1a Eva zou meerdere keren eenzelfde persoon kunnen aanwijzen.

1b Wilco houdt er geen rekening mee dat ABC, ACB, BAC, BCA, CAB en CBA hetzelfde drietal is.

1c Het aantal drietallen uit een groep van 10 personen is $\binom{10}{3} = 120$ of $\frac{10 \cdot 9 \cdot 8}{3!} = 120$.

```
10 nCr 3
            120
10*9*8/3!
            120
```

```
MATH NUM CPX PRB
1:rand
2:nPr
3:nCr
4:!
5:randInt(
6:randNorm(
7:randBin(
```

2 $P(\text{geen rode knikker}) = \frac{\binom{7}{5}}{\binom{15}{5}} = \frac{\binom{8}{0} \cdot \binom{7}{5}}{\binom{15}{5}}$.

```
7 nCr 5/15 nCr 5
       .006993007
8 nCr 0*7 nCr 5/
15 nCr 5
       .006993007
```

NIEUWE SCHRIJFWIJZE:
dubbel onderstreept betekent
"niet alleen" in de genoteerde volgorde

3a $P(\text{3 rood}) = \frac{\binom{7}{3}}{\binom{21}{3}} \approx 0{,}026$.

```
7 nCr 3/21 nCr 3
      .0263157895
15 nCr 3/21 nCr
3
      .3421052632
```

3b $P(\text{0 groen}) = \frac{\binom{15}{3}}{\binom{21}{3}} \approx 0{,}342$.

3c $P(\text{0 wit}) = \frac{\binom{13}{3}}{\binom{21}{3}} \approx 0{,}215$.

```
13 nCr 3/21 nCr
3
       .215037594
```

3d $P(\underline{\underline{\text{rood rood wit}}}) = \frac{\binom{7}{2} \cdot \binom{8}{1}}{\binom{21}{3}} \approx 0{,}126$.

```
7 nCr 2*8 nCr 1/
21 nCr 3
      .1263157895
8 nCr 2*13 nCr 1
/21 nCr 3
      .2736842105
```

3e $P(\text{2 wit}) = \frac{\binom{8}{2} \cdot \binom{13}{1}}{\binom{21}{3}} \approx 0{,}274$.

3f $P(\text{1 rood}) = \frac{\binom{7}{1} \cdot \binom{14}{2}}{\binom{21}{3}} \approx 0{,}479$.

```
7 nCr 1*14 nCr 2
/21 nCr 3
      .4789473684
```

4a $P(\text{6 wit}) = \frac{\binom{32}{6}}{\binom{62}{6}} \approx 0{,}015$.

```
32 nCr 6/62 nCr
6
      .0147409368
```

4b $P(\text{van elke kleur 2}) = \frac{\binom{18}{2} \cdot \binom{12}{2} \cdot \binom{32}{2}}{\binom{62}{6}} \approx 0{,}081$.

```
18 nCr 2*12 nCr
2*32 nCr 2/62 nC
r 6
      .0814745374
32 nCr 3*12 nCr
3/62 nCr 6
      .0177504439
```

4c $P(\underline{\underline{\text{3 wit en 3 blauw}}}) = \frac{\binom{32}{3} \cdot \binom{12}{3}}{\binom{62}{6}} \approx 0{,}018$.

4d $P(\text{0 wit}) = \frac{\binom{30}{6}}{\binom{62}{6}} \approx 0{,}010$.

```
30 nCr 6/62 nCr
6
        .00965888
```

4e $P(\text{4 wit}) = \frac{\binom{32}{4} \cdot \binom{30}{2}}{\binom{62}{6}} \approx 0{,}254$.

```
32 nCr 4*30 nCr
2/62 nCr 6
      .2544566473
18 nCr 1*44 nCr
5/62 nCr 6
      .3179877503
```

4f $P(\text{1 rood}) = \frac{\binom{18}{1} \cdot \binom{44}{5}}{\binom{62}{6}} \approx 0{,}318$.

5a $P(\text{0 blauw}) = \frac{\binom{6}{0} \cdot \binom{10}{3}}{\binom{16}{3}} \approx 0{,}214$; $P(\text{1 blauw}) = \frac{\binom{6}{1} \cdot \binom{10}{2}}{\binom{16}{3}} \approx 0{,}482$; $P(\text{2 blauw}) = \frac{\binom{6}{2} \cdot \binom{10}{1}}{\binom{16}{3}} \approx 0{,}268$; $P(\text{3 blauw}) = \frac{\binom{6}{3} \cdot \binom{10}{0}}{\binom{16}{3}} \approx 0{,}036$.

Neem nu deze waarden over in de tabel.

5b De kansen zijn samen 1. (zie het basisscherm van de GR)
In de tabel staan alle mogelijke uitkomsten.

```
Plot1 Plot2 Plot3
\Y1=6 nCr X*10 n
Cr (3-X)/16 nCr
3
\Y2=
```

X	Y1
0	.21429
1	.48214
2	.26786
3	.03571
4	ERROR
5	ERROR
6	ERROR

Y1=.214285714286

```
Y1(0)+Y1(1)+Y1(2
)+Y1(3)
                1
```

6a Vaas met 60 knikkers (de loten) waarvan 1 rood (de hoofdprijs), 5 wit (tweede prijzen) en 54 blauw (geen prijs).
Dennis pakt 5 knikkers.

6b $P(\text{2 tweede prijzen (en verder niets)}) = \frac{\binom{5}{2} \cdot \binom{54}{3}}{\binom{60}{5}} \approx 0{,}045$.

```
5 nCr 2*54 nCr 3
/60 nCr 5
      .0454159947
```

6c $P(\underline{\underline{\text{hoofdprijs en 1 tweede prijs}}}) = \frac{\binom{1}{1} \cdot \binom{5}{1} \cdot \binom{54}{3}}{\binom{60}{5}} \approx 0{,}023$.

```
1 nCr 1*5 nCr 1*
54 nCr 3/60 nCr
5
      .0227079973
```

7a $P(\text{Monique 1 prijs}) = \frac{\binom{10}{1} \cdot \binom{30}{2}}{\binom{40}{3}} \approx 0{,}440$.

```
10 nCr 1*30 nCr
2/40 nCr 3
      .4402834008
7 nCr 2*30 nCr 2
/40 nCr 4
      .0999562315
```

7b $P(\text{Barbara wint 2 tweede prijzen}) = \frac{\binom{7}{2} \cdot \binom{30}{2}}{\binom{40}{4}} \approx 0{,}100$.

7c $P(\text{met de 7 loten geen prijs}) = \frac{\binom{30}{7}}{\binom{40}{7}} \approx 0{,}109$.

```
30 nCr 7/40 nCr
7
      .1091958832
10 nCr 4/40 nCr
4
      .0022978444
```

7d $P(\text{Barbara 4 prijzen}) = \frac{\binom{10}{4}}{\binom{40}{4}} \approx 0{,}002$.

8 $P(\text{het getal zit erbij}) = \frac{\binom{1}{1} \cdot \binom{14}{2}}{\binom{15}{3}} = 0{,}2$.

```
1 nCr 1*14 nCr 2
/15 nCr 3
               .2
```

9 $P(\text{goedgekeurd}) = P(\text{alle vier geteste lampen goed}) = \dfrac{\binom{18}{4}}{\binom{20}{4}} \approx 0{,}632.$

```
18 nCr 4/20 nCr
4
        .6315789474
```

10 $P(\text{alle 25 appels in de doos gaaf}) = \dfrac{\binom{490}{25}}{\binom{500}{25}} \approx 0{,}596.$

```
490 nCr 25/500 n
Cr 25
        .5958702855
```

11 $P(\text{3 en 12 leeg}) = \dfrac{\binom{18}{18}}{\binom{20}{18}} \approx 0{,}005.$

```
18 nCr 18/20 nCr
18
        .0052631579
```

12a $P(\text{geen uit Californië}) = \dfrac{\binom{98}{8}}{\binom{100}{8}} \approx 0{,}846.$

12b $P(\text{één uit Arizona en één uit Florida}) = \dfrac{\binom{2}{1}\cdot\binom{2}{1}\cdot\binom{96}{6}}{\binom{100}{8}} \approx 0{,}020.$

```
98 nCr 8/100 nCr
8
        .8456565657
2 nCr 1*2 nCr 1*
96 nCr 6/100 nCr
8
        .0199271061
```

13 $P(\text{drie met een tijd van meer dan 3 minuten in één rij}) = \dfrac{\binom{5}{3}\cdot\binom{23}{1}}{\binom{28}{4}} \approx 0{,}011.$

```
5 nCr 3*23 nCr 1
/28 nCr 4
        .0112332112
```

14a $P(\text{drie leden van OOP}) = \dfrac{\binom{36}{3}\cdot\binom{84}{9}}{\binom{120}{12}} \approx 0{,}249.$

```
0.3*120
                 36
120-36
                 84
36 nCr 3*84 nCr
9/120 nCr 12
        .2493153428
```

14b $P(\text{twee docenten op fiets}) = \dfrac{\binom{42}{2}\cdot\binom{78}{10}}{\binom{120}{12}} \approx 0{,}103.$

```
1/2*84
                 42
120-42
                 78
42 nCr 2*78 nCr
10/120 nCr 12
        .1027624468
```

14c $P(\text{vijf op fiets}) = \dfrac{\binom{54}{5}\cdot\binom{66}{7}}{\binom{120}{12}} \approx 0{,}234.$

```
42+12
                 54
120-54
                 66
54 nCr 5*66 nCr
7/120 nCr 12
        .2336111354
```

	meisje	jongen	totaal
havo	3	2	5
niet havo	5	2	7
totaal	8	4	12

15a $P(\text{louter meisjes}) = \dfrac{\binom{8}{4}}{\binom{12}{4}} \approx 0{,}141.$

```
8 nCr 4/12 nCr 4
        .1414141414
```

15b $P(\text{precies 2 op de havo}) = \dfrac{\binom{5}{2}\cdot\binom{7}{2}}{\binom{12}{4}} \approx 0{,}424.$

15c $P(\text{precies 1 jongen niet op de havo}) = \dfrac{\binom{2}{1}\cdot\binom{10}{3}}{\binom{12}{4}} \approx 0{,}485.$

```
5 nCr 2*7 nCr 2/
12 nCr 4
        .4242424242
2 nCr 1*10 nCr 3
/12 nCr 4
        .4848484848
```

16a $P(\text{nummer 14 bij de eerste drie}) = \dfrac{\binom{1}{1}\cdot\binom{15}{2}}{\binom{16}{3}} \approx 0{,}188.$

```
1 nCr 1*15 nCr 2
/16 nCr 3
              .1875
3 nCr 3/16 nCr 3
        .0017857143
```

16b $P(\text{nummers 1, 2 en 3 bij de laatste drie}) = \dfrac{\binom{3}{3}}{\binom{16}{3}} \approx 0{,}002.$

16c $P(\text{nummers 3, 7, 8 en 9 bij de eerste acht}) = \dfrac{\binom{4}{4}\cdot\binom{12}{4}}{\binom{16}{8}} \approx 0{,}038.$

```
4 nCr 4*12 nCr 4
/16 nCr 8
        .0384615385
```

17a $P(\text{zeven even getallen}) = \dfrac{\binom{20}{7}}{\binom{41}{7}} \approx 0{,}003.$

```
20 nCr 7/41 nCr
7
        .003448101
```

17b $P(\text{zeven getallen kleiner dan 15}) = \dfrac{\binom{14}{7}}{\binom{41}{7}} \approx 0{,}00015 \approx 0{,}000.$

```
14 nCr 7/41 nCr
7
   1.526558651E-4
```

17d $P(\underline{\text{37 en zes getallen kleiner dan 37}}) = \dfrac{\binom{1}{1}\cdot\binom{36}{6}}{\binom{41}{7}} \approx 0{,}087.$

```
1 nCr 1*36 nCr 6
/41 nCr 7
        .0866380748
```

17c $P(\text{zeven getallen groter dan 5}) = \dfrac{\binom{41-5}{7}}{\binom{41}{7}} \approx 0{,}371.$

```
36 nCr 7/41 nCr
7
        .371306035
```

17e $P(\underline{\text{10 en 35 en vijf getallen tussen 10 en 35}}) = \dfrac{\binom{2}{2}\cdot\binom{34-10}{5}}{\binom{41}{7}} \approx 0{,}002.$

```
2 nCr 2*24 nCr 5
/41 nCr 7
        .0018905842
```

18a $P(\text{rood} = 2) = \dfrac{\binom{5}{2}\cdot\binom{3}{1}}{\binom{8}{3}} \approx 0{,}536.$

```
5 nCr 2*3 nCr 1/
8 nCr 3
        .5357142857
```

18b $P(\text{rood} = 3) = \dfrac{\binom{5}{3}}{\binom{8}{3}} \approx 0{,}179.$

```
5 nCr 3/8 nCr 3
        .1785714286
```

18c $P(\text{rood} > 1) = P(\text{rood} \geq 2) = P(\text{rood} = 2) + P(\text{rood} = 3).$ Je moet dus de antwoorden van 18a en 18b optellen.

