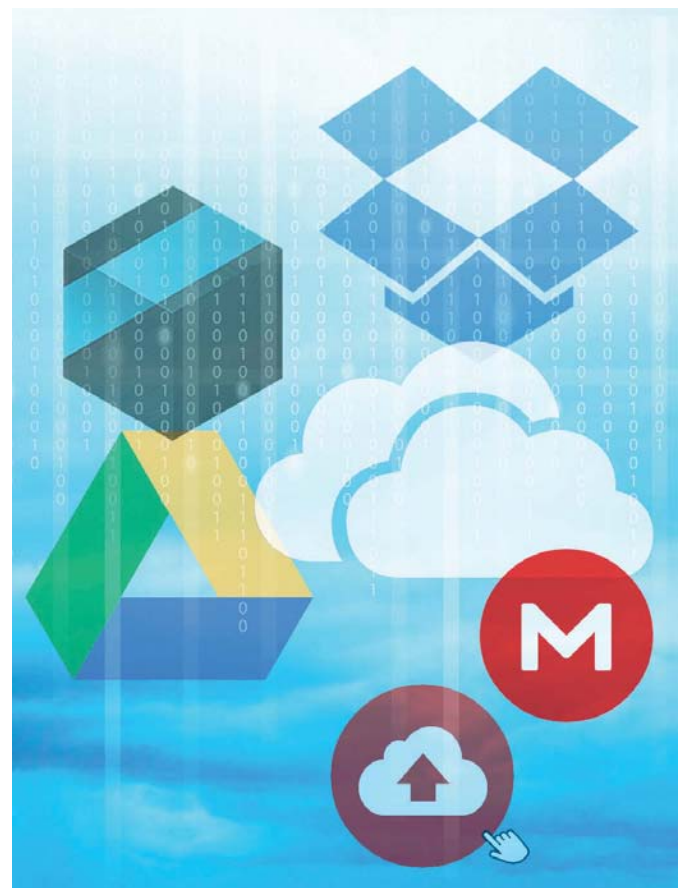
APPLE WATCH ALTERN

Apple may have finally released a smartwatch, but its rivals have little to fear, as Ashleigh Allsopp finds

A pple generated plenty of hype to accompany the release of the Apple Watch in April, but the company is by no means the only player in the smartwatch market. So what about the competition? There are, after all, plenty of alternatives to Apple's latecomer. Samsung, LG, Pebble, Motorola and Sony have all been selling smartwatches for rather longer, and have good reason to feel confident.

Samsung Gear S
Price: From £329
Compatible with Android

Arguably Apple's biggest rival, Samsung has several offerings in the wearables market, and its repertoire just keeps growing. The Gear S (the S stands for Solo) has Bluetooth, wireless and 3G connectivity, so it can work independently of a smartphone to allow you to make and receive phone calls, texts, emails and other notifications.

That broad connectivity is why the Gear S is more expensive than Samsung's other

SAMSUNG GEAR S

smartwatch offerings, starting at £329. It runs Tizen OS, just like the Samsung Gear 2. It's available in black or white, and has a 2in curved screen that fits comfortably

around the wrist. Other features include a heart-rate scanner and an IP67 rating (which means it's both dustproof and waterproof). If you want to use the Gear S as a standalone device, you'll need a Samsung smartphone to activate it – you'll have to pay for a second tariff, though, and will get a second phone number dedicated to the watch.

Samsung Gear 2
Price: £250
Compatible with Android

Samsung's Gear 2 smartwatch has a Tizen-based operating system rather than Android, and enjoyed a significantly better market reaction than the company's original Gear.

Priced at £250, it's not a cheap piece of kit. However, it's feature-packed and stylish, with a smaller and thinner face and a better-looking strap than its predecessor; the watch strap can be switched for another if you prefer.

Samsung appears to be covering all the bases, offering the obvious wristwatch

SAMSUNG GEAR 2 NEO

ATIVES

SAMSUNG GEAR 2

functionality in Gear 2 as well as fitness tools, a music player, notifications and even the ability to answer calls, take photos and use the device as a remote control.

One of the most common features for a smartwatch is health and fitness tracking. The Gear 2 has a heart-rate sensor as well as a pedometer that can be used with the S Health app to track your exercise.

It also has IP67 certification, meaning it's resistant to dust and water up to one metre deep, making it a pretty durable device. It's particularly reassuring, as such everyday activities as washing your hands, making a cuppa and simply walking outside in the UK can all result in wet wrists.

You'll need a Samsung smartphone to use the Gear 2, though, as it's only compatible with Samsung devices, connecting via Bluetooth. Models supported include the Galaxy S5, Note 2, S4, S3 and Mega.

Samsung Gear 2 Neo
Price: From £180
Compatible with Android
The Samsung Gear 2 Neo is much the same as the Gear 2 but at £180 is significantly cheaper. Why? The biggest difference is that

the Neo doesn't have a camera. However, both Gear 2s have the same 1.63in Super AMOLED display with the same 278ppi resolution, and boast the same fitness tracking, music and remote control features.

Some may prefer the Gear 2 Neo over the Gear 2 if the camera isn't important to them, as it's slimmer and lighter thanks to the omission of the snapper. Plus, of course, there's that £70 you'll save.

Samsung Gear Live
Price: £169
Compatible with Android
Samsung's Gear Live runs Google's Android Wear operating system, and was one of the first smartwatches to do so. It has a 1.64in Super AMOLED display and is powered by a 1.2GHz processor paired with 512MB of RAM. There's 4GB of internal memory and a 300mAh lithium-ion battery that Samsung describes as all-day.

It's also got a heart rate monitor for those popular fitness applications, as well as

Bluetooth 4.0, accelerometer, gyroscope and compass. It's IP67-certified, as are the other Samsung smartwatches, and comes with a changeable strap that is available in black or wine red.

The good news is that you don't need a Samsung smartphone to use the Gear Live. It's compatible with any Android smartphone running version 4.3 (Jelly Bean) or higher. Plus, at £169, it's cheaper than the company's other smartwatches.

Pebble Time
Price: $199 (£133)
Compatible with Android and iOS
The Time is Pebble's third smartwatch device, following on from the success of the company's original offering. It measures just 9.5mm thick, and while it retains the Pebble style, you can tell it is a complete redesign of the Pebble smartwatch. It's available in three colours; black, white or red, with varying colours of bezel and silicon bands.

The Pebble Time comes with a new colour ePaper display; it's a huge step up from the black and white screen used in the original Pebble. While you may question Pebble's use of an ePaper display rather than an LCD or OLED screen, it makes more sense when you realise it means the Pebble Time can last seven days on a single charge.

While the Apple Watch and some of the other devices offer a range of switchable straps, the Time goes much further down the swappable watch strap route. Even though you get a silicone band with the Pebble Time, any standard 22mm watch strap should fit it.

Like many other smartwatches, the Time handles all notifications from your phone – and it doesn't stop there. The Pebble Store has over 6,500 apps and watch faces ready for you to use, including various health and fitness apps that make use of the sensors built into the watch.

PEBBLE STEEL

The Pebble Time is currently available on Kickstarter (Pebble used the crowdfunding site to finance Time's development) where you can get your hands on one for a reduced price of $179 (£115).

Pebble Time Steel
Price: $299 (£200)
Compatible with Android and iOS
Pebble has also launched a new generation of its Steel series – the Pebble Time Steel. Also on Kickstarter for a slightly reduced price of $250 (£170) but with an RRP of $299 (£200), the Pebble Time Steel will appeal to those who prefer the look and feel of a stainless steel watch on their wrist.

To be more specific, the watch has a CNC-finished 316L stainless steel casing and comes with both a premium leather watch strap and stainless steel version. Not enough to merit the upgrade? Pebble has also upped the battery life for the Time Steel, giving up

to a whopping 10 days from a single charge.

The Time Steel is available in three finishes: silver with a stone leather band, gunmetal black with a black leather band, and gold with a red leather band – the latter is similar to the £13,500 Apple Watch Edition.

Except for the design and improved battery life, the Pebble Time Steel is largely the same as the Pebble Time. It is slated for release in July.

Huawei Watch
Price: £TBC
Compatible with Android
The Huawei Watch is looking to compete with other mid-range smartwatches. It comes with the Android Wear OS, which is good news for Android users.

Like the Apple Watch, the Huawei Watch has a sapphire crystal display and stainless steel case, which makes it look and feel like a gorgeous watch rather than a cheap, plastic smartwatch. Huawei decided to go for a more traditional circular display for its watch – but while that looks beautiful, circular screens can throw up issues, especially with text cropping.

As far as health and fitness-related activities go, the Huawei Watch is able to track your steps, your activities and your heart rate. It's described on the company's website as an 'intelligent data centre' that can offer you an insight into your health and enable you to change the way that you exercise.

The Huawei Watch boasts over 40 interfaces to choose from and a selection of apps courtesy of Android Wear.

LG Watch Urbane and Urbane LTE
Price: Urbane £299, Urbane LTE £TBC
Compatible with Android
Unveiled by LG in 2014, the LG G Watch R (opposite page) was one of only a few smartwatches that had a circular display. This year the company has announced two newer and more stylish watches, dubbed the LG Watch Urbane and LG Urbane LTE.

The Urbane and Urbane LTE both have the same circular OLED display as their predecessor, which is set in a polished gold or silver steel body. The straps for both smartwatches, as with the Pebble Time, are interchangeable with any standard 22mm watch strap. It's all very unlike Apple, which has designed the Apple Watch so only its custom, fairly expensive watchstraps fit.

The Urbane runs a custom version of the Android Wear operating system while the Urbane LTE, which is slightly bigger, runs its own separate OS with phone and wallet functions.

Both come equipped with a heart-rate monitor, barometer (for elevation) and 4GB of storage. However, neither has the onboard

PEBBLE TIME

ALCATEL ONETOUCH WATCH

GPS offered by the Sony SmartWatch 3. The Urbane and Urbane LTE both have an IP67 water and dust resistance rating, although that's not up to showering or swimming.

The LTE really sets itself apart with 1GB of RAM (the standard model has 512MB) as well as a larger battery – 700mAh compared with 410mAh. And it doesn't stop there. The LTE has 4G LTE connectivity built-in and offers NFC and Wi-Fi, features that seem unique even when compared to competitors.

You can currently pre-order the LG Watch Urbane for a cool £299 – the Urbane LTE pricing hasn't been announced yet but, judging by the price tag of its little brother, it'll be expensive.

Alcatel OneTouch Watch
Price: $150 (£100)
Compatible with Android and iOS

Introduced this year, the Alcatel OneTouch Watch has attracted lots of attention thanks to its stylish design and good features in a package that comes with a small price tag. It's not yet available in the UK, but cost $150 when it went on sale in March in the US, so we expect it to cost around £100 here.

The OneTouch Watch looks a lot like the Motorola Moto 360 (on the next page), with a round screen that comes in different styles. It comes in chrome, steel or plastic and is available in a range of colours.

Alcatel has gone for its own software rather than opting for Android Wear, which

means the Alcatel OneTouch Watch works with iOS and Android smartphones via Bluetooth or NFC if available.

In addition to all the normal sensors for counting steps, the OneTouch Watch boasts an optical heart-rate sensor, the small price tag notwithstanding. It also provides the usual notifications for messages, calls and social media apps.

Garmin Vivoactive
Price: £TBC
Compatible with Android and iOS

Also launched in January this year at the same CES show as the Alcatel OneTouch Watch was the Garmin Vivoactive smartwatch. It's a GPS-enabled device aimed at fitness enthusiasts.

It has a squared design, like the Apple Watch, and is available in black or white with a range of swappable straps. Like the Alcatel OneTouch Watch, it doesn't run Android Wear, but rather Garmin's own software, which allows it to work with both Android and iOS devices. It's waterproof up to 50m, so is ideal for swimmers, and takes advantage of Garmin's map database to provide really helpful information for golfers, including the distance to the hole and what the par is for that particular hole.

We expect the Garmin Vivoactive to cost around £200, which is reasonable for a feature-filled smartwatch like this with built-in GPS. It could turn out to be a real winner for the company when it becomes available in the UK later this year.

LG G Watch
Price: £159

The LG G Watch was launched in June 2014. It's available from the Google Play Store for £159, so it's reasonably priced and cheaper than Samsung's offerings. LG's watch has a 1.65in IPS LCD display powered by a 1.2GHz processor. Like the Samsung Gear Live, it has 4GB of built-in memory and 512GB of RAM. It's dust and water-resistant, and has metal charging contacts rather than a clunky Micro-USB that would otherwise be required. It's also got an all-day battery.

LG G Watch R
Price: £199
Compatible with Android

The LG G Watch R is one of the best smartwatches we've seen to date. It comes with a stainless steel frame and a leather strap that you can change, thanks to the standard 22mm size.

Just like the LG G Watch, it's IP67-rated and has the same processor, RAM and internal storage. You'll need a smartphone running Android 4.3 (Jelly Bean) or above to use this device.

GARMIN VIVOACTIVE

LG G WATCH R

each of which is easy to swap out should you get bored with it.

There is 4GB of onboard storage, which can be used to store some songs if you want to, and there's also built-in GPS, something that many of its smartwatch rivals lack. Combined, those two features mean that you can leave your smartphone behind when you're going out for a run, for example, and the SmartWatch 3 will still be able to gather data about where you've been and how far you've travelled. There's no heart-rate monitor, though.

You can't use the SmartWatch 3 to make a call in the same way as you can with Samsung's Gear products (because there's no microphone or speaker built-in), but you can use it to make or receive calls remotely if you're using a Bluetooth headset.

As with the other smartwatches in this round-up, you'll also receive notifications

MOTO 360

including text messages, emails, calls, Facebook, Twitter and more.

Sony's watch also boasts NFC, which means you can pair it with any NFC-compatible Android phone with one touch. There's no camera, but it is water, dust and scratch-resistant, and we think it's rather good looking.

It'll cost you £189, so it's cheaper than Samsung's offerings but more pricey than those available from the likes of Pebble and Martian.

Motorola Moto 360
Price: £170

The Motorola Moto 360 launched in September 2014 to a very positive reception. We have previously described the device as "the best smartwatch you can buy right now", although that was before the arrival of the LG G Watch R.

It's another Android Wear smartwatch, running Google's made-for-smartwatches operating system.

Like some of the other smartwatches here (and unlike the Apple Watch), the Moto 360 is dustproof and waterproof with an IP67 rating. It uses Bluetooth 4.0, has 4GB of internal storage and 512MB of RAM.

Pebble Steel
Price: £179
Compatible with Android and iOS

The Pebble Steel costs £179 and ships free worldwide, so it's cheaper than many of its smartwatch rivals. It looks much like a traditional wristwatch, and can act just like one too, but it also includes the ability to run apps and receive notifications.

Unlike the Samsung Gear and Android Wear ranges, the Pebble can communicate with many Android and iOS devices.

Pebble even has its own app store that's open to submissions from third-party developers, so you can expect new capabilities to arrive on a regular basis.

Unlike the Samsung smartwatches, though, the Pebble Steel's display is ePaper, with a low resolution of 175ppi, so while the battery life is likely to be longer, the screen will display only pixellated, black and white images.

The Pebble Steel comes with a stylish stainless steel band, and the option of leather watch bands.

Asus ZenWatch
Price: £199
Compatible with Android

Asus has gone for a rectangular watch face for the ZenWatch, like many of its rivals, with a 1.63in AMOLED Gorilla Glass 3 screen that's curved to create what Asus describes as a 2.5D effect. It has a 1.2GHz Qualcomm Snapdragon 400 processor, 4GB of storage and 512MB of RAM. As can be expected from most smartwatches, it has a heart-rate monitor and Bluetooth 4.0.

Sony SmartWatch 3
Price: £189
Compatible with Android

One of Apple's biggest smartphone and tablet rivals is Sony, which also has a smartwatch offering running Android Wear. Its SmartWatch 3 can connect to Android devices via Bluetooth to act as an extension of your smartphone or tablet. It comes with a variety of different strap options available,

ASUS ZENWATCH

Martian Notifier
Price: £129
Compatible with Android and iOS

Even cheaper still, though, are Martian's Notifier smartwatches. As the name suggests, the Notifier has a primary aim of providing the wearer with easy-to-view notifications without the need to get out a smartphone. Any notifications that your iOS

MARTIAN NOTIFIER

or Android device can receive can be shown on that small display, just like on the Martian Voice Command watches.

You can't use the watch to make calls or send texts, though, and, again, there are no additional apps or fitness features included. Really, the Notifier acts as little more than a stylish wristwatch that can be used as an extension of your smartphone screen but no further actions can be carried out. That makes it one of the most basic, if also one of the cheapest, smartwatches available at £129.

It can, however, be used as an alarm and a way of finding your lost phone too. And it even offers a remote control for your device's camera for better selfies, if that's what floats your boat.

Cookoo 2
Price: $149 (£100)
Compatible with Android and iOS
The Cookoo 2 watch is similar to the Martian Notifier in terms of the features it offers. You'll receive notifications for incoming calls, missed calls, social media, reminders, text messages, emails and more. You'll also be alerted if you've left your connected iOS or Android device behind, or if your smartphone or tablet has almost run out of power.

It, too, comes with a selfie-taking feature as Notifier does, and it can also act as a remote control for your music. Battery life is excellent thanks to a standard watch battery, which can be easily replaced. Of course, that means you'll eventually need to buy a new battery, though.

The display of the Cookoo is right in the middle of the circular watch face, behind the hands of the traditional watch.

The UK price for the Cookoo 2 hasn't been announced yet, but in the US it's $149, so it's likely to be around £100 when it arrives here. Its predecessor was £80, and is still available, with similar features but an older and less stylish design.

MetaWatch M1 Core
Price: £235
Compatible with Android and iOS
Stylish in design but basic in specs, the MetaWatch M1 Core is available in a range of designs. There's a stainless steel option and limited edition gold and rose gold modes, along with a monochrome, low-resolution display that will remind you of the original Pebble. This does mean an almost week-long battery life, though.

MetaWatch has teamed up with fitness-tracking company Misfit to utilise some of Misfit's technology and app features within the M1 range.

The M1 Core connects to your iOS or Android device via Bluetooth, and uses a dedicated app to help you choose and rearrange the widgets to display on your watch. In addition to the fitness features, you can get notifications, see the weather forecast and control your music.

The MetaWatch M1 Core is pricey at around £235 for the stainless steel version, although the range does seem to be on offer at the time of writing with significant price cuts. The cheapest M1 available right now is the M1 Color Red and M1 Color White, currently available for around £100.

Qualcomm Toq
Price: £150
Compatible with Android
Yes, we're still going, but we've now reached the last device in our round-up. We told you the smartwatch market is getting rather busy, didn't we? The last in our long list is Qualcomm's Toq (we love the name).

The Toq is a smartwatch that works with Android devices, and offers a dedicated Toq app for customisation and configuration. It can allow you to receive notifications and accept or decline calls, although you can't make a phone call directly from the watch. You'll get access to your calendar and music, and can also add weather and share price apps.

Qualcomm has recently released an update to the Toq's Android app that adds activity-tracking features to the device. While still in beta form, the Activity feature should be able to monitor your daily activities and award you activity points.

The Toq makes use of Mirasol display technology, which exploits reflected light to minimise its power requirements and help you view it in any conditions, even in bright sunlight.

QUALCOMM TOQ

Verdict
The 21 smartwatches included here are rather more than just smartband or activity trackers such as the Fitbit Charge, Sony SmartBand and SmartBand Talk, Razer Nabu, Jawbone Up and Lenovo Vibe Band VB10.

A smartwatch is a very personal gadget, and we think it's worth taking the time to investigate several options to see which one suits your budget and needs. Ask yourself what you want to achieve with your smartwatch. Perhaps fitness features are most important to you, or maybe making phone calls is more important. Do you prefer round watches or rectangular? And, of course, another essential thing to consider is compatibility with your smartphone.

Our smartwatch of choice is the LG G Watch R. It's stylish, and can be mistaken for an ordinary watch, but offers all the functionality of Android Wear and the compatibility that comes with Google's smartwatch software. ⊠

SONY SMARTWATCH 3

HOW TO GET BROADBAND WITHOUT A LANDLINE

Why pay £17 a month for a phone line you never use, asks Nik Rawlinson

You want broadband, but you don't need a phone line. Sound familiar? Fortunately, there are ways to get your internet fix without paying BT's monthly fee. This feature explains how you can have broadband without a phone line.

Alternatives to traditional ADSL promise broadband connections without also demanding that you sign up for a phone line you may well never use. Shop carefully, though, as while such connections are often faster, they aren't always as cheap as you might expect.

Landlines are so last century. If you're anything like us, you'll make most of your calls on your mobile phone, and other than that you'll use email, WhatsApp, Hangouts and instant messaging to keep in touch with friends and family. Video calling is easy and – even better – it no longer requires thousands of pounds worth of kit to make it happen, so you can talk to distant relatives using nothing more than your voice and a cheap smartphone or tablet.

So why do we still pay £17 a month for a landline that few of us use and even fewer actually need? Doesn't it feel like a waste of money to be paying for it on top of your monthly broadband subscription? Isn't it just a con that you can't get online with most of the headline broadband providers without being forced to pay for a hardly used voice line on top?

Well, we've got news for you. You can stop paying for your landline right away – so long as you're happy to change your broadband provider. If you're not tied into an ongoing contract that imposes penalties for ducking out early, you should look again at the alternatives to traditional ADSL. We're talking satellite, fibre to the house, cable and the ever expanding 4G wireless network.

As we'll show here, it's easy to get online without signing up to ADSL. However, before jumping straight in, think carefully about your needs – and about the overall costs too. Some people may well be better off with an ADSL broadband deal that includes a monthly line rental charge.

Satellite broadband

Ten years ago, satellite broadband would have been your only option if you lived far away from a major conurbation, but as access

by traditional means has got faster and more comprehensive it's now just one of several choices for most of us.

The technology behind it isn't particularly new, with Eutelsat launching its broadband-enabled e-BIRD satellite in 2003. Built by Boeing and launched on the back of an Ariane rocket, e-BIRD was designed to fly for a decade, but it's still going strong and provides satellite broadband to Turkey, Greenland, and a whole swathe of Europe in between, Britain included.

Eutelsat champions satellite broadband as one of the cleanest means of communication. The satellites themselves work off solar power, there's no need to build expensive and polluting infrastructure on the ground – exchanges, cables and the like – and the launch procedure, potentially the most damaging part of the whole process, creates about the same amount of carbon pollution as a single jumbo jet flight from one side of the US to the other.

Eutelsat sells its services under the Tooway brand through a range of distributors. To sign up, you'll need to navigate a fairly Byzantine pricing structure that takes both usage and speed into account. At the budget end, Avonline Broadband's entry-level service gets you 2GB of data, with downloads maxing out at 5Mb/s and uploads at 1Mb/s. It's a 24-month contract, with the first three months charged at £9.99 and the remainder at £19.95 a month. While the introductory deal may be tempting, neither the speeds nor the cap compare favourably with a lot of regular ADSL.

Avonline's most popular package is a 25GB bundle with uncapped overnight downloads, which would make it worthwhile sitting up to grab your iPlayer programmes outside of peak. Or you can opt for uncapped email and browsing round the clock for £74.95 a month, with a 100GB cap on other data, such as streamed media.

Multiply those prices by 24 months to find out what it'll cost you over a standard contract and you're looking at £448 at the lower end, rising to £1,798 for the gold standard. You'll need to add on either £5 a

month to rent the necessary hardware (or £275 to buy it outright), £100 for installation (or £10 a month for 12 months if you want to pay it off over the first year) and £49.95 if you want to cut your commitment from 24 months to 12. All in all, it works out rather expensive when compared to ADSL and a landline combined.

For example, ignoring any introductory deals, Plusnet's unlimited broadband and calls package, with download speeds of up to 17Mb/s and free weekend calls, costs £9.99 a month plus £15.95 line rental for a 12-month term. That's £311 over your first year, plus installation at £49.99, giving a grand total of £361 without the need to pay ongoing costs for equipment rental. Upgrading to Plusnet's 18-month fibre contract with speeds touching 40Mb/s at best ups the annual cost to £371.28 (£14.99 a month for the broadband and £15.95 monthly line rental) and commits you to 18 months of service. Again, there's an installation fee of £49.99 to consider, but that still pegs the overall cost at £421 for the first year, and £371 for each subsequent year.

That's bad news for satellite broadband. While it might save you the cost of a landline you'll never use, unless you live in one of the increasingly rare spots where reliable broadband still isn't an option, satellite is struggling to compete in the speed versus value equation.

Cable

You could be forgiven for thinking that the UK has just one cable provider – Virgin Media – but in fact we have two. WightFibre remains the only standalone cable-co in Britain, and the only cable option for subscribers on the Isle of Wight.

It offers speeds of 30 to 152Mb/s for between £22.50 and £37.50 a month without line rental (£270 to £450 a year, plus an additional installation fee of £30 for the cheaper of those), although right now it's offering broadband for free for the first 12 months if you pay £15.30 a month for a landline. That reduces the cost to a flat £183.60 for up to 152Mb/s.

If you're not on the Isle of Wight, none of these deals applies, so you'll have to look to Virgin Media instead. Its regular ADSL service is available nationwide, but we're interested in the cable service, which doesn't yet boast national coverage and isn't ever likely to do so. If you've spotted service plates in the street bearing the acronym CATV, there's a good chance you're living in a cabled area, but enter your postcode at store.virginmedia.com to be sure. If you're not yet covered, you can click the Cable My Street button to add support for a roll-out in your direction.

Virgin Media's 'slowest' connections start at 50Mb/s (£28.50 a month, £342 annually) and top out at a WightFibre-matching 152Mb/s (£41 a month, £492 annually). None of them requires a landline and there's no fee for the installation of hardware, either. However, signing up for a landline does reduce the cost of the broadband.

For example, 152Mb/s broadband without a landline costs £41 a month and ties you in for 12 months for a total cost of £492. Add a landline and the contract extends to 18 months, but the cost of your broadband drops to £24.50 for the first 12 months and £30 thereafter. You need to add on £16.99 a month for the landline rental, but there's still no fee for installation, so the overall cost is £779.92. The saving you'd make over the

Osprey Black from EE
★★★★★ 331 reviews > reevoo •.•

Upfront cost:
FREE

On plans for £15 per month (24 Months)

✓ Now in stock Despatched to you or an EE store within 1 day(s)

Colour Selected: Black

CHOOSE YOUR PLAN

Looking to upgrade? >

OSPREY
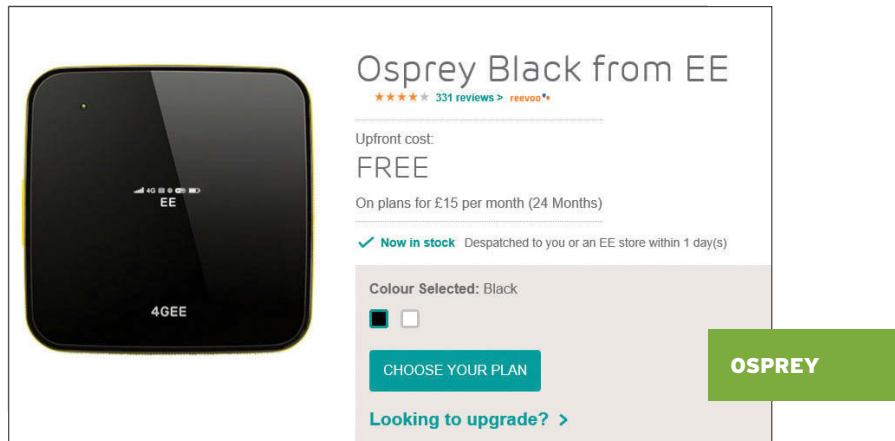
same period by not taking the landline is therefore a little less than £40.

How does that compare to BT's superfast Infinity service? Assuming that you have coverage (you can check at tinyurl.com/c3ntbwq to see whether superfast Infinity is available in your area), its Unlimited BT Infinity 2 + Weekend Calls option including free BT Sport and 50GB of cloud storage costs £25 a month for the broadband, plus £16.99 monthly line rental, for a total year one cost of £503.88. Add the one-off £6.95 charge for delivering a HomeHub and the total's around £10 more than Virgin Media is charging for a faster pipe without the bundled phone line. That makes Virgin the more attractive option here.

4G
Cellular connections are by far the most flexible option, as you can take them with you wherever you go. Just be wary of the fact that, as Britain's 4G roll-out remains incomplete, performance will vary from place to place and you may well find yourself stepping back to slower 3G.

Relish is a dedicated 4G broadband provider serving central London and London Docklands. It claims that no-one else has as much 4G spectrum as it does, nor as much capacity. So if you live or work in its area, it's a tempting proposition, not least on account of its competitive prices.

There's no setup fee, just one speed – up to 50Mb/s – and one price, which is £20 a month whether you sign up for one month or 12. The only inducement to tying yourself into an annual contract is the upfront cost of the 4G router, which is £50 on monthly pay as you go, but waived on the 12-month package. Pay upfront, then, and your first year of coverage is £240, all in, with no restrictions on how much data you use.

EE's 4GEE service works beyond this limited swathe of the capital, offering 3G and 4G coverage nationwide (subject to network propagation). There are three hardware options: Buzzard 2, which plugs into a car

socket for broadband on the move, and Osprey or Kite, which are more traditional pocket-sized wireless 4G routers.

Contracts on each of these options run for one month or two years, with the upfront costs being lower on the longer-term deals.

There are also two levels of service: 4GEE for light users and 4GEE Extra for those with higher consumption.

Opt for the smart Apple TV-like Osprey router on the entry-level 4GEE service and it's £10 a month for 1GB of data, £15 a month for 3GB and an upfront cost of £19.99 on the 1GB, two-year deal. The router is free if you sign up to £15 a month for two years, but if you sign up for just a month you'll be looking at a £39.99 bill for the router before you've even got online, whichever package you choose.

None of these prices is extortionate when you consider the convenience of being able to create a Wi-Fi hotspot wherever and whenever you need (you can connect up to 10 devices to Osprey simultaneously), with a two-year commitment to the 3GB bundle tipping the scales at just £360 – or £180 a year. Beware, though, that with a few catch-up downloads, some music streaming and a bit of YouTube action, you'll quickly eat through your monthly allowance.

You might accordingly want to look at 4GEE Extra instead, which offers bundles

of 15GB, 25GB and 50GB for £20, £30 and £50 a month respectively, each on 24-month contracts. These come closer to matching entry-level ADSL connections, but the convenience of being able to hook up wherever you find yourself comes at a price. That £50 deal for the top-end data pack means you'll end up paying £1,200 over the course of the contract, which is more than most ADSL plus landline combos.

Fibre to the building
Perhaps the most exciting of all the current options is fibre to the building. We're not talking about BT Infinity or Virgin Media here, but a dedicated fibre line running directly to your router.

Hyperoptic offers synchronous connections of 1Gb/s flat-out. That means there's no difference in the speed of uploads and downloads as there is with ADSL, and you shouldn't see any degradation in the speed of the service as you move away from the connection point either.

Prices start at £29 a month for the first six months, and £60 a month thereafter, but if that's more than you need, you can step down to 100Mb/s for £17 a month for the first six months (£35 a month thereafter), or 20Mb/s for £10 a month for the first six months (£22 a month thereafter). In each case, there's a £40 connection fee to add on top, but the £200 installation fee is waived.

At the top end of the scale, then, you're looking at a year one cost of £574; that's roughly what you'd be paying for the 152Mb/s deal available from Virgin Media and slightly more than BT's fibre-based Infinity service, while enjoying far higher speeds. The mid-range package, which in speed terms sits between what BT and Virgin Media offer, costs a total of £352 in the first year and £310 a year thereafter, which is excellent value for money.

But there is a catch.

Because it's building its own fibre network, Hyperoptic is concentrating on multi-dwelling buildings and, as it explains on its website, if your building is within its

1Gb Fibre Optic Broadband
#theraceisover

Learn more

HYPEROPTIC

And then there's 4G, which can't be beaten for convenience. But unless you're in central London you may find the data caps restrictive and the coverage variable.

Which brings us back to traditional ADSL. For many of us it's the only practical option, which means we're stuck with the landline charge. By splitting it out from the headline cost of their broadband deals, though, Britain's ISPs aren't exactly helping themselves. Yes, it's great to be able to advertise a £5.99 broadband package – until you hit the customer with an extra £16.70 a month that they'd rather not pay. If there is no option but to cough up for the service, then the advertised cost in this case should be £22.69, not sub-£6.

It doesn't make the charge any easier to swallow, but you can at least console yourself with the thought that your landline fee is paying to maintain the line from your house to the nearest box on the street, which the fee for a traditional ADSL contract almost certainly isn't. In that respect you can think of it as a digital standing charge, like the one you pay to hook up your home to the National Grid, the gas lines and the water supply – or, indeed, the road tax you pay to drive your car.

It's an investment in the national infrastructure, and as such it probably ought to be renamed. Perhaps then, paying the fee will feel less like being fleeced. ⊠

catchment area, and enough residents show support by registering for it online, then the company can connect you to its 'future-proof full-fibre network'.

Its service is currently installed in 100,000 homes spread across 1,000 buildings, and if yours is among them you'll already know. If it's not, and you live in a block of flats, your best bet is to enter your postcode at hyperoptic.com, fill in the form to register your interest in the service and get your neighbours to do the same. If you live in a terrace, semi or detached house, though, don't get your hopes up just yet.

Are landlines a necessary evil?

So it's not as clear-cut as you might think. Yes, a lot of us are paying for landlines we don't use, and that hurts, but the alternatives aren't always better value for money.

Fibre to the home is the fastest option since it's 21st century technology all the way from the exchange to your router, rather than fibre to the cabinet in your street, and limiting copper (which can't push downloads beyond 76Mb/s) from there to your house.

Cable has better coverage, and again it's faster than ADSL at present, but it's not been rolled out nationwide.

SERVICE COMPARISON

Technology	Provider	Package	Installation fee	Equipment	Monthly cost	Term	Total cost	Year one cost
4G	EE	1GB monthly data with Osprey router, 4GEE	£0	£19.99	£10	24 months	£259.99	£139.99
4G	EE	3GB monthly data with Osprey router, 4GEE	£0	£0	£15	24 months	£360	£180
4G	EE	15GB monthly data with Osprey router, 4GEE Extra	£0	£0	£20	24 months	£480	£240
4G	EE	25GB monthly data with Osprey router, 4GEE Extra	£0	£0	£30	24 months	£720	£360
4G	EE	50GB monthly data with Osprey router, 4GEE Extra	£0	£0	£50	24 months	£1,200	£600
4G	Relish	1-month contract	£0	£50	£20	1 month	£70	£290
4G	Relish	12-month contract	£0	£0	£20	12 months	£240	£240
Cable	Virgin Media	50Mb/s, no landline	£0	£0	£28.50	12 months	£342	£342
Cable	Virgin Media	100Mb/s, no landline	£0	£0	£33.50	12 months	£402	£402
Cable	Virgin Media	152Mb/s, no landline	£0	£0	£41	12 months	£492	£492
Cable	WightFibre	30Mb/s, no landline	£30	£0	£22.50	24 months	£570	£300
Cable	WightFibre	70Mb/s, no landline	£0	£0	£32.50	24 months	£780	£390
Cable	WightFibre	150Mb/s, no landline	£0	£0	£37.50	24 months	£900	£450
Fibre to the home	Hyperoptic	20Mb/s, no landline	£40	£0	£10 for 6 months, then £22	12 months	£232	£232
Fibre to the home	Hyperoptic	100Mb/s, no landline	£40	£0	£17 for 6 months, then £35	12 months	£352	£352
Fibre to the home	Hyperoptic	1Gb/s, no landline	£40	£0	£29 for 6 months, then £60	£12 months	£574	£574
Satellite	Avonline	2GB data allowance	£100	£5/month	£9.95 for 3 months, then £19.95	£24 months	£688.80	£389.4*
Satellite	Avonline	10GB data allowance	£100	£5/month	£24.95	£24 months	£838.80	£479.40*
Satellite	Avonline	25GB daytime, unlimited overnight	£100	£5/month	£44.95	£24 months	£1,318.80	£719.40*
Satellite	Avonline	40GB daytime, unlimited overnight	£100	£5/month	£59.95	£24 months	£1,678.80	£899.40*
Satellite	Avonline	100GB; uncapped email/web	£100	£5/month	£74.95	£24 months	£2,038.80	£1079.40*

*Assumes equipment is rented in 12 x £5 payments (it can be bought outright for £275) and that installation is settled in a single £100 lump sum (can also be paid in 12 x £10 instalments)

LEARN TO CODE IN 2015

Want to code your own app or website? We investigate the best programming languages to learn in 2015, how to get started, and where to find the resources you will need. By Mike Bedford

If you want to learn to code, we explain which languages you should learn – right now in 2015 – and how to start programming and creating your own apps, websites and more. Here in the UK, 2014 was the Year of Code, an initiative that aimed to encourage people across the country to get coding for the first time. Programming was also added to the school curriculum in September (replacing outmoded lessons in learning, for example, how to use a mouse), so children as young as five are now learning to code.

Many people see this as the most significant shake-up since the BBC Micro was introduced to schools in the 1980s, a move that led to a resurgence in the fortunes of the British computer industry. It will be some time before the impact of these moves becomes fully apparent, of course, but there's strong evidence that the interest in programming that last year's initiatives brought about didn't evaporate as the Year of Code drew to a close. If anything, it's really only just

getting started. Whether you're young, old or somewhere in between, programming is not only rewarding, it can also earn you good money as a career.

Where to start

With so many different programming languages and, indeed, types of programming, the first consideration is which languages you should invest your time and effort in learning. Do you want to create apps for smartphones and tablets? Would you like to design and build websites? There's even the programming of the embedded computers which are built into everything from your TV to your car. Each area requires radically different code, so while we can't decide which is best for you, we can explain where to start looking.

If you expect to be learning to code in full-time education, there's a good case for working with the programming languages most commonly used in schools. Alternatively, for those who hope to employ

their coding skills in the workplace, we'll give some thought to which languages are used in industry for various applications.

Just knowing which language to learn isn't enough, though. So we'll also provide some guidance on what software you need to learn each language, and which resources and courses will help you in your quest.

It's important to recognise that there's no single best language. In preparing this article we spoke with Mark Chambers, CEO of Naace, a community of educators, technologists and policy makers who share a vision for the role of technology in advancing education. Chambers was keen to avoid recommending specific programming languages; indeed, the national curriculum doesn't require particular languages to be taught.

Programming by blocks

One of the two most commonly used programming languages in schools is Scratch, which was developed by the Lifelong Kindergarten Group at the MIT Media Lab.

Unlike most languages, Scratch programs are created by linking blocks together on screen. This allows students to learn about the structure of programs and the concept of algorithms without having to learn syntax (the exact textual format of an instruction in a conventional language). In addition, because the blocks resemble jigsaw pieces, their shapes reduce the likelihood of blocks being connected together when the end result would be nonsensical.

Despite this unconventional approach, Scratch genuinely is a procedural language, as are most of the popular computer languages, with the notable exception of some of those used in web design that we'll look at later. A procedural language allows the programmer to define a sequence of operations for the computer to carry out.

Scratch is often used in primary schools but it would be unwise to set an upper age limit above which a student should learn a conventional language instead. It's also used in secondary schools. Indeed, it could be beneficial for anyone who has never coded before, although it will always be a stepping stone to the types of language that are used in business and industry.

Scratch is available free of charge at scratch.mit.edu. You can download a version to use offline or create programs directly on the website.

Another block-based language that is gaining popularity is Google Blockly.

The Basic alternative

When there was last a big push on teaching computing in schools, Basic was the language of choice since it was available on the BBC Micro as well as on many of the cheaper home computers of the time. Although Basic was designed as an educational language, its continued use for learning to program is the subject of some debate. Some argue that it's an old-fashioned language that gets students into habits they'll find it hard to break when they start to learn newer languages. Others say that, because it's such a simple language, it parallels the way processors work better than more modern languages do.

Basic is still taught in schools quite extensively because it's more familiar to a large number of teachers. What's more, rather than teaching 'bad habits', it is useful, or so some suggest, for learning different programming paradigms, something that studying newer languages alone won't provide. All of this seems to suggest that Basic is still a good language to learn, at least as part of the mix.

In its 50 years, Basic has spawned a huge number of dialects. Newer versions of Basic include concepts such as block structure and object orientation but there's a lot to be said

SCRATCH
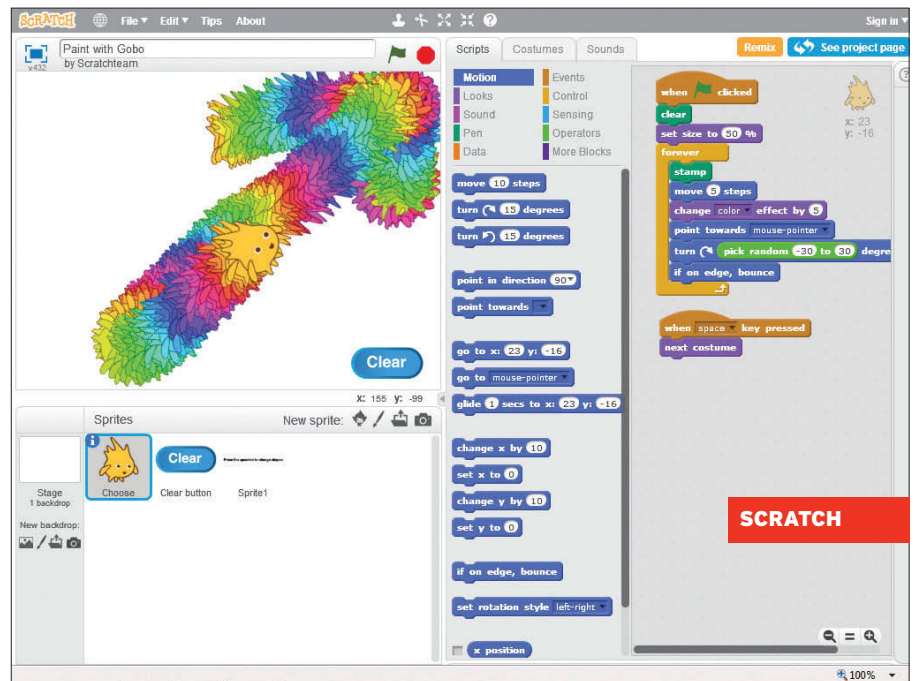
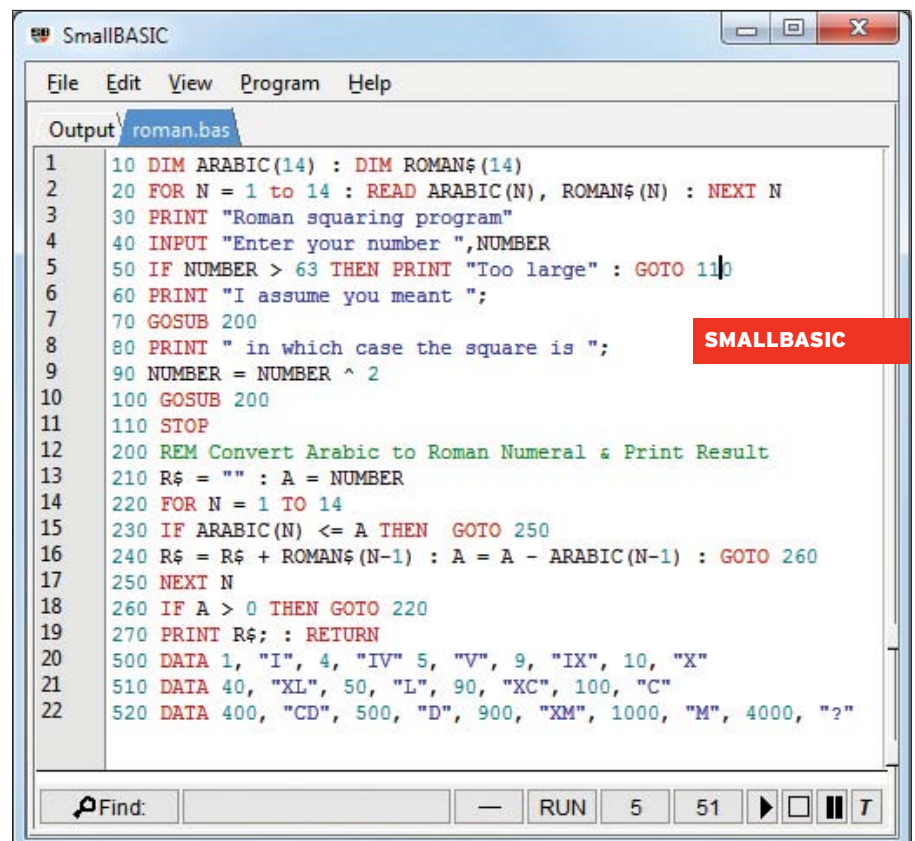for sticking with a version that is true to the language's roots.

For a fairly basic Basic, but with extensions to carry out graphics programming, SmallBasic (not the same language as Microsoft's variant of the same name) would be a good choice – it's freely available from smallbasic.sourceforge.net.

Microsoft's Visual Basic (often referred to as .Net) is very different from the Basic

of old. Indeed, the current version of Visual Basic is object-oriented (which we'll explain below) and another possible contender if you want to learn this type of language.

Object-oriented languages

The second most popular language in education is Python. Unlike Basic, it adheres to current thinking in programming such as block structure and object orientation.

SMALLBASIC

```
1   10 DIM ARABIC(14) : DIM ROMAN$(14)
2   20 FOR N = 1 to 14 : READ ARABIC(N), ROMAN$(N) : NEXT N
3   30 PRINT "Roman squaring program"
4   40 INPUT "Enter your number ",NUMBER
5   50 IF NUMBER > 63 THEN PRINT "Too large" : GOTO 110
6   60 PRINT "I assume you meant ";
7   70 GOSUB 200
8   80 PRINT " in which case the square is ";
9   90 NUMBER = NUMBER ^ 2
10  100 GOSUB 200
11  110 STOP
12  200 REM Convert Arabic to Roman Numeral & Print Result
13  210 R$ = "" : A = NUMBER
14  220 FOR N = 1 TO 14
15  230 IF ARABIC(N) <= A THEN  GOTO 250
16  240 R$ = R$ + ROMAN$(N-1) : A = A - ARABIC(N-1) : GOTO 260
17  250 NEXT N
18  260 IF A > 0 THEN GOTO 220
19  270 PRINT R$; : RETURN
20  500 DATA 1, "I", 4, "IV" 5, "V", 9, "IX", 10, "X"
21  510 DATA 40, "XL", 50, "L", 90, "XC", 100, "C"
22  520 DATA 400, "CD", 500, "D", 900, "XM", 1000, "M", 4000, "?"
```

```
while running:
        if gameOver==True:
                message_to_screen("Game over",red,-50,size="large")
                message_to_screen("Press C to play again or Q to quit",black,50,size="medium")
                pygame.display.update()

        while gameOver == True:
                #gameDisplay.fill(white)

                for event in pygame.event.get():
                        if event.type==pygame.QUIT:
                                gameOver=False
                                running=False
                        if event.type==pygame.KEYDOWN:
                                if event.key==pygame.K_q:
                                        running=False
                                        gameOver=False
                                if event.key==pygame.K_c:
                                        gameLoop()

        for event in pygame.event.get():
                if event.type == pygame.QUIT:
                        running = False
                if event.type == pygame.KEYDOWN:
                        if event.key == pygame.K_LEFT:
                                direction="left"
                                lead_x_change = -block_size
                                lead_y_change = 0
                        elif event.key == pygame.K_RIGHT:
                                direction="right"
                                lead_x_change = block_size
                                lead_y_change = 0
                        elif event.key == pygame.K_UP:
                                direction="up"
                                lead_y_change = -block_size
                                lead_x_change = 0
                        elif event.key == pygame.K_DOWN:
                                direction="down"
                                lead_y_change = block_size
                                lead_x_change = 0
                        elif event.key==pygame.K_p:
                                pause()
        if lead_x>=display_width or lead_x<0 or lead_y<0 or lead_y>=display_height:
                gameOver=True
                dead_sound.play()
```

A SECTION OF PYTHON CODE

Most of today's most popular languages are object-oriented. Although the syntax varies between the different languages, if you learn one such language you'll be in a good position to migrate to another. If you want to discover which are the most commonly used in industry today, take a look at the Tiobe index – it's at tiobe.com.

Web programming: HTML and CSS

Coding for the web is very different from everything we've seen so far since, at its most basic, it uses a completely different type of language. Even so, it's a vital skill to learn. To create the simplest of web pages you use a language called HTML (and ideally the latest version, HTML5), which stands for HyperText Markup Language. As a markup language, it doesn't provide a list of instruction that are executed in sequence as procedural languages do; instead, it describes how text and images are displayed on screen.

Quite a lot of an HTML document will be the text you see on screen when it's displayed on the web. Crucially, though, that text will be interspersed with so-called tags. For example, if some text is preceded by:
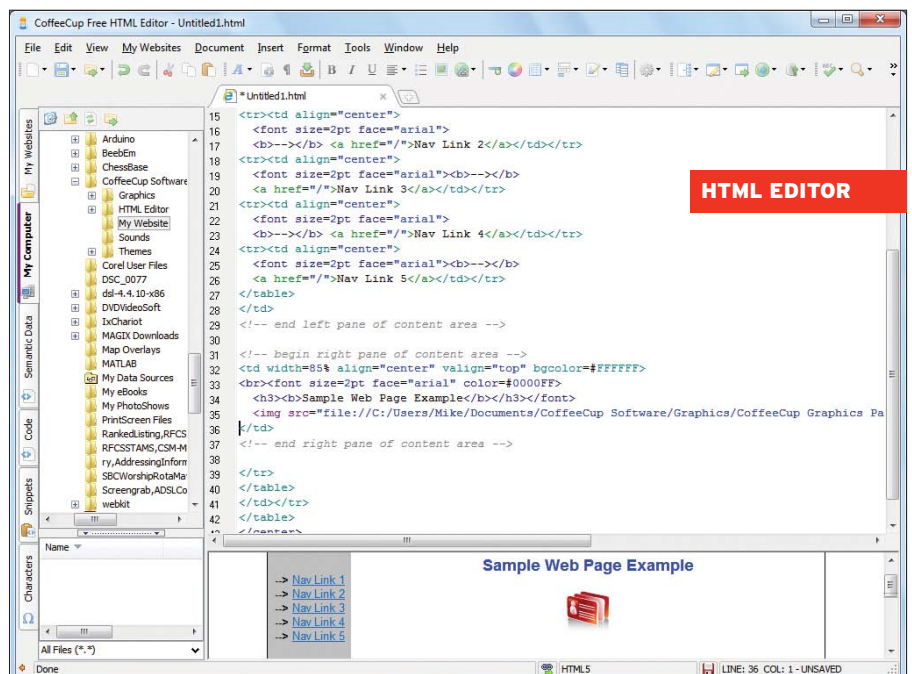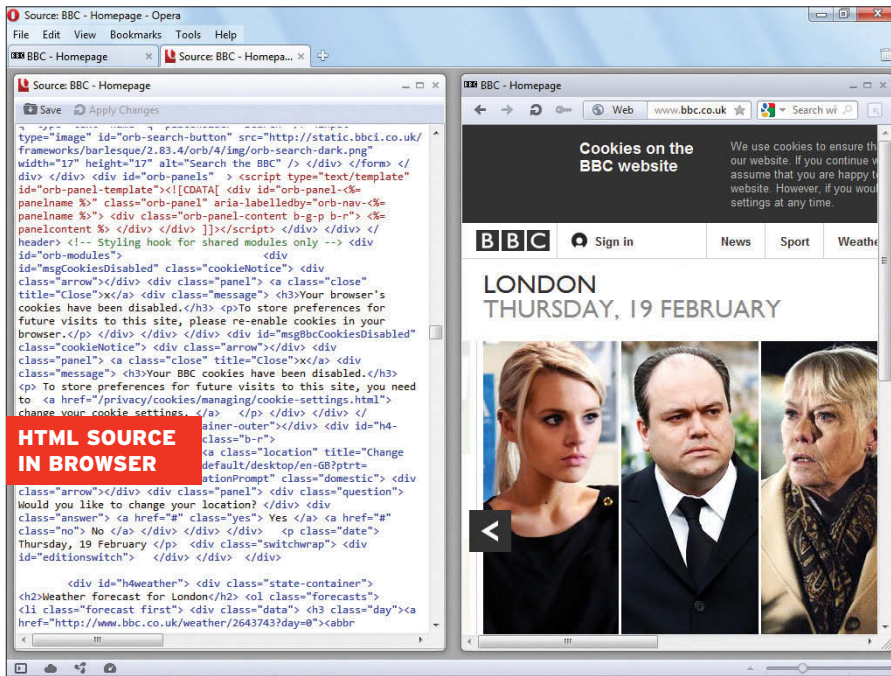<h1>
and has:
</h1>
following it, then that portion of the text between the pair of angle-bracket tags is displayed as a level 1 heading. This is a simple example and it gets more involved when you start to add graphics, tables and links, but the concept of tags applies throughout.

Trying your hand at writing HTML requires software that will already be on your PC. You can create an HTML document

As such, it's similar to C++ and C#, which are widely used in industry (together with their predecessor C), although Python is generally considered easier to learn. We're not going to delve into exactly what object orientation actually means – after all, that will be something you'd become familiar with if you were to learn Python – and will say only that expertise in this type of language is a very useful skill to have. You can download a Python interpreter from python.org – it's free.

With the explosive growth in the take-up of Android smartphones and tablets, it would be natural to want to learn to create your own Android apps, a large majority of which are written in Java (which is not the same language as JavaScript, as we explain later). In addition, Android's popularity means that learning it could be a good move from the viewpoint of career prospects.

Java is another object-oriented language, so it would represent a logical progression from Python or, if you don't fancy learning two similar languages, an alternative to Python, albeit one that's not as commonly used in schools.

If you want to learn Java you have several options. The Java Developers' Kit (JDK) is freely available and runs on your PC. There are also several online resources that allow you to enter and run your code in a web page.

However, if you specifically want to try your hand at Android app development, you'll need Android Studio and, in addition to the Java programming language, you'll need to learn about the Android environment. You can download Android Studio but you'd be best advised, first of all, to get to grips with Java itself before turning your attention to Android.

HTML EDITOR

HTML SOURCE IN BROWSER

Learning resources

You don't have to go it alone if you want to learn how to code as there's plenty of help out there. Many would-be programmers will already be learning to code at school, college or university but there are plenty of resources for those who aren't in full-time education or who simply want to augment their education.

The most easily accessible are the myriad online programming courses for just about any modern programming language you could imagine. As well as Googling for your preferred language, be sure to take a look at Codecademy (codeacademy.com).

Also look at adult courses at your local college because the ability to interact with a lecturer and chat with other students can make the learning experience so much easier. While some colleges only provide courses on using computers and software, some do offer evening programming courses at reasonable prices.

School students can benefit from coding clubs. These are free, independent programming clubs for young people, led by volunteers and often sponsored by industry, that aim to supplement class teaching. Take a look at Code Club (codeclub.org.uk) and CoderDojo (coderdojo.com), both of which tend to concentrate on the languages most used in schools, and Apps for Good (appsforgood.org), which teaches young people to create apps.

We hope this guide has inspired you to get started in coding. Whichever language or languages you choose, and whether you decide to learn alone or in the company of like-minded individuals, there's every chance that your learning experience will prove to be both a productive and an exhilarating one. ⊠

using an ordinary text editor like Notepad and, so long as you give it a filename that ends with .htm or .html, double-clicking on it in Windows Explorer will cause your default web browser to display it, just as if it was hosted on the web. In addition, most browsers will let you see the HTML source code that generated the page you're viewing.

Dedicated HTML editors (such as the CoffeeCup Free HTML Editor from coffeecup. com) offer additional features such as colouring tags for easy identification while editing, and perhaps the ability to preview how your page will appear in a browser.

Unless you're working as part of a multi-disciplinary team, you'll also need some graphics design skills. While we need to mention this to present the full picture, it would be stretching a point to refer to this aspect of web design as coding.

A web page created using HTML alone will be static but other languages allow you to create dynamic content. The very first step in this direction is the use of another language called CSS (which stands for Cascading Style Sheets). We've seen how text can be turned into a heading in HTML and, in the simplest of cases, the browser will use its own default font, size and colour for each level of heading. While HTML allows you to define these characteristics yourself, CSS provides a better way.

CSS files define exactly how each heading level appears, making it easy to alter the appearance of an HTML document just by specifying a different CSS file. Using a CSS file, every page on a company website can be given the same corporate look and feel without the formatting information having to be repeated in every single HTML file.

The next stage in making web pages dynamic is to add code that responds to the user's actions. This sort of dynamic code is executed, for example, when you log in to a website. While we're not going to get too involved in this here, it's important to recognise that this involves the use of procedural languages – that is, those that define sequences of instructions, rather than markup languages like HTML or style sheet languages like CSS. In particular, a language called JavaScript (which is quite different to Java) is often used to define code that runs in the browser, while PHP is used to define code that runs on the remote server that hosts your website.

ONLINE JAVA DEVELOPMENT

4G VS LTE
Why you're not getting true 4G speed

4G isn't the same thing as LTE. Lewis Painter explains the difference between the two mobile technologies

4G, LTE, LTE-A, carrier aggregation. It's all tech nonsense if you don't understand what the jargon means. Here we'll explain the differences between 4G and LTE so you're better equipped to choose not only the best phone, but also the best tariff for you.

These days, there are a lot of decisions to make when getting a new phone. Along with deciding which handset is best, you might also have to choose a new tariff, and that's a complex business in itself.

4G is the latest buzzword you'll hear or come across, but what exactly is 4G? Is it the same as LTE? In a word, no, but phone manufacturers and mobile operators love to use them interchangeably, and tend to further muddy the waters with dumbed-down marketing materials.

In this article, we'll explain everything you need to know about 4G, the speeds you can expect to get, and how to choose a phone and tariff that's right for you.

What is 4G?
The International Telecommunications Union-Radio (ITU-R) is the United Nations official agency for all kind of information and communication technologies. It decided on the spec for the 4G standard in 2008.

It decided that the peak download speeds for 4G should be 100Mb/s for high mobility devices, such as when you're using a phone in a car or on a train.

When a mobile device is stationary, the ITU-R decided that 4G should be able to deliver speeds up to around 1Gb/s.

So if true 4G is supposed to offer us download speeds of up to 1Gb/s, why are we getting 100 times less than that in the UK, at around 10- to 12Mb/s in real-world speeds?

Unfortunately, the ITU-R doesn't control the standard's implementation, which led to first-generation technologies like LTE being criticised for not being true 4G.

The reason for this is that other groups (3GPP is one example) that work with the

technology companies who develop the hardware had already decided on the next-generation technologies, leaving us with substandard 4G capabilities.

What is LTE?
Though originally marketed as 4G technology, LTE (Long Term Evolution) didn't satisfy the technical requirements that the ITU-R outlined, meaning that many early tariffs sold as 4G weren't actually 4G at all.

However, on account of marketing pressures and the significant advances that LTE brings to 3G technologies, the ITU subsequently decided that LTE could be called 4G technology.

So LTE is a first-generation 4G technology that should theoretically be able to reach speeds of around 100Mb/s. Unfortunately, Ofcom reports that the UK average for LTE is around 15.1Mb/s. While that's around twice the speed of an average 3G connection, it's a long way off the theoretical top speed of LTE.

As well as lacking in overall download speed, LTE is deficient in uplink spectral efficiency and speed. Uplink spectral efficiency refers to the efficiency of the rate at which data is uploaded and transmitted from your smartphone.

LTE falls short of true 4G capacity mainly because of the lack of carrier aggregation and because phones don't have many antennas. MIMO (Multiple Input Multiple Output) is a practical technique for sending and receiving more than one data signal on the same channel at the same time by using more than one antenna.

With better carrier aggregation (see below) and MIMO, we can head towards a new standard: LTE Advanced. This is also known as 'true' 4G.