19a Bij $\binom{74}{1} = 74$ is de regel $\binom{n}{1} = n$ gebruikt.

19b Het voordeel is dat je minder hoeft in te tikken.

20a $P(\text{rood} = 2 \text{ of rood} = 3) = P(\text{rood} = 2) + P(\text{rood} = 3) = \dfrac{\binom{4}{2}\cdot\binom{6}{1}}{\binom{10}{3}} + \dfrac{\binom{4}{3}}{\binom{10}{3}} \approx 0{,}333.$

```
4 nCr 2*6 nCr 1+
4 nCr 3
            40
Ans/10 nCr 3
  .3333333333
```

20b $P(\text{groen} < 2) = P(\text{groen} = 0) + P(\text{groen} = 1) = \dfrac{\binom{6}{3}}{\binom{10}{3}} + \dfrac{\binom{4}{1}\cdot\binom{6}{2}}{\binom{10}{3}} \approx 0{,}667.$

```
6 nCr 3+4 nCr 1*
6 nCr 2
            80
Ans/10 nCr 3
  .6666666667
```

21a $P(\text{meisjes} < 2) = P(\text{meisjes} = 0) + P(\text{meisjes} = 1) = \dfrac{\binom{13}{4}}{\binom{28}{4}} + \dfrac{\binom{15}{1}\cdot\binom{13}{3}}{\binom{28}{4}} \approx 0{,}244.$

```
13 nCr 4+15 nCr
1*13 nCr 3
          5005
Ans/28 nCr 4
  .2444444444
```

21b $P(\text{jongens én meisjes}) = P(\text{jongens} = 1) + P(\text{jongens} = 2) + P(\text{jongens} = 3) = \dfrac{\binom{13}{1}\cdot\binom{15}{3}}{\binom{28}{4}} + \dfrac{\binom{13}{2}\cdot\binom{15}{2}}{\binom{28}{4}} + \dfrac{\binom{13}{3}\cdot\binom{15}{1}}{\binom{28}{4}} \approx 0{,}898.$

```
13 nCr 1*15 nCr
3+13 nCr 2*15 nC
r 2+13 nCr 3*15
nCr 1
         18395
Ans/28 nCr 4
  .8984126984
```

22a $P(\text{prijzen} < 2) = P(\text{prijzen} = 0) + P(\text{prijzen} = 1) = \dfrac{\binom{76}{5}}{\binom{80}{5}} + \dfrac{\binom{4}{1}\cdot\binom{76}{4}}{\binom{80}{5}} \approx 0{,}982.$

```
76 nCr 5+4 nCr 1
*76 nCr 4
      23606740
Ans/80 nCr 5
  .9819768839
```

22b $P(\text{prijs} = € 50) = P(1 \times € 50) + P(2 \times € 25) = \dfrac{\binom{1}{1}\cdot\binom{76}{4}}{\binom{80}{5}} + \dfrac{\binom{3}{2}\cdot\binom{76}{3}}{\binom{80}{5}} \approx 0{,}062.$

```
1 nCr 1*76 nCr 4
+3 nCr 2*76 nCr
3
       1493875
Ans/80 nCr 5
  .0621411816
```

23 $P(\text{de administratie aan dezelfde tafel}) = P(\text{aan de tafel voor acht}) + P(\text{aan de tafel voor tien}) = \dfrac{\binom{3}{3}\cdot\binom{15}{5}}{\binom{18}{8}} + \dfrac{\binom{3}{3}\cdot\binom{15}{7}}{\binom{18}{10}} \approx 0{,}216.$

```
3 nCr 3*15 nCr 5
/18 nCr 8+3 nCr
3*15 nCr 7/18 nC
r 10
  .2156862745
```

24a $P(\text{N\&T} < 2) = P(\text{N\&T} = 0) + P(\text{N\&T} = 1) = \dfrac{\binom{85-15}{10}}{\binom{85}{10}} + \dfrac{\binom{15}{1}\cdot\binom{70}{9}}{\binom{85}{10}} \approx 0{,}439.$

```
70 nCr 10+15 nCr
1*70 nCr 9
  1.372207453E12
Ans/85 nCr 10
  .438522249
```

24b $P(\text{jongens} > 7) = P(\text{jongens} = 8) + P(\text{jongens} = 9) + P(\text{jongens} = 10) = \dfrac{\binom{44}{8}\cdot\binom{41}{2}}{\binom{85}{10}} + \dfrac{\binom{44}{9}\cdot\binom{41}{1}}{\binom{85}{10}} + \dfrac{\binom{44}{10}}{\binom{85}{10}} \approx 0{,}057.$

```
44 nCr 8*41 nCr
2+44 nCr 9*41 nC
r 1+44 nCr 10
  1.768781617E11
Ans/85 nCr 10
  .0565257164
```

24c $P(\text{N\&G-meisjes is 2 of 3}) = P(\text{N\&G-meisjes} = 2) + P(\text{N\&G-meisjes} = 3) = \dfrac{\binom{15}{2}\cdot\binom{70}{8}}{\binom{85}{10}} + \dfrac{\binom{15}{3}\cdot\binom{70}{7}}{\binom{85}{10}} \approx 0{,}491.$

```
15 nCr 2*70 nCr
8+15 nCr 3*70 nC
r 7
  1.536679344E12
Ans/85 nCr 10
  .4910832401
```

25a $P(\text{wit} = 4) = \dfrac{\binom{10}{4}}{\binom{22}{4}} \approx 0{,}029.$

```
10 nCr 4/22 nCr
4
    .028708134
```

25b $P(\text{wit} < 4) = P(\text{wit} = 0) + P(\text{wit} = 1) + P(\text{wit} = 2) + P(\text{wit} = 3) = \dfrac{\binom{12}{4}}{\binom{22}{4}} + \dfrac{\binom{10}{1}\cdot\binom{12}{3}}{\binom{22}{4}} + \dfrac{\binom{10}{2}\cdot\binom{12}{2}}{\binom{22}{4}} + \dfrac{\binom{10}{3}\cdot\binom{12}{1}}{\binom{22}{4}} \approx 0{,}971.$

```
12 nCr 4+10 nCr
1*12 nCr 3+10 nC
r 2*12 nCr 2+10
nCr 3*12 nCr 1
          7105
Ans/22 nCr 4
  .971291866
```

26a $P(\text{prijzen} \geq 1) = 1 - P(\text{prijzen} = 0) = 1 - \dfrac{\binom{21}{3}}{\binom{25}{3}} \approx 0{,}422.$

```
1-21 nCr 3/25 nC
r 3
  .4217391304
```

26b $P(\text{prijzen} \neq 3) = 1 - P(\text{prijzen} = 3) = 1 - \dfrac{\binom{4}{3}}{\binom{25}{3}} \approx 0{,}998.$

```
1-4 nCr 3/25 nCr
3
  .9982608696
```

26c $P(\text{prijzen} = 2) = \dfrac{\binom{4}{2}\cdot\binom{21}{1}}{\binom{25}{3}} \approx 0{,}055.$

```
4 nCr 2*21 nCr 1
/25 nCr 3
  .0547826087
```

26d $P(\text{prijzen} = 0) = \dfrac{\binom{21}{3}}{\binom{25}{3}} \approx 0{,}578.$

```
21 nCr 3/25 nCr
3
  .5782608696
```

27a $P(\text{groen} \geq 1) = 1 - P(\text{groen} = 0) = 1 - \dfrac{\binom{9}{3}}{\binom{12}{3}} \approx 0{,}618.$

```
1-9 nCr 3/12 nCr
3
  .6181818182
```

27b $P(\text{blauw} \leq 2) = 1 - P(\text{blauw} = 3) = 1 - \dfrac{\binom{5}{3}}{\binom{12}{3}} \approx 0{,}955.$

```
1-5 nCr 3/12 nCr
3
  .9545454545
```

27c $P(\underline{\underline{\text{geel groen blauw}}}) = \dfrac{\binom{4}{1}\cdot\binom{3}{1}\cdot\binom{5}{1}}{\binom{12}{3}} \approx 0{,}273.$

```
4 nCr 1*3 nCr 1*
5 nCr 1/12 nCr 3
  .2727272727
```

27d $P(\text{alle drie dezelfde kleur}) = P(\text{geel} = 3) + P(\text{groen} = 3) + P(\text{blauw} = 3) = \dfrac{\binom{4}{3}}{\binom{12}{3}} + \dfrac{\binom{3}{3}}{\binom{12}{3}} + \dfrac{\binom{5}{3}}{\binom{12}{3}} \approx 0{,}068.$

```
4 nCr 3+3 nCr 3+
5 nCr 3
              15
Ans/12 nCr 3
   .0681818182
```

28a $P(\text{groen} = 0) = 1 - P(\text{groen} > 0) = 1 - P(\text{groen} = 1 \text{ of groen} = 2 \text{ of groen} = 3 \text{ of groen} = 4 \text{ of groen} = 5) \neq 1 - P(\text{groen} = 5).$

28b $P(\text{dezelfde kleur}) = 1 - P(\text{niet dezelfde kleur}) = 1 - P(\text{verschillende kleuren})$ IS DUS WEL GOED $\neq 1 - P(\text{drie verschillende kleuren}).$

28c $P(\text{rood} > 2) = 1 - P(\text{rood} \leq 2) \neq 1 - P(\text{rood} < 2).$

28d $P(\text{wit} \leq 3) = 1 - P(\text{wit} > 3) \neq 1 - P(\text{wit} \geq 3).$

29a $P(\text{aantal glazen met barst in deze doos} \geq 1) = 1 - P(\text{aantal glazen met barst in deze doos} = 0) = 1 - \dfrac{\binom{56}{12}}{\binom{60}{12}} \approx 0{,}601.$

```
1-56 nCr 12/60 n
Cr 12
   .6009720385
```

29b $P(\text{aantal glazen met barst in deze doos} = 4) = \dfrac{\binom{4}{4}\cdot\binom{56}{8}}{\binom{60}{12}} \approx 0{,}001.$

```
4 nCr 4*56 nCr 8
/60 nCr 12
   .0010151035
```

30 $P(\text{minstens één prijs}) = 1 - P(\text{geen prijs}) = 1 - \dfrac{\binom{7}{4}}{\binom{10}{4}} \approx 0{,}833.$

```
1-7 nCr 4/10 nCr
4
   .8333333333
```

31a $P(\text{minstens één speler moet wachten}) = 1 - P(\text{geen speler moet wachten}) = 1 - \dfrac{\binom{54-8}{6}}{\binom{54}{6}} \approx 0{,}637.$

```
1-46 nCr 6/54 nC
r 6
   .6373268611
```

31b $P(\text{Woonink en secretaresse hoeven niet te wachten}) = \dfrac{\binom{54-2}{6}}{\binom{54}{6}} \approx 0{,}788.$

```
52 nCr 6/54 nCr
6
   .7882599581
```

32a $P(\text{bestuursleden} \geq 2) = 1 - P(\text{bestuursleden} < 2)$

$= 1 - \left(\dfrac{\binom{59}{5}}{\binom{65}{5}} + \dfrac{\binom{6}{1}\cdot\binom{59}{4}}{\binom{65}{5}}\right) \approx 0{,}063.$

```
59 nCr 5+6 nCr 1
*59 nCr 4
         7737142
Ans/65 nCr 5
    .9367127012
1-Ans
    .0632872988
```

winkeliersvereniging Groenport Passage

	supers	niet supers	totaal
bestuur	**2**		**6**
niet bestuur			59
totaal	**8**	57	**65**

32b $P(\text{leden uit supermarkt} \geq 1) = 1 - P(\text{leden uit supermarkt} = 0) = 1 - \dfrac{\binom{57}{5}}{\binom{65}{5}} \approx 0{,}493.$

```
1-57 nCr 5/65 nC
r 5
    .4930795672
53 nCr 5/65 nCr
5
    .3474242024
```

32c $P(\text{leden uit supermarkt} = 0 \text{ én bestuursleden} = 0) = \dfrac{\binom{53}{5}}{\binom{65}{5}} \approx 0{,}347.$

33a $P(\text{prijzen} < 2) = P(\text{prijzen} = 0) + P(\text{prijzen} = 1) = \dfrac{\binom{42}{4}}{\binom{50}{4}} + \dfrac{\binom{8}{1}\cdot\binom{42}{3}}{\binom{50}{4}} \approx 0{,}885.$

```
42 nCr 4+8 nCr 1
*42 nCr 3
          203770
Ans/50 nCr 4
    .8848024316
```

Prijs	aantal
€ 100	1
€ 50	3
€ 25	4
geen	42
totaal	50

33b $P(\text{prijs} = € 100) = P(1 \times € 100) + P(2 \times € 50) + P(1 \times € 50 + 2 \times € 25) + P(4 \times € 25)$

$= \dfrac{\binom{1}{1}\cdot\binom{42}{3}}{\binom{50}{4}} + \dfrac{\binom{3}{2}\cdot\binom{42}{2}}{\binom{50}{4}} + \dfrac{\binom{3}{1}\cdot\binom{4}{2}\cdot\binom{42}{1}}{\binom{50}{4}} + \dfrac{\binom{4}{4}}{\binom{50}{4}} \approx 0{,}064.$

```
(1 nCr 1*42 nCr
3+3 nCr 2*42 nCr
 2+3 nCr 1*4 nCr
 2*42 nCr 1+4 nC
r 4)/50 nCr 4
    .0643508467
```

33c $P(\text{prijs} = € 50) = P(1 \times € 50) + P(2 \times € 25) = \dfrac{\binom{3}{1}\cdot\binom{42}{3}}{\binom{50}{4}} + \dfrac{\binom{4}{2}\cdot\binom{42}{2}}{\binom{50}{4}} \approx 0{,}172.$

```
3 nCr 1*42 nCr 3
+4 nCr 2*42 nCr
2
           39606
Ans/50 nCr 4
    .1719756839
```

```
1-(3 nCr 1*4 nCr
 1*42 nCr 2+4 nC
r 3*42 nCr 1)/50
 nCr 4
    .9544072948
```

33d $P(\text{prijs} \neq € 75) = 1 - P(\text{prijs} = € 75) = 1 - \big(P(1 \times € 50 + 1 \times € 25) + P(3 \times € 25)\big) = 1 - \left(\dfrac{\binom{3}{1}\cdot\binom{4}{1}\cdot\binom{42}{2}}{\binom{50}{4}} + \dfrac{\binom{4}{3}\cdot\binom{42}{1}}{\binom{50}{4}}\right) \approx 0{,}954.$

34a $P(\text{minstens één niet-voorbereid onderwerp}) = 1 - P(\text{geen niet-voorbereid onderwerp}) = 1 - \frac{\binom{7}{4}}{\binom{10}{4}} \approx 0{,}833.$

```
1-7 nCr 4/10 nCr
4
      .8333333333
```

34b $P(\text{drie niet-voorbereide onderwerpen}) = \frac{\binom{3}{3}\cdot\binom{7}{1}}{\binom{10}{4}} \approx 0{,}033.$

```
3 nCr 3*7 nCr 1/
10 nCr 4
      .0333333333
```

35a $P(0\text{–} < 10 \text{ km} \geq 6) = P(0\text{–} < 10 \text{ km} = 6) + P(0\text{–} < 10 \text{ km} = 7) + P(0\text{–} < 10 \text{ km} = 8) = \frac{\binom{20}{6}\cdot\binom{10}{2}}{\binom{30}{8}} + \frac{\binom{20}{7}\cdot\binom{10}{1}}{\binom{30}{8}} + \frac{\binom{20}{8}}{\binom{30}{8}} \approx 0{,}452.$

```
(20 nCr 6*10 nCr
 2+20 nCr 7*10 n
Cr 1+20 nCr 8)/3
0 nCr 8
      .451974013
```

35b $P(\text{jongens} < 7) = 1 - P(\text{jongens} \geq 7) = 1 - \left(P(\text{jongens} = 7) + P(\text{jongens} = 8)\right) = 1 - \left(\frac{\binom{12}{7}\cdot\binom{18}{1}}{\binom{30}{8}} + \frac{\binom{12}{8}}{\binom{30}{8}}\right) \approx 0{,}997.$

```
1-(12 nCr 7*18 n
Cr 1+12 nCr 8)/3
0 nCr 8
      .9974797217
```

35c $P(\text{meisjes van } 0\text{–} < 10 \text{ km} = 3) = \frac{\binom{13}{3}\cdot\binom{17}{5}}{\binom{30}{8}} \approx 0{,}302.$

```
13 nCr 3*17 nCr
5/30 nCr 8
      .3023732578
```

36a $P(\text{paar} = 4) = P(\text{li} = 4 \text{ én re} = 4) = \frac{\binom{9}{4}\cdot\binom{6}{4}}{\binom{15}{8}} \approx 0{,}294.$

```
9 nCr 4*6 nCr 4/
15 nCr 8
      .2937062937
```

36b $P(\text{paar} = 0) = P(\text{li} = 8 \text{ of re} = 8) = P(\text{li} = 8) + \cancel{P(\text{re} = 8)} = \frac{\binom{9}{8}}{\binom{15}{8}} + 0 \approx 0{,}001.$

```
9 nCr 8/15 nCr 8
      .0013986014
```

36c $P(\text{paar} \geq 2) = P(\text{li} = 2 \text{ én re} = 6) + P(\text{li} = 3 \text{ én re} = 5) + P(\text{li} = 4 \text{ én re} = 4) + P(\text{li} = 5 \text{ én re} = 3) + P(\text{li} = 6 \text{ én re} = 2)$

$= \frac{\binom{9}{2}\cdot\binom{6}{6}}{\binom{15}{8}} + \frac{\binom{9}{3}\cdot\binom{6}{5}}{\binom{15}{8}} + \frac{\binom{9}{4}\cdot\binom{6}{4}}{\binom{15}{8}} + \frac{\binom{9}{5}\cdot\binom{6}{3}}{\binom{15}{8}} + \frac{\binom{9}{6}\cdot\binom{6}{2}}{\binom{15}{8}} \approx 0{,}965.$

```
(9 nCr 2*6 nCr 6
+9 nCr 3*6 nCr 5
+9 nCr 4*6 nCr 4
+9 nCr 5*6 nCr 3
+9 nCr 6*6 nCr 2
)/15 nCr 8
      .965034965
```

OF $P(\text{paar} \geq 2) = 1 - P(\text{paar} < 2) = 1 - \left(P(\text{paar} = 0) + P(\text{paar} = 1)\right)$

$= 1 - \left(\cancel{P(\text{re} = 8)} + P(\text{li} = 8) + \cancel{P(\text{li} = 1 \text{ én re} = 7)} + P(\text{li} = 7 \text{ én re} = 1)\right) = 1 - \left(0 + \frac{\binom{9}{8}}{\binom{15}{8}} + 0 + \frac{\binom{9}{7}\cdot\binom{6}{1}}{\binom{15}{8}}\right) \approx 0{,}965.$

```
9 nCr 8+9 nCr 7*
6 nCr 1
             225
Ans/15 nCr 8
      .034965035
1-Ans
      .965034965
```

37a Uit de gegevens volgt de tabel hiernaast.

leeftijd	15	16	17	totaal
Hoogzijl	6	10	1	17
elders	2	5	4	11
totaal	8	15	5	28

$P(\text{tenminste één 16-jarige}) = 1 - P(\text{geen 16-jarige}) = 1 - \frac{\binom{13}{4}}{\binom{28}{4}} \approx 0{,}965.$

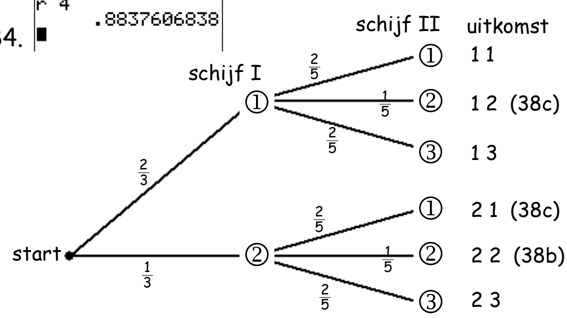
```
1-13 nCr 4/28 nC
r 4
      .9650793651
```

37b $P(\text{geen 17-jarige van elders}) = \frac{\binom{24}{4}}{\binom{28}{4}} \approx 0{,}519.$

```
24 nCr 4/28 nCr
4
      .518974359
```

37c $P(\text{hoogstens drie uit Hoogzijl}) = 1 - P(\text{vier uit Hoogzijl}) = 1 - \frac{\binom{17}{4}}{\binom{28}{4}} \approx 0{,}884.$

```
1-17 nCr 4/28 nC
r 4
      .8837606838
```



38a Neem het boomdiagram over en maak het af zoals hiernaast.

38b $P(2\,2) = \frac{1}{3}\cdot\frac{1}{5} = \frac{1}{15}.$

38c $P(\underline{\underline{12}}) = P(12) + P(21) = \frac{2}{3}\cdot\frac{1}{5} + \frac{1}{3}\cdot\frac{2}{5} = \frac{2}{15} + \frac{2}{15} = \frac{4}{15}.$

39a $\frac{2}{3}\times\frac{3}{10} = \frac{2\times 3}{3\times 10} = \frac{2}{10} = \frac{1}{5}.$

39b $\frac{5}{10} + \frac{3}{10} = \frac{5+3}{10} = \frac{8}{10} = \frac{4}{5}.$

39c $4\times\frac{1}{3}\times\frac{1}{2} = \frac{4\times 1\times 1}{3\times 2} = \frac{4}{6} = \frac{2}{3}.$

39d $3\times(\frac{2}{5})^3 = \frac{3\times 2\times 2\times 2}{5\times 5\times 5} = \frac{24}{125}.$

39e $\frac{1}{3}\times\frac{5}{6} + \frac{2}{9}\times\frac{1}{2} = \frac{5}{18} + \frac{2}{18} = \frac{7}{18}.$

39f $\frac{2}{5}\times 3\times\frac{1}{6} = \frac{2\times 3\times 1}{5\times 6} = \frac{6}{30} = \frac{1}{5}.$

40a $\frac{2}{5}\times\frac{1}{3}\times\frac{3}{4}=\frac{2\times1\times3}{5\times3\times4}=\frac{6}{60}=\frac{1}{10}$.