Imagine playing a PlayStation 3 when you could be playing a PlayStation 4. The PS3 isn't necessarily too slow to use, but you'd have a better experience using the faster console, the PS4. It's the same with LTE: LTE is the PlayStation 3 and LTE Advanced (LTE-A) is the PlayStation 4.

Why carrier aggregation matters

Carrier aggregation is part of the LTE-Advanced spec. It lets operators treat multiple radio channels in different bands (or the same frequency band) as if they were one, producing quicker speeds and allowing users to perform bandwidth-hogging activities like streaming HD video much faster than ever before.

Think of your wireless connection as a pipe. You might not be able to increase the size of the pipe, but you can add a second and even a third pipe. Use all three simultaneously and you'll have three times the flow rate. It's the same concept with carrier aggregation.

Another advantage of carrier aggregation is that speeds don't decrease, however far away from the cell tower you are.

Combining two signals – or channels – should theoretically double the download speed to around 150Mb/s. In future, there could be aggregation across more than two channels, potentially up to five, which was defined in the LTE Advanced standard.

What about HSPA+?

HSPA+ may be marketed as 4G technology but it's technically 3G. HSPA+ stands for High Speed Packet Access Plus. It was the next step after 3G, with UK network provider Three aiming for it to be used by 2012 (before the introduction of LTE).

The technology was developed with a theoretical top speed of 21Mb/s, which is pretty impressive for technology that doesn't count as 4G (3G has an average speed of around 1Mb/s). However, it was quite a way away from its theoretical top speed as the average is around 4Mb/s.

Who offers the fastest 4G LTE?

Now you know more about what the difference is between true 4G and the 4G LTE we're being sold, it's worth considering which UK network provides the best 4G LTE connection. In November 2014, Ofcom tested the 3G and 4G connections of every major provider in the UK in five cities.

The results (see graph) showed EE has the fastest 4G LTE connection, with 18.4Mb/s on average, although that's still a long way from the theoretical top speed of LTE.

It's not just the download speed that dictates responsiveness of a 4G connection; latency also plays an important part. A lower latency provides better responsiveness and reduced delays when using data for browsing, video calling, and so on.

Surprisingly, EE wasn't the best provider when it came to latency – that award went to Three. Ofcom reports that Three took the least time to deliver data on both 4G (47.6ms) and 3G (53.8ms). O2 came last, with the highest levels of latency, measuring in at 62.7ms on 4G and 86.4ms on 3G.
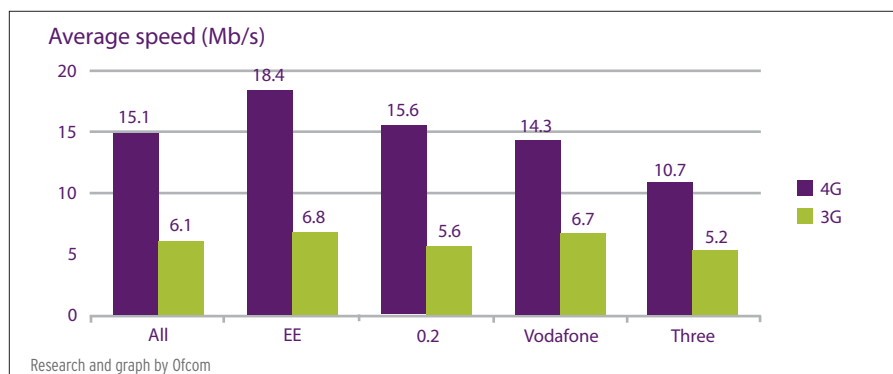
LTE-A availability

Surprisingly, LTE-A is already available in selected areas. Vodafone announced the start of its LTE-A roll-out in October last year in Birmingham, Manchester and London. EE has also joined the LTE-A race, trialling the technology in London's Tech City. Upgrading infrastructure to support LTE-A will be a slow process and is likely to take a couple of years, much like the initial 4G roll-out did. And you won't automatically get LTE-A when it has been rolled out, as there are other factors that have to be taken into consideration.
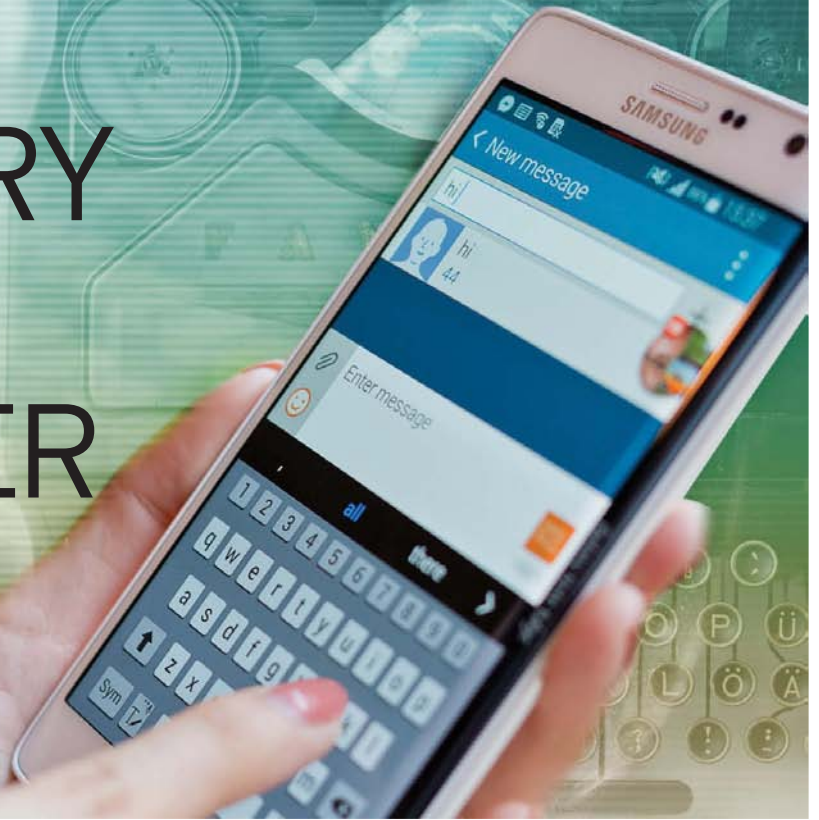
The main one is compatibility. Your phone needs to support LTE-A. Just as was the case with the 3G to 4G migration, many existing phones don't have the technology to be compatible with LTE-A. There are a few exceptions though, including:

- Amazon Fire phone
- iPhone 6 and iPhone 6 Plus
- BlackBerry Z10/Z30/Q10/Passport
- HTC One M8 and M9
- Google Nexus 6
- LG G Flex 2 and G3
- Huawei Honor 6
- Galaxy Note 3 and 4
- Galaxy Note Edge
- Galaxy Note S4, S5 and S6
- Sony Xperia Z2 and Z3

The good news is that it looks like neither Vodafone nor EE is charging people for the extra speed. As long as you're in a supported area and using a compatible phone, you should be able to enjoy the benefits of LTE-A's carrier aggregation and see download speeds of around 150Mb/s. Just watch out that you don't burn through your monthly data allowance in a few minutes. ⊠

Average speed (Mb/s)

	All	EE	0.2	Vodafone	Three
4G	15.1	18.4	15.6	14.3	10.7
3G	6.1	6.8	5.6	6.7	5.2

Research and graph by Ofcom

9 TYPING TIPS EVERY ANDROID & iOS USER SHOULD KNOW

Sometimes the alphabet and the numbers aren't enough – or aren't fast enough. **By Ben Patterson**

Wish it were easier to type in all caps on your smartphone, or ever get stumped looking for the en dash? What about typing letters with acute accents, or dealing with cumbersome URLs?

Read on for nine ways to make typing on your iPhone, iPad or Android device a little easier, from how to turn on Caps Lock to a simple shortcut for the exclamation mark.

1 After the dot: .coms made easy (iOS)

Want to type a URL directly into the address bar in Safari (on iOS) or Chrome (for Android)? You can without having to bother

FOREIGN FIELDS: IMPRESS YOUR INTERNATIONAL FRIENDS WITH YOUR CANNY USE OF ACCENTS
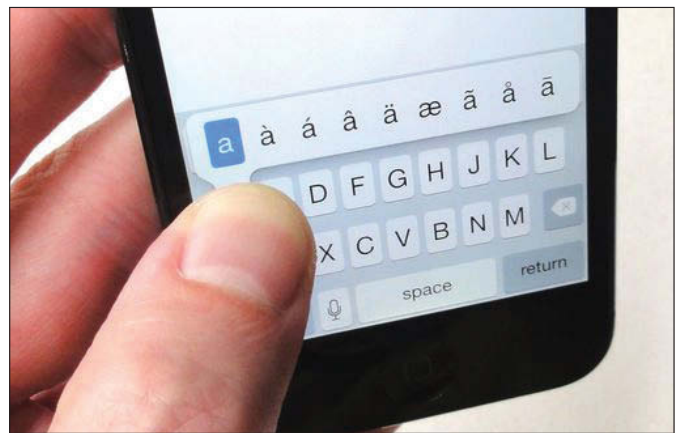
HITS THE DOT: NEVER TYPE .COM OR .ORG AGAIN WITH THIS iOS TRICK
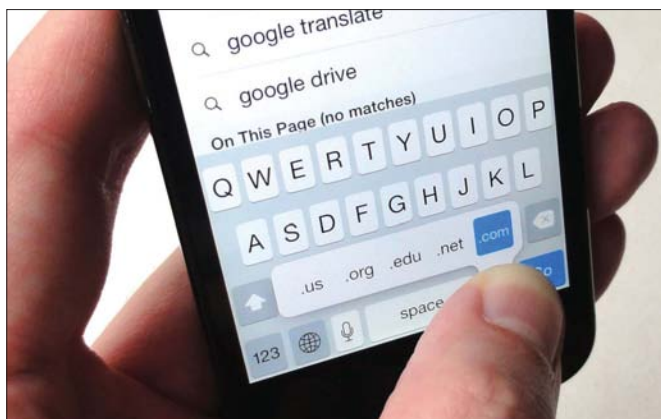
with laboriously tapping in .com or .net to end the URL. Instead, just tap and hold down the full-stop ('.') key. When you do this, a pop-up balloon will reveal a series of shortcuts, including .co.uk, .com and .org.

2 Acutes, tildes and more (Android and iOS)

Don't get caught skipping the grave accent in 'voilà' while typing that email on your phone.

You can access a generous range of accent marks – acute, grave, circumflex and otherwise – by tapping and holding down the letter key you want to place the accent on.
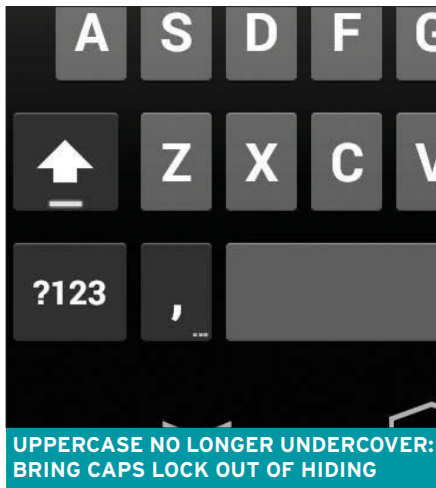
UPPERCASE NO LONGER UNDERCOVER: BRING CAPS LOCK OUT OF HIDING

3 Swipe to type
(Android and iOS)

Sick to death of painstakingly tapping out messages on your Android or iPhone touchscreen? Swiping to type is a nifty trick.

The concept is simple. Rather than tapping each individual key when you are typing out a word, with a swipe-to-type keyboard you can just slide your fingertip from one key to the next, not taking your finger off the surface.

As your finger loops around the keys, your phone predicts the word you're trying to type.

Sound weird? Indeed, swiping to type does take some getting used to, but it'll become second nature with practice.

The standard Android keyboard has its own built-in swipe-to-type feature. Just tap Settings > Language & Input, tap the Settings icon next to Google Keyboard, then tap the checkbox next to 'Enable gesture typing'.

There are also plenty of third-party, swipe to type-ready keyboards in the Google Play store. Swype is one of the most notable.

Oh, and wondering why there's no Caps Lock key on the keyboard of your Android or iOS device? Well, there is one – it's just cunningly concealed. (See tip 4.)

The standard iOS keyboard lacked the swipe-to-type capabilities of Android until iOS 8 came along. That update finally brought third-party keypads – particularly Swype – to the iPhone and iPad.

4 Keep it all caps
(Android and iOS)

See the Shift key? Just double-tap it. When you do, a little horizontal line will appear near the bottom of the key, in iOS. In Android, just tap the Shift key twice.

5 Gimme the money
(Android and iOS)

Want to type the currency symbols for the pound (£), the euro (€) or the dollar ($)? Simple.

Just tap and hold down the key for the dollar sign. When you do, a pop-up bubble will display a series of additional money-minded options.

6 Do it with dash
(Android and iOS)

I've rarely met an en dash (that's '–') that I haven't liked, and, come to think of it, I'm a sucker for bulleted lists too. How does someone like me survive typing on an Android phone or iPhone? Easy. Tap and hold the dash key to reveal even more dashing buttons, including the en dash (twice as long as the dash used for hyphenating words), the em dash (—), a bullet (●) and the indispensable underline.

Bonus tip: Try tapping and holding other symbol keys. For example, you'll find curly quotes by tapping and holding the quote key.

7 Can you feel it?
(Android and iOS)

The world is unlikely to find itself running out of emoticons any time soon.

WALK THE LINE: ENS, EMS AND BULLETS, TOO

SMILEYS, FROWNIES AND MORE: ACCESS YOUR INNER EMOJI

What's a text message without a smiley? It's a good question. Luckily, both the Android and iOS keyboards come with more emoji (aka emoticons) than you can shake a stick at.

On the standard Android keyboard, tap and hold down the Done or carriage-return key in the bottom-right corner of the keypad, then slide your finger over the pop-up emoticon button. You'll see the first of hundreds of available emoticons – just keep on swiping to see a dizzying number of variations and categories.

For iOS, you'll first need to enable the emoji keyboard. Tap Settings > General > Keyboard, then tap Keyboard again and check to see if Emoji is in the list of installed keyboards.

Not there? Then tap 'Add New Keyboard' and find Emoji in the list. Now head to the keyboard, tap the key with the globe icon, and feast your eyes on all the emoticons.

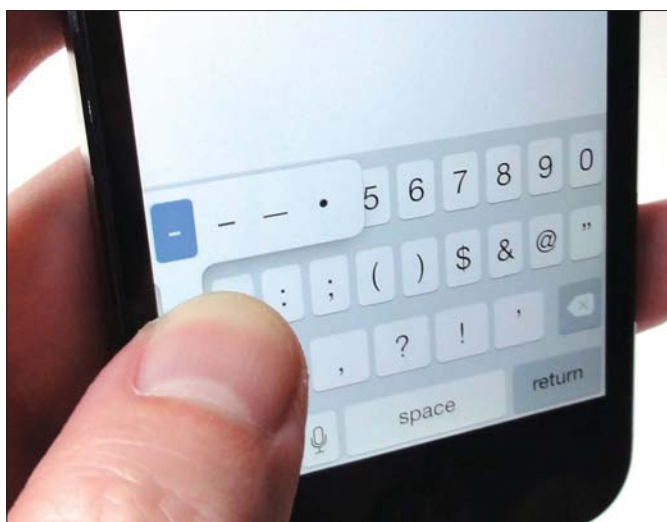### 8 Talk, don't type
(Android and iOS)

It's easy to forget that both iOS and Android phones will take dictation whenever you're not in the mood to type.

Just tap the little microphone icon on the keyboard. For iOS, it's to the left of the space bar, while on Android phones it's sitting in the top-right corner (assuming you're using the standard Android keyboard).

9 Nimbler symbols
(Android)

On the standard Android keyboard, there's no need to flip to an alternative set of keys to get to the exclamation mark, the percent sign or other everyday symbols.

Instead, just tap and hold down the full-stop key. When you do, a pop-up of more than a dozen common symbols will appear – everything from the ampersand (&) to the question mark. ⊠

Fix broadband connection problems

Jim Martin's troubleshooting tips will help ensure you are always connected to the internet

Power cuts in the UK are thankfully rare occurrences, but the same can't always be said for internet dropouts. If your internet keeps going off, here's how to figure out why it's happening and fix it.

Isolate the device causing the problem

First, you need to establish whether it's a problem only with the device you're using or not. So, if you keep losing your connection to the internet, try using a different laptop, phone or tablet and see if it's still happening.

If it's your laptop or PC that's the problem, try swapping from Wi-Fi to a wired connection (or vice versa) if you can. That should narrow down the cause to a particular network adaptor: you can then try updating the drivers to fix the issue. If the hardware is at fault, you can buy a USB Wi-Fi adaptor for a few pounds, which should fix the problem.

You obviously can't apply the same process to a smartphone or tablet, but you can make sure you're running the latest version of Android, iOS or whichever operating system your device runs.

Troubleshooting a router

If all your devices are experiencing problems with the internet connection, turn your attention to your router.

The first thing to try isn't very technical: turn it off and back on again. Rebooting the router fixes connection problems a surprisingly high proportion of the time.

If not, check all the wires are properly connected, especially the ADSL filter and connection between it and your router. (That applies if you have ADSL broadband rather than cable or satellite of course.) In fact, ASDL micro-filters are often the cause of broadband problems, as are phone extension cables. Make sure

your router is connected to an ADSL micro-filter, which is itself connected to the main (master) phone socket in the house.

If none of that works, you can also try completely resetting the router, as well as upgrading its firmware to the latest version. Bear in mind that resetting it could mean you need to enter your broadband settings again, as well as changing the Wi-Fi settings or re-entering the Wi-Fi password on all wireless devices.

If you have one, try swapping out the router for a spare to see if it cures the problem.

Check the service status

If your broadband is out for a while, check whether there's a problem affecting your local area. This is tricky without an internet connection, but you could use a smartphone (with a 3G or 4G web connection) to search for any issues with your broadband provider.

Alternatively, you can check these service status pages, or ring the following numbers for the main providers:

BT service status page: tinyurl.com/L9r5ud5
BT phone line: 0800 169 0199

TalkTalk service status page: tinyurl.com/osvzpow
TalkTalk phone line: 0870 444 1820
(0203 441 5550 from a mobile phone)

Virgin service status page: tinyurl.com/cvwcafg
Virgin phone line: 0345 454 1111

Sky service status page: tinyurl.com/kdtq2hr
Sky phone line: 03442 411 653 ⊠

Find files with Windows' search tool

Lincoln Spencer reveals how Windows' built-in search tool can be a powerful ally – if you know its tricks

At first glance, Windows' search tool seems simple but underpowered. You open up Windows Explorer (File Explorer in Windows 8), type a word in the search field, and files containing that word appear. But there's really much more to it than that.

To begin a search, pick a location to search through. Open Windows/File Explorer and go to the location you want to search. If in doubt, try Documents, your user folder, or the whole drive. Windows will search through that location and its subfolders.

But remember that searching through unindexed folders slows things down considerably. So what's indexed? By default, your libraries (Documents, Music, Pictures, and Video), email, and other common data folders. To see and possibly change what's indexed, type **index** into the Start menu's Search field or Windows 8's search charm, and select Indexing Options.

Once you've got Explorer showing your chosen folder, type the word you're looking for in the Search field, which you'll find in the upper-right corner of the Explorer window. You'll soon get a list of every file containing that word in either the file name, the contents, or the metadata.

But searching for more than one word complicates things. For instance, if you typed daisy miller (upper- and lowercase is irrelevant here), you would get every file containing the full name

Daisy Miller. But you'd also get every file containing the words daisy and 'miller', even if there are hundreds of words between them. To find only files with the name, type **"daisy miller"** with quotation marks as shown, so it will be treated as a whole phrase and not two separate words.

There are other options: **daisy NOT miller** will bring up files that have the word daisy but not miller. **Daisy OR miller** would find every file that has either of these words.

By the way, NOT and OR have to be capitalised. Daisy not miller will find every file with those three words.

You've probably noticed that filter options appear when you click the search field – although which filters pop up will vary as Windows tries to second-guess you. You might get Authors, Kind, Date modified, Type, and so on. What's the difference between Kind and Type? Kind filters by broad definitions, documents, pictures, and so on, whereas Type really means file extension, such as DOCX, XLS or JPEG.

If the filter you want doesn't show up, just type it. When you type or select a filter, you'll get a pull-down list of options.

And that brings us to the metadata filters. You can type in the name of a metadata field – for example, tag: – and a word, and Windows will find any file with that word in that metadata field. ⌧

Install Windows 10 on your smartphone

If you have the right Lumia, you can get Windows 10 on your phone now. Chris Martin explains how

Windows 10 won't launch until later this year but you can already try it out on your smartphone. The operating system will run across all devices including PCs, laptops, tablets and smartphones, and will take over from the Windows Phone OS. New features include full-size art for the Start screen, more settings in Action Center, interactive notifications, better speech-to-text and an improved Photos app. Future builds will include universal apps versions of Word, Excel and PowerPoint, Mail and Calendar.

Supported devices

The Lumia 520, 525, 526, 530, 530 Dual Sim, 535, 620, 625, 630, 630 Dual Sim, 635, 636, 638, 720, 730, 730 Dual SIM, 735, 810, 820, 822, 830, 920, 925, 928, 1020, 1320, 1520 and ICON, and the Microsoft Lumia 430, 435, 435 Dual SIM, 435 Dual SIM DTV, 532, 532 Dual SIM, 535 Dual SIM and 640 Dual SIM.

Microsoft stresses that bugs may cause some devices to be removed from the list and fixes may add others.

WINDOWS INSIDER

overview review

Windows Insider
Microsoft Corporation
free

★★★★★
58 ratings

This app sets up your phone to receive prerelease software and services from Microsoft.

Prerelease software and services may not work as expected. Potential problems include not being able to place calls (including emergency calls), increased data charges, and damage that causes your phone to stop working permanently. Remember to back up your data frequently. Learn more.

🔍 Get preview builds

START Head to the Store on your Windows Phone device and download the Windows Insider app.

2 Once it's installed, launch the app and select the 'Get preview builds' option.

3 You'll need to enrol on the Windows Insider programme to get preview builds of the software and you have two options, Insider Slow or Insider Fast. Fast will get you updates quicker but they have the potential to be more buggy and crash. The Slow option will involve you waiting longer but receiving a more stable build. Select the one you prefer and hit the arrow button at the bottom of the screen.

WINDOWS INSIDER
enroll

Insider Slow
Windows 10 Technical Preview for phones
You'll get prerelease builds of Windows 10, but you'll get them a little after Insiders who select to receive Fast updates. This could mean that more solutions are available for issues.

Insider Fast
Windows 10 Technical Preview for phones
You'll get prerelease builds of Windows 10 ahead of everyone else. This means you'll see new things sooner, but there may be fewer solutions available for issues.

4 Before you can install Windows 10 on your phone you have to accept the terms and conditions of the Insider Programme. Most importantly, it could void your warranty and have bugs that make your device unusable in some ways. We don't advise installing it on your main phone. If the device is your main phone and you really want to install Windows 10, opt for the Slow Insider option to ensure a more stable build.

WINDOWS INSIDER
confirm

You are installing experimental and early prerelease software and services, which might not be fully tested.

• You may void your warranty (check with your device/service provider)
• It is not intended as a substitute for your primary means of telecommunications.
• In some circumstances, you may not be able to place calls (including calls for emergency services).
• It may damage your device, causing it to stop working permanently.
• You may experience increased data charges.
• You might experience crashes, security

SETTINGS
phone update

Update status

Your phone is up to date. Last checked about 3 weeks ago.

check for updates

6 Once the update has downloaded and installed, your phone will reboot and migrate some data. You'll then be given a 'success' message but you're not quite done. As it says, you can leave the phone plugged into the mains and let it do the rest or head to the Insider app to complete the upgrade. ⊠

Update successful

There's one more step to get your phone ready to update to Windows 10 Technical Preview for phones. We'll handle this for you if you leave your phone plugged into AC power and we'll notify you when the update is ready. If you'd like to start the process now, simply launch the Windows Insider app and select your preview build again. This will reboot your phone and initiate the update to Windows 10 Technical Preview.

5 Once you've accepted the terms, go to the 'phone update' section of the system settings and hit Check for updates.

Unsubscribe from Deezer Premium+ or Elite

Chris Martin shows how to cancel your subscription to this music streaming service and return to free account

START Log into your Deezer account in a web browser. You can't unsubscribe from Deezer from any of the mobile apps.
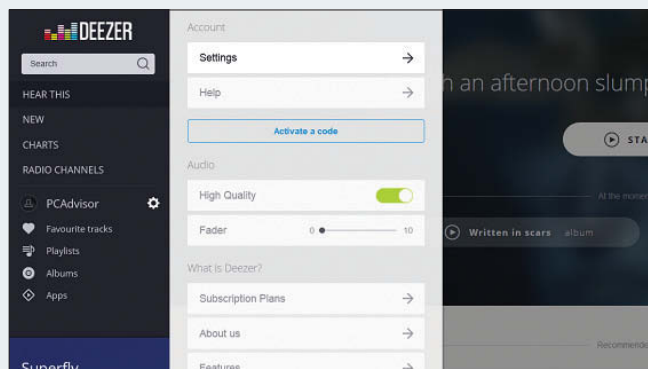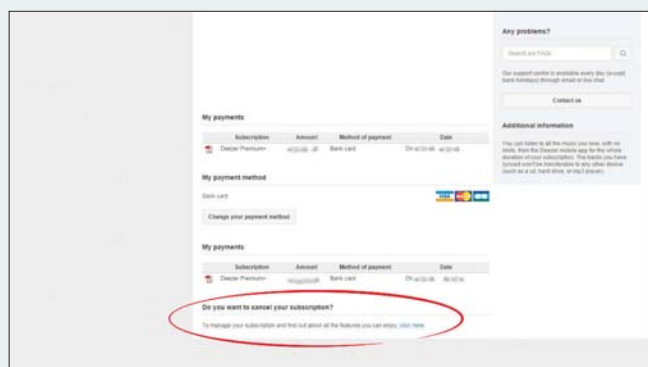
2 Once logged in, click on the cog wheel next to your account name and choose the settings button at the top.
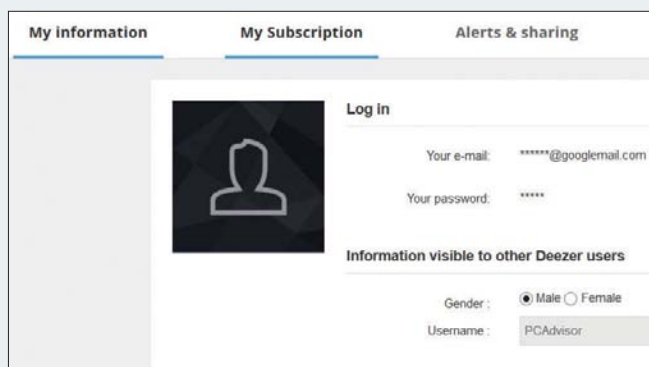
3 At the top of the page, click on My Subscriptions.

4 You'll find a section at the bottom which says 'Do you want to cancel your subscription?'. Click the link in the sentence below and fill in the details and answer the questions. Your subscription and payments will then be cancelled. ⊠

Sign into a Wi-Fi network with Android

Jim Martin reveals how to connect to secure and open hotspots with your Android device

The latest version of Android is Lollipop, and Google has made a few changes to the way you access Wi-Fi settings. Signing into Wi-Fi networks on Android varies from phone to phone (and tablet) as manufacturers tweak and change the interface. We're using a Moto G 4G here, but the process is similar on most Android devices.

In Lollipop, swiping down from the top of the screen brings up a redesigned notification area. You have to swipe down a second time to bring up the toggle controls for Wi-Fi, Bluetooth, and more (screen 1).

However, tapping on the Wi-Fi icon here will enable or disable the wireless radio, so to connect to a network you need to tap the cog icon at the top of the screen. Now, tap Wi-Fi under Wireless & networks to show a list of available devices and hotspots. Tap on the network you want to join, and enter the password. When connected you can tap on the network name to see extra details such as the connection quality, speed, and more (screen 2).

If the network is unsecured – one that doesn't need a password to connect to the Wi-Fi hotspot – but requires you to log in (such as free public Wi-Fi in an airport or paid-for internet in a hotel), you might see a notification saying 'Sign into Wi-Fi network' and the name of the network below it.

Tap the notification to open up your web browser. A page should open with the access point's instructions for logging in. You'll have to fill out any details required, possibly choose a payment option and enter your payment details.