40b $\frac{2}{5}\times\frac{1}{3}+\frac{6}{15}=\frac{2\times1}{5\times3}+\frac{6}{15}=\frac{2}{15}+\frac{6}{15}=\frac{8}{15}$.

40c $\frac{3}{4}\times\frac{2}{3}+\frac{5}{6}\times\frac{1}{2}=\frac{3\times2}{4\times3}+\frac{5\times1}{6\times2}=\frac{6}{12}+\frac{5}{12}=\frac{11}{12}$.

40d $4\times\frac{1}{9}+(\frac{2}{3})^2=\frac{4\times1}{9}+\frac{2\times2}{3\times3}=\frac{4}{9}+\frac{4}{9}=\frac{8}{9}$.

40e $6\times(\frac{2}{3})^2=\frac{6\times2\times2}{3\times3}=\frac{24}{9}=\frac{8}{3}=2\frac{2}{3}$.

40f $3\times\frac{7}{8}+\frac{1}{2}\times\frac{3}{4}=\frac{3\times7}{8}+\frac{1\times3}{2\times4}=\frac{21}{8}+\frac{3}{8}=\frac{24}{8}=3$.

41a $5\times(\frac{3}{4})^3+3\times(\frac{1}{8})^2=\frac{5\times3\times3\times3}{4\times4\times4}+\frac{3\times1\times1}{8\times8}=\frac{135}{64}+\frac{3}{64}=\frac{138}{64}=\frac{69}{32}=2\frac{5}{32}$.

41b $\frac{5}{6}\times\frac{1}{3}+\frac{5}{9}\times\frac{1}{2}=\frac{5\times1}{6\times3}+\frac{5\times1}{9\times2}=\frac{5}{18}+\frac{5}{18}=\frac{10}{18}=\frac{5}{9}$.

41c $4\times\frac{2}{3}\times\frac{1}{5}+3\times\frac{1}{3}\times\frac{2}{5}=\frac{4\times2\times1}{3\times5}+\frac{3\times1\times2}{3\times5}=\frac{8}{15}+\frac{6}{15}=\frac{14}{15}$.

41d $(\frac{3}{4})^2+5\times\frac{1}{16}+(\frac{1}{2})^4=\frac{9}{16}+\frac{5}{16}+\frac{1}{16}=\frac{15}{16}$.

41e $(\frac{1}{6})^2+3\times(\frac{1}{2})^2\times\frac{1}{9}=\frac{1}{36}+3\times\frac{1}{4}\times\frac{1}{9}=\frac{1}{36}+\frac{3}{36}=\frac{4}{36}=\frac{1}{9}$.

41f $3\times(\frac{1}{4})^3+\frac{5}{32}\times\frac{1}{2}\times6=3\times\frac{1}{64}+\frac{30}{64}=\frac{3}{64}+\frac{30}{64}=\frac{33}{64}$.

$\bar{4}$ betekent "niet 4"

42a $P(\underline{\underline{4\bar{4}\bar{4}}})=P(4\bar{4}\bar{4})+P(\bar{4}4\bar{4})+P(\bar{4}\bar{4}4)=\frac{1}{4}\cdot\frac{3}{4}\cdot\frac{3}{4}+\frac{3}{4}\cdot\frac{1}{4}\cdot\frac{3}{4}+\frac{3}{4}\cdot\frac{3}{4}\cdot\frac{1}{4}=\frac{9}{64}+\frac{9}{64}+\frac{9}{64}=\frac{27}{64}$.

42b $P(\text{minstens één 2})=1-P(\text{geen 2})=1-P(\bar{2}\bar{2}\bar{2})=1-\frac{3}{4}\cdot\frac{3}{4}\cdot\frac{3}{4}=1-\frac{27}{64}=\frac{64}{64}-\frac{27}{64}=\frac{37}{64}$.

```
MATH NUM CPX PRB
1:▸Frac
2:▸Dec
3:³
4:³√(
5:ˣ√
6:fMin(
7↓fMax(
```

```
1/4*3/4*3/4*3▸Fr
ac
           27/64
1-(3/4)^3▸Frac
           37/64
```

43a $P(33)=\frac{2}{4}\cdot\frac{1}{3}=\frac{2}{12}=\frac{1}{6}$.

43b $P(\bar{2}\bar{2})=\frac{3}{4}\cdot\frac{2}{3}=\frac{6}{12}=\frac{1}{2}$.

43c $P(\underline{\underline{3\bar{3}}})=P(3\bar{3})+P(\bar{3}3)=\frac{2}{4}\cdot\frac{2}{3}+\frac{2}{4}\cdot\frac{1}{3}=\frac{4}{12}+\frac{2}{12}=\frac{6}{12}=\frac{1}{2}$.

43d $P(\text{som}=4)=P(22)+P(31)=\frac{1}{4}\cdot\frac{1}{3}+\frac{2}{4}\cdot\frac{1}{3}=\frac{1}{12}+\frac{2}{12}=\frac{3}{12}=\frac{1}{4}$.

43e $P(\text{minstens één 3})=1-P(\text{geen 3})=1-P(\bar{3}\bar{3})=1-\frac{2}{4}\cdot\frac{2}{3}=1-\frac{4}{12}=\frac{8}{12}=\frac{2}{3}$.

```
2/4*1/3▸Frac
             1/6
3/4*2/3▸Frac
             1/2
2/4*2/3+2/4*1/3▸
Frac
             1/2
1/4*1/3+2/4*1/3▸
Frac
             1/4
1-2/4*2/3▸Frac
             2/3
```

44a $P(bb)=\frac{3}{10}\cdot\frac{2}{5}=\frac{6}{50}=\frac{3}{25}$.

44b $P(\underline{\underline{bw}})=P(bw)+P(wb)=\frac{3}{10}\cdot\frac{2}{5}+\frac{5}{10}\cdot\frac{2}{5}=\frac{6}{50}+\frac{10}{50}=\frac{16}{50}=\frac{8}{25}$.

44c $P(\text{hoogstens één witte})=1-P(ww)=1-\frac{5}{10}\cdot\frac{2}{5}=1-\frac{10}{50}=\frac{40}{50}=\frac{4}{5}$.

44d $P(\text{geen witte})=P(\bar{w}\bar{w})=\frac{5}{10}\cdot\frac{3}{5}=\frac{15}{50}=\frac{3}{10}$.

45a $P(\text{drie keer minder dan 5})=\frac{4}{6}\cdot\frac{4}{6}\cdot\frac{4}{6}=\frac{2}{3}\cdot\frac{2}{3}\cdot\frac{2}{3}=\frac{8}{27}$.

45b $P(\text{drie keer geen 5})=P(\bar{5}\bar{5}\bar{5})=\frac{5}{6}\cdot\frac{5}{6}\cdot\frac{5}{6}=\frac{125}{216}$.

```
(4/6)^3▸Frac
            8/27
(2/3)^3▸Frac
            8/27
(5/6)^3▸Frac
         125/216
```

45c $P(\text{drie keer meer dan 4})=\frac{2}{6}\cdot\frac{2}{6}\cdot\frac{2}{6}=\frac{1}{3}\cdot\frac{1}{3}\cdot\frac{1}{3}=\frac{1}{27}$.

```
(2/6)^3▸Frac
            1/27
```

46a $P(\text{drie keer doorlopen})=P(d\,d\,d)=P(\bar{r}\,\bar{r}\,\bar{r})=0{,}6\cdot0{,}3\cdot0{,}8=0{,}144$.

46b $P(\underline{\underline{w\,d\,d}})=P(\underline{\underline{r\,\bar{r}\,\bar{r}}})=P(r\,\bar{r}\,\bar{r})+P(\bar{r}\,r\,\bar{r})=0{,}4\cdot0{,}3\cdot0{,}8+0{,}6\cdot0{,}7\cdot0{,}8=0{,}432$.

```
0.6*0.3*0.8
            .144
0.4*0.3*0.8+0.6*
0.7*0.8
            .432
```

47 $P(A\text{ functioneert})=P(A)=1-0{,}001=0{,}999$.
$P(A\ B\ C\ D\ E)=0{,}999\cdot0{,}997\cdot0{,}998\cdot0{,}992\cdot0{,}975\approx0{,}961$.

```
0.999*0.997*0.99
8*0.992*0.975
    .9614074334
```

48a $P(\text{tweejarige wordt 4})=0{,}40\cdot0{,}25=0{,}1$.

48b $P(\text{pasgeboren muis wordt 3 maar geen 4})=0{,}42\cdot0{,}60\cdot0{,}40\cdot0{,}75\approx0{,}076$.

48c $P(\text{pasgeboren muis wordt geen 3})=1-P(\text{pasgeboren muis wordt 3})=1-0{,}42\cdot0{,}60\cdot0{,}40\approx0{,}899$.

```
0.4*0.25
              .1
0.42*0.6*0.4*0.7
5
           .0756
1-0.42*0.6*0.4
           .8992
```

49a Afhankelijk, want de kinderen komen uit hetzelfde gezin.

49b Onafhankelijk, want de plaatsen liggen ver van elkaar. De gevraagde kans is $0{,}7\cdot0{,}2=0{,}14$.

```
0.7*0.2
             .14
```

49c Afhankelijk, want de plaatsen liggen dicht bij elkaar.

50a $P(\text{geen enkele keer 6})=P(\bar{6}\,\bar{6}\,\bar{6}\,\bar{6})=\frac{5}{6}\cdot\frac{5}{6}\cdot\frac{5}{6}\cdot\frac{5}{6}=\frac{625}{1296}$.

```
(5/6)^4▸Frac
        625/1296
```

50b $P(\text{geen enkele 6})=P(\bar{6}\,\bar{6}\,\bar{6}\,\bar{6})=\frac{625}{1296}$.

51a $P(\underline{\underline{a\,a\,a\,p\,p\,p}})=\binom{6}{3}\cdot P(a\,a\,a\,p\,p\,p)=\binom{6}{3}\cdot(\frac{2}{5})^3\cdot(\frac{2}{5})^3=\frac{256}{3125}\ (\approx0{,}082)$.

51b $P(a\geq1)=1-P(a<1)=1-P(a=0)=1-P(\bar{a}\,\bar{a}\,\bar{a}\,\bar{a}\,\bar{a}\,\bar{a})=1-(\frac{3}{5})^6\approx0{,}953$.

```
6 nCr 3*(2/5)^3*
(2/5)^3
          .08192
Ans▸Frac
        256/3125
1-(3/5)^6▸Frac
         .953344
```

51c $P(b=3)=P(\underline{\underline{b\,b\,b\,\bar{b}\,\bar{b}\,\bar{b}}})=\binom{6}{3}\cdot P(b\,b\,b\,\bar{b}\,\bar{b}\,\bar{b})=\binom{6}{3}\cdot(\frac{1}{5})^3\cdot(\frac{4}{5})^3=\frac{256}{3125}\ (\approx0{,}082)$.

```
6 nCr 3*(1/5)^3*
(4/5)^3
          .08192
Ans▸Frac
        256/3125
```

52a $P(\underline{\underline{a\,b}}) = \binom{2}{1} \cdot P(a\,b) = \binom{2}{1} \cdot \frac{2}{5} \cdot \frac{1}{5} = \frac{4}{25}$.

```
2 nCr 1
                2
2*2/5*1/5▸Frac
             4/25
```

52b $P(\bar{b}\,\bar{b}) = (\frac{4}{5})^2 = \frac{16}{25}$.

```
(4/5)²▸Frac
            16/25
2*2/5*1/5+2*2/5*
2/5+2*1/5*2/5▸Fr
ac
            16/25
```

52c $P(\text{twee verschillende vruchten}) = P(\underline{\underline{a\,b}}) + P(\underline{\underline{a\,p}}) + P(\underline{\underline{b\,p}}) = \binom{2}{1} \cdot \frac{2}{5} \cdot \frac{1}{5} + \binom{2}{1} \cdot \frac{2}{5} \cdot \frac{2}{5} + \binom{2}{1} \cdot \frac{1}{5} \cdot \frac{2}{5} = \frac{16}{25}$.

53a $P(\bar{g}\,\bar{g}\,\bar{g}\,\bar{g}\,\bar{g}\,\bar{g}) = (\frac{3}{4})^6 = \frac{729}{4096}\ (\approx 0{,}178)$.

```
(3/4)^6
      .1779785156
Ans▸Frac
         729/4096
```

53c $P(\underline{\underline{g\,g\,\bar{g}\,\bar{g}\,\bar{g}\,\bar{g}}}) = \binom{6}{2} \cdot (\frac{1}{4})^2 \cdot (\frac{3}{4})^4 = \frac{1215}{4096}\ (\approx 0{,}297)$.

53b $P(\text{minstens één goed}) = 1 - P(\text{geen goed}) = 1 - P(\bar{g}\,\bar{g}\,\bar{g}\,\bar{g}\,\bar{g}\,\bar{g}) = 1 - (\frac{3}{4})^6 = \frac{3367}{4096}\ (\approx 0{,}822)$.

```
1-(3/4)^6
      .8220214844
Ans▸Frac
        3367/4096
```

```
6 nCr 2*(1/4)²*(
3/4)^4
      .2966308594
Ans▸Frac
        1215/4096
```

54a $P(z\,z\,z\,z) = (\frac{18}{38})^4 \approx 0{,}050$.

54b $P(\underline{\underline{z\,z\,r\,r}}) = \binom{4}{2} \cdot P(z\,z\,r\,r) = \binom{4}{2} \cdot (\frac{18}{38})^2 \cdot (\frac{18}{38})^2 \approx 0{,}302$.

```
(18/38)^4
      .0503449175
4 nCr 2*(18/38)^
4
      .3020695053
```

54c $P(groen \geq 1) = 1 - P(groen < 1) = 1 - P(groen = 0) = 1 - P(\bar{g}\,\bar{g}\,\bar{g}\,\bar{g}) = 1 - (\frac{36}{38})^4 \approx 0{,}194$.

54d $P(uitkering = €\,40) = P(rood = 2) = P(\underline{\underline{r\,r\,\bar{r}\,\bar{r}}}) = \binom{4}{2} \cdot P(r\,r\,\bar{r}\,\bar{r}) = \binom{4}{2} \cdot (\frac{18}{38})^2 \cdot (\frac{20}{38})^2 \approx 0{,}373$.

```
1-(36/38)^4
      .1944813192
4 nCr 2*(18/38)²
*(20/38)²
      .3729253152
```

55a $P(\text{vijf weken geen foto}) = P(\bar{f}\,\bar{f}\,\bar{f}\,\bar{f}\,\bar{f}) = (\frac{4}{5})^5 = \frac{1024}{3125}\ (\approx 0{,}328)$.

```
(4/5)^5
           .32768
Ans▸Frac
        1024/3125
```

55b $P(\text{in zes weken minstens één foto}) = 1 - P(\text{in zes weken minstens geen foto}) = 1 - P(\bar{f}\,\bar{f}\,\bar{f}\,\bar{f}\,\bar{f}\,\bar{f}) = 1 - (\frac{4}{5})^6 \approx 0{,}738$.

```
1-(4/5)^6
          .737856
Ans▸Frac
          .737856
```

55c $P(\text{in acht weken precies één foto}) = P(\underline{\underline{f\,\bar{f}\,\bar{f}\,\bar{f}\,\bar{f}\,\bar{f}\,\bar{f}\,\bar{f}}}) = \binom{8}{1} \cdot P(f\,\bar{f}\,\bar{f}\,\bar{f}\,\bar{f}\,\bar{f}\,\bar{f}\,\bar{f}) = \binom{8}{1} \cdot \frac{1}{5} \cdot (\frac{4}{5})^7 \approx 0{,}336$.

```
8 nCr 1*1/5*(4/5
)^7
        .33554432
Ans▸Frac
        .33554432
```

56a $P(s) = 0{,}22 \Rightarrow P(z) = 1 - 0{,}22 = 0{,}78$. Dus $P(\text{minstens twee in één keer slagen}) = 1 - P(\text{geen of 1 leerling in één keer slagen}) =$
$= 1 - \left(P(z\,z\,z\,z\,z\,z\,z\,z) + P(\underline{s\,z\,z\,z\,z\,z\,z\,z})\right) = 1 - \left(0{,}78^8 + \binom{8}{1} \cdot 0{,}22 \cdot 0{,}78^7\right) \approx 0{,}554$.

```
1-(0.78^8+8 nCr
1*0.22*0.78^7)
      .5538345511
```

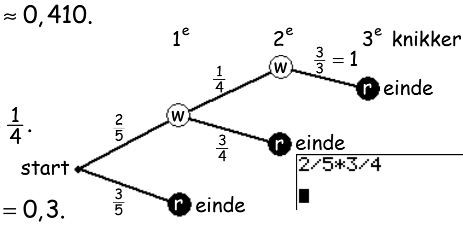
56b $P(s) = 0{,}53 \Rightarrow P(z) = 1 - 0{,}53 = 0{,}47$. Dus $P(\text{zes of zeven in één keer slagen}) =$
$= P(\underline{s\,s\,s\,s\,s\,s\,z\,z\,\ldots\,z}) + P(\underline{s\,s\,s\,s\,s\,s\,s\,z\,\ldots\,z}) = \binom{12}{6} \cdot 0{,}53^6 \cdot 0{,}47^6 + \binom{12}{7} \cdot 0{,}53^7 \cdot 0{,}47^5 \approx 0{,}434$.

```
12 nCr 6*0.53^6*
0.47^6+12 nCr 7*
0.53^7*0.47^5
      .4341329198
```

56c $P(\text{hoogstens 2 zakken}) = P(\text{geen zakt}) + P(\text{1 zakt}) + P(\text{2 zakken}) = P(s\,s\,s\,s\,s\,s\,s\,s\,s\,s) + P(\underline{\underline{z\,s\,s\,s\,s\,s\,s\,s\,s\,s}}) + P(\underline{\underline{z\,z\,s\,s\,s\,s\,s\,s\,s\,s}}) =$
$= 0{,}71^{10} + \binom{10}{1} \cdot 0{,}29 \cdot 0{,}71^9 + \binom{10}{2} \cdot 0{,}29^2 \cdot 0{,}71^8 \approx 0{,}410$.

```
0.71^10+10 nCr 1
*0.29*0.71^9+10
nCr 2*0.29²*0.71
^8
      .4098985115
```

57a Na de eerste keer een witte knikker gepakt te hebben, zijn er nog 3 rode en 1 witte knikker in de vaas $\Rightarrow P(w) = \frac{1}{4}$.



57b Zie de kansboom hiernaast.

57c $P(\text{twee knikkers}) = P(\text{eerst wit en dan pas rood}) = P(w\,r) = \frac{2}{5} \cdot \frac{3}{4} = 0{,}3$.

```
2/5*3/4
               .3
```

58a $P(\text{twee knikkers}) = P(\bar{w}\,w) = \frac{5}{8} \cdot \frac{3}{7} \approx 0{,}268$.

58b $P(\text{vier knikkers}) = P(\bar{w}\,\bar{w}\,\bar{w}\,w) = \frac{5}{8} \cdot \frac{4}{7} \cdot \frac{3}{6} \cdot \frac{3}{5} \approx 0{,}107$.

```
5*3/8/7
      .2678571429
5*4*3*3/8/7/6/5
      .1071428571
```

59a $P(\text{vierde dvd van mindere kwaliteit}) = P(g\,g\,g\,m) = \frac{8}{10} \cdot \frac{7}{9} \cdot \frac{6}{8} \cdot \frac{2}{7} \approx 0{,}133$.

59b $P(\text{zesde dvd van mindere kwaliteit}) = P(g\,g\,g\,g\,g\,m) = \frac{8}{10} \cdot \frac{7}{9} \cdot \frac{6}{8} \cdot \frac{5}{7} \cdot \frac{4}{6} \cdot \frac{2}{5} \approx 0{,}089$.

```
8*7*6*2/10/9/8/7
      .1333333333
8*7*6*5*4*2/10/9
/8/7/6/5
      .0888888889
```

```
4 nCr 3*8*7*6*2*
1/10/9/8/7/6
      .0888888889
8 nCr 3*2 nCr 1/
10 nCr 4*1/6
      .0888888889
```

59c $P(\text{vijfde al de tweede van mindere kwaliteit}) = P(\underline{\underline{g\,g\,g\,m}}\,m) = P(\underline{\underline{g\,g\,g\,m}}) \cdot P(m) = \binom{4}{3} \cdot \frac{8}{10} \cdot \frac{7}{9} \cdot \frac{6}{8} \cdot \frac{2}{7} \cdot \frac{1}{6} \approx 0{,}089$. OF: $\frac{\binom{8}{3}\binom{2}{1}}{\binom{10}{4}} \cdot \frac{1}{6}$

60a $P(\text{Sanne wint in twee sets}) = P(S\,S) = 0{,}6 \cdot 0{,}6 = 0{,}36$.

60b $P(\text{Johan wint de eerste enSanne de volgende twee sets}) = P(J\,S\,S) = 0{,}4 \cdot 0{,}6 \cdot 0{,}6 = 0{,}144$.

```
0.6²
              .36
0.4*0.6²
             .144
```

60c $P(\text{de partij duurt drie sets}) = P(\underline{\underline{J\,S}}\,S) + P(\underline{\underline{J\,S}}\,J) = \binom{2}{1} \cdot 0{,}4 \cdot 0{,}6 \cdot 0{,}6 + \binom{2}{1} \cdot 0{,}4 \cdot 0{,}6 \cdot 0{,}4 = 0{,}48$.

```
2 nCr 1*0.4*0.6²
+2 nCr 1*0.4*0.6
*0.4
              .48
```

61a $P(\text{Koos wint in twee sets}) = P(K\,K) = 0{,}65 \cdot 0{,}65 \approx 0{,}423$.