It's always worth remembering not to use any banking websites or do any online shopping where you have to enter your username, password, credit or debit card details over an unsecure network. ⊠
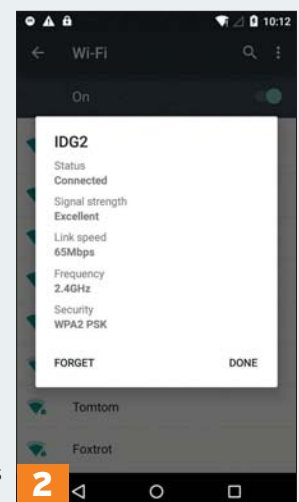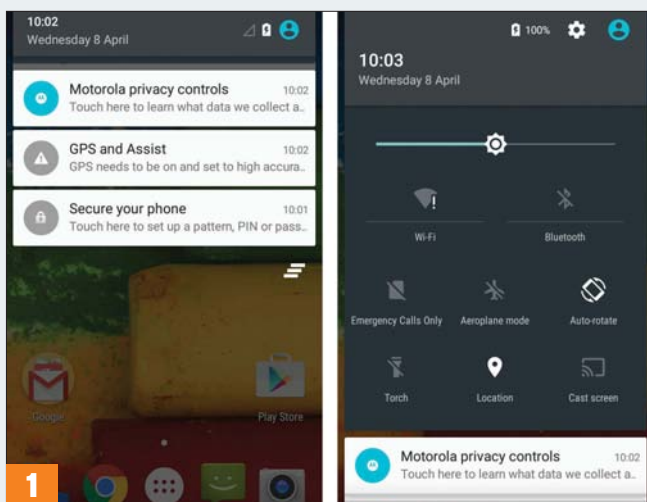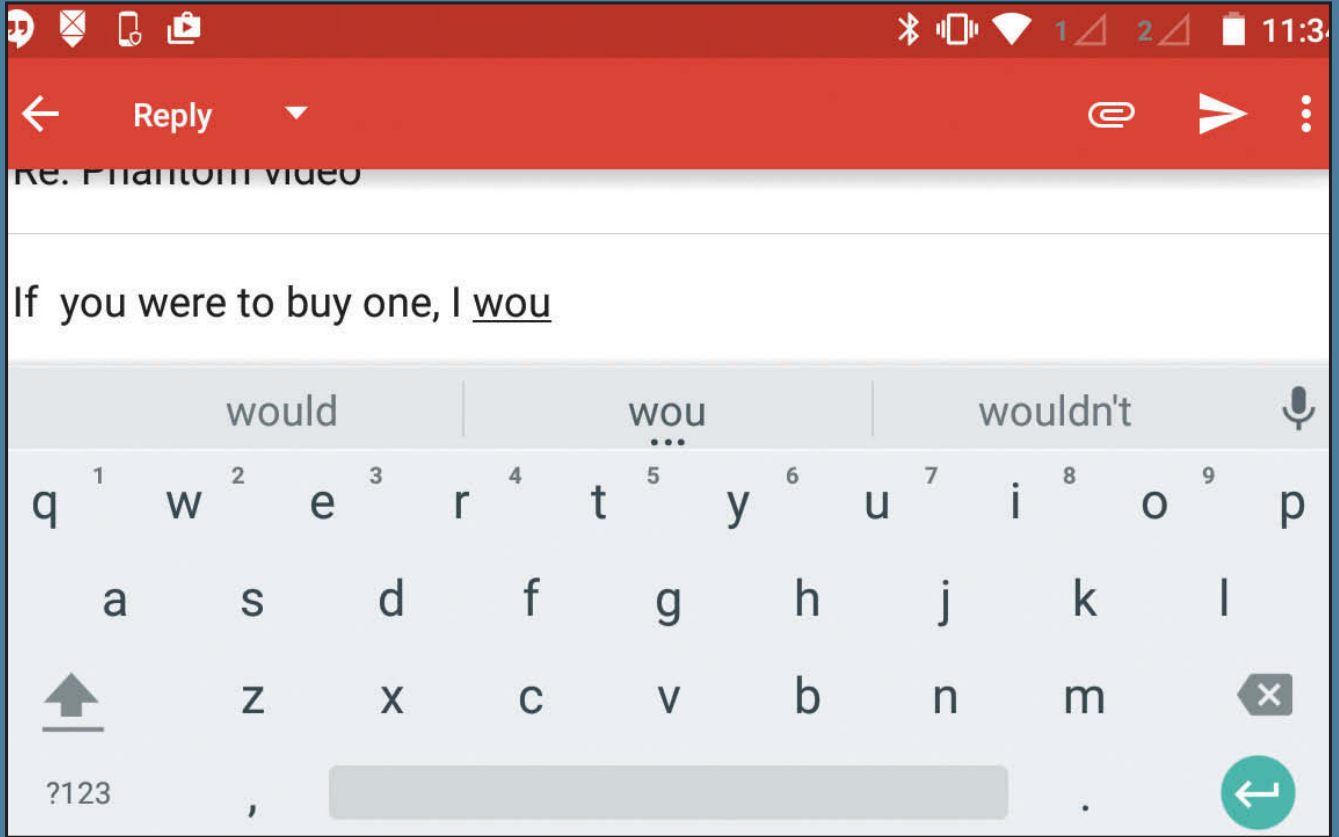
Turn off predictive text on Android

Jim Martin reveals how you can set up an Android keyboard just the way you want it

One of the (many) great things about Android is that it's so customisable. Sometimes it's hard to know where to go to change settings, though, so here we explain how to turn off predictive text on Android and how to set other keyboard preferences. We're using a Moto G with Lollipop here, and the Google Keyboard, but the process is largely the same for KitKat.

Turn off predictive text

START Drag down from the top of the screen twice if you have Lollipop to bring up the quick settings. Then tap the cog icon to open the settings menu. On other phones, it might be a slightly different route to settings, but you can always check the app tray for the Settings app and pin it to your home screen if you want a really quick way to change settings.
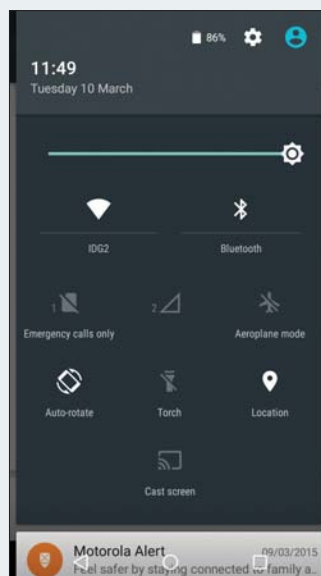
2 Scroll down to Language & input and tap on it. Under the sub-heading Keyboard & input methods you will see which keyboard you are currently using and – not so obviously – the settings for it beneath that: the menu item states the name of the keyboard and the language.
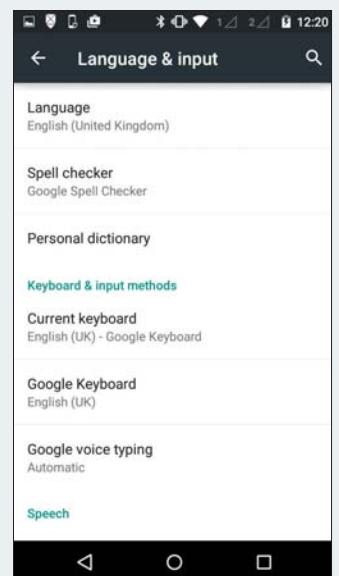
3 Tap on the name of the keyboard – in this case Google Keyboard and you will see all the available settings. To turn off predictive text, tap Text correction and then at the bottom of the next screen, turn off 'Next-word suggestions'.
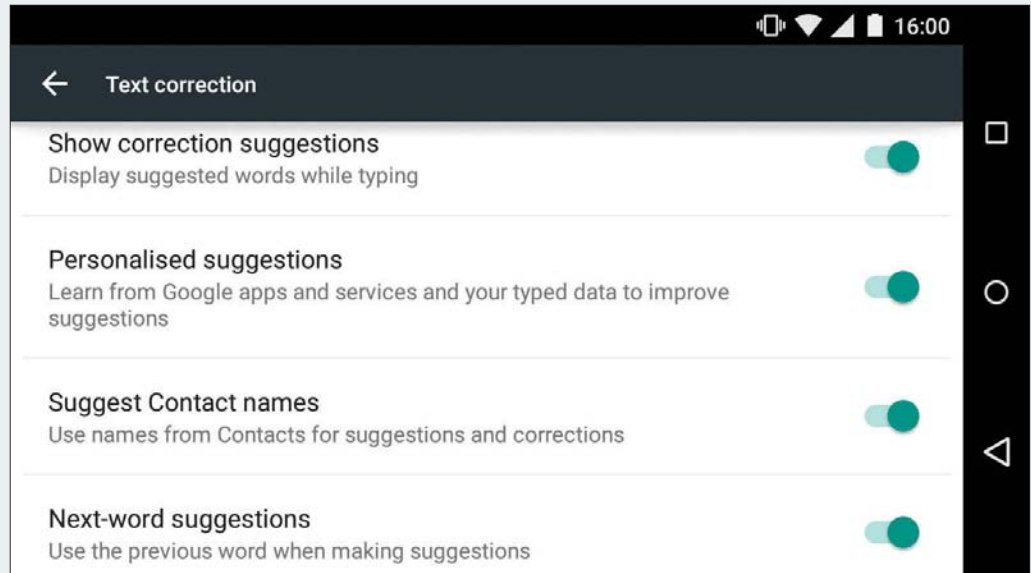
Text correction options

Another option in the Text correction menu is your Personal dictionary. You can add words to this, and it's useful if Android tends to auto-correct someone's name or another word you use regularly. When you add a word, you can also enter a shortcut to type that word – that's invaluable when you have long or complex words.

Yet more options include toggles for showing correction suggestions; personalised suggestions (which shows words you type a lot or are learned from other Google services); and showing contact names as suggestions.
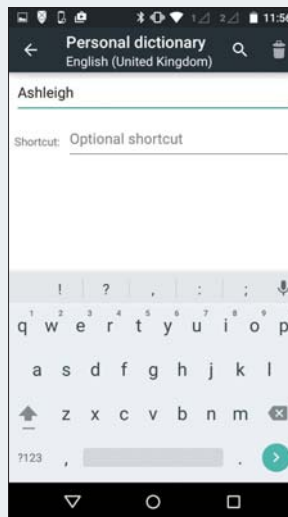
Gesture typing

If you back up a level from the Text correction menu, you'll find the Gesture Typing menu. In that, you can disable the ability to type words by swiping across the keyboard, turn off the gesture trail and turn off automatically adding spaces between words when you swipe over the spacebar.
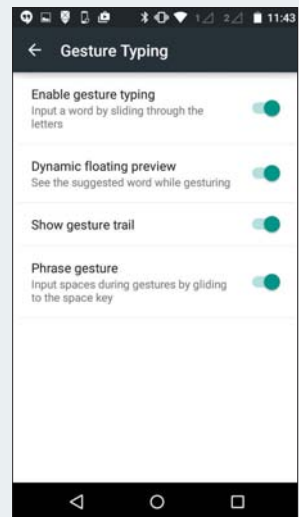
Advanced settings

In the Advanced menu, options vary depending on your phone model. On some, you can set the delay time for a long key press – such as when you hold down 'T' to get the number 5 – and the vibration duration for a key press. Here you can also choose how long the phone vibrates when you tap a key. ⊠
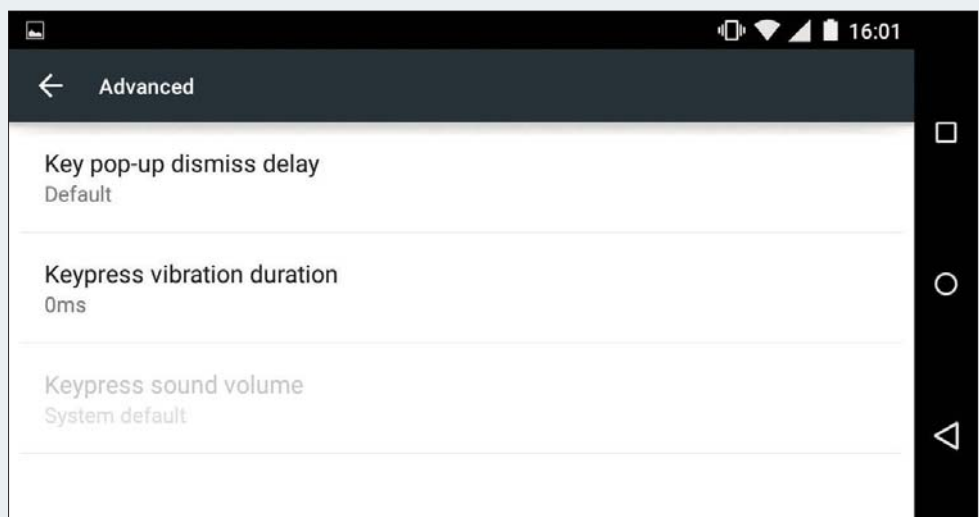
Back up your Android device for free

Whether something goes wrong or you get a new device, Marie Brewis shows how to back up for free

You can be as careful as you like in ensuring your phone or tablet isn't lost or stolen, but one day it could simply refuse to turn on. Then you'll lose everything if it isn't backed up. Here's a simple guide on how to back up your Android phone or Android tablet, including how to back up photos, video, contacts and more.

While you can purchase third-party apps that promise set-and-forget backup solutions, it's easy enough to back up your Android phone or tablet yourself – and for free. Our screenshots have been taken on an HTC Desire Eye with HTC's Sense UI, so yours may look a little different but the settings will be the same.

Back up App data, settings and Google data

There are a couple of settings within Android that can safeguard some of your important data. Open your Settings menu, then choose Backup & reset. Ensure the option to 'Back up my data' is enabled (screen 1). This takes care of your app data, Chrome bookmarks, Wi-Fi passwords and other settings. There's also a setting here to automatically restore any backed up settings and data to a reinstalled app, which will also be useful if you get a new phone or tablet.

Next head to Settings, Accounts & Sync, then click on Google. Tap on your Gmail account to see a list of what is and is not being synched to Google's servers, and enable any that you want to ensure are backed up (screen 2). All the services in this list are associated with the Google apps preinstalled on your phone or tablet, such as Contacts and Calendar, Chrome, Play Music, Gmail and Sheets (for Google Drive spreadsheets). By synching
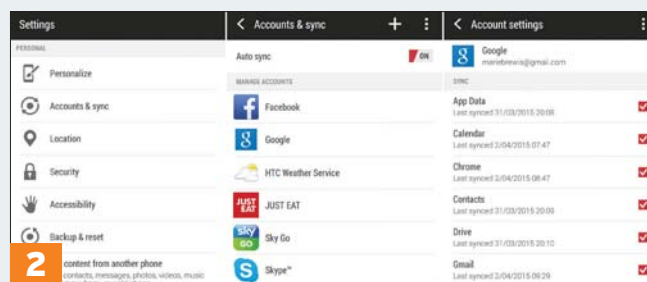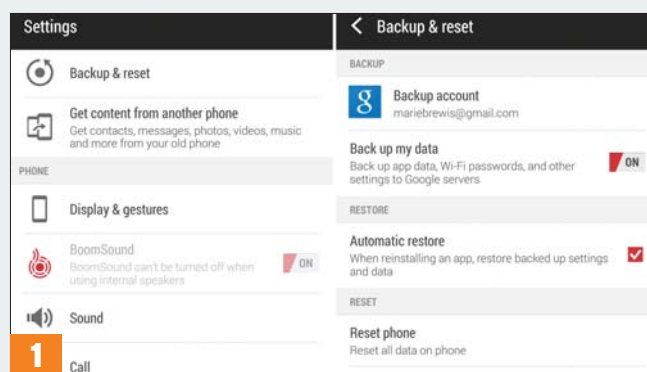
the data within these apps to Google's server you also make them available on any other device to which you are signed into your Google account.

Back up photos and video on Android

The easiest way to back up photos and video stored on your phone or tablet is to automatically back them up to Google Photos, where they will remain private unless you specify otherwise, visible only to you within your Drive, Google+ and Photos apps.

Photos allows you to store an unlimited number of standard-resolution files (2048px), but if you want to upload them at their full size (the default) it will count against your Google Drive storage limit. Google Drive gives you 15GB for free, and thereafter you can buy 100GB for $1.99 per month, or 1TB for $9.99 per month.

You can access the option to Auto-Backup images through the Google Photos app preinstalled on your Android phone or tablet. Launch Photos, tap the three dots in the top-right corner, then choose Auto-Backup and slide the toggle on (screen 3).
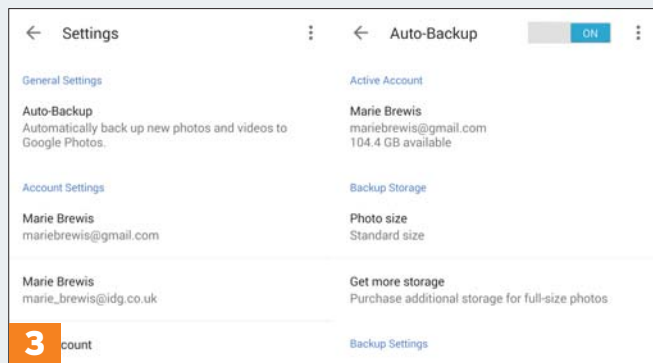
If you don't want to pay for extra storage, tap Photo size and choose Standard size (screen 4). We'd advise leaving at their defaults the options to back up photos only over a Wi-Fi connection and not while roaming. You can also select an option to back up photos only when the device is on charge.

That takes care of the photos and video captured by your device's camera. To also back up screenshots, photos and video downloaded via the web, Bluetooth or apps such as WhatsApp, open Google Photos and tap the three horizontal lines icon at the top left of the screen. Choose On Device, then tap the cloud icon next to each category you want to back up (screen 5).
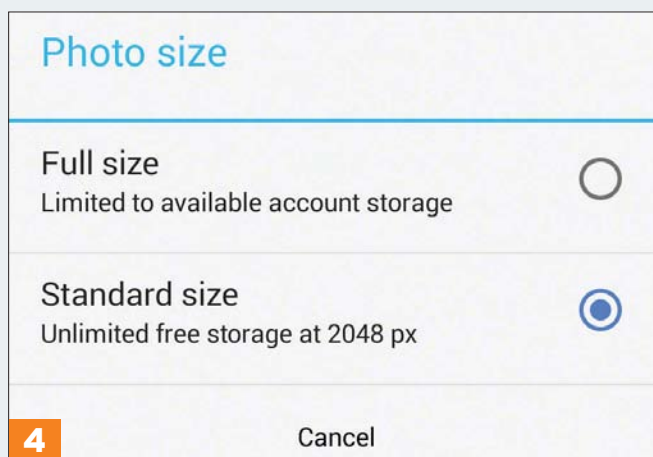
This bit's important: if you want to delete a photo or video from your phone to save space, but keep it on Google Photos, open Photos, tap the three horizontal lines icon at the top left and choose On Device. Tap and hold on an item to select it, then tap the trash can icon. If you have Photos rather than On Device selected, you will delete it from everywhere. (If that happens you will be able to restore it from the Trash folder for up to 60 days, as long as it was backed up properly and you haven't emptied the trash.)
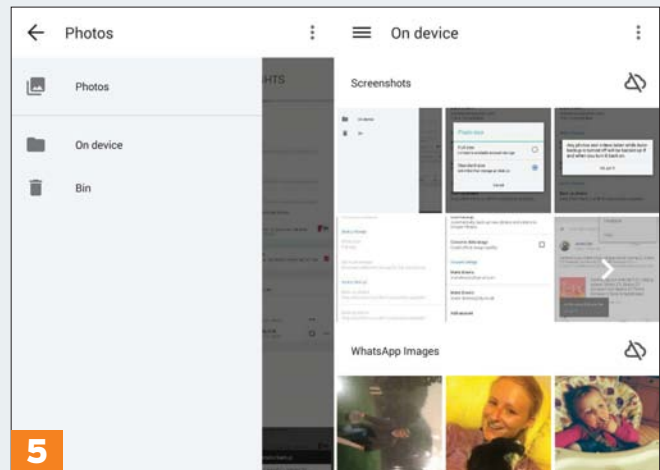

You can also manually back up your photos and video by connecting your device to a PC over USB, then accessing it as you would an external hard drive. You'll find photos and video in the DCIM folder, which you can drag-and-drop to your PC (screen 6).
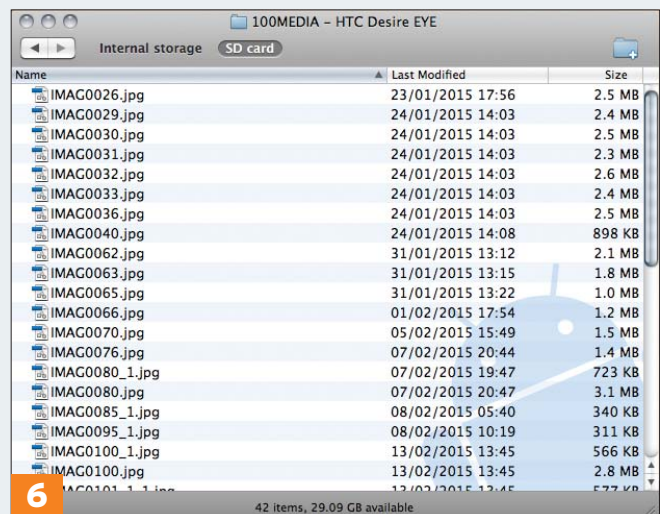
Back up text messages on Android

You may find your phone has preinstalled software to back up your text messages, as is the case with our HTC Desire Eye, so it's a good idea to check. Open your Messaging app, open the options menu and look for a Backup/Restore option (screen 7). If you don't have one you can download a third-party app such as SMS Backup +, which also backs up call logs and multimedia messages. ⊠
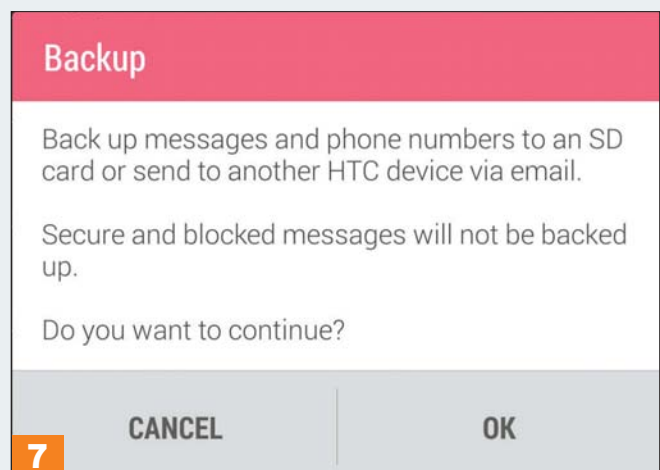
Remove a virus from an Android device

Viruses on Android are rare, but they exist. Marie Brewis reveals how to remove one from your device

If you believe your Android phone or tablet has a virus, then the good news is that it's really easy to delete.

First of all, it's worth pointing out that it's unlikely that your Android phone or tablet has a virus. What you're more likely to be seeing is an ad that wants to convince you that Android is infected and you need to download an app, or a dodgy pop-up, or perhaps your device is just misbehaving. But viruses for Android do exist. If you're sure your device has one, here's how to remove it.

All Android viruses are delivered via apps installed on your device, so if your phone or tablet doesn't already have a virus, the best way to avoid it getting one is to never install software outside of the Google Play app store. Open your Settings

menu, look for the Security option, then ensure the option for Unknown Sources (allow installation of apps from unknown sources) is disabled.

If you're determined to install an app from outside Google Play, do your research. Check its permissions (does a video player really need to see your contacts?), look online for reviews and have a good look at the developer's site to see what else it offers.

You can also install an antivirus app, and plenty of free Android antivirus apps are available that are able to detect and remove malicious apps, for example 360 Mobile Security, Avast and Lookout. These all include an app scanner that will seek out anything dodgy, but note that these apps can also trigger false-positives – reporting an app you've been using for months as malware when you know it's fine. In most cases you can simply ignore these alerts.

If you believe you already have a virus on your Android phone or tablet – perhaps one that is resisting your attempts to uninstall the associated app or even let you bypass the lock screen – a factory reset will remove it, returning your device to its out-of-the-box state. But doing so also means you'll lose everything on your phone that's not backed up. Instead, follow the below steps to remove a virus from Android.
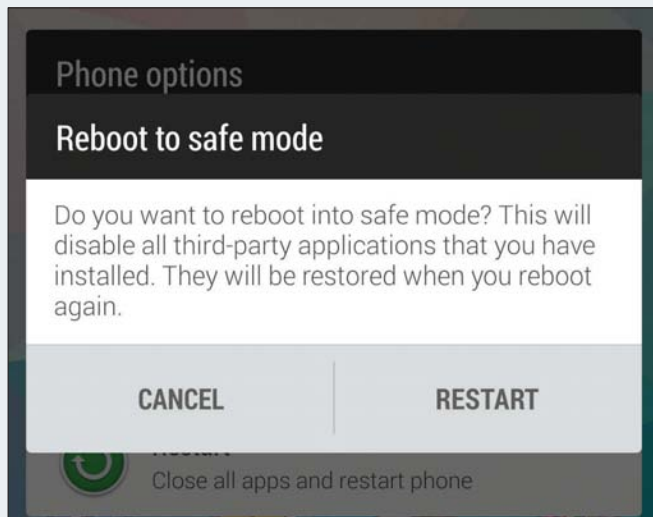
START Put your phone or tablet into Safe mode. This prevents any third-party apps running, including any malware. On many devices you can press the power button to access the power off options, then press and hold Power off to bring up an option to restart in Safe mode. If this doesn't work for your device, then you should Google 'How to put [your model name] into Safe mode' and follow the instructions. When in Safe mode, you'll see 'Safe mode' at the bottom left of the screen.
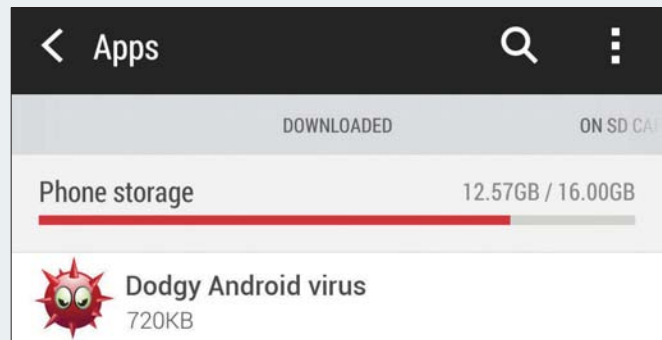
2 Open your Settings menu and choose Apps, then make sure you're viewing the Downloaded tab. If you don't know the name of the virus you think has infected your device, go through the list and look for anything dodgy-looking or that you know you haven't installed or shouldn't be running on your device.
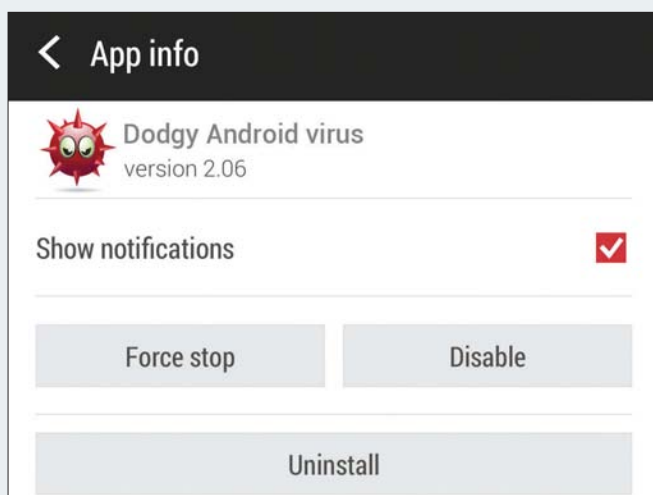
3 Tap on the malicious app (clearly it won't be called 'Dodgy Android virus', this is just an illustration) to open the App info page, then click Uninstall. In most cases, this is all you need to do to remove the virus, but occasionally you might find the Uninstall button is greyed out. This is because the virus has given itself Device administrator status.

4 Exit the Apps menu and tap on Settings, Security, Device Administrators. Here you'll find a list of any apps on your phone or tablet with administrator status. Simply untick the box for the app you want to remove, then tap Deactivate on the next screen. You should now be able to return to the apps menu and remove that app.

With the virus now off your Android phone or tablet, all you need do is restart the device to take it out of Safe mode. Now that it's working correctly, it's a good time to back up whatever important data you have stored on the device (see our How To on page 106), and install an Android antivirus app to protect you from any future viruses that come your way. ⌧

Send and receive texts from your tablet

Fancy a bigger screen for managing your text- and multimedia messages? Marie Brewis reveals how

A phone is all most people need to send and receive text messages, but sync your inbox to your Android tablet and you can more easily manage your SMS- and multimedia messages. You get a bigger screen and larger keypad for typing too, so here's how to get text messages on a tablet.

The service we demonstrate in this article is completely free. It syncs text messages between your phone and tablet over the internet (Wi-Fi or mobile), but the messages themselves are still carried through your mobile network. This might be useful if you

are going somewhere you know you will have Wi-Fi but no mobile reception, allowing you to leave the phone at home and take the tablet instead. All you pay is whatever your mobile operator charges you to send a text message. Most mobile contracts include free texts, but rarely picture messages.

If the reason you need to be able to text from your tablet is that your phone never gets a signal, or you're looking for a completely free messaging service that syncs between phone and tablet, sidestepping mobile operator charges, try WhatsApp.
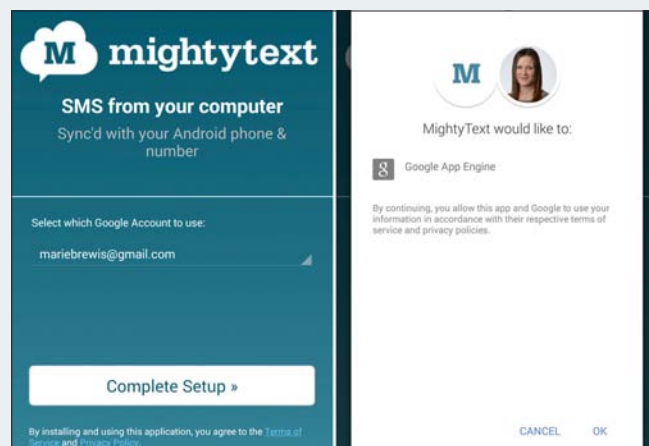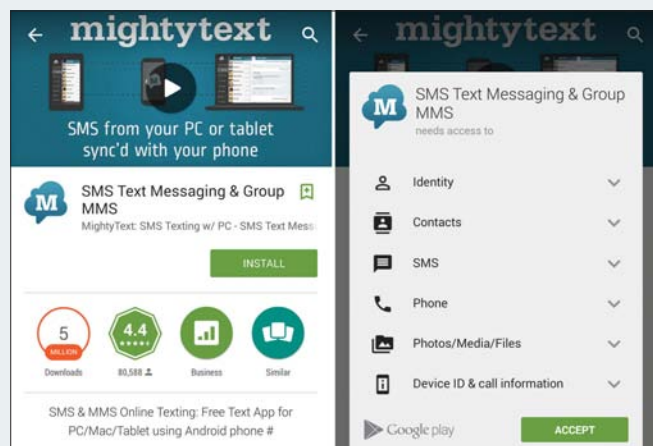
START On your Android phone launch the Google Play Store app and search for MightyText. Select it in the list of results, then tap Install on the next screen. MightyText will request access to various permissions; tap Accept.

2 If your Android phone is logged into a Google account MightyText should pick this up. Here the app is prompting us to select which Google account to use: work- or personal. Tap 'Complete Setup', and on the next screen tap OK.