61b $P(\text{de partij is afgelopen in twee sets}) = P(K\,K) + P(B\,B) = 0{,}65 \cdot 0{,}65 + 0{,}35 \cdot 0{,}35 = 0{,}545$.

```
0.65²
            .4225
Ans+0.35²
             .545
```

61c $P(\text{Koos wint}) = P(K\,K) + P(\underline{\underline{K\,B}}\,K) = 0{,}65 \cdot 0{,}65 + \binom{2}{1} \cdot 0{,}65 \cdot 0{,}35 \cdot 0{,}65 \approx 0{,}718$.

```
0.65²+2 nCr 1*0.
65*0.35*0.65
           .71825
1-Ans
           .28175
```

61d $P(\text{Bart wint}) = 1 - P(\text{Bart wint}) \approx 1 - 0{,}718 = 0{,}282$.
OF: $P(\text{Bart wint}) = P(B\,B) + P(\underline{\underline{K\,B}}\,B) = 0{,}35 \cdot 0{,}35 + \binom{2}{1} \cdot 0{,}65 \cdot 0{,}35 \cdot 0{,}35 \approx 0{,}282$.

```
0.35²+2 nCr 1*0.
65*0.35*0.35
           .28175
```

62a $P(\text{bij de tweede herkansing slagen}) = P(\text{bij derde examen slagen}) = P(\bar{s}\ \bar{s}\ s) = 0{,}4 \cdot 0{,}7 \cdot 0{,}3 = 0{,}084.$

62b $P(\text{defintief afgewezen}) = P(\text{bij vierde examen niet slagen}) = P(\bar{s}\ \bar{s}\ \bar{s}\ \bar{s}) = 0{,}4 \cdot 0{,}7 \cdot 0{,}7 \cdot 0{,}7 \approx 0{,}137.$

```
0.4*0.7*0.3
            .084
0.4*0.7^3
           .1372
```

63a $P(\text{vier keer gooien}) = P(\bar{4}\ \bar{4}\ \bar{4}\ 4) = \frac{3}{4} \cdot \frac{3}{4} \cdot \frac{3}{4} \cdot \frac{1}{4} = \frac{27}{256} (\approx 0{,}105).$

```
(3/4)^3*1/4
      .10546875
Ans▸Frac
         27/256
```

63b $P(\text{zes keer gooien}) = P(\bar{4}\ \bar{4}\ \bar{4}\ \bar{4}\ \bar{4}\ 4) = (\frac{3}{4})^5 \cdot \frac{1}{4} = \frac{243}{4096} (\approx 0{,}059).$

```
(3/4)^5*1/4
   .0593261719
Ans▸Frac
       243/4096
```

63c $P(\text{minder dan drie keer gooien}) = P(4) + P(\bar{4}\ 4) = \frac{1}{4} + \frac{3}{4} \cdot \frac{1}{4} = \frac{7}{16} (\approx 0{,}438).$

63d $P(\text{minstens drie keer gooien}) = 1 - P(\text{minder dan drie keer gooien}) = 1 - \frac{7}{16} = \frac{9}{16} (\approx 0{,}562).$

```
1/4+3/4*1/4
          .4375
Ans▸Frac
           7/16
1-Ans
          .5625
```

64a $P(\text{rood uit I}) = \frac{\text{aantal gunstige uitkomsten}}{\text{aantal mogelijke uitkomsten}} (\text{kansdefinitie van Laplace}) = \frac{\text{aantal rode knikkers}}{\text{aantal knikkers}} = \frac{a}{10}.$

$P(\text{zwart uit I}) = \frac{\text{aantal gunstige uitkomsten}}{\text{aantal mogelijke uitkomsten}} (\text{Laplace}) = \frac{\text{aantal zwarte knikkers}}{\text{aantal knikkers}} = \frac{10-a}{10}.$

64b $P(\text{rood uit II}) = \frac{\text{aantal gunstige uitkomsten}}{\text{aantal mogelijke uitkomsten}} (\text{Laplace}) = \frac{\text{aantal rode knikkers}}{\text{aantal knikkers}} = \frac{b}{8}.$

$P(\text{zwart uit II}) = \frac{\text{aantal gunstige uitkomsten}}{\text{aantal mogelijke uitkomsten}} (\text{Laplace}) = \frac{\text{aantal zwarte knikkers}}{\text{aantal knikkers}} = \frac{8-b}{8}.$

	vaas I	vaas II
rood	a	b
zwart	10 - a	8 - b
totaal	10	8

65a $P(r\ r) = \frac{x}{11} \cdot \frac{x}{6} = \frac{x^2}{66}.$

65b $P(z\ r) = \frac{11-x}{11} \cdot \frac{x}{6} = \frac{(11-x) \cdot x}{66} = \frac{11x - x^2}{66}.$

65c Voer in op de GR: $P = \frac{11x - x^2}{66}$ (met $x \leq 6$ en x een heel aantal $\Rightarrow$ TABLE).
Dit geeft $P_{max} (\approx 0{,}4545)$ voor $x = 5$ en $x = 6$.
Dus bij 5 rode en 6 zwarte knikkers in vaas I en 5 rode en 1 zwarte knikker in vaas II
en bij 6 rode en 5 zwarte knikkers in vaas I en 6 rode en geen zwarte knikker in vaas II.

```
Plot1 Plot2 Plot3
\Y1=(11X-X²)/66
\Y2=
```

X	Y1
1	.15152
2	.27273
3	.36364
4	.42424
5	.45455
6	.45455
7	.42424

Y1=.454545454545

	vaas I	vaas II
rood	x	x
zwart	11 - x	6 - x
totaal	11	6

66a $P(r\ r) = \frac{5}{a} \cdot \frac{3}{a} = \frac{15}{a^2}.$

66b $P(\underline{\underline{r\ w}}) = P(r\ w) = \frac{5}{a} \cdot \frac{a-3}{a} = \frac{5 \cdot (a-3)}{a^2} = \frac{5a-15}{a^2}.$

66c $P(\underline{\underline{r\ z}}) = P(z\ r) = \frac{a-5}{a} \cdot \frac{3}{a} = \frac{(a-5) \cdot 3}{a^2} = \frac{3a-15}{a^2}.$

66d Voer in op de GR: $P = \frac{3a-15}{a^2}$ (met a een heel aantal $\Rightarrow$ TABLE).
Dit geeft $P_{max} (= 0{,}15)$ voor $a = 10$.
Dus bij (5 rode en) 5 zwarte knikkers in vaas I
(en 3 rode en 7 zwarte knikker in vaas II).

66e Ook lees je af dat $P > 0{,}1$ voor $a = 7$ tot en met $a = 23$.
Dus als er 7 tot en met 23 knikkers in vaas I zitten.

	vaas I	vaas II
rood	5	3
zwart	a - 5	0
wit	0	a - 3
totaal	a	a

```
Plot1 Plot2 Plot3
\Y1=(3X-15)/X²
\Y2=
```

X	Y1
6	.08333
7	.12245
8	.14063
9	.14815
10	.15
11	.14876
12	.14583

Y1=.15

X	Y1
13	.14201
14	.13776
15	.13333
16	.12891
17	.12457
18	.12037
19	.11634

Y1=.116343490305

X	Y1
20	.1125
21	.10884
22	.10537
23	.10208
24	.09896
25	.096
26	.0932

Y1=.102079395085

67a $P(\text{twee knikkers}) = P(z\ r) = \frac{8-a}{8} \cdot \frac{a}{7} = \frac{(8-a) \cdot a}{56} = \frac{8a - a^2}{56}.$

67b $\frac{8a - a^2}{56} = 0{,}125$ (met $a \leq 8$ en a een heel aantal $\Rightarrow$ TABLE).
Dit geeft $P = 0{,}125$ voor $a = 1$ en $a = 7$. Dus bij 1 rode knikker of bij 7 rode knikkers.

```
Plot1 Plot2 Plot3
\Y1=(8X-X²)/56
\Y2=0.125
```

X	Y1	Y2
1	.125	.125
2	.21429	.125
3	.26786	.125
4	.28571	.125
5	.26786	.125
6	.21429	.125
7	.125	.125

X=7

68a $P(r\ r) = \frac{3}{8} \cdot \frac{10-a}{10} = \frac{3 \cdot (10-a)}{80} = \frac{30-3a}{80}.$ 68b $P(\underline{\underline{w\ z}}) = P(w\ z) = \frac{5}{8} \cdot \frac{a}{10} = \frac{5a}{80}.$

68c $P(\underline{\underline{r\ z}}) = P(r\ z) = \frac{3+a}{8+a} \cdot \frac{a}{10} = \frac{(3+a) \cdot a}{(8+a) \cdot 10} = \frac{3a + a^2}{80 + 10a} = \frac{a^2 + 3a}{10a + 80}.$

68d $\frac{a^2 + 3a}{10a + 80} = 0{,}55$ (met $a \leq 10$ en a een heel aantal $\Rightarrow$ TABLE).
Dit geeft $P = 0{,}55$ voor $a = 8$. Dus er moeten 8 rode knikkers aan vaas I worden toegevoegd.

```
Plot1 Plot2 Plot3
\Y1=(X²+3X)/(10X
+80)
\Y2=0.55
```

X	Y1	Y2
4	.23333	.55
5	.30769	.55
6	.38571	.55
7	.46667	.55
8	.55	.55
9	.63529	.55
10	.72222	.55

X=8

69a 25% van $28 = \frac{1}{4} \cdot 28 = 7 \Rightarrow P(lid = 2) = P(l\ l) = \frac{\binom{7}{2}}{\binom{28}{2}} \approx 0{,}056.$

```
7 nCr 2/28 nCr 2
    .0555555556
```

69b Nee, in 69b kan twee keer dezelfde sector worden aangewezen. (bij 69a kies je niet twee keer dezelfde leerling)

70a $P(groen=2)=P(\underline{\underline{g\,g\,\bar{g}}})=\dfrac{\binom{16}{2}\cdot\binom{24}{1}}{\binom{40}{3}}\approx 0{,}291.$

```
16 nCr 2*24 nCr
1/40 nCr 3
       .2914979757
```

70b $P(blauw\geq 1)=1-P(blauw=0)=1-P(\bar{b}\,\bar{b}\,\bar{b})=1-\dfrac{\binom{16}{3}}{\binom{40}{3}}\approx 0{,}943.$

```
1-16 nCr 3/40 nC
r 3
       .9433198381
```

70c $P(groen=2)=P(\underline{\underline{g\,g\,\bar{g}}})=\binom{3}{2}\cdot P(g\,g\,\bar{g})=\binom{3}{2}\cdot\frac{16}{40}\cdot\frac{16}{40}\cdot\frac{24}{40}=0{,}288.$

70d $P(blauw\geq 1)=1-P(blauw<1)=1-P(blauw=0)=1-P(\bar{b}\,\bar{b}\,\bar{b})=1-\frac{16}{40}\cdot\frac{16}{40}\cdot\frac{16}{40}=0{,}936.$

```
3 nCr 2*(16/40)²
*24/40
              .288
1-(16/40)^3
              .936
```

71a Een leerling kan meerdere boeken winnen, dus met terugleggen.
$P(meisjes=4)=P(m\,m\,m\,m)=(\frac{12}{22})^4\approx 0{,}089.$

```
(12/22)^4
       .0885185438
```

71b Een leerling kan hoogstens één taart winnen, dus zonder terugleggen.
$P(meisjes=4)=P(m\,m\,m\,m)=\dfrac{\binom{12}{4}}{\binom{22}{4}}\approx 0{,}068.$

```
12 nCr 4/22 nCr
4
       .0676691729
```

71c $P(meisjes=3)=P(\underline{\underline{m\,m\,m\,\bar{m}}})=\dfrac{\binom{12}{3}\cdot\binom{10}{1}}{\binom{22}{4}}\approx 0{,}301.$

```
12 nCr 3*10 nCr
1/22 nCr 4
       .3007518797
```

71d $P(meisjes=3)=P(\underline{\underline{m\,m\,m\,\bar{m}}})=\binom{4}{3}\cdot P(m\,m\,m\,\bar{m})=\binom{4}{3}\cdot(\frac{12}{22})^3\cdot\frac{10}{22}\approx 0{,}295.$

```
4 nCr 3*(12/22)^
3*10/22
       .2950618127
```

72a $P(vrouwen=3)=P(v\,v\,v)=\dfrac{\binom{38}{3}}{\binom{60}{3}}\approx 0{,}247.$

72b $P(vrouwen=3)=P(v\,v\,v)=\frac{38}{60}\cdot\frac{38}{60}\cdot\frac{38}{60}=0{,}254.$

```
38 nCr 3/60 nCr
3
       .2465225015
(38/60)^3
        .254037037
```

73a $P(rood=2)=P(\underline{\underline{r\,r\,\bar{r}\,\bar{r}\,\bar{r}}})=\dfrac{\binom{3}{2}\cdot\binom{7}{3}}{\binom{10}{5}}\approx 0{,}417.$

73b $P(rood=2)=\dfrac{\binom{30}{2}\cdot\binom{70}{3}}{\binom{100}{5}}\approx 0{,}316.$

```
3 nCr 2*7 nCr 3/
10 nCr 5
       .4166666667
30 nCr 2*70 nCr
3/100 nCr 5
       .3162795109
```

73c $P(rood=2)=\dfrac{\binom{300}{2}\cdot\binom{700}{3}}{\binom{1000}{5}}\approx 0{,}309.$

73d $P(rood=2)=\dfrac{\binom{3000}{2}\cdot\binom{7000}{3}}{\binom{10000}{5}}\approx 0{,}309.$

```
300 nCr 2*700 nC
r 3/1000 nCr 5
       .3094372232
3000 nCr 2*7000
nCr 3/10000 nCr
5
       .3087735222
```

73e $P(rood=2)=P(\underline{\underline{r\,r\,\bar{r}\,\bar{r}\,\bar{r}}})=\binom{5}{2}\cdot P(r\,r\,\bar{r}\,\bar{r}\,\bar{r})=\binom{5}{2}\cdot 0{,}3^2\cdot 0{,}7^3\approx 0{,}309.$
(N.B.: $\frac{3}{10}=\frac{30}{100}=\frac{300}{1000}=\frac{3000}{10000}=0{,}3$ en $\frac{7}{10}=\frac{70}{100}=\frac{700}{1000}=\frac{7000}{10000}=0{,}7$)

```
5 nCr 2*0.3²*0.7
^3
             .3087
```

74a $P(\text{niemand in Nederland op vakantie})=P(\bar{N}\,\bar{N}\,\bar{N}\,\bar{N}\,\bar{N}\ldots\bar{N})=(1-0{,}22)^{15}=0{,}78^{15}\approx 0{,}024.$

```
1-0.22
               .78
Ans^15
       .0240668383
```

74b $P(\text{twee in Nederland op vakantie})=P(\underline{\underline{N\,N\,\bar{N}\,\bar{N}\,\bar{N}\ldots\bar{N}}})=\binom{15}{2}\cdot 0{,}22^2\cdot 0{,}78^{13}\approx 0{,}201.$

```
15 nCr 2*0.22²*0
.78^13
       .2010316771
```

74c $P(\text{minstens 2 in Nederland op vakantie})$
$=1-P(\text{minder dan 2 in Nederland op vakantie})=1-P(\text{geen of één in Nederland op vakantie})$
$=1-\left(P(\bar{N}\,\bar{N}\,\bar{N}\,\bar{N}\,\bar{N}\ldots\bar{N})+P(\underline{\underline{N\,\bar{N}\,\bar{N}\,\bar{N}\,\bar{N}\ldots\bar{N}}})\right)=1-\left(0{,}78^{15}+\binom{15}{1}\cdot 0{,}22\cdot 0{,}78^{14}\right)\approx 0{,}874.$

```
1-(0.78^15+15 nC
r 1*0.22*0.78^14
)
       .8741119226
```

75a $P(bijtend=0)=P(\overline{by}\,\overline{by}\,\overline{by}\,\overline{by}\,\overline{by}\,\overline{by}\,\overline{by}\,\overline{by}\,\overline{by}\,\overline{by})=(1-0{,}15)^{10}=0{,}85^{10}\approx 0{,}197.$

75b $P(brandbaar=8\text{ én }bijtend=2)=P(\underline{\underline{br\,br\,br\,br\,br\,br\,br\,br\,by\,by}})=\binom{10}{8}\cdot 0{,}60^8\cdot 0{,}15^2\approx 0{,}017.$

```
0.85^10
       .1968744043
10 nCr 8*0.60^8*
0.15²
        .017006112
```

75c $P(brandbaar\geq 9)=P(brandbaar=9)+P(brandbaar=10)=\binom{10}{1}\cdot 0{,}60^9\cdot 0{,}40+0{,}60^{10}\approx 0{,}046.$

```
10 nCr 1*0.6^9*0
.4+0.6^10
       .0463574016
```

76a $P(\text{wekelijks naar de markt} = 0) = P(\overline{m}\,\overline{m}\,\overline{m}\,\overline{m}\,\overline{m}\,\overline{m}\,\overline{m}\,\overline{m}) = (1 - 0{,}23)^8 = 0{,}77^8 \approx 0{,}124.$

```
1-0.23
            .77
Ans^8
   .1235736292
```

76bc $P(\text{wekelijks naar de markt} = 2) = P(\underline{\underline{m\,m\,\overline{m}\,\overline{m}\,\overline{m}\,\overline{m}\,\overline{m}\,\overline{m}}}) = \binom{8}{2} \cdot 0{,}23^2 \cdot 0{,}77^6 \approx 0{,}309.$

Je verwacht er dan $Ans \times 27 \approx 8{,}335$. Dus 8 leerlingen.

```
8 nCr 2*0.23²*0.
77^6
   .3087152294
Ans*27
   8.335311193
```

77a $P(\textit{kinderdagverblijf} = 2) = P(\underline{\underline{k\,k\,\overline{k}\,\overline{k}\,\overline{k}\,\overline{k}\,\overline{k}\,\overline{k}}}) = \binom{8}{2} \cdot 0{,}14^2 \cdot 0{,}86^6 \approx 0{,}222.$

```
8 nCr 2*0.14²*0.
86^6
   .2220264986
```

77b $P(\textit{betaalde oppas} \geq 2) = 1 - P(\textit{betaalde oppas} < 2) = 1 - \left(P(\textit{betaalde oppas} = 0) + P(\textit{betaalde oppas} = 1)\right)$

$= 1 - \left(P(\overline{b}\,\overline{b}\,\overline{b}\,\overline{b}\,\overline{b}\,\overline{b}\,\overline{b}\,\overline{b}) + P(\underline{\underline{b\,\overline{b}\,\overline{b}\,\overline{b}\,\overline{b}\,\overline{b}\,\overline{b}\,\overline{b}}})\right) = 1 - \left(0{,}95^8 + \binom{8}{1} \cdot 0{,}05 \cdot 0{,}95^7\right) \approx 0{,}057.$

```
1-(0.95^8+8 nCr
1*0.05*0.95^7)
   .0572446503
```

77c $P(\textit{geen oppas} > 6) = P(\textit{geen oppas} = 7) + P(\textit{geen oppas} = 8)$

$= P(\underline{\underline{g\,g\,g\,g\,g\,g\,g\,\overline{g}}}) + P(g\,g\,g\,g\,g\,g\,g\,g) = \binom{8}{7} \cdot 0{,}74^7 \cdot 0{,}26 + 0{,}74^8 \approx 0{,}343.$

5% + 21% = 26% heeft oppas (betaald dan wel onbetaald)

```
8 nCr 7*0.74^7*0
.26+0.74^8
   .3426661037
```

77d $P(\textit{geen opvang} = 6) = P(\underline{\underline{\overline{o}\,\overline{o}\,\overline{o}\,\overline{o}\,\overline{o}\,\overline{o}\,o\,o\,o\,o}}) = \dfrac{\binom{12}{6} \cdot \binom{16}{4}}{\binom{28}{10}} \approx 0{,}128.$

28 − 12 = 16 met kinderopvang (kinderdagverblijf of oppas)

```
12 nCr 6*16 nCr
4/28 nCr 10
   .1281464531
```

77e $P(\textit{kinderdagverblijf} \geq 2) = 1 - P(\textit{kinderdagverblijf} < 2) = 1 - \left(P(\textit{kinderdagverblijf} = 0) + P(\textit{kinderdagverblijf} = 1)\right)$

$= 1 - \left(P(\overline{k}\,\overline{k}\,\overline{k}\,\overline{k}\,\overline{k}\,\overline{k}\,\overline{k}\,\overline{k}\,\overline{k}\,\overline{k}) + P(\underline{\underline{k\,\overline{k}\,\overline{k}\,\overline{k}\,\overline{k}\,\overline{k}\,\overline{k}\,\overline{k}\,\overline{k}\,\overline{k}}})\right) = 1 - \left(\dfrac{\binom{20}{10}}{\binom{28}{10}} + \dfrac{\binom{8}{1} \cdot \binom{20}{9}}{\binom{28}{10}}\right) \approx 0{,}884.$

```
1-(20 nCr 10/28
nCr 10+8 nCr 1*2
0 nCr 9/28 nCr 1
0)
   .8835309618
```

78a $P(\textit{eenoudergezin} = 0) = P(\overline{e}\,\overline{e}\,\overline{e}\,\overline{e}\,\overline{e}\,\overline{e}\,\overline{e}\,\overline{e}\,\overline{e}\,\overline{e}\,\overline{e}) = (1 - 0{,}12)^{11} = 0{,}88^{11} \approx 0{,}245.$

```
0.88^11
   .2450808589
```

78b $P(\textit{eenoudergezin} \leq 2) = P(\textit{eenoudergezin} = 0) + P(\textit{eenoudergezin} = 1) + P(\textit{eenoudergezin} = 2)$

$= P(\overline{e}\,\overline{e}\,\overline{e}\,\overline{e} \ldots \overline{e}) + P(\underline{\underline{e\,\overline{e}\,\overline{e}\,\overline{e} \ldots \overline{e}}}) + P(\underline{\underline{e\,e\,\overline{e}\,\overline{e} \ldots \overline{e}}}) = 0{,}88^{22} + \binom{22}{1} \cdot 0{,}12 \cdot 0{,}88^{21} + \binom{22}{2} \cdot 0{,}12^2 \cdot 0{,}88^{20} \approx 0{,}498.$

```
0.88^22+22 nCr 1
*0.12*0.88^21+22
 nCr 2*0.12²*0.8
8^20
   .4982633863
```

78c $P(\textit{eenoudergezin} = 2) = \dfrac{\binom{5}{2} \cdot \binom{30}{4}}{\binom{35}{6}} \approx 0{,}169.$

```
5 nCr 2*30 nCr 4
/35 nCr 6
   .1688373297
```

79a $P(\text{RSI-klachten} = 1) = P(\underline{\underline{R\,\overline{R}}}) = \binom{2}{1} \cdot P(R\,\overline{R}) = \binom{2}{1} \cdot 0{,}18 \cdot 0{,}82 \approx 0{,}295.$

```
2 nCr 1*0.18*0.8
2
   .2952
```

79b $P(\text{RSI-klachten} \geq 2) = 1 - P(\text{RSI-klachten} < 2) = 1 - \left(P(\text{RSI-klachten} = 0) + P(\text{RSI-klachten} = 1)\right)$