3 Pick up your Android tablet and either browse to mightytext. net/app and select 'Install tablet app' or launch the Google Play Store app and search for 'SMS Text Messaging – Tablet SMS'. As before, tap Install and accept the requested permissions.


4 Open MightyText on your tablet, select your Google account and tap Complete Setup. Tap OK on the next screen. You'll get a message confirming your tablet has been linked with MightyText. Tap Launch MightyText Tablet App.
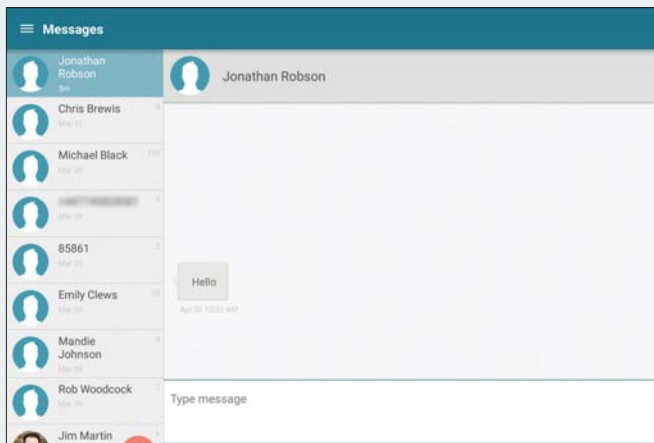

5 On your tablet you'll see what looks like an email inbox. In the left panel you get a list of conversations, and tapping on any of these brings up the conversation thread in the main panel. At the bottom is a text-entry field that can be used to send texts.
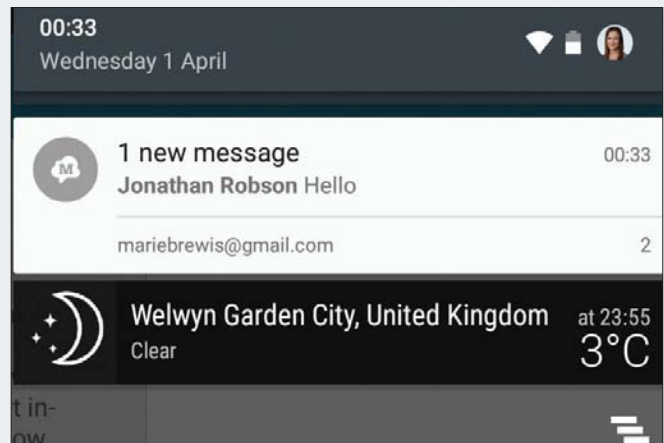

6 Should you receive a new text message, it will still go to your phone's usual Messaging inbox. However, you will also receive a notification on your tablet that you have received a new text message, and it will appear in the MightyText app on your tablet.
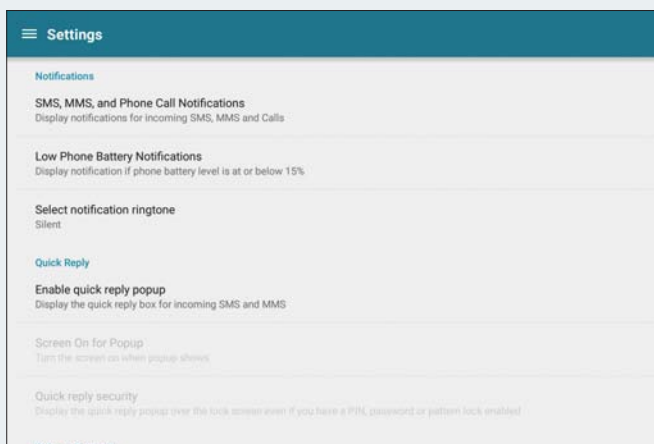
7 It's possible to turn off new message notifications – or at least mute them – on the tablet from within the Settings menu. Tap the three horizontal lines at the top left of the app, choose Settings, then disable 'SMS, MMS and Phone Call Notifications'.
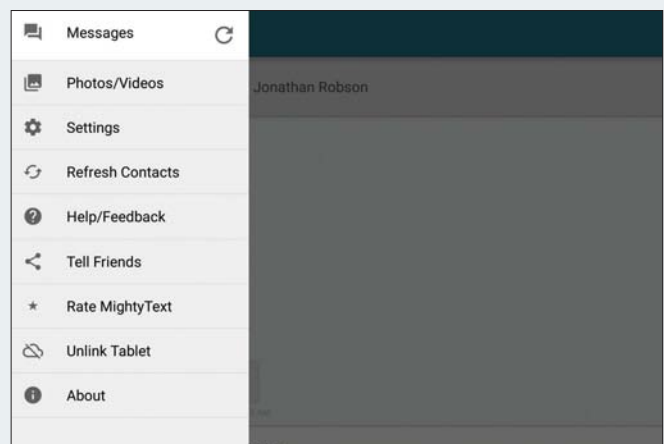
8 Also in this options menu is a Photos/Video entry. Tap on this option to manage any media sent to your phone within multimedia messages. ⊠

LETITIA
AUSTIN

ONLINE REGISTRATION REQUIRED

Auslogics File Recovery 5

FULL PROGRAM (FOUR-MONTH LICENCE) AVAILABLE ONLY ON THE DISC+

Installation details

Go to My Computer, right-click the DVD icon and open the disc. Select Files 240\Auslogics File Recovery 5 and open the install file.

Online registration required: Follow the instructions within the program before 16 June 2015.

System requirements

Windows XP/Vista/7/8 /10; 1GHz processor; 256MB RAM; 15MB drive space; 800x600 screen resolution

Mistakes happen. You may, for example, have cleared a folder by mistake or lost important files due to a virus attack, a system crash or another accident. Whether those are work documents or precious photo memories, losing something so valuable is never fun.

The solution: File Recovery 5, which can bring back the files you thought were lost for good. It works with hard drives, USB storage drives and memory cards, recovering all file types, even from lost partitions. No reason to panic when you have such a powerful tool in your arsenal.

Why File Recovery?

You may be surprised at how much data the program can recover from your hard drive or memory card, even after a quick-format. You can customize your scan for deleted files, preview items from the search results and recover only the files you really need.

Exclusive Auslogics technology is proven safe and effective in multiple tests, used by PC manufacturers and recommended by experts.
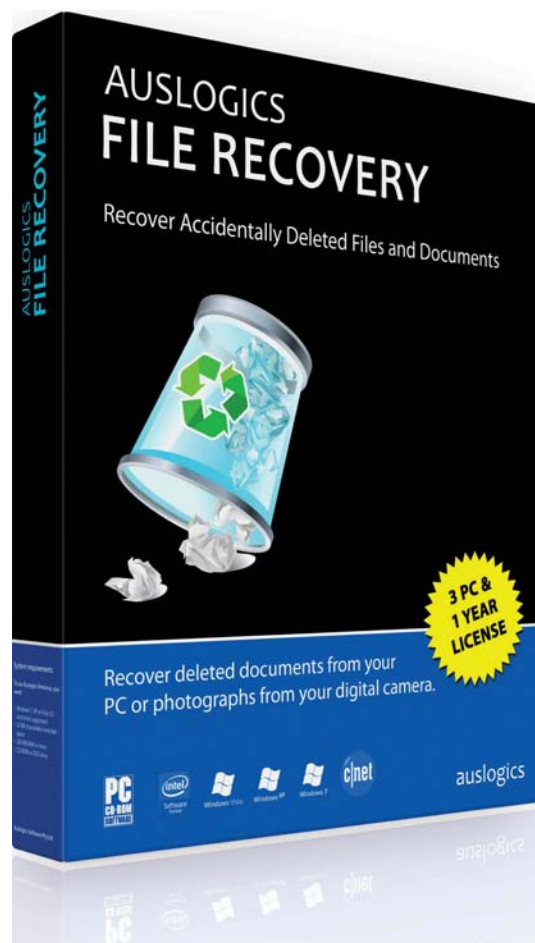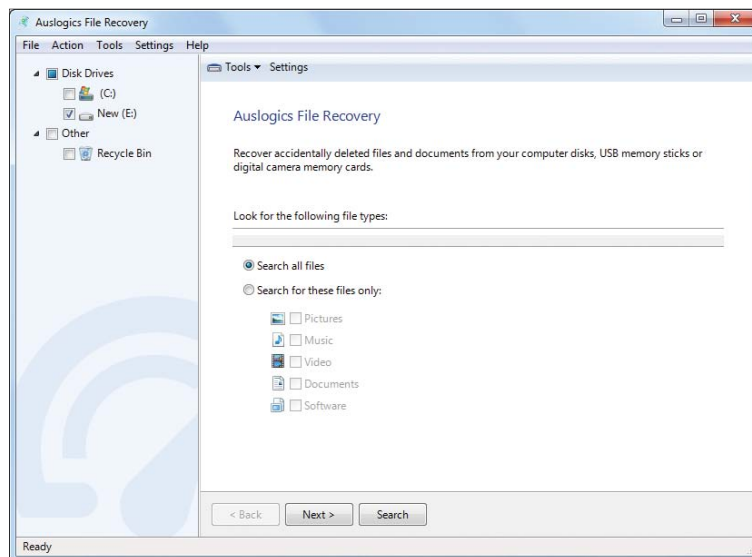
1-abc.net File Encrypter 7

FULL PROGRAM AVAILABLE ONLY ON THE DISC+

Installation details
Go to My Computer. Right-click the disc icon and open the disc. Select Files 240\1-abc. net File Encrypter 7 and open the install file.

Online registration required: Go to tinyurl. com/c8sLho8. Follow the instructions by 16 June 2015.

### System requirements
Windows XP/Vista/7

There are many reasons why you should encrypt your files and data, but many of us think it's just too complicated to bother with. 1-abc.net File Encrypter simplifies the process, so all you have to do is add it to your file list and click Encrypt Now. To decrypt the file, select it and choose Decrypt Now.

Eleven symmetrical and asymmetrical encryption methods are available, and all of them can be combined with each other. Eight encryption procedures require a personal password that you can determine by yourself, so that only you can open the file again.

Protect your private data: use 1-abc.net File Encrypter to secure your privacy.

Features
• Easy-to-use interface
• Encrypt and decrypt files on your hard drive, camera cards or USB stick
• 11 encryption methods: Simple HEX Encoding, Caesar 3, Caesar 9, Simple XOR, Extended XOR, Advanced Encryption Standard (AES), Blowfish, Twofish, Serpent, MARS and Tiny Encryption Algorithm (TEA)
• Three easy encrypting procedures (no password required)
• Eight secure encrypting procedures (password required)
• Encrypt your data to a self-extracting .exe file for users who do not have this program installed on their systems
• Log your encrypting and decrypting activity to the history file by option
• Start program with Windows automatically and encrypt data from Windows Explorer directly
• Encrypt and decrypt files from the right-click menu of Windows Explorer
• Context menu for fast access to most used features
• Program can be installed on USB sticks, camera cards or nearly all other rewritable media
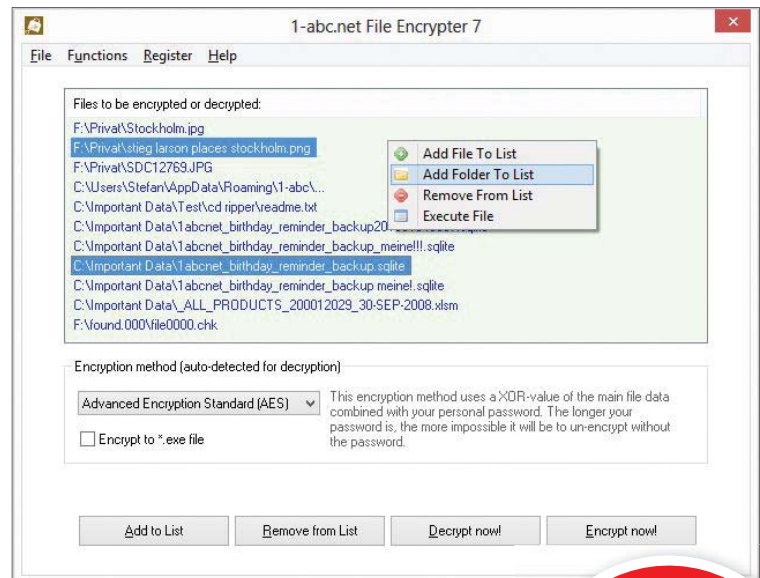
PCA OFFER SAVE 33% AND UPGRADE TO 1-ABC. NET SECURITY BOX FOR JUST £17.99

MAGIX Music Maker Silver 2015

ONLINE REGISTRATION REQUIRED

FULL PROGRAM AVAILABLE ONLY ON THE DISC+

Installation details

Go to My Computer. Right-click the DVD icon, and open the disc. Select Files 240\MAGIX Music Maker Silver 2015 and open the install file.

Online registration required: Follow the links during installation before 16 June 2015.

System requirements
Windows XP/Vista/7/8; 1GB RAM; 5.5GB drive space; 2GHz processor; 1024x768 resolution

MAGIX has completely redesigned its intuitive music software with new innovations, including a virtual synthesizer and drum machine and Vita Sampler. Easy-to-understand features, thousands of loops and samples, high-quality virtual instruments and tons of effects make it possible for both beginners and more advanced users to easily create impressive songs. Thanks to the user-friendly interface and practical guides, even beginners can have fun making music with no previous experience at all.

Reallusion iClone 5 Standard

ONLINE REGISTRATION REQUIRED

FULL PROGRAM AVAILABLE ONLY ON THE DISC+

Installation details

Click the Windows install URL button and follow the onscreen instructions to install Reallusion iClone 5 Standard.

Online registration required: Follow the links during installation before 16 June 2015.

System requirements
Windows XP/Vista/7; 1GB RAM; 2GB drive space; 4.2GHz processor; 1024x768 resolution

iClone is an all-in-one 3D animation studio, that allows anyone to create their own 3D characters by importing photos of themselves and mapping them on to CG models. Users can animate by choosing motions from the content library, or simply using their mouse to puppeteer characters, vehicles and props. Real-life actors can even be brought in, and mixed with virtual environments to create television shows and school presentations. ⊠

DISC INSTRUCTIONS

Place disc in drive. Open the file 'Click here to begin.pdf' for extra information.

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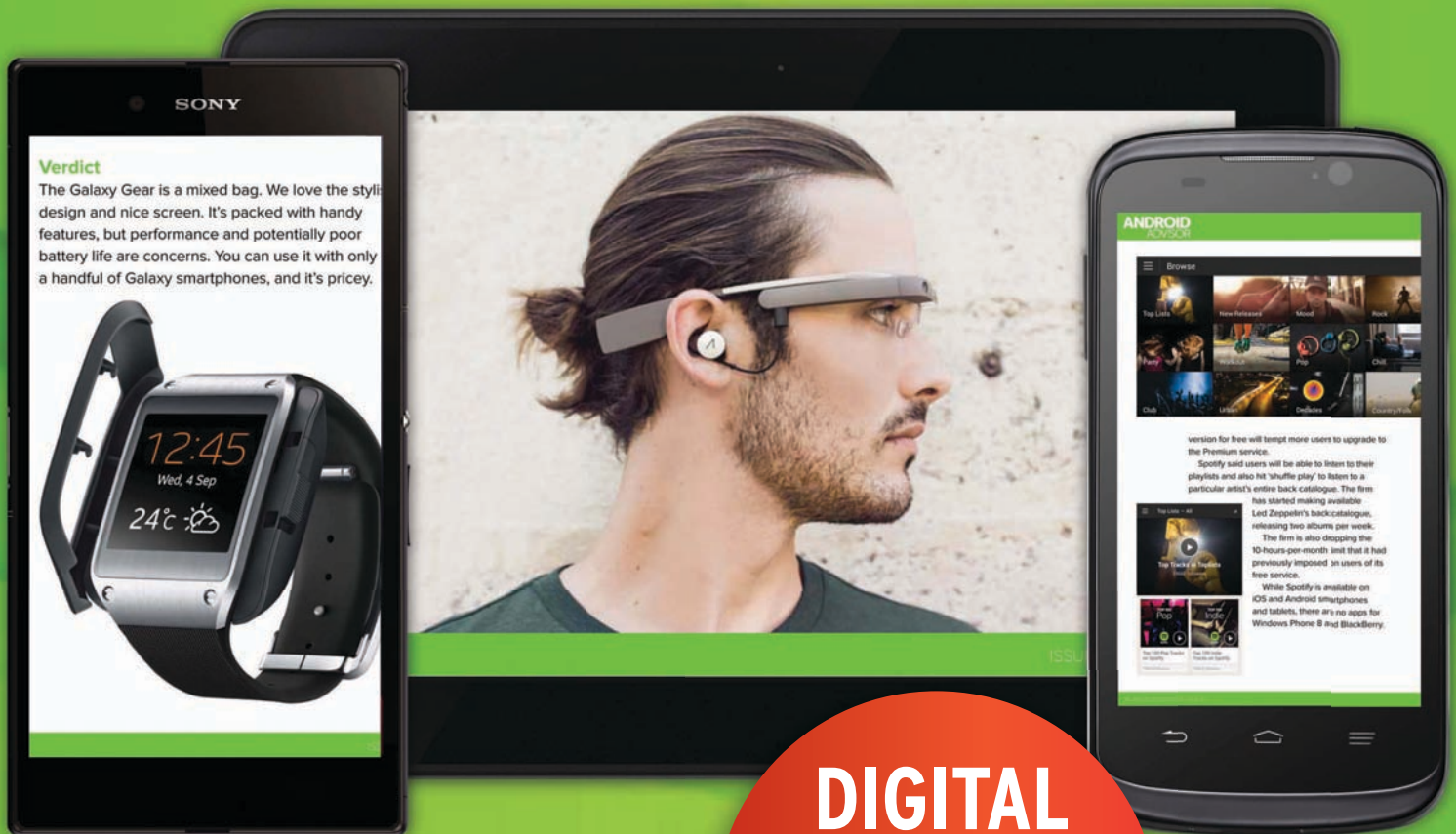
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FREE GIFT

This month we've teamed up with ARCTIC to give new subscribers an exclusive gift, a FREE Power Bank battery charger

The Power Bank 2200 is a stylish accessory that doubles the battery life of your smartphone. The sleek aluminium, pocket-size design allows you to carry this 2200mAh portable battery charger with you anywhere you go.

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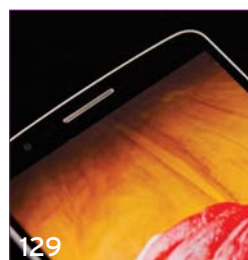
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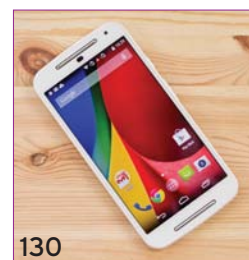
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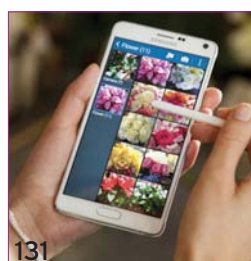
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Prices listed are those quoted by the distributor or manufacturer and include VAT. They are intended only as a guide.

If you're interested in purchasing one of the products reviewed here then please contact the manufacturer or supplier directly, mentioning both *PC Advisor* and the issue in which you saw the product. If it won't supply the product as reviewed, contact us at jim_martin@idg.co.uk.

Manufacturers are under no obligation to feature reviewed products on their websites. Our recommendations are for guidance only.

Star ratings and Gold, Recommended and Best Buy badges are awarded at the time of the original review and given in relation to the market competition at that time.

Best laptops	1 Aorus X7 v2	2 Aorus X3 Plus	3 MSI GE70 2PE Apache Pro	4 Schenker XMG P304	5 Dell XPS 15
Price	£1,720 inc VAT	£1,530 inc VAT	£1,100 inc VAT	£1,100 inc VAT	£1,449 inc VAT
Website	Aorus.com	Aorus.com	UK.msi.com	Mysn.co.uk	Dell.co.uk
Launch date	Sep 14	Nov 14	Sep 14	Jul 14	Sep 14
Build rating	★★★★☆	★★★★☆	★★★½☆	★★★★☆	★★★★½
Features rating	★★★★½	★★★★½	★★★★☆	★★★★☆	★★★★☆
Performance rating	★★★★½	★★★★½	★★★★☆	★★★★½	★★★★½
Value rating	★★★½☆	★★★½☆	★★★★☆	★★★★☆	★★★★☆
Overall rating	★★★★½	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Processor	2.4GHz Intel Core i7-4860HQ	2.4GHz Intel Core i7-4860HQ	2.5GHz Intel Core i7-4710HQ	2.2GHz Intel Core i7-4702MQ	2.3GHz Intel Core i7-4712HQ
RAM	16GB DDR3	16GB DDR3	16GB DDR3	8GB DDR3	16GB DDR3
Storage	1TB HDD, 3x 128GB SSD	2x 128GB SSD	1TB HDD, 2x 128GB SSD	250GB SSD	512GB SSD
Screen size	17.3in matt	14in matt	17.3in matt	13.3in matt	15.6in gloss
Screen resolution	1920x1080	3200x1800	1920x1080	1920x1080	3200x1800
Graphics	2x nVidia GeForce GTX 860M	nVidia GeForce GTX 870M	nVidia GeForce GTX 860M	nVidia GeForce GTX 860M	nVidia GeForce GT 750M
Video memory	8GB	6GB	2GB	2GB	2GB
Wireless	802.11a/b/g/n/ac	802.11a/b/g/n/ac	802.11b/g/n/ac	802.11b/g/n/ac	802.11b/g/n/ac
Ethernet	Gigabit	Gigabit	Gigabit	Gigabit	✗
Bluetooth	✓	✓	✓	✓	✓
USB	3x USB 3.0, 2x USB 2.0	2x USB 3.0, 1x USB 2.0	2x USB 3.0, 2x USB 2.0	3x USB 3.0, 1x USB 2.0	3x USB 3.0, 1x USB 2.0
FireWire	✗	✗	✗	✗	✗
Thunderbolt	✗	✗	✗	✗	✗
DisplayPort	✓	✓	✗	✗	✓
HDMI	✓	✓	✓	✓	✓
DVI	✗	✗	✗	✗	✗
VGA	✓	✗	✓	✗	✓
eSATA	✗	✗	✗	✓	✗
Media card slot	✓	✓	✓	✓	✓
Audio	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic
Optical drive	N/A	N/A	N/A	None	N/A
Extras	HD webcam	HD webcam	HD webcam	720p webcam	720p webcam
Operating system	Windows 8.1 64-bit	Windows 8.1 64bit	Windows 8.1 64-bit	Windows 8.1 64-bit	Windows 8.1 64-bit
Bundled software	None	None	None	None	None
Gaming scores	189/157fps in Tomb Raider	60.9/38.3fps in Tomb Raider	120fps in Batman (1080p)	115fps in Stalker (1080p)	68fps in Stalker (1080p)
Battery	74.7Wh lithium-polymer	73.26Wh lithium-polymer	49Wh lithium-ion	62Wh lithium-ion	91Wh lithium-ion
Battery life	1 hr 48 mins	1 hr 48 mins	2 hrs	5 hrs 5 mins	5 hrs
PCMark7 score	6304	6627	6241	5500	5833
Dimensions	425x303x24.5mm	330x263.5x22.9mm	418x269x39mm	374x250x37mm	372x254x18mm
Weight	3.24kg	1.8kg	3kg	2kg	2kg
Warranty	2-year return-to-base	2-year return-to-base	2-year return-to-base	2-year collect-and-return	1-year next day in-home
FULL REVIEW	TINYURL.COM/KLUXLGE	TINYURL.COM/LS8696O	TINYURL.COM/PU5L5GK	TINYURL.COM/Q4JWVSM	TINYURL.COM/N9GRT4U

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Best budget laptops	1 Lenovo IdeaPad Z50-70	2 Toshiba Chromebook 2	3 Acer Chromebook 13	4 Dell Chromebook 11	5 Acer Aspire V13
Price	£399 inc VAT	£269 inc VAT	£219 inc VAT	£239 inc VAT	£410 inc VAT
Website	Lenovo.com/uk	Toshiba.co.uk	Acer.co.uk	Dell.co.uk	Acer.co.uk
Launch date	Jan 15	Jan 15	Sep 14	Dec 14	Jan 15
Build rating	★★★½☆	★★★★☆	★★★★☆	★★★★☆	★★★☆☆
Features rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Performance rating	★★★½☆	★★★★½	★★★★☆	★★★★☆	★★★★☆
Value rating	★★★½☆	★★★★½	★★★★☆	★★★★☆	★★★★☆
Overall rating	★★★★☆	★★★★½	★★★★☆	★★★★☆	★★★★☆
Processor	1.7GHz Intel Core i3-4010U	Intel Celeron	2.1GHz nVidia Tegra K1	1.4GHz Intel Celeron 2955U	2GHz Intel Core i3-4158U
RAM	4GB DDR3	4GB DDR3	4GB DDR3	4GB DDR3	4GB DDR3
Storage	1TB HDD	16GB SSD	32GB SSD	16GB SSD	500GB HDD with 8GB flash
Screen size	15.6in gloss	13.3in IPS	13.3in	11.6in glossy	13.3in matt
Screen resolution	1920x1080	1920x1080	1920x1080	1366x768	1366x768
Graphics	nVidia GeForce 820M	Intel HD graphics	nVidia Kepler	Intel HD Graphics	Intel Iris Graphics 5100
Video memory	2GB	N/A	N/A	N/A	N/A
Wireless	802.11b/g/n	802.11a/b/g/n/ac	802.11a/b/g/n/ac	802.11a/b/g/n	802.11a/b/g/n
Ethernet	Gigabit	Gigabit	Gigabit	Gigabit	Gigabit
Bluetooth	✓	✓	✓	✓	✓
USB	1x USB 3.0, 2x USB 2.0	1x USB 3.0, 1x USB 2.0	2x USB 3.0	2x USB 3.0	1x USB 3.0, 1x USB 2.0
FireWire	✗	✗	✗	✗	✗
Thunderbolt	✗	✗	✗	✗	✗
DisplayPort	✗	✗	✗	✗	✗
HDMI	✓	✓	✓	✓	✓
DVI	✗	✗	✗	✗	✗
VGA	✓	✗	✗	✗	✗
eSATA	✗	✗	✗	✗	✗
Media card slot	✓	✓	✓	✓	✓
Audio	Headphone minijack	Headphone minijack	Headphone minijack	Headphone minijack	Headphone minijack
Optical drive	DVD Writer	None	None	None	None
Extras	None	Webcam	Webcam	Webcam	None
Operating system	Windows 8.1	Google Chrome OS	Google Chrome OS	Google Chrome OS	Windows 8.1
Bundled software	None	None	None	None	None
Battery	41Wh Lithium-ion	9 hrs	9 hrs 20 mins	Lithium	48Wh Lithium-ion
Battery life	4 hrs 58 mins	Not tested	660ms	7 hrs 17 mins	6 hrs 35 mins
PCMark 8 Home score	1959	Not tested	Not tested	N/A	2358 (3396 Work)
Batman (Low/High)	33/29fps	Not tested	Not tested	N/A	29/24fps
Dimensions	382x265x27.5mm	320x214x19.3mm	18x327x227.5mm	295x201x24mm	327x227x20.6mm
Weight	2.4kg	1.35kg	1.5kg	1.3kg	1.5kg
Warranty	1-year return-to-base	1 year	1 year	1-year depot	1-year return-to-base
FULL REVIEW	TINYURL.COM/NJNNKWQ	TINYURL.COM/OP9NQAY	TINYURL.COM/Q2YT5AD	TINYURL.COM/NBUL2NO	TINYURL.COM/OQ94SKB

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Best ultraportable laptops	Apple MacBook Pro 13in Retina	Apple MacBook Air 13in	HP Spectre 13-3010ea	Dell XPS 13 9343	Toshiba Kira-101
	1 PC ADVISOR GOLD	**2** PC ADVISOR GOLD	**3**	**4**	**5**
Price	**£1,399 inc VAT**	**£849 inc VAT**	**£999 inc VAT**	**£1,099 inc VAT**	**£1,299 inc VAT**
Website	Apple.com/uk	Apple.com/uk	Hp.com/uk	Dell.co.uk	Toshiba.co.uk
Launch date	July 14	Apr 14	Sep 14	Mar 15	Aug 14
Build rating	★★★★★	★★★★½	★★★★½	★★★★½	★★★★½
Features rating	★★★★½	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Performance rating	★★★★☆	★★★★☆	★★★★½	★★★★½	★★★★☆
Value rating	★★★★☆	★★★★½	★★★★☆	★★★★½	★★★½☆
Overall rating	★★★★½	★★★★½	★★★★☆	★★★★☆	★★★★☆
Processor	2.8GHz Intel Core i5	1.4GHz Intel Core i5	1.6GHz Intel Core i5-4200U	2.4GHz Intel Core i7-5500U	1.8GHz Intel Core i7-4500U
RAM	8GB DDR3L	4GB DDR3L	8GB DDR3	8GB DDR3	8GB DDR3
Storage	512GB SSD	128GB SSD	256GB SSD	256GB SSD	256GB SSD
Screen size	13.3in glossy (anti-glare)	13.3in glossy (anti-glare)	13.3in glossy	13.3in IPS	13.3in glossy
Screen resolution	2560x1600	1440x900	1920x1080	3200x2000	2560x1440
Graphics	Intel Iris Graphics	Intel HD Graphics 5000	Intel HD Graphics 4400	Intel HD Graphics 5500	Intel HD Graphics 4400
Video memory	N/A	N/A	N/A	N/A	N/A
Wireless	802.11a/b/g/n/ac	802.11a/b/g/n/ac	802.11a/b/g/n/ac	802.11ac	802.11b/g/n/ac
Ethernet	Optional	Optional	None	None	None
Bluetooth	✓	✓	✓	✓	✓
USB	2x USB 3.0	2x USB 3.0	2x USB 3.0	2x USB 3.0	3x USB 3.0
FireWire	✗	✗	✗	✗	✗
Thunderbolt	2x	✓	✗	✗	✗
DisplayPort	✗	✓	✓	✗	✗
HDMI	✓	✗	✓	✗	✓
DVI	✗	✗	✗	✗	✗
VGA	✗	✗	✗	✗	✗
eSATA	✗	✗	✗	✗	✗
Media card slot	✓	✓	✓	✓	✓
Audio	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic	Headphone jack	Headphone jack, mic
Optical drive	N/A	N/A	N/A	N/A	N/A
Extras	FaceTime HD webcam	HD webcam, multitouch trackpad, backlit keyboard	1080p webcam	720p webcam	720p webcam
Operating system	Mac OS X 10.10 Yosemite	Mac OS X 10.10 Yosemite	Windows 8.1 64-bit	Windows 8.1 64-bit	Windows 8.1 Pro 64-bit
Bundled software	iLife 11	iLife 11	None	Microsoft Office 2013 Trial	None
Gaming scores	Not tested	Not tested	31fps in Stalker (720p)	40fps Batman: Arkham City	17fps (1080p)
Battery	71.8Wh lithium-polymer	54Wh lithium-polymer	51Wh lithium-ion	52Wh lithium-polymer	52Wh lithium-polymer
Battery life	9 hrs 55 mins	12 hrs 57 mins	7 hrs 30 mins	6 hrs 12 mins	7 hrs 10 mins
PCMark 7 score	Not tested	4602	5006	Not tested	5100
Dimensions	314x219x18mm	325x227x4-17.5mm	324x220x15mm	304x200x15mm	316x207x19.8mm
Weight	1.57kg	1.35kg	1.52kg	1.3kg	1.26kg
Warranty	1 year return-to-base	1-year return-to-base	2-year return-to-base	1-year next business day	2-year onsite
FULL REVIEW	TINYURL.COM/PNTUMPW	TINYURL.COM/KNXWZW3	TINYURL.COM/N4CJQL9	TINYURL.COM/PPD3BYW	TINYURL.COM/QHP9F9T

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Best Chromebooks	1 Toshiba Chromebook 2	2 Acer Chromebook 13	3 Dell Chromebook 11	4 HP Chromebook 14	5 Acer C720p
Price	£269 inc VAT	£219 inc VAT	£239 inc VAT	£259 inc VAT	£249 inc VAT
Website	Toshiba.co.uk	Acer.co.uk	Dell.co.uk	Hp.com/uk	Uk.asus.com
Launch date	Jan 15	Sep 14	Dec 14	Sep 14	Jan 14
Build rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Features rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Performance rating	★★★★½	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Value rating	★★★★½	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Overall rating	★★★★½	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Processor	Intel Celeron	2.1GHz nVidia Tegra K1	1.4GHz Intel Celeron 2955U	1.4GHz Intel Celeron 2955U	1.4GHz Intel Celeron 2955U
RAM	4GB DDR3	4GB DDR3	4GB DDR3	4GB DDR3	2GB DDR3
Storage	16GB SSD	32GB SSD	16GB SSD	16GB SSD	16GB SSD
Screen size	13.3in IPS	13.3in	11.6in glossy	14in glossy	11.6in glossy
Screen resolution	1920x1080	1920x1080	1366x768	1366x768	1366x768
Graphics	Intel HD graphics	nVidia Kepler	Intel HD Graphics	Intel HD graphics	Intel HD graphics
Video memory	N/A	N/A	N/A	N/A	N/A
Wireless	802.11a/b/g/n/ac	802.11a/b/g/n/ac	802.11a/b/g/n	802.11a/b/g/n	802.11a/b/g/n
Ethernet	Gigabit	Gigabit	Gigabit	Gigabit	Gigabit
Bluetooth	✓	✓	✓	✓	✓
USB	1x USB 3.0, 1x USB 2.0	2x USB 3.0	2x USB 3.0	2x USB 3.0, 1x USB 2.0	1x USB 3.0, 1x USB 2.0
FireWire	✗	✗	✗	✗	✗
Thunderbolt	✗	✗	✗	✗	✗
DisplayPort	✗	✗	✗	✗	✗
HDMI	✓	✓	✓	✓	✓
DVI	✗	✗	✗	✗	✗
VGA	✗	✗	✗	✗	✗
eSATA	✗	✗	✗	✗	✗
Media card slot	✓	✓	✓	✓	✓
Audio	Headphone minijack	Headphone minijack	Headphone minijack	Headphone minijack	Headphone minijack
Optical drive	None	None	None	None	None
Extras	Webcam	Webcam	Webcam	Webcam	Webcam
Operating system	Google Chrome OS	Google Chrome OS	Google Chrome OS	Google Chrome OS	Google Chrome OS
Bundled software	None	None	None	None	None
Battery life	9 hrs	9 hrs 20 mins	7 hrs 17 mins	7 hrs 50 mins	6 hrs 7 mins
SunSpider score	Not tested	660ms	465ms	470ms	502ms
Peacekeeper score	Not tested	Not tested	2468	2478	2453
Browsermark score	Not tested	Not tested	3732	3643	3698
Dimensions	320x214x19.3mm	18x327x227.5mm	295x201x24mm	20.5x345x239mm	19.1x288x204mm
Weight	1.35kg	1.5kg	1.3kg	1.7kg	1.35kg
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/OP9NQAY	TINYURL.COM/Q2YT5AD	TINYURL.COM/M3D3QJ4	TINYURL.COM/OCU7FTY	TINYURL.COM/O9KFZMA

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Best gaming laptops	1 Aorus X7 v2	2 Gigabyte P35W v2	3 Aorus X7 Pro	4 Schenker XMG C504	5 Aorus X3 Plus
Price	£1,720 inc VAT	£1,399 inc VAT	£2,100 inc VAT	£1,099 inc VAT	£1,530 inc VAT
Website	Aorus.com	Uk.gigabyte.com	Aorus.com	Mysn.co.uk	Aorus.com
Launch date	Sep 14	Jun 14	Jan 15	Jan 15	Nov 14
Build rating	★★★★☆	★★★★½	★★★★☆	★★★★☆	★★★★☆
Features rating	★★★★½	★★★★☆	★★★★½	★★★★☆	★★★★½
Performance rating	★★★★½	★★★★½	★★★★½	★★★★☆	★★★★½
Value rating	★★★½☆	★★★★½	★★★½☆	★★★★☆	★★★½☆
Overall rating	★★★★½	★★★★½	★★★★☆	★★★★☆	★★★★☆
Processor	2.4GHz Intel Core i7-4860HQ	2.5GHz Intel Core i7-4710HQ	2.4GHz Intel Core i7-4860HQ	2.5GHz Intel Core i7-4710HQ	2.4GHz Intel Core i7-4860HQ
RAM	16GB DDR3	16GB DDR3L	16GB DDR3	8GB DDR3	16GB DDR3
Storage	1TB HDD, 3x 128GB SSD	1TB HDD, 2x 128GB SSD	2x 256GB SSD	1TB HDD, 2x 120GB SSD	2x 128GB SSD
Screen size	17.3in matt	15.6in matt	17.3in matt	15.6in matt	14in matt
Screen resolution	1920x1080	1920x1080	1920x1080	1920x1080	3200x1800
Graphics	2x nVidia GeForce GTX 860M	Intel HD 4600/GeForce 870M	2x nVidia GTX 870M	Intel HD 4600/GeForce 860M	nVidia GeForce GTX 870M
Video memory	8GB	6GB	6GB	4GB	6GB
Wireless	802.11a/b/g/n/ac	802.11a/b/g/n	802.11a/b/g/n/ac	802.11a/b/g/n/ac	802.11a/b/g/n/ac
Ethernet	Gigabit	Gigabit	Gigabit	Gigabit	Gigabit
Bluetooth	✓	✓	✓	✓	✓
USB	3x USB 3.0, 2x USB 2.0	2x USB 3.0, 2x USB 2.0	3x USB 3.0, 2x USB 2.0	2x USB 3.0, 2x USB 2.0	2x USB 3.0, 1x USB 2.0
FireWire	✗	✗	✗	✗	✗
Thunderbolt	✗	✗	✗	✗	✗
DisplayPort	✓	✓	✓	✓	✓
HDMI	✓	✓	✓	✓	✓
DVI	✗	✗	✗	✗	✗
VGA	✓	✓	✓	✓	✗
eSATA	✗	✗	✗	✗	✗
Media card slot	✓	✓	✓	✓	✓
Audio	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic
Optical drive	N/A	N/A	N/A	N/A	N/A
Extras	HD webcam	HD webcam	HD webcam	HD webcam	HD webcam
Operating system	Windows 8.1 64-bit	Windows 8.1 64-bit	Windows 8.1 64-bit	Windows 8.1 64-bit	Windows 8.1 64bit
Bundled software	None	None	None	None	None
Gaming scores	189/157fps in Tomb Raider	60/40fps in Tomb Raider	221/170fps in Tomb Raider	105fps in Stalker (1080p)	60.9/38.3fps in Tomb Raider
Battery	74.7Wh lithium-polymer	75.8Wh lithium-polymer	74.7Wh lithium-polymer	78Wh lithium-ion	73.26Wh lithium-polymer
Battery life	1 hr 48 mins	4 hrs	1 hr 48 mins	3 hrs 45 mins	1 hr 48 mins
PCMark 7 score	6304	6226	6474	5635	6627
Dimensions	425x303x24.5mm	385x270x20.9mm	425x303x24.5mm	385x270x21mm	330x263.5x22.9mm
Weight	3.24kg	2.5kg	3.24kg	2.16kg	1.8kg
Warranty	2-year return-to-base	2-year	2-year return-to-base	2-year collect-and-return	2-year return-to-base
FULL REVIEW	TINYURL.COM/KLUXLGE	TINYURL.COM/O9WUF8S	TINYURL.COM/OZVQ6JQ	TINYURL.COM/QDV7234	TINYURL.COM/LS8696O

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Best family PCs	1 Chillblast Fusion Commando	2 Wired2Fire Diablo Reactor	3 Chillblast Fusion Pharoah	4 Mesh Elite 4670-PCA	5 Dino PC Raging Lizard V2
Price	£799 inc VAT	£668 inc VAT	£799 inc VAT	£799 inc VAT	£780 inc VAT
Website	Chillblast.com	Wired2fire.co.uk	Chillblast.com	Meshcomputers.com	Dinopc.com
Launch date	Jul 13	May 14	May 14	May 14	May 14
Build rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★½☆
Features rating	★★★★☆	★★★½☆	★★★★★	★★★★½	★★★½☆
Performance rating	★★★★½	★★★★½	★★★★★	★★★★½	★★★★☆
Value rating	★★★★☆	★★★★½	★★★★☆	★★★★☆	★★★★☆
Overall rating	★★★★½	★★★★½	★★★★½	★★★★☆	★★★★☆
Processor	3.2GHz Intel Core i5-4570	3.4GHz Intel Core i5-4670	3.5GHz Intel Core i5-4690	3.4GHz Intel Core i5-4670	3.5GHz Intel Core i5-4690
RAM	16GB DDR3	8GB DDR3 1600MHz	16GB DDR3 1600MHz	16GB DDR3 1600MHz	8GB DDR3 1600MHz
Storage	1TB HDD + 120GB SSD	1TB HDD	1TB HDD + 120GB SSD	2TB HDD + 120GB SSD	1TB HDD + 128GB SSD
Motherboard	Asus B85M-G	Asus B85M-G	Asus B85M-G	MSI B85M-E45	Gigabyte H97M-D3H
CPU cooler	Arctic Cooling Freezer 7 Pro	Standard Intel Cooler	Standard Intel Cooler	Standard Intel Cooler	Standard Intel Cooler
Power supply	600W CiT	500W FSP	500W FSP	500W FSP	500W CIT
Screen	23in Iiyama X2377	24in AOC E2495Sh	23in Asus VS239HV	24in Iiyama E2483HS-B1	24in Iiyama E2483HS-B1
Screen resolution	1920x1080	1920x1080	1920x1080	1920x1080	1920x1080
Graphics	Zotac nVidia GeForce GTX 650 Ti	AMD Radeon R7 265	AMD Radeon R7 265	nVidia GeForce GTX 750 Ti	nVidia GeForce GTX 750 Ti
Video memory	N/A	2GB	2GB	2GB	2GB
Connectivity	802.11b/g/n, gigabit ethernet	Gigabit ethernet	Gigabit ethernet	Gigabit ethernet	Gigabit ethernet, 802.11b/g/n
USB	3x USB 3.0, 6x USB 2.0	3x USB 3.0, 6x USB 2.0, 2x HDMI, VGA	3x USB 3.0, 6x USB 2.0, 2x DVI, 2x HDMI, DP, VGA	4x USB 3.0, 8x USB 2.0, HDMI, VGA, DVI-D, DVI, DP	5x USB 3.0, 3x USB 2.0, 2x HDMI (1x e-Mini), VGA, 2x DVI
Media card slot	None	None	None	None	None
Sound	Onboard	Onboard	Onboard	Onboard	Onboard
Speakers	2x Logitech LS220	None	None	None	None
Case	Cooler Master Force 500	Zalman Z3 Plus	Zalman Z3 Plus	Zalman Z3 Plus	Fractal Design Core 1000 USB3
Keyboard	Logitech MK260	Octigen wireless combo	Logitech MK270 (wireless combo)	Logitech MK270 (wireless combo)	Gigabyte KM6150 (wired combo)
Optical drive	LG BD-ROM/DVD±RW	LiteOn DVD±RW	LiteOn BD-ROM/DVD±RW	24x DVD RW	None
Operating system	Windows 8 64-bit	Windows 8.1 64-bit	Windows 8.1 64-bit	Windows 8.1 64-bit	Windows 8.1 64-bit
Bundled software	None	None	None	None	None
Sniper V2 Elite score (Low/High/Ultra)	147/59/14fps	240/76/18fps	240/76/18fps	195/68/16fps	196/83/20fps
Alien vs Predator score (720p/1080p)	52/27fps	83/44fps	83/44fps	71/37fps	102/53fps
PCMark 7 score	6177	3938	5953	7304	6431
Warranty	2-year collect-and-return	2-year return-to-base	5-year labour, 2-year collect-and-return	3-years labour (2-year parts, 3-months free C&R)	3-year labour (2-year parts)
FULL REVIEW	TINYURL.COM/KF6G3T7	TINYURL.COM/OA8UKDP	TINYURL.COM/K2KF83U	TINYURL.COM/OZCSHYU	TINYURL.COM/PFA55F7

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- Onboard High Definition Audio
- Microsoft Windows 8.1 64bit OEM

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Best gaming PCs	1 PC ADVISOR RECOMMENDED	2 PC ADVISOR RECOMMENDED	3	4	5
	Eclipse SuperNova i5r285oc	Dino PC Dark Spark GTX 960	Cyberpower Infinity Achilles	Chillblast Fusion Mantis	Vibox Wildfire
Price	£999 inc VAT	£999 inc VAT	£999 inc VAT	£749 inc VAT	£999 inc VAT
Website	Eclipsecomputers.com	Dinopc.com	Cyberpowersystem.co.uk	Chillblast.com	Vibox.co.uk
Launch date	Mar 15	Mar 15	Mar 15	Mar 15	Mar 15
Build rating	★★★★★	★★★★½	★★★★½	★★★★½	★★★★★
Features rating	★★★★★	★★★★★	★★★★½	★★★☆☆	★★★★☆
Performance rating	★★★★☆	★★★★☆	★★★★½	★★★½☆	★★★★☆
Value rating	★★★★☆	★★★★☆	★★★½☆	★★★★★	★★★★☆
Overall rating	★★★★½	★★★★½	★★★★½	★★★★½	★★★★
Processor	3.5GHz Intel Core i5-4690K (OC 4.4GHz)	3.5GHz Intel i5-4670K (OC 4.6GHz)	3.5GHz Intel Core i5-4690K	3.5GHz Intel Core i5-4690K (OC 4.2GHz)	3.5GHz Intel Core i5-4690K (OC 4,4GHz)
CPU cooler	Zalman CNPS11X Extreme	Be Quiet Pure Rock BK009	Cooler Master Seidon 120mm RL-S12M-FLNN-S1	Corsair H55 Water Cooler	Corsair H75 AIO CPU Cooler
Memory	16GB HyperX Savage	8GB DDR3	8GB DDR3	8GB DDR3	16GB DDR3
Storage	2TB HDD + 250GB SSD	1TB HDD + 120GB SSD	1TG HDD + 120GB SSD	1TB SSHD	1TB HDD + 240GB SSD
Power supply	550W XFX Core Edition	450W Corsair	600W Cooler Master	600W Corsair	650W Superflower Golden Green
Motherboard	Asus Z97-K	Gigabyte Z97X-Gaming 3	Gigabyte H81M-S2H	Gigabyte Z97-HD3	MSI Z97 Gaming 3
Operating system	Windows 8.1	Windows 8.1	Windows 8.1	Windows 8.1 64-bit	Windows 8.1
Screen	26in HKC 2615	24in Iiyama GE2488HS-B1	24in AOC E2470SWDA	None supplied	26in AOC E2470SWDA
Graphics	XFX AMD Radeon R9 285 DD Edition	Palit nVidia GeForce GTX 690	MSI nVidia GeForce GTX 970	MSI GeForce GTX 960	MSI GeForce GTX 960 Gaming
Sound	Onboard	Onboard	Onboard	Onboard	Onboard
Connectivity	Gigabit ethernet	Gigabit ethernet	Gigabit ethernet	Gigabit ethernet	Gigabit LAN
Ports	6x USB 3.0, 4x USB 2.0	6x USB 3.0, 4x USB 2.0, 2x PS/2, D-Sub, DVI-D, 6x SATA	6x USB 3.0, 3x USB 2.0, 2x DVI, HDMI, DP	6x USB 3.0, 2x USB 2.0, 2x DVI, HDMI, DP, PS/2	4x USB 3.0, 2x USB 2.0, VGA, DVI, HDMI, DP
Optical drive	Samsung DVD±RW	None	None	None	External USB DVD±RW
Case	XFX Type 1 Bravo	NZXT Source 340	NZXT Source 340 Black	NZXT Source 340	NZXT H440 Red
Keyboard & mouse	Cooler Master Storm Devastator Set	Corsair	Cooler Master Devastator Keyboard and Mouse	None	Cooler Master Devastator Keyboard and Mouse
Other	None	Corsair Raptor Bundle	None	Chillblast Family Software pack (optional)	White internal LED lighting kit
PCMark 7 score	7931	7090	5945	5823	7095
Alien vs Predator score (720p/1080p)	111.4/59.8fps	103.4/54.7	167.8/89fps	104.2/55.2fps	113.5/59.7fps
Final Fantasy XIV (Maximum)	91fps	86fps	120fps	86fps	95fps
Sniper Elite V2 (Low/Medium/Ultra)	292.1/106.8/26.5fps	285.6/123.6/28.9fps	281.1/192.9/48.1fpsfps	289.3/123.8/29fps	316.8/136.2/31.9fps
Power Consumption	76/432W	77/310W	48/261W	50/277W	69/307W
Warranty	3-year return-to-base	3-year PromoCare	2-year parts, 3-year return-to-base, 30-day C&R	5-year labour (2-year collect-and-return)	1-year parts and labour (90-day collect-and-return)
FULL REVIEW	TINYURL.COM/K5AJLBO	TINYURL.COM/MVBK6KX	TINYURL.COM/KKKRXAD	TINYURL.COM/L5H9ZDR	TINYURL.COM/L7XU6YD

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All-in-one PCs	1 Apple iMac with 5K display	2 Acer Aspire AZ3-615	3 Chillblast Volante AIO	4 Asus Eee Top	5 HP Envy Beats 23-n001na
Price	£1,999 inc VAT	£799 inc VAT	£1,299 inc VAT	£799 inc VAT	£900 inc VAT
Website	Apple.com/uk	Acer.co.uk	Chillblast.com	Asus.com/uk	Hp.com/uk
Launch date	Dec 14	Dec 14	Dec 14	Dec 14	Dec 14
Build rating	★★★★★	★★★★½	★★★	★★★★½	★★★★
Features rating	★★★★★	★★½	★★★★	★★★★	★★★
Performance rating	★★★★	★★★★½	★★★★★	★★½	★★★½
Value rating	★★★★½	★★★★	★★★★	★★★	★★★★½
Overall rating	★★★★★	★★★★	★★★★	★★★★	★★★★
Processor	3.9GHz Intel Core i5-4690	2.7GHz Intel Core i5-4460T	4GHz Intel Core i7-4790S	2.6GHz Intel Core i5-4200U	3.2GHz Intel Core i7-4785T
RAM	8GB DDR3	8GB DDR3	16GB DDR3	6GB DDR3	8GB DDR3
Storage	1TB Fusion Drive	1TB HDD	1TB SSD	1TB HDD	1TB HDD
Screen	27in	23in touchscreen	24in	23in touchscreen	23in touchscreen
Screen resolution	5120x2880	1920x1080	1920x1080	1920x1080	1920x1080
Graphics card	AMD Radeon M9 M290X	nVidia GeForce GT 840M	nVidia GeForce GT 750M	Intel HD Graphics 4400	Intel HD Graphics 4600
Video memory	2GB	2GB	2GB	N/A	N/A
Wireless	802.11b/g/n	802.11b/g/n	802.11b/g/n	802.11b/g/n	802.11b/g/n
Ethernet	Gigabit	Gigabit	Gigabit	Gigabit	Gigabit
Bluetooth	✗	✗	✗	✗	✗
USB	4x USB 3.0	2x USB 3.0, 3x USB 2.0	4x USB 3.0, 2x USB 2.0	3x USB 3.0, 3x USB 2.0	2x USB 3.0, 4x USB 2.0
FireWire	✗	✗	✗	✗	✗
Thunderbolt	✓	✗	✗	✗	✗
HDMI	✗	✗	✓	✓	✓
Media card slot	✓	✓	✓	✓	✓
Optical drive	None	DVD Writer	Blu-Ray Combo	DVD Writer	DVD Writer
Other	Final Cut Pro X, Logic Pro X, Aperture	1Mp webcam, wireless keyboard and mouse	Logitech MK520 wireless keyboard and mouse	2Mp webcam, Freeview TV, wireless keyboard and mouse	Wireless keyboard and mouse, Beats Audio stereo speaker system (8x 12W)
Operating system	OS X Yosemite	Windows 8.1 64-bit	Windows 8.1 64-bit	Windows 8.1 64-bit	Windows 8.1 64-bit
Power consumption (idle/max)	46/215W	46/91W	35/177W	33/69W	43/81W
Sniper V2 Elite (Low/High/Ultra)	113.8/84/21.2fps	47.7/18.7/5.1fps	91.5/41.2/10.5fps	31.4/7.8/5fps	27.7/7.4/5fps
PCMark 8 Home score	4008	2906	3776	2828	2702
Dimensions	650x203x516mm	540x489x579mm	585x200x450mm	571x359x50-214mm	563x143x413mm
Weight	9.54kg	8.8kg	14.6kg	9kg	8.4kg
Warranty	1-year return-to-base	Not stated	5-year labour (2-year collect-and-return)	1-year return-to-base	1-year limited parts, labour, and pickup-and-return service
FULL REVIEW	TINYURL.COM/NWJUJSF	TINYURL.COM/QEY8FOE	TINYURL.COM/LO8A5MC	TINYURL.COM/PRPHC7L	TINYURL.COM/O6M4BCN

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Best smartphones	1 PC ADVISOR GOLD	2 PC ADVISOR RECOMMENDED	3 PC ADVISOR GOLD	4 PC ADVISOR RECOMMENDED	5 PC ADVISOR RECOMMENDED
	LG G3	Samsung Galaxy S6	Sony Xperia Z3 Compact	HTC One M9	Apple iPhone 6
Price	£479 inc VAT	£349 inc VAT	£349 inc VAT	£579 inc VAT	£550 inc VAT
Website	Lg.com/uk	Samsung.com/uk	Sony.co.uk	HTC.com/uk	Apple.com/uk
Launch date	May 14	Apr 15	Sep 14	Mar 15	Oct 14
Build rating	★★★★½	★★★★½	★★★★½	★★★★½	★★★★½
Features rating	★★★★½	★★★★½	★★★★☆	★★★★☆	★★★★☆
Performance rating	★★★★½	★★★★½	★★★★½	★★★★☆	★★★★½
Value rating	★★★★½	★★★★☆	★★★★★	★★★½☆	★★★½☆
Overall rating	★★★★½	★★★★½	★★★★½	★★★★☆	★★★★☆
OS (out of box)	Android 4.4 KitKat	Android 5.0 Lollipop	Android 4.4 KitKat	Android 5.0 Lollipop	iOS 8.3
Processor	2.5GHz Snapdragon 801	2.1GHz Exynos 7420	2.5GHz Snapdragon 801	Snapdragon 810 octa-core	Apple A8
RAM	2GB/3GB	3GB	2GB	3GB	1GB
Storage	16GB/32GB	32/64GB	16GB	32GB	16/64/128GB
MicroSD support	No	No	Up to 128GB	Up to 128GB	No
Graphics	Adreno 330	Mali-T760 GPU	Adreno 330	Adreno 430	Apple A8
Screen size	5.5in	5.1in	4.6in	5in	4.7in
Screen resolution	1440x2560	1440x2560	720x1280	1080x1920	1334x750
Pixel density	534ppi	577ppi	319ppi	441ppi	326ppi
Screen technology	IPS	Super AMOLED	IPS	IPS	IPS
Front camera	2Mp	5Mp	2.2Mp	4Mp (UltraPixel)	1.2Mp
Rear camera	13Mp, LED flash	16Mp, LED flash	20.7Mp, LED flash	20Mp	8Mp, LED flash
Video recording	4K	4K	4K	4K	1080p
Cellular connectivity	4G	4G	4G	4G	4G
SIM type	Micro-SIM	Nano-SIM	Nano-SIM	Nano-SIM	Nano-SIM
Dual-SIM as standard	No	No	No	No	No
Wi-Fi	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band
Bluetooth	Bluetooth 4.0 (aptX)	Bluetooth 4.1	Bluetooth 4.0	Bluetooth 4.1 (aptX)	Bluetooth 4.0
GPS	A-GPS, Glonass	GPS, Glonass	A-GPS, Glonass	GPS, Glonass	GPS, Glonass
NFC	Yes	Yes	Yes	Yes	Yes, but only for Apple Pay
USB OTG	Yes	Yes	Yes	Yes	Yes
Extra features	24-bit/192kHz audio, rear key	Heart-rate sensor, fingerprint scanner	Waterproof, PS4 Remote Play	BoomSound speakers	TouchID fingerprint scanner
Geekbench 3.0 (single)	Not tested	1347	Not tested	1160	1569
Geekbench 3.0 (multi)	2465	4438	2800	3378	2794
SunSpider	959ms	1048ms	944ms	867ms	351ms
GFXBench: T-Rex	20fps	30fps	41fps	50fps	49.1fps
GFXBench: Manhattan	Not tested	14fps	26fps	24fps	26fps
Battery	3000mAh, removable, Qi	2550mAh, non-removable	2600mAh, non-removable	2840mAh, non-removable	2915mAh, non-removable
Dimensions	75x146x8.9mm	143.4x70.5x6.8mm	64.9x127x8.6mm	70x145x9.7mm	138.1x67x6.9mm
Weight	149g	138g	129g	157g	129g
Warranty	1 year	1 year	2 years	1 year	1 year
FULL REVIEW	TINYURL.COM/OA76T73	TINYURL.COM/PC2KOYQ	TINYURL.COM/NBBUY82	TINYURL.COM/PUS2XEJ	TINYURL.COM/NZM859P
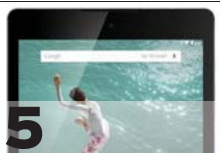
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Best budget smartphones

	Motorola Moto G 3G 2014	Motorola Moto E 4G 2015	Motorola Moto G 4G 2014	Motorola Moto G 4G 2015	Doogee F1 Turbo Mini
	1 PC ADVISOR RECOMMENDED	2 PC ADVISOR RECOMMENDED	3 PC ADVISOR RECOMMENDED	4	5 PC ADVISOR RECOMMENDED
Price	£140 inc VAT	£109 inc VAT	£117 inc VAT	£149 inc VAT	£102 inc VAT
Website	Motorola.co.uk	Motorola.co.uk	Motorola.co.uk	Motorola.co.uk	Coolicool.com
Launch date	Sep 14	Feb 15	May 14	Mar 15	Jan 15
Build rating	★★★★☆	★★★★☆	★★★★½	★★★★☆	★★★★☆
Features rating	★★★★☆	★★★★☆	★★★★☆	★★★½☆	★★★★☆
Performance rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Value rating	★★★★☆	★★★★★	★★★★★	★★★★☆	★★★★½
Overall rating	★★★★☆	★★★★☆	★★★★½	★★★★☆	★★★★☆
OS (out of box)	Android 4.4 KitKat	Android 5.0 Lollipop	Android 4.4 KitKat	Android 5.0 Lollipop	Android 4.4 KitKat
Processor	1.2GHz Snapdragon 400	1.2GHz Snapdragon 410	1.2GHz Snapdragon 400	1.2GHz Snapdragon 400	1.5GHz MediaTek MT6732
RAM	1GB	1GB	1GB	1GB	1GB
Storage	8GB	8GB	8GB	8GB	8GB
MicroSD support	Up to 32GB	Up to 32GB	Up to 32GB	Up to 32GB	Up to 64GB
Graphics	Adreno 305	Adreno 306	Adreno 305	Adreno 305	ARM Mali-T760
Screen size	5in	4.5in	4.5in	5in	4.5in
Screen resolution	720x1280	540x960	720x1280	720x1280	540x960
Pixel density	294ppi	245ppi	326ppi	294ppi	245ppi
Screen technology	IPS	IPS	IPS	IPS	IPS
Front camera	2Mp	0.3Mp	1.3Mp	2Mp	5Mp
Rear camera	8Mp, LED flash	5Mp	5Mp, LED flash	8Mp, LED flash	8Mp, LED flash
Video recording	720p	720p	720p	720p	720p
Cellular connectivity	3G	4G	4G	4G	4G
SIM type	Micro-SIM	Micro-SIM	Micro-SIM	Micro-SIM	Micro-SIM + Mini-SIM
Dual-SIM as standard	Yes	No	No	No	Yes, dual-standby
Wi-Fi	802.11b/g/n	802.11b/g/n	802.11b/g/n	802.11b/g/n	802.11b/g/n
Bluetooth	Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.0
GPS	A-GPS, Glonass	GPS, A-GPS, Glonass	A-GPS, Glonass	A-GPS, Glonass	GPS
NFC	No	No	No	No	No (HotKnot)
USB OTG	Yes	No	Yes	Yes	Yes
Extra features	Stereo speakers	Double-twist launches camera, lockscreen alerts	None	Stereo speakers	Useful gestures, Visitor mode
Geekbench 3.0 (single)	340	464	334	345	647
Geekbench 3.0 (multi)	1144	1463	1168	1182	1947
SunSpider	1526ms	1301ms	1504ms	1968ms	1133ms
GFXBench: T-Rex	11fps	13fps	11fps	11fps	25fps
GFXBench: Manhattan	4fps	6fps	Not tested	4fps	13fps
Battery	2390mAh, non-removable	2390mAh, non-removable	2070mAh, non-removable	2390mAh, non-removable	2000mAh, removable
Dimensions	71x142x11mm	66.8x5.2-12.3x129.9mm	66x130x11.6mm	71x142x11mm	65x8x132mm
Weight	155g	145g	143g	155g	112g
Warranty	1 year	1 year	1 year	1 year	See Coolicool.com
FULL REVIEW	TINYURL.COM/OAE6AH5	TINYURL.COM/Q7Q9NXR	TINYURL.COM/Q7Q9NXR	TINYURL.COM/Q9RQCKU	TINYURL.COM/NCOJXHN

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Best phablets	Samsung Galaxy Note 4	LG G3	OnePlus One	Google Nexus 6	Apple iPhone 6 Plus
	1 PC ADVISOR RECOMMENDED	2 PC ADVISOR GOLD	3 PC ADVISOR GOLD	4	5 PC ADVISOR RECOMMENDED
Price	£599 inc VAT	£479 inc VAT	£229 inc VAT	£499 inc VAT	£619 inc VAT
Website	Samsung.com/uk	Lg.com/uk	Oneplus.net	Play.google.com	Apple.com/uk
Launch date	Sep 14	May 14	Jul 14	Oct 14	Sep 14
Build rating	★★★★☆	★★★★⯪	★★★★☆	★★★★☆	★★★★☆
Features rating	★★★★⯪	★★★★⯪	★★★⯪☆	★★★★☆	★★★★⯪
Performance rating	★★★★☆	★★★★⯪	★★★★☆	★★★★☆	★★★★☆
Value rating	★★★★☆	★★★★⯪	★★★★★	★★★⯪☆	★★★⯪☆
Overall rating	★★★★☆	★★★★⯪	★★★★⯪	★★★★☆	★★★★☆
OS (out of box)	Android 4.4 KitKat	Android 4.4 KitKat	Cyanogen 11S (Android 4.4)	Android 5.0 Lollipop	iOS 8
Processor	2.7GHz Snapdragon 805	2.5GHz Snapdragon 801	2.5GHz Snapdragon 801	2.7GHz Snapdragon 805	Apple A8
RAM	3GB	2GB/3GB	3GB	3GB	1GB
Storage	32GB	16GB/32GB	16GB/64GB	32GB/64GB	16GB/64GB/128GB
MicroSD support	Up to 128GB	No	No	No	No
Graphics	Adreno 420	Adreno 330	Adreno 330	Adreno 420	Apple M8
Screen size	5.7in	5.5in	5.5in	5.96in	5.5in
Screen resolution	1440x2560	1440x2560	1920x1080	1440x2560	1920x1080
Pixel density	515ppi	534ppi	401ppi	493ppi	401ppi
Screen technology	Super AMOLED	IPS	IPS	IPS	IPS
Front camera	3.7Mp	2Mp	5Mp	2Mp	1.2Mp
Rear camera	16Mp, LED flash	13Mp, LED flash	13Mp, LED flash	13Mp, LED flash	8Mp, LED flash
Video recording	4K	4K	4K	4K	1080p
Cellular connectivity	4G	4G	4G	4G	4G
SIM type	Micro-SIM	Micro-SIM	Micro-SIM	Nano-SIM	Nano-SIM
Dual-SIM as standard	No	No	No	No	No
Wi-Fi	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band	802.11b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band
Bluetooth	Bluetooth 4.1	Bluetooth 4.0 (aptX)	Bluetooth 4.0	Bluetooth 4.1	Bluetooth 4.0
GPS	GPS, Glonass	A-GPS, Glonass	GPS, Glonass	GPS, Glonass	GPS, Glonass
NFC	Yes	Yes	Yes	Yes	Yes, but only for Apple Pay
USB OTG	Yes	Yes	Yes	Yes	No
Extra features	Fingerprint, UV, heart-rate sensors, S Pen stylus	24bit/192kHz audio, rear key	None	None	TouchID fingerprint scanner
Geekbench 3.0 (single)	Not tested	Not tested	969	Not tested	Not tested
Geekbench 3.0 (multi)	3272	2465	2570	3304	2917
SunSpider	1367ms	959ms	877ms	791ms	369ms
GFXBench: T-Rex	27fps	20fps	29fps	27fps	41fps
GFXBench: Manhattan	11fps	Not tested	Not tested	12fps	19fps
Battery	3220mAh, removable	3000mAh, removable, Qi	3100mAh, non-removable	3220mAh, non-removable, Qi	2915mAh, non-removable
Dimensions	78.6x153.5x8.5mm	75x146x8.9mm	75.9x152.9x8.9mm	82x159x10.4mm	77.8x158.1x7.1mm
Weight	176g	149g	162g	183g	172g
Warranty	2 years	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/PNHJCZ4	TINYURL.COM/OA76T73	TINYURL.COM/PK3S5CP	TINYURL.COM/NLZ4UD9	TINYURL.COM/O9RX9UN

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Best 7- & 8in tablets	**1** Google Nexus 7	**2** Samsung Galaxy Tab S 8.4	**3** Sony Xperia Z3 Tablet Compact	**4** Apple iPad mini 2	**5** Google Nexus 9
Price	£199 inc VAT	£319 inc VAT	£299 inc VAT	£239 inc VAT	£319 inc VAT
Website	Play.google.com	Samsung.com/uk	Sony.co.uk	Apple.com/uk	Play.google.com
Launch date	Aug 13	Aug 14	Sep 14	Oct 13	Oct 14
Build rating	★★★★☆	★★★★☆	★★★★☆	★★★★⯪	★★★⯪☆
Features rating	★★★★⯪	★★★★⯪	★★★★⯪	★★★★☆	★★★★☆
Performance rating	★★★★⯪	★★★★⯪	★★★★⯪	★★★★⯪	★★★★⯪
Value rating	★★★★⯪	★★★★⯪	★★★★☆	★★★★☆	★★★★☆
Overall rating	★★★★⯪	★★★★⯪	★★★★⯪	★★★★⯪	★★★★☆
OS (out of box)	Android 4.3 Jelly Bean	Android 4.4 KitKat	Android 4.4 KitKat	iOS 8.2	Android 5.0 Lollipop
Processor	1.5GHz Snapdragon S4 Pro	Exynos 5420, octa-core	2.5GHz Snapdragon 801	Apple A7, Apple M7	2.3GHz nVidia Tegra K1
RAM	2GB	3GB	3GB	1GB	2GB
Storage	16GB/32GB	16GB/32GB	16GB/32GB	16GB/32GB	16GB/32GB
MicroSD support	No	Up to 128GB	Up to 128GB	No	No
Graphics	Adreno 320	ARM Mali-T628 MP6	Adreno 330	Apple A7	192-core Kepler
Screen size	7in	8.4in	8in	7.9in	8.9in
Screen resolution	1920x1200	2560x1440	1920x1200	2048x1536	2048x1536
Pixel density	323ppi	359ppi	283ppi	326ppi	287ppi
Screen technology	IPS	Super AMOLED	IPS	IPS	IPS
Front camera	1.2Mp	2.1Mp	2.2Mp	1.2Mp	1.6Mp
Rear camera	5Mp	8Mp, LED flash	8.1Mp	5Mp	8Mp, LED flash
Video recording	1080p	1080p	1080p	1080p	1080p
Cellular connectivity	4G version available	4G version available	4G version available	4G version available	4G version available
Wi-Fi	802.11b/g/n, dual-band	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n, dual-band	802.11a/b/g/n/ac, dual-band
Bluetooth	Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.1
GPS	GPS, Glonass	GPS, Glonass	A-GPS, Glonass	A-GPS, Glonass	GPS, Glonass
NFC	Yes	No	Yes	No	Yes
USB OTG	Yes	Yes	Yes	No	Yes
Fingerprint scanner	No	Yes	No	No	No
Waterproof	No	No	Yes	No	No
Extra features	None	Stereo speakers	PS4 Remote Play, stereo speakers	None	BoomSound speakers
Geekbench 3.0 (single)	Not tested	Not tested	Not tested	Not tested	1904
Geekbench 3.0 (multi)	Not tested	2765	2708	Not tested	3352
SunSpider	1136ms	1089ms	1017ms	397ms	955ms
GFXBench: T-Rex	Not tested	14fps	28fps	Not tested	48fps
GFXBench: Manhattan	Not tested	3fps	11fps	Not tested	22fps
Battery	3950mAh, non-removable, Qi	4900mAh, non-removable	4500mAh, non-removable	6470mAh, non-removable	6700mAh, non-removable
Dimensions	200x114x8.65mm	126x213x6.6mm	213x124x6.4mm	134.7x7.5x200mm	153.7x228.3x8mm
Weight	299g	294g	270g	331g	425g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/PUJDJBY	TINYURL.COM/OUEM64Z	TINYURL.COM/NJ6VHEO	TINYURL.COM/PCJPB5L	TINYURL.COM/NQ6K77Y

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PC ADVISOR TEST CENTRE

Best 9- & 10in tablets	Apple iPad Air 2	Samsung Galaxy Tab S 10.5	Sony Xperia Z2 Tablet	Apple iPad Air	Google Nexus 10
	1 PC ADVISOR GOLD	2 PC ADVISOR RECOMMENDED	3 PC ADVISOR RECOMMENDED	4 PC ADVISOR RECOMMENDED	5 PC ADVISOR RECOMMENDED
Price	£399 inc VAT	£399 inc VAT	£369 inc VAT	£319 inc VAT	£389 inc VAT
Website	Apple.com/uk	Samsung.com/uk	Sony.co.uk	Apple.com/uk	Play.google.com
Launch date	Oct 14	Aug 14	Mar 14	Oct 13	Oct 12
Build rating	★★★★★	★★★★☆	★★★★½	★★★★☆	★★★★½
Features rating	★★★★½	★★★★½	★★★★½	★★★★½	★★★★½
Performance rating	★★★★½	★★★★½	★★★★½	★★★★½	★★★★½
Value rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★½
Overall rating	★★★★½	★★★★½	★★★★½	★★★★☆	★★★★½
OS (out of box)	iOS 8.2	Android 4.4 KitKat	Android 4.4 KitKat	iOS 8.2	Android 4.2 Jelly Bean
Processor	Apple A8X, Apple M8	Exynos 5420, octa-core	2.3GHz Snapdragon 801	Apple A7, Apple M7	1.7GHz Exynos 5250
RAM	2GB	3GB	3GB	1GB	2GB
Storage	16GB/64GB/128GB	16GB/32GB	16GB	16GB/32GB	16GB/32GB
MicroSD support	No	Up to 128GB	Up to 64GB	No	No
Graphics	Apple A8X	ARM Mali-T628 MP6	Adreno 330	Apple A7	ARM Mali T604
Screen size	9.7in	10.5in	10.1in	9.7in	10.1in
Screen resolution	2048x1536	2560x1600	1920x1200	2048x1536	2560x1600
Pixel density	264ppi	288ppi	224ppi	264ppi	300ppi
Screen technology	IPS	Super AMOLED	IPS	IPS	IPS
Front camera	1.2Mp	2.1Mp	2.2Mp	1.2Mp	1.9Mp
Rear camera	8Mp	8Mp, LED flash	8.1Mp	5Mp	5Mp, LED flash
Video recording	1080p	1080p	1080p	1080p	1080p
Cellular connectivity	4G version available	4G version available	4G version available	4G version available	No
Wi-Fi	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n, dual-band	802.11b/g/n, dual-band
Bluetooth	Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.0
GPS	A-GPS, Glonass	GPS, Glonass	GPS, Glonass	A-GPS, Glonass	GPS, Glonass
NFC	Yes (for Apple Pay)	No	Yes	No	Yes
USB OTG	No	Yes	Yes	No	Yes
Fingerprint scanner	Yes	Yes	No	No	No
Waterproof	No	No	Yes	No	No
Extra features	None	Stereo speakers	PlayStation certified	None	None
Geekbench 3.0 (single)	1816	Not tested	967	1487	Not tested
Geekbench 3.0 (multi)	4523	2769	2719	2703	Not tested
SunSpider	Not tested	1079ms	1099ms	400ms	1329ms
GFXBench: T-Rex	48fps	14fps	27fps	23fps	Not tested
GFXBench: Manhattan	Not tested	3fps	Not tested	Not tested	Not tested
Battery	7340mAh, non-removable	7900mAh, non-removable	6000mAh, non-removable	8600mAh, non-removable	9000mAh, non-removable
Dimensions	240x169.5x6.1mm	247x177x6.6mm	266x172x6.4mm	240x169x7.5mm	264x178x8.9mm
Weight	437g	465g	439g	469g	603g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/PLQXWSZ	TINYURL.COM/OESDFZQ	TINYURL.COM/M8BZZUN	TINYURL.COM/NVOOF6H	TINYURL.COM/PUAG9RN

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Best smartwatches

	1 LG G Watch R	2 Motorola Moto 360	3 Sony Smartwatch 3	4 Asus ZenWatch	5 LG G Watch
Price	£195 inc VAT	£199 inc VAT	£189 inc VAT	£199 inc VAT	£159 inc VAT
Website	Lg.com/uk	Motorola.co.uk	Sony.co.uk	Uk.asus.com	Lg.com/uk
Launch date	Nov 14	Oct 14	Sep 14	Jan 15	Jul 14
Overall rating	★★★★½	★★★★½	★★★½	★★★½	★★★★
Operating system	Android Wear	Android Wear	Android Wear	Android Wear	Android Wear
Compatibility	Android	Android	Android	Android	Android
Display	1.3in 320x320 P-OLED	1.56in 290x320 LCD	1.6in 320x320 LCD	1.6in 320x320 AMOLED	1.65in 280x280 IPS
Processor	1.2GHz Snapdrgon 400	TI OMAP 3	1.2GHz ARM V7	1.2GHz Snapdragon 400	1.2GHz Snapdragon 400
RAM	512MB	512MB	512MB	512MB	512MB
Storage	4GB	4GB	4GB	4GB	4GB
Waterproof	Yes	Yes	Yes	Yes	Yes
Battery	410mAh	320mAh	420mAh	1.4Wh	400mAh
Dimensions	46.4x53.6x9.7mm	46x11.5mm	36x51x10mm	51 x39.9x7.9-9.4mm	37.9x46.5x9.95mm
Weight	62g	49g (leather band model)	45g	75g	63g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/QATY8FT	TINYURL.COM/O9C69K6	TINYURL.COM/OQVZ3PN	TINYURL.COM/NN7GA7W	TINYURL.COM/Q84WL6L

Best smartwatches

	6 Pebble Steel	7 Sony Smartwatch 2	8 Samsung Gear 2 Neo	9 Martian Notifier	10 Samsung Gear 2
Price	£179 inc VAT	£125 inc VAT	£169 inc VAT	£99 inc VAT	£260 inc VAT
Website	Getpebble.com	Sony.co.uk	Samsung.com/uk	Martianwatches.com	Samsung.com/uk
Launch date	Sep 14	Jun 13	Apr 14	Dec 14	Apr 14
Overall rating	★★★★	★★★★	★★★★	★★★★	★★★½
Operating system	Proprietary	Proprietary	Tizen	Proprietary	Tizen
Compatibility	iOS, Android	Android	Samsung phones	iOS, Android	Samsung phones
Display	1.26in 144x168 E-Paper	1.6in 220x176 LCD	1.6in 320x320 Super AMOLED	1.01in 96x16 OLED	1.6in 320x320 Super AMOLED
Processor	Not specified	Not specified	Dual-core	Not specified	1GHz dual-core
RAM	512MB	Not specified	512MB	Not specified	512MB
Storage	Not specified	Not specified	4GB	Not specified	4GB
Waterproof	Yes	Yes	Yes	Yes	Yes
Battery	130mAh	Not specified	300mAh	Not specified	300mAh
Dimensions	46x34x10.5mm	42x41x9mm	58.8x37.9x10mm	43x43x12.7mm	36.9x58.4x10mm
Weight	156g	123g	55g	52g	68g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/PPBXV7J	TINYURL.COM/P4X7AZM	TINYURL.COM/Q68FS5U	TINYURL.COM/NS9E8GK	TINYURL.COM/QXCZ8J3

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Best activity trackers

	1	2	3	4	5
	Fitbit Charge HR	**Fitbit Surge**	**Fitbit Charge**	**Fitbit One**	**Basis Peak**
Price	£119 inc VAT	£199 inc VAT	£99 inc VAT	£79 inc VAT	£169 inc VAT
Website	Fitbit.com/uk	Fitbit.com/uk	Fitbit.com/uk	Fitbit.com/uk	En-gb.mybasis.com
Launch date	Jan 15	Jan 15	Nov 14	Jan 14	Apr 15
Overall rating	★★★★½	★★★★½	★★★★☆	★★★★½	★★★½☆
Compatibility	iOS, Android, Windows	iOS, Android, Windows	iOS, Android, Windows	iOS, Android	iOS, Android
Display	OLED	Touchscreen	OLED	OLED	E-Ink
Pedometer	Yes	Yes	Yes	Yes	Yes
Heart-rate monitor	Yes	Yes	No	No	Yes
Sleep tracking	Yes	Yes	Yes	Yes	Yes
Alarm	Yes	Yes	Yes	Yes	No
Third-party app synching	Yes	Yes	Yes	Yes	No
Call notifications	Yes	Yes	Yes	No	Yes
Waterproof	Yes	Yes	Yes	No	Yes
Battery life	5+ days	5 days	7-10 days	10-14 days	4 days
Dimensions, weight	21.1mm, 26g	34mm, 51g	21.1mm, 24g	35.5x28x9.65mm, 8g	33x43x10mm, 51g
FULL REVIEW	TINYURL.COM/PCKV4SU	TINYURL.COM/O83DR47	TINYURL.COM/PFMQ9KH	TINYURL.COM/PT2TC6F	TINYURL.COM/LHMQ2AC

Best activity trackers

	6	7	8	9	10
	Xiaomi Mi Band	**Jawbone Up Move**	**Jawbone Up24**	**Misfit Flash**	**Withings Activité**
Price	£29 inc VAT	£39 inc VAT	£99 inc VAT	£49 inc VAT	£320 inc VAT
Website	Mobilefun.co.uk	Jawbone.com	Jawbone.com	Misfit.com	Withings.com
Launch date	Feb 15	Nov 14	Mar 14	Sep 14	Oct 14
Overall rating	★★★★½	★★★★☆	★★★½☆	★★★½☆	★★★★☆
Compatibility	iOS, Android	iOS, Android	iOS, Android	iOS, Android	iOS, Android
Display	No	No	No	No	Clock face
Pedometer	Yes	Yes	Yes	Yes	Yes
Heart-rate monitor	No	No	No	No	No
Sleep tracking	Yes	Yes	Yes	Yes	Yes
Alarm	Yes	No	Yes	Yes	Yes
Third-party app synching	No	Yes	Yes	Yes	No
Call notfications	Yes	No	No	No	No
Waterproof	Yes	Splashproof	Splashproof	Yes	Yes
Battery life	30 days	Six months, non-rechargable	7 days	Six months, non-rechargable	Eight months, non-rechargeable
Dimensions, weight	157-205mm, 13g	27.6x27.6x9.8mm, 6.8g	S: 19g, M: 22g, L: 23g	28.5x8.0x28.5mm, 6g	36.3x195mm, 37g
FULL REVIEW	TINYURL.COM/QZ3YVCR	TINYURL.COM/PFXQFNE	TINYURL.COM/ND8YMB8	TINYURL.COM/NPZZB9E	TINYURL.COM/OMBEHEG

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Best budget printers

	1 Samsung Xpress M2070W	2 Canon Pixma MG5550	3 Canon i-Sensys LBP6230dw	4 Samsung Xpress M2022W	5 Canon Pixma MX535
Price	£100 inc VAT	£60 inc VAT	£91 inc VAT	£68 inc VAT	£70 inc VAT
Website	Samsung.com/uk	Canon.co.uk	Canon.co.uk	Samsung.com/uk	Canon.co.uk
Launch date	Mar 14	Apr 14	Mar 15	Aug 14	Jul 14
Overall rating	★★★★½	★★★★☆	★★★★½	★★★★☆	★★★★☆
Technology	Mono laser	Colour inkjet	Mono laser	Mono laser	Colour inkjet
Max print resolution	1200x1200	4800x1200dpi	1200x1200dpi	1200x1200dpi	4800x1200dpi
Actual print speed	B=17.1ppm	B=11.8ppm C=8.7ppm	B=22.2ppm	B=18ppm	B=9.7ppm C=3.8ppm
Scan/fax facilities	1200x1200 scans	1200x2400 scans	None	None	1200x2400 scans/fax
Supported interfaces	USB 2.0, 802.11b/g/n, NFC	USB 2.0, 802.11b/g/n	USB 2.0, 802.11b/g/n	USB 2.0, 802.11b/g/n	USB 2.0, 802.11b/g/n, AirPrint
Cost per page	B=3.8p	B=2.4p C=4.8p	B=2p	B=5p	B=2.7p C=4.8p
Media card/auto duplex	✗✗	✗✓	✗✓	✗✗	✗✓
Input capacity	150 sheets	100 sheets	250 sheets	150 sheets	100 sheets + 30-sheet ADF
Dimensions	406x360x253mm	455x369x148mm	379x293x243mm	332x215x178mm	458x385x200mm
Weight	7.4kg	6.3kg	7kg	4kg	8.5kg
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/OYZKJKE	TINYURL.COM/LKWLJDE	TINYURL.COM/KZW8VU3	TINYURL.COM/NFJHDOR	TINYURL.COM/N9LXVN7

Best printers

	1 Canon i-Sensys MF6180dw	2 Epson Ecotank L555	3 Brother HL-L9200CDWT	4 HP OfficeJet Pro X551dw	5 Kyocera Ecosys P6030cdn
Price	£320 inc VAT	£330 inc VAT	£548 inc VAT	£275 inc VAT	£546 inc VAT
Website	Canon.co.uk	Epson.co.uk	Brother.co.uk	Hp.com/uk	Kyoceradocumentsolutions.co.uk
Launch date	May 14	Jan 15	Aug 14	Aug 13	Jul 14
Overall rating	★★★★½	★★★★☆	★★★★½	★★★★½	★★★★☆
Technology	Mono laser	Colour inkjet	Colour laser	Colour inkjet	Colour laser
Max print resolution	1200x600dpi	5760x1440dpi	2400x600dpi	2400x2400	9600x600dpi
Actual print speed	B=24ppm	B=8.5ppm C=4ppm	B=30ppm C=30ppm	B=42.9ppm C=15.8ppm	B=27ppm C=27ppm
Scan/fax facilities	600dpi scanner, 33.6Kb/s fax	1200dpi scanner, 33.6Kb/s fax	None	None	None
Supported interfaces	USB 2.0, ethernet, 802.11b/g/n	USB 2.0, 802.11b/g/n	USB 2.0, ethernet, 802.11b/g/n	USB 2.0, ethernet, 802.11b/g/n	USB 2.0
Cost per page	B=1.5p	B=0.2p C=0.4p	B=1p C=5.9p	B=1p C=4.3p	B=1.2p C=1.7p
Media card/auto duplex	✗✓	✗✗	✗✓	✗✓	✗✓
Input capacity	250 + 50 sheet + 50 ADF	100 + 30 sheet	750 sheets + 50 sheet	500 + 50 sheet	500 sheets + 150 (2150 max)
Dimensions	390x473x431mm	474x377x226mm	410x495x445mm	517x399x414mm	345x518x480mm
Weight	19.1kg	6.2kg	28.3kg	17.1kg	29.5kg
Warranty	1 year	1 year	1 year	1 year	2 years
FULL REVIEW	TINYURL.COM/LE9WA5N	TINYURL.COM/N8NS5QL	TINYURL.COM/PT52MH6	TINYURL.COM/CZO5P65	TINYURL.COM/N4MCYLF

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Best wireless routers

	1 Apple AirPort Extreme PC ADVISOR BEST BUY	2 Netgear Nighthawk R7000 PC ADVISOR RECOMMENDED	3 D-Link DIR 880L PC ADVISOR RECOMMENDED	4 TP-Link Archer C7 PC ADVISOR RECOMMENDED	5 Asus RT-AC68U AC1900 PC ADVISOR RECOMMENDED
Price	£169 inc VAT	£150 inc VAT	£108 inc VAT	£90 inc VAT	£160 inc VAT
Website	Apple.com/uk	Netgear.co.uk	Dlink.com	Tp-link.com	Uk.asus.com
Launch date	Jan 14	Sep 14	Sep 14	Jan 14	Jan 14
Overall rating	★★★★☆	★★★★⯪	★★★★☆	★★★★☆	★★★★☆
Standards supported	802.11a/b/g/n/ac	802.11a/b/g/n/ac	802.11a/b/g/n/ac	802.11a/b/g/n/ac	802.11a/b/g/n/ac
Frequency modes	2.4GHz/5GHz (concurrent)	2.4GHz/5GHz (concurrent)	2.4GHz/5GHz (concurrent)	2.4GHz/5GHz (concurrent)	2.4GHz/5GHz (concurrent)
Antennas	6x internal	3x external	3x external	3x external, 3x internal	3x external, 3x internal
Built-in modem	✗	✗	✗	✗	✗
Manufacturer's rating	1300/450Mb/s	1300/600Mb/s	1300/600Mb/s	1300/450Mb/s	1300/600Mb/s
WPS	✗	✓	✓	✓	✓
Ports	Gigabit WAN, 3x gigabit LAN, USB	Gigabit WAN, 1x USB 3.0, 1x USB 2.0	Gigabit WAN, 1x USB 3.0, 1x USB 2.0	Gigabit WAN, 4x gigabit LAN, 2x USB 2.0	Gigabit WAN, 4x gigabit LAN, 2x USB 2.0
Average power use	8W	9W	10W	N/A	N/A
Max speed (11n/11ac)	171/572Mb/s	171/592Mb/s	171/625Mb/s	110/505Mb/s	98/610Mb/s
Dimensions, weight	98x168x98mm, 945g	285x186x45mm, 750g	247x190x47mm, 745g	32.5x243x160mm, 508g	160x83x220mm, 640g
Warranty	1 year	N/S	N/S	3 years	2 years
FULL REVIEW	TINYURL.COM/MFDLLSC	TINYURL.COM/Q2NR8Q	TINYURL.COM/OZ5G7KG	TINYURL.COM/KKJMPCE	TINYURL.COM/K4ZATKV

Best powerline adaptors

	1 Solwise SmartLink 1200AV2	2 TrendNet Powerline 500 AV2	3 Devolo dLan 1200+	4 TP-Link TL-WPA4230P	5 Devolo dLan 500AV Wireless+
Price	£43 inc VAT	£41 inc VAT	£119 inc VAT	£88 inc VAT	£129 inc VAT
Website	Solwise.com	Trendnet.com	Devolo.com/uk	Uk.tp-link.com	Devolo.com/uk
Launch date	Nov 14	Mar 14	Sep 14	Apr 14	Nov 12
Overall rating	★★★★⯪	★★★★⯪	★★★★⯪	★★★★☆	★★★★☆
No of adaptors in kit	1 (2 required)	2	2	2	2
Max throughput	1200Mbps	600Mbps	1200Mbps	500Mbps	500Mbps
Near test result	410Mbps	146Mbps	357Mbps	100Mbps	96Mbps
Far test result	107Mbps	71Mbps	126Mbps	65Mbps	47Mbps
Ethernet ports	2x gigabit	1x gigabit	1x gigabit	3x fast	3x fast
Passthrough socket	Yes	No	Yes	Yes	Yes
Wireless hotspot	No	No	No	Yes	Yes
Encryption	128-bit	128-bit	128-bit	128-bit	128-bit
Dimensions	62x122x41mm	55x87x58mm	130x66x42mm	126x64x42mm	152x76x40mm
Weight	Not specified	90g	Not specified	Not specified	Not specified
Warranty	2 years	3 years	3 years	1 year	3 years
FULL REVIEW	TINYURL.COM/NZ4EJW8	TINYURL.COM/QYEPJQ7	TINYURL.COM/Q4EOO4M	TINYURL.COM/NKWAVP9	TINYURL.COM/KC2R6J2

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Best NAS drives

	1 Qnap TS-421	2 Synology DS115j	3 Qnap HS-210	4 Synology DS414j	5 Western Digital Red 6TB
Price	£320 inc VAT (diskless)	£83 inc VAT (diskless)	£190 inc VAT (diskless)	£270 inc VAT (diskless)	£220 inc VAT (diskless)
Website	Qnap.com	Synology.com	Qnap.com	Synology.com	Wdc.com
Launch date	Mar 14	Feb 15	Dec 14	Jan 15	Jan 15
Overall rating	★★★★☆	★★★★☆	★★★★½	★★★★☆	★★★★½
Drive bays	4	1	2	4	1
Processor	2GHz Marvell single-core	800MHz Marvell Armada 370	1.6GHz Marvell single-core	1.2GHz Mindspeed Concerto	N/A
Memory	1GB DDR3	256MB DDR3	512MB DDR3	512MB DDR3	64MB
Remote access	✓	✓	✓	✓	✓
eSATA	2x	✗	✗	1x	✗
USB port	2x USB 3.0, 2x USB 2.0	2x USB 2.0	2x USB 3.0, 2x USB 2.0	1x USB 3.0, 1x USB 2.0	n/a
Raid options	0/1/5/6/10/JBOD	None	0/1/JBOD	0/1/5/6/10/JBOD	n/a
Software	Backup Station	DSM 5.1	HD Station	DSM 5.0	NASware
Dimensions	177x180x235mm	71x161x224mm	302x220x41mm	184x168x230mm	147x102x26mm
Weight	3kg	700g	1.5kg	2.2kg	750g
Warranty	2 years	1 year	2 years	3 years	3 years
FULL REVIEW	TINYURL.COM/MCYWUB8	TINYURL.COM/MNEYVNK	TINYURL.COM/OEXRYNY	TINYURL.COM/M643BSG	TINYURL.COM/NBDGM5W

Best external hard drives

	1 Transcend StoreJet 25M3	2 Toshiba Canvio Basics	3 WD My Passport Ultra Metal	4 Seagate Seven mm	5 iStorage diskAshur Pro
	PC ADVISOR BEST BUY	PC ADVISOR RECOMMENDED			
Price	£70 inc VAT	£76 inc VAT	£90 inc VAT	£99 inc VAT	£269 inc VAT
Website	Uk.transcend-info.com	Toshiba.co.uk	Wdc.com/en	Seagate.com/gb/en	Istorage-uk.com
Launch date	Feb 15	Feb 15	Feb 15	Feb 15	Feb 15
Overall rating	★★★★½	★★★★☆	★★★★☆	★★★★☆	★★★½☆
Capacity tested	2TB	2TB	2TB	500GB	1TB
Capacity range	500GB, 1TB, 2TB	500GB, 1TB, 2TB	1TB, 2TB	500GB	500GB, 1TB, 1.5TB, 2TB
Disk size	2.5in	2.5in	2.5in	2.5in	2.5in
Spin speed	5400rpm	5400rpm	N/A	5400rpm	5400rpm
Transfer speed	135MB/s	117MB/s	114MB/s	49MB/s	115MB/s
Encryption	256-bit AES	256-bit AES	256-bit AES	N/A	256bit AES-XTS
Other interfaces	USB 3.0	USB 3.0	USB 3.0	USB 3.0	USB 3.0
Software	Transcend Elite	None	WD Drive Utilities	Seagate Dashboard	Security utilities
Dimensions	130x82x19mm	111x79x21mm	110x80x19mm	123x82x7mm	120x85x20mm
Weight	234g	207g	241g	178g	200g
Warranty	3 years	2 years	3 years	2 years	2 years
FULL REVIEW	TINYURL.COM/M72D3EP	TINYURL.COM/JWHHACB	TINYURL.COM/L2B7V3B	TINYURL.COM/O6KZFDM	TINYURL.COM/MZOBZ6J

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Best SSDs

	1 Crucial M550	2 OCZ Vector 150	3 Crucial M500	4 Samsung 840 EVO	5 Seagate 600 SSD
Price	£338 inc VAT	£125 inc VAT	£155 inc VAT	£320 inc VAT	£202 inc VAT
Website	Crucial.com/uk	Ocz.com	Crucial.com/uk	Samsung.com/uk	Seagate.com/gb
Launch date	May 14	May 14	Aug 13	Nov 13	May 14
Overall rating	★★★★½	★★★★☆	★★★★½	★★★★½	★★★★☆
Capacity tested	1TB	240GB	480GB	750GB	480GB
Price per GB	34p	52p	32p	43p	43p
Memory cache	1GB LP DDR2	512MB	512MB DDR3	1GB LPDDR2	N/A
Controller	Marvell 88SS9189	Indilinx Barefoot 3 M00	Marvell 88SS9187	Samsung MEX (3-core ARM)	Link A Media Device
Encryption	AES 256-bit	AES 256-bit	AES 256-bit	AES 256-bit	None
Flash	Micron 20nm MLC NAND	Toshiba 19nm MLC	Micron 20nm MLC NAND	Samsung 19nm Toggle NAND	Toshiba 19nm MLC
Firmware updated via	Bootable CD	OCZ Toolbox, bootable	ISO boot disc	SSD Magician for Windows	Seagate Firmware, bootable
ATTO peak sequential	R: 563MB/s; W: 514MB/s	R: 557MB/s; W: 534MB/s	R: 539MB/s; W: 433MB/s	R: 554MB/s; W: 537MB/s	R: 555MB/s; W: 474MB/s
CDM peak IOPS	100 / 91.7	92.9 / 94.7	89.8k (read)	104K (read)	96.8 / 88.6
CDM 4kB rnd	30/99	25/97	N/A	N/A	28/78
Warranty	3 years	5 years or 91TB writes	3 years	5 years	3 years
FULL REVIEW	TINYURL.COM/MSWD98Z	TINYURL.COM/KBED2W6	TINYURL.COM/M2NCSMJ	TINYURL.COM/L5EDQOY	TINYURL.COM/N58RB8G

Best projectors

	1 ViewSonic PLED-W800	2 BenQ W1300	3 Optoma W316	4 InFocus IN126STa	5 NEC M352WS
Price	£512 inc VAT	£730 inc VAT	£458 inc VAT	£525 inc VAT	£778 inc VAT
Website	Viewsoniceurope.com/uk	Benq.co.uk	Optoma.co.uk	Infocus.com	Nec-display-solutions.com
Launch date	Feb 15	Jun 14	Jul 14	Sep 14	Jul 14
Overall rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Projection technology	DLP	DLP	DLP	DLP	DLP
Resolution (pixels)	1280x800	1920x1080	1280x800	1280x800	1280x800
Brightness, Contrast	800, 120,000:1	2000, 10,000:1	3400, 15,000:1	3300, 15,000:1	3500, 10,000:1
Image size	100in	300in	300in	300in	150in
Supported aspect ratios	16:10 native	16:9 native	16:10, 16:9, 4:3	16:10, 16:9, 4:3	16:10
Noise levels (dB)	34 (32 eco)	33 (30 eco)	29db	32db (30 eco)	33 (39 bright mode)
Connections	VGA, HDMI, USB	VGA, 2x HDMI, USB, 3D	VGA, HDMI, Mini-USB, 3D	2x VGA, HDMI, USB, ethernet	2x VGA, 2x HDMI, USB
Lamp/lamp life	90W/30000 hrs	240W/6000 hrs	190W/10000 hrs	278W/3500 hrs	278W/8000 hrs
Dimensions	175x52x138mm	330x257x128mm	315x223x102mm	292x220x108mm	368x268x97mm
Weight	0.83kg	3.4kg	2.5kg	3.7kg	3.6kg
Warranty	3 years	3 years	2 years	1 year	3 years
FULL REVIEW	TINYURL.COM/K83X8LA	TINYURL.COM/K4FA89Q	TINYURL.COM/OCWTHGW	TINYURL.COM/NHH3QPB	TINYURL.COM/Q6J2N6W

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Best budget graphics cards

	1 MSI Radeon R9 270X	2 MSI Radeon R9 270 Gaming Ed	3 MSI R7 260X OC	4 XFX Radeon R7-265	5 Gigabyte GTX 750 Ti
Price	£130 inc VAT	£125 inc VAT	£91 inc VAT	£110 inc VAT	£120 inc VAT
Website	Uk.msi.com	Uk.msi.com	Uk.msi.com	Sapphiretech.com	Uk.gigabyte.com
Launch date	Dec 13	Jul 14	May 14	Sep 14	Aug 14
Overall rating	★★★★☆	★★★★½	★★★½☆	★★★★☆	★★★½☆
Graphics processor	AMD Radeon R9 270X	AMD Radeon R9 270	AMD Radeon R7 260X	AMD Radeon R7 265	nVidia GeForce GTX 750 Ti
Installed RAM	2GB GDDR5	2GB GDDR5	2GB GDDR5	2GB GDDR5	2GB GDDR5
Memory interface	256-bit	256-bit	128-bit	128-bit	128-bit
Core clock/boost	1030MHz/1120MHz	900MHz/975MHz	1175MHz/none	900MHz/925MHz	1033MHz/1111MHz
Memory clock/Effective	1.4/5.6GHz	1.4/5.6GHz	1625MHz/6.5GHz	1.4/5.6GHz	1.35/5.4GHz
Stream processors	1280	1280	896	Varies	640
Texture units	80	80	56	64	40
Power connectors	2x 6-pin	1x 6-pin	1x 6-pin	1x 6-pin	N/A
DirectX	11	11.2	11.1	11	11.2
Digital interface	2x DVI, HDMI, DisplayPort	2x DVI, HDMI, DP	2x DVI, HDMI, Mini-DP	2x DVI, 1x HDMI, 1x DP	2x DVI, 2x HDMI
Warranty	2 years	3 years	3 years	2 years	3 years
FULL REVIEW	TINYURL.COM/OYA2DFJ	TINYURL.COM/MCE7353	TINYURL.COM/OZ6WUYT	TINYURL.COM/LV69BEM	TINYURL.COM/Q7K4ESV

Best graphics cards

	1 Gigabyte GeForce GTX 770 2GB	2 Sapphire Radeon R9 280X	3 XFX Radeon R9 290X	4 Zotac Geforce GTX 960	5 MSI Radeon R9 295 X2
Price	£200 inc VAT	£200 inc VAT	£280 inc VAT	£285 inc VAT	£680 inc VAT
Website	Uk.gigabyte.com	Sapphiretech.com	Xfxforce.com	Zotac.com	Uk.msi.com
Launch date	Aug 13	Mar 14	Apr 14	Mar 15	May 14
Overall rating	★★★★½	★★★★½	★★★★½	★★★★☆	★★★★☆
Graphics processor	nVidia GeForce GTX 770	AMD Radeon R9 280X	AMD Radeon R9 290X	nVidia GeForce GTX 960	AMD Radeon R9 295 X2
Installed RAM	2GB GDDR5	3GB GDDR5	4GB GDDR5	2GB GDDR5	8GB GDDR5
Memory interface	256-bit	384-bit	512-bit	128-bit	2x 512-bit
Core clock/boost	950/1020MHz	950/1070MHz	1/1GHz	1266/1329MHz	1018MHz/N/A
Memory clock/Effective	1.5GHz/6GHz	1.55GHz/6.2GHz	1.25GHz/5GHz	1752MHz/7.1GHz	1.25GHz/5GHz
Stream processors	1536	2048	2816	1024	2x 2816
Texture units	128	128	176	64	2x 176
Power connectors	1x 6-pin, 1x 8-pin	2x 8-pin	8-pin, 6-pin	1x 6-pin	2x 8-pin
DirectX	11	11	11	12	11
Digital interface	2x DVI, HDMI, DisplayPort	DVI, HDMI, 2x Mini-DisplayPort	2x DVI, HDMI, DisplayPort	DVI, HDMI, 3x DisplayPort	DVI, 4x Mini-DP
Warranty	3 years	2 years	3 years	5 years	3 years
FULL REVIEW	TINYURL.COM/OAG6277	TINYURL.COM/OWVAP37	TINYURL.COM/NPET8ER	TINYURL.COM/MWBCO36	TINYURL.COM/POTAOGZ

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Best budget flat-panel displays	1 AOC i2369Vm	2 Philips 234E5QHAW	3 NEC MultiSync E243WMi	4 BenQ EW2740L	5 BenQ GL2450
Price	£130 inc VAT	£130 inc VAT	£194 inc VAT	£175 inc VAT	£108 inc VAT
Website	Aoc-europe.com/en	Philips.co.uk	Nec-display-solutions.com	Benq.co.uk	Benq.co.uk
Launch date	Jul 14	Jul 14	Jun 14	Aug 14	Jul 14
Overall rating	★★★★⯪	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Screen size	23in	23in	23.8in	27in	24in
Panel type	IPS matt	IPS matt	IPS matt	VA semi-matt	TN matt
Native resolution	1920x1080	1920x1080	1920x1080	1920x1080	1920x1080
Pixel density	96ppi	96ppi	93ppi	82ppi	92ppi
Brightness	220cd/m²	187cd/m²	250cd/m²	300cd/m²	261cd/m²
Static contrast ratio	630:1	210:1	650:1	280:1	610:1
Response time	6ms	5ms	6ms	4ms	5ms
Ports	HDMI, HDMI/MHL, DP, VGA	2x HDMI (QHAB) or 1x HDMI (QDAB), VGA	DP, DVI-D, VGA	2x HDMI, VGA	DVI-D, VGA
Dimensions	531x204x398mm	532x213x414mm	558x214x380-490mm	623x191x451mm	579x179x436mm
Weight	3.75kg	3.5kg	6.3kg	4.2kg	4.1kg
Warranty	3 years	2 years	3 years	2 years	2 years
FULL REVIEW	TINYURL.COM/OOEFYPR	TINYURL.COM/KLYLW4V	TINYURL.COM/KNCGVOU	TINYURL.COM/OO6EC5L	TINYURL.COM/OOUPFUE

Best flat-panel displays	1 LG 34UM95	2 HP DreamColor Z27x	3 Dell UltraSharp 32 Ultra	4 BenQ PG2401PT	5 ViewSonic VP2772
Price	£760 inc VAT	£750 inc VAT	£1,455 inc VAT	£855 inc VAT	£540 inc VAT
Website	Lg.com/uk	hp.com/uk	Dell.co.uk	Benq.co.uk	Viewsoniceurope.com/uk
Launch date	Dec 14	Jan 15	Jun 14	Oct 14	Jun 14
Overall rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★⯪☆
Screen size	34in 21:9	27in	31.5in	24.1in	27in
Panel type	IPS matt	AH-IPS	IGZO	IPS	AH-IPS
Native resolution	3440x1440	2560x1440	3840x2160	1920x1200	2560x1440
Pixel density	110ppi	109ppi	140ppi	94ppi	109ppi
Brightness	320cd/m²	250cd/m²	350cd/m²	317cd/m²	350cd/m²
Static contrast ratio	1000:1	800:1	550:1	540:1	560:1
Response time	5ms	7ms	8ms	5ms	6ms
Ports	HDMI, DP, Thunderbolt, USB 3.0	HDMI, DP, USB 3.0, USB 2.0	HDMI, DP, Mini-DP, 4x USB 3.0	DVI, DP, HDMI, VGA, 3x USB 3.0	HDMI, DVI, Mini-DP, 4x USB 3.0
Dimensions	830x83x380mm	641x655x379mm	750x214x483-572mm	543x254x555mm	643x348x470mm
Weight	6.7kg	8.8kg	9.2kg	7kg	8.5kg
Warranty	2 years	3 years	3 years	1 year	3 years
FULL REVIEW	TINYURL.COM/QYKH6UM	TINYURL.COM/NKUF9EN	TINYURL.COM/O4CTO3S	TINYURL.COM/PMV5L5V	TINYURL.COM/LLQRWTX

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Best e-book readers

	1 Amazon Kindle Voyage	2 Amazon Kindle (7th gen)	3 Amazon Kindle Paperwhite	4 Nook GlowLight	5 Kobo Aura H2O
Price	£169 inc VAT	£59 inc VAT	£109 inc VAT	£89 inc VAT	£139 inc VAT
Website	Amazon.co.uk	Amazon.co.uk	Amazon.co.uk	Nook.com/gb	Kobo.com
Launch date	Oct 14	Sep 14	Sep 13	Oct 13	Sep 14
Overall rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★☆☆
Screen size	6in touchscreen	6in touchscreen	6in touchscreen	6in touchscreen	6.8in touchscreen
Screen technology	E Ink	E Ink	E Ink	E Ink	E Ink
Screen resolution	1440x1080	600x800	768x1024	758x1024	1430x1080
Built-in light	Yes	No	Yes	Yes	Yes
Storage	4GB	4GB	2GB	4GB	4GB, microSD up to 32GB
Book store	Amazon Kindle	Amazon Kindle	Amazon Kindle	Nook	Kobo
Cellular connectivity	Optional extra	No	Optional extra	No	No
Battery life	Six weeks	Four weeks	Eight weeks	Eight weeks	Two months
Dimensions	162x115x7.6mm	169x119x10.2mm	117x169x9.1mm	127x166x10.7mm	179x129x9.7mm
Weight	180g	191g	206g	175g	233g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/NXAAU3Q	TINYURL.COM/NSFORJE	TINYURL.COM/PREZPRK	TINYURL.COM/OZ5WMPO	TINYURL.COM/MJVR4M9

Best media streamers

	1 Roku Streaming Stick	2 Roku 3	3 Google Chromecast	4 Apple TV	5 Amazon Fire TV
Price	£49 inc VAT	£99 inc VAT	£30 inc VAT	£59 inc VAT	£79 inc VAT
Website	Roku.com	Roku.com	Play.google.com	Apple.com/uk	Amazon.co.uk
Launch date	Mar 14	Mar 13	Mar 14	Mar 12	Oct 14
Overall rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Type	Dongle	Set-top box	Dongle	Set-top box	Set-top box
Ports	HDMI, Micro-USB	HDMI, USB, ethernet	HDMI, Micro-USB	HDMI, ethernet, Micro-USB	HDMI, USB, ethernet
Processor	600MHz single-core	900MHz single-core	Single-core	Apple A5 single-core	1.7GHz Qualcomm quad-core
RAM	512MB	512MB	512MB	512MB	2GB
Graphics	Not specified	Not specified	Not specified	Not specified	Adreno 320
Storage	None	512MB plus microSD slot	None	8GB (not user-accessible)	8GB
Voice search	No	Yes	No	No	Yes
Remote control	Yes	Yes	No	Yes	Yes
Dimensions	78.7x27.9x12.7mm	89x89x25mm	72x35x12mm	98x98x23mm	115x115x17.5mm
Weight	18g	170g	34g	270g	281g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/OAP9QF9	TINYURL.COM/PT7MGUL	TINYURL.COM/QBGTCS2	TINYURL.COM/OLCJRC3	TINYURL.COM/P4RE7WP

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Best games consoles

	1 Sony PlayStation 4	2 Microsoft Xbox One	3 Nintendo Wii U Premium	4 Sony PlayStation 3 Super Slim	5 Microsoft Xbox 360
Price	£349 inc VAT	£349 inc VAT	£249 inc VAT	£249 inc VAT	£199 inc VAT
Website	Playstation.com	Xbox.com	Nintendo.co.uk	Playstation .com	Xbox.com
Launch date	Nov 13	Nov 13	Nov 12	Sep 12	Dec 05
Overall rating	★★★★☆	★★★★☆	★★★★☆	★★★★⯪	★★★★★
Processor	Octa-core AMD x86	1.75GHz octa-core AMD x86	IBM Power multicore CPU	IBM CPU	IBM Xenon CPU
Graphics	1.84TFlops AMD Radeon GPU	1.31TFlops AMD Radeon GPU	AMD Radeon GPU	256MB nVidia RSX	512MB ATI Xenos
RAM	8GB GDDR5	8GB DDR3	Not specified	Not specified	512MB GDDR3
Storage	500GB	500GB	32GB, plus SD card support	500GB	500GB
Optical drive	Blu-ray, DVD, game discs	Blu-ray, DVD, game discs	Wii U, Wii discs only	Blu-ray, DVD, game discs	DVD, game discs
Ports	2x USB 3.0, AUX, HDMI	USB 3.0, HDMI	4x USB 2.0, HDMI	2x USB 2.0, HDMI	5x USB, HDMI
Connectivity	Ethernet, 802.11b/g/n, Bluetooth	Ethernet, 802.11b/g/n	802.11b/g/n	Ethernet, 802.11b/g/n, Bluetooth	Ethernet, 802.11b/g/n
Other	1 controller	1 controller, 4K, Kinect option	1 controller	1 controller	1 controller
Dimensions	275x53x305mm	333x274x79mm	46x269x171mm	290x230x60mm	269x75x264mm
Weight	2.8kg	3.2kg	1.6kg	2.1kg	2.9kg
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/NBFLQK2	TINYURL.COM/M6J4KHS	TINYURL.COM/6J49LHL	TINYURL.COM/QDJP56O	TINYURL.COM/PFP9CCK

Best budget portable speakers

	1 Lumsing B9	2 i-box Twist	3 Lava BrightSounds	4 iClever IC-BTS02	5 Edifier Sound To Go Plus
Price	£23 inc VAT	£41 inc VAT	£39 inc VAT	£23 inc VAT	£37 inc VAT
Website	Lumsing.com	Iboxstyle.com	Lavaaccessories.co.uk	Hisgadget.com	Edifier-international.com
Launch date	Aug 14	Nov 12	Dec 14	Nov 14	Apr 12
Overall rating	★★★★⯪	★★★★⯪	★★★★⯪	★★★★☆	★★★★☆
Speaker(s)	2x 3W	2x 3W	1x 5W	1x 5W	2x 1.5W
Bluetooth	Bluetooth 3.0 + EDR	Bluetooth 2.1	Not specified	Bluetooth 4.0	Not specified
Handsfree calls	Yes	Yes	Yes	Yes	No
NFC	Yes	No	No	No	No
Frequency response	20Hz to 20kHz	Not specified	Not specified	90Hz to 18kHz	270Hz to 17kHz
Impedence	4 ohms	Not specified	Not specified	Not specified	Not specified
Extra features	MicroSD slot, lanyard	None	IPX4 splashproof, LED lamp	None	Carry case
Claimed battery life	25 hours	5 hours	8 hours	8-12 hours	10 hours
Dimensions	177x50x70mm	246x59x56mm	190x95x103mm	64.5x64.5x70.1mm	261x36x44mm
Weight	300g	380g	821g	261g	370g
Warranty	1 year	5 years	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/P623MK8	TINYURL.COM/LET9RDF	TINYURL.COM/KOM2ZT3	TINYURL.COM/Q2YT6NV	TINYURL.COM/OW7TF38

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Best budget headphones	1 PC ADVISOR RECOMMENDED	2 PC ADVISOR RECOMMENDED	3 PC ADVISOR RECOMMENDED	4 PC ADVISOR RECOMMENDED	5
	RHA MA450i	Sennheiser HD 429	Rock Jaw Alpha Genus	AKG K77	Vibe Slick Zip V3
Price	£39 inc VAT	£45 inc VAT	£41 inc VAT	£25 inc VAT	£12 inc VAT
Website	Rha-audio.com/uk	En-uk.sennheiser.com	Rockjawaudio.com	Uk.akg.com	Vibeaudio.co.uk
Launch date	Nov 14	Jan 11	Jun 14	May 08	Sep 13
Overall rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★☆☆
Type	In-ear	Circumaural over-ear	In-ear	Circumaural over-ear	In-ear
Frequency response	16Hz to 22kHz	18Hz to 22kHz	20Hz to 20kHz	18Hz to 20.5kHz	20Hz to 20kHz
Nominal impedence	16 ohms	32 ohms	16 ohms	32 ohms	16 ohms
Sensitivity	103dB	110dB	108dB	112dB	93dB
In-line remote	Yes (3 button)	No	No	No	Yes (1 button)
Mic	Yes	No	No	No	Yes
Extra grommets	Yes	N/A	Yes, and filters	N/A	Yes
Carry case	Yes	No	Yes	No	No
Cable length	1.5m (braided)	3m	1.2m (twisted)	2.5m	1.2m
Weight	14g	218g	11g	190g	21g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/P7W7RVL	TINYURL.COM/ND8TD8O	TINYURL.COM/NNYUFBF	TINYURL.COM/PA8FOX4	TINYURL.COM/QJULK9P

Best headphones	1 PC ADVISOR BEST BUY	2 PC ADVISOR RECOMMENDED	3	4 PC ADVISOR RECOMMENDED	5 PC ADVISOR RECOMMENDED
	Denon AH-D600	Bose QC20	Denon AH-W150	Bowers & Wilkins P3	RHA MA450i
Price	£229 inc VAT	£259 inc VAT	£59 inc VAT	£169 inc VAT	£39 inc VAT
Website	Denon.co.uk	Bose.co.uk	Denon.co.uk	Bowers-wilkins.co.uk	Rha-audio.com/uk
Launch date	Aug 2012	Jun 13	Aug 12	Jun 12	Nov 14
Overall rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Type	Circumaural over-ear	In-ear	Over-ear wireless buds	On-ear, foldable	In-ear
Frequency response	8Hz to 25kHz	20-21kHz	5Hz to 25kHz	10Hz to 20kHz	16Hz to 22kHz
Nominal impedence	37 ohms	32 ohms	16 ohms	34 ohms	16 ohms
Sensitivity	120dB	105dB	102dB	111dB	103dB
In-line remote	Yes	Yes	Yes	Yes	Yes (3 button)
Mic	No	Yes	Yes	Yes	Yes
Extra grommets	N/A	Yes	Yes	N/A	Yes
Carry case	Yes	Yes	Yes	Yes	Yes
Cable length	3m	1.3m	N/A	1.2m	1.5m (braided)
Weight	250g	44g	23g	132g	14g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/NBCFJW6	TINYURL.COM/OEAGFOF	TINYURL.COM/O2CJV3R	TINYURL.COM/PZO7PON	TINYURL.COM/P7W7RVL

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Best power banks

	Zendure A2	Anker Astro Mini	Intocircuit Power Castle	Intocircuit PowerMini	Lumsing 10400mAh
	1 PC ADVISOR GOLD	2 PC ADVISOR RECOMMENDED	3 PC ADVISOR RECOMMENDED	4 PC ADVISOR RECOMMENDED	5
Price	£33 inc VAT	£13 inc VAT	£22 inc VAT	£10 inc VAT	£17 inc VAT
Website	Zendure.com	Ianker.com	Hisgadget.com	Hisgadget.com	Lumsing.com
Launch date	May 14	Apr 13	Mar 13	Jul 14	Apr 14
Overall rating	★★★★½	★★★★½	★★★★½	★★★★☆	★★★★½
Capacity	6000mAh	3200mAh	11200mAh	3000mAh	10400mAh
Input	1x 7.5W Micro-USB	1x 4W Micro-USB	1x 5W Micro-USB	1x 5W Micro-USB	1x 7.5W Micro-USB
Outputs	1x 10.5W USB	1x 5W USB	1x 10.5W USB, 1x 5W USB	1x 5W USB	1x 10.5W USB, 1x 5W USB
Auto-on/-off	Yes	No	Auto-on	No	No
Passthrough charging	Yes	No	Yes	No	No
Status indicator	4 LEDs	No	LCD screen	3 LEDs	4 LEDs
LED flashlight	No	No	Yes	Yes	No
Carry case	Yes	Yes	Yes	Yes	Yes
Dimensions	93x48x23mm	92x23x23mm	110x71x22mm	110x20x20mm	138x59x20mm
Weight	137g	80g	280g	118g	354g
Warranty	1 year	18 months	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/NGCNO5F	TINYURL.COM/PZHUHJO	TINYURL.COM/P5M9NKE	TINYURL.COM/KWONE54	TINYURL.COM/Q9DYG5G

Best desktop chargers

	iClever USB Travel Charger	Zendure Turbo Charger	Olixar Smart IC Charger	Inateck USB Charger	Lumsing 5-Port Charger
	1 PC ADVISOR RECOMMENDED	2	3	4	5
Price	£20 inc VAT	£25 inc VAT	£34 inc VAT	£15 inc VAT	£8 inc VAT
Website	Hisgadget.com	Zendure.com	Mobilefun.co.uk	Inateck.com	Lumsing.com
Launch date	Oct 14	May 14	Feb 15	Feb 14	Apr 14
Overall rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★☆☆
Max output	50W	40W	50W	35W	30W
Outputs: USB 1	12W USB	12W USB	12.5W USB	10.5W USB	10W USB
USB 2	12W USB	12W USB	12.5W USB	10.5W USB	10W USB
USB 3	12W USB	12W USB	12.5W USB	5W USB	10W USB
USB 4	12W USB	12W USB	12.5W USB	5W USB	5W USB
USB 5	12W USB	12W USB	12.5W USB	5W USB	5W USB
USB 6	12W USB	N/A	12.5W USB	N/A	N/A
Colours available	Black	Black, white	White	Black	Black
Dimensions	100x69x27mm	97x60x27mm	100x69x26mm	100x55x20mm	136x68x30mm
Weight	180g	166g	189g	340g	422g
Warranty	1 year	1 year	2 years	1 year	1 year
FULL REVIEW	TINYURL.COM/MPA4DWC	TINYURL.COM/NKYNJ7P	TINYURL.COM/OCZXK93	TINYURL.COM/KBXUHDF	TINYURL.COM/LK22OGY

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MATT EGAN

Politicians don't get the web

While I write this, my doormat is buried under a pile of flyers from all the local candidates. Now answer me this: when was the last time you decided for whom to vote on the basis of a piece of paper thrust through your door? That's right – never. I wouldn't choose a pizza shop that way. And although I take my pizzas seriously, I think my vote is much more important.

Meanwhile, the two biggest parties do battle through the medium of open letters in the national newspapers whose circulation and influence decline month on month.

A recent internet meme was a hilarious photo of David Cameron next to a schoolgirl who had planted her face into the desk. In essence meaningless, but indisputably funny. My question is this: what exactly where Cameron's advisors hoping to get out of a photo opportunity with very young children? Didn't they realise that every photographer present was waiting for the one (inevitable) moment when a child looked bored or unhappy, and that this was the shot everyone would share online? And that no-one will change their voting preference on the basis of any of this.

It gets worse when the politicos try to engage with 'new' media. We've seen the Tories promise to stop children from accessing porn online, and every newspaper in the land report this as fact.

They can't do it, of course. They might as well promise to catch all the criminals or fix all the problems. So they are either technically inept, cynical or both. I wish I thought it was all cynicism.

Meanwhile, Labour scored an initial success by launching a Facebook app via which you can find out how many registered voters share your name. A clever way of creating engagement via social media, yes. But when I signed up for the app, I didn't realise I was subscribing to a Labour party email database. Reader: I am not going to tell you which way I lean, but I will tell you that receiving an unsolicited email every day from the red party does not make me more sympathetic to its cause. Quite the opposite. I would wager that not a single person will change their vote to Labour because of this campaign.

Whenever established politicians attempt to engage with normal folk using the internet or social media, it is simply cringeworthy.

I suspect that at the next General Election in five years' time our media landscape will be more settled. Some major publications will no longer exist or no longer count, and our political parties will be staffed by people who grew up with social media and the internet. They'll understand how to reach people regardless of the medium. The message will be the thing, not the tech. ⊠

> " Receiving an unsolicited email every day from the red party does not make me more sympathetic to its cause "

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