$= 1 - \left(P(\overline{R}\,\overline{R}\,\overline{R}\,\overline{R}\,\overline{R}\,\overline{R}\,\overline{R}\,\overline{R}) + P(\underline{\underline{R\,\overline{R}\,\overline{R}\,\overline{R}\,\overline{R}\,\overline{R}\,\overline{R}\,\overline{R}}})\right) = 1 - \left(0{,}82^8 + \binom{8}{1} \cdot 0{,}18 \cdot 0{,}82^7\right) \approx 0{,}437.$

```
1-(0.82^8+8 nCr
1*0.18*0.82^7)
   .4366148365
```

79c $P(\text{RSI-klachten} = 20\% \text{ van } 85) = P(\text{RSI-klachten} = 17) = \binom{85}{17} \cdot 0{,}18^{17} \cdot 0{,}82^{68} \approx 0{,}096.$

```
0.2*85
             17
85-17
             68
85 nCr 17*0.18^1
7*0.82^68
   .0962168261
```

80a $P(\text{ernstige geurhinder} = 0) = P(\overline{E}\,\overline{E}\,\overline{E}\,\overline{E}\,\overline{E}\,\overline{E}\,\overline{E}\,\overline{E} \ldots \overline{E}) = (1 - 0{,}12)^{16} = 0{,}88^{16} \approx 0{,}129.$

80b $P(\text{ernstige geurhinder} = 2) = P(\underline{\underline{E\,E\,\overline{E}\,\overline{E}\,\overline{E}\,\overline{E}\,\overline{E}\,\overline{E} \ldots \overline{E}}}) = \binom{16}{2} \cdot 0{,}12^2 \cdot 0{,}88^{14} \approx 0{,}289.$

```
0.88^16
   .1293369914
16 nCr 2*0.12²*0
.88^14
   .288603204
```

80c $P(\underline{\underline{\text{5 lichte en 11 geen geurhinder}}}) = P(\underline{\underline{L\,L\,L\,L\,L\,\overline{G}\,\overline{G}\,\overline{G} \ldots \overline{G}}}) = \binom{16}{5} \cdot 0{,}25^5 \cdot 0{,}63^{11} \approx 0{,}026.$

```
100-12-25
             63
16 nCr 5*0.25^5*
0.63^11
   .0264684626
```

Diagnostische toets

D1a $P(\text{geen prijs}) = \dfrac{\binom{33}{4}}{\binom{40}{4}} \approx 0{,}448.$

```
33 nCr 4/40 nCr
4
        .4477513951
```

D1b $P(\text{twee prijzen}) = \dfrac{\binom{7}{2}\cdot\binom{33}{2}}{\binom{40}{4}} \approx 0{,}121.$

```
7 nCr 2*33 nCr 2
/40 nCr 4
        .1213261845
```

D1c $P(\text{hoofdprijs en 1 tweede prijs}) = \dfrac{\binom{1}{1}\cdot\binom{6}{1}\cdot\binom{33}{2}}{\binom{40}{4}} \approx 0{,}035.$

```
1 nCr 1*6 nCr 1*
33 nCr 2/40 nCr
4
        .0346646241
```

D1d $P(\text{minstens één prijs}) = 1 - P(\text{geen prijs}) = 1 - \dfrac{\binom{33}{4}}{\binom{40}{4}} \approx 0{,}552.$

```
1-33 nCr 4/40 nC
r 4
        .5522486049
```

D2 $P(\text{twee niet in orde}) = \dfrac{\binom{16}{2}\cdot\binom{144}{18}}{\binom{160}{20}} \approx 0{,}305.$

```
16 nCr 2*144 nCr
 18/160 nCr 20
        .3046408672
```

D3a $P(\text{minstens 1 rood}) = 1 - P(\text{geen rood}) = \dfrac{\binom{8}{4}}{\binom{14}{4}} \approx 0{,}930.$

```
1-8 nCr 4/14 nCr
 4
        .9300699301
```

D3b $P(\text{hoogstens 1 wit}) = P(\text{0 wit}) + P(\text{1 wit}) = \dfrac{\binom{9}{4}}{\binom{14}{4}} + \dfrac{\binom{5}{1}\cdot\binom{9}{3}}{\binom{14}{4}} \approx 0{,}545.$

```
9 nCr 4+5 nCr 1*
9 nCr 3
                546
Ans/14 nCr 4
        .5454545455
```

D3c $P(\text{geen rood}) = \dfrac{\binom{8}{4}}{\binom{14}{4}} \approx 0{,}070.$

```
8 nCr 4/14 nCr 4
        .0699300699
```

D3d $P(\text{minder dan 3 zwart}) = 1 - P(\text{3 zwart}) - P(\text{4 zwart}) = 1 - \dfrac{\binom{3}{3}\cdot\binom{11}{1}}{\binom{14}{4}} - 0 \approx 0{,}989.$

```
1-3 nCr 3*11 nCr
 1/14 nCr 4
         .989010989
```

D4a $P(\text{1 prijs}) = \dfrac{\binom{5}{1}\cdot\binom{115}{5}}{\binom{120}{6}} \approx 0{,}210.$

```
5 nCr 1*115 nCr
5/120 nCr 6
         .210083278
```

D4b $P(\text{minder dan 2 prijzen}) = P(\text{0 prijzen}) + P(\text{1 prijs}) = \dfrac{\binom{115}{6}}{\binom{120}{6}} + \dfrac{\binom{5}{1}\cdot\binom{115}{5}}{\binom{120}{6}} \approx 0{,}980.$

```
115 nCr 6+5 nCr
1*115 nCr 5
         3581110120
Ans/120 nCr 6
        .9803886307
```

D4c $P(\text{€ 100}) = P(\text{hoofdprijs}) + P(\text{4 prijzen van € 25}) = \dfrac{\binom{1}{1}\cdot\binom{115}{5}}{\binom{120}{6}} + \dfrac{\binom{4}{4}\cdot\binom{115}{2}}{\binom{120}{6}} \approx 0{,}042.$

```
1 nCr 1*115 nCr
5+4 nCr 4*115 nC
r 2
          153482703
Ans/120 nCr 6
        .0420184501
```

D4d $P(\text{geen verlies}) = 1 - P(\text{verlies}) = 1 - P(\text{geen prijs of € 25 aan prijs})$

$= 1 - P(\text{geen prijs}) - P(\text{€ 25 aan prijs}) = 1 - \dfrac{\binom{115}{6}}{\binom{120}{6}} - \dfrac{\binom{4}{1}\cdot\binom{115}{5}}{\binom{120}{6}} \approx 0{,}062.$

```
115 nCr 6+4 nCr
1*115 nCr 5
         3427633972
Ans/120 nCr 6
        .9383719751
1-Ans
        .0616280249
```

D5a $P(\text{minstens vijf "} \geq 7\text{"}) = P(\text{vijf "} \geq 7\text{"}) + P(\text{zes "} \geq 7\text{"}) + P(\text{zeven "} \geq 7\text{"}) = \dfrac{\binom{10}{5}\cdot\binom{19}{2}}{\binom{29}{7}} + \dfrac{\binom{10}{6}\cdot\binom{19}{1}}{\binom{29}{7}} + \dfrac{\binom{10}{7}}{\binom{29}{7}} \approx 0{,}030.$

```
10 nCr 5*19 nCr
2+10 nCr 6*19 nC
r 1+10 nCr 7
              47202
Ans/29 nCr 7
         .030242571
```

D5b $P(\text{minder dan 3 jongens}) = P(\text{geen jongen}) + P(\text{1 jongen}) + P(\text{2 jongens}) = \dfrac{\binom{14}{7}}{\binom{29}{7}} + \dfrac{\binom{15}{1}\cdot\binom{14}{6}}{\binom{29}{7}} + \dfrac{\binom{15}{2}\cdot\binom{14}{5}}{\binom{29}{7}} \approx 0{,}166.$

```
14 nCr 7+15 nCr
1*14 nCr 6+15 nC
r 2*14 nCr 5
             258687
Ans/29 nCr 7
        .1657421289
```

D5c $P(\text{minstens twee "} \leq 5\text{"}) = 1 - P(\text{geen "} \leq 5\text{"}) - P(\text{één "} \leq 5\text{"}) = 1 - \dfrac{\binom{21}{7}}{\binom{29}{7}} - \dfrac{\binom{8}{1}\cdot\binom{21}{6}}{\binom{29}{7}} \approx 0{,}647.$

```
21 nCr 7+8 nCr 1
*21 nCr 6
             550392
Ans/29 nCr 7
        .3526390651
1-Ans
        .6473609349
```

D6a $(\frac{3}{4})^3+7\times(\frac{1}{4})^3=\frac{3\times3\times3}{4\times4\times4}+\frac{7\times1\times1\times1}{4\times4\times4}=\frac{27}{64}+\frac{7}{64}=\frac{34}{64}=\frac{17}{32}.$

D6b $\frac{1}{5}\times\frac{2}{3}\times\frac{2}{7}+3\times\frac{1}{15}\times\frac{3}{7}=\frac{1\times2\times2}{5\times3\times7}+\frac{3\times1\times3}{15\times7}=\frac{4}{105}+\frac{9}{105}=\frac{13}{105}.$

D6c $(\frac{3}{8})^2+5\times(\frac{1}{4})^2\times(\frac{1}{2})^2=\frac{3\times3}{8\times8}+\frac{5\times1\times1\times1\times1}{4\times4\times2\times2}=\frac{9}{64}+\frac{5}{64}=\frac{14}{64}=\frac{7}{32}.$

D6d $10\times\frac{1}{6}\times\frac{3}{8}+(\frac{3}{4})^2\times\frac{2}{3}=\frac{10\times1\times3}{6\times8}+\frac{3\times3\times2}{4\times4\times3}=\frac{30}{48}+\frac{18}{48}=\frac{48}{48}=1.$

D7a $P(\text{K K K})=\frac{2}{5}\cdot\frac{1}{3}\cdot\frac{1}{4}=\frac{2}{60}=\frac{1}{30}.$

D7b $P(\underline{\underline{\text{P}\,\bar{\text{P}}\,\bar{\text{P}}}})=P(\text{P}\,\bar{\text{P}}\,\bar{\text{P}})+P(\bar{\text{P}}\,\text{P}\,\bar{\text{P}})+P(\bar{\text{P}}\,\bar{\text{P}}\,\text{P})=\frac{2}{5}\cdot\frac{2}{3}\cdot\frac{3}{4}+\frac{3}{5}\cdot\frac{1}{3}\cdot\frac{3}{4}+\frac{3}{5}\cdot\frac{2}{3}\cdot\frac{1}{4}=\frac{12}{60}+\frac{9}{60}+\frac{6}{60}=\frac{27}{60}=\frac{9}{20}.$

D7c $P(\text{S}\geq2)=P(\underline{\underline{\text{S S}\,\bar{\text{S}}}})+P(\text{S S S})=P(\text{S S}\,\bar{\text{S}})+P(\text{S}\,\bar{\text{S}}\,\text{S})+P(\bar{\text{S}}\,\text{S S})+P(\text{S S S})=\frac{1}{5}\cdot\frac{1}{3}\cdot\frac{2}{4}+\frac{1}{5}\cdot\frac{2}{3}\cdot\frac{2}{4}+\frac{4}{5}\cdot\frac{1}{3}\cdot\frac{2}{4}+\frac{1}{5}\cdot\frac{1}{3}\cdot\frac{2}{4}=\frac{16}{60}=\frac{4}{15}.$

D7d $P(\text{drie keer dezelfde letter})=P(\text{K K K})+P(\text{P P P})+P(\text{S S S})=\frac{2}{5}\cdot\frac{1}{3}\cdot\frac{1}{4}+\frac{2}{5}\cdot\frac{1}{3}\cdot\frac{1}{4}+\frac{1}{5}\cdot\frac{1}{3}\cdot\frac{2}{4}=\frac{2}{60}+\frac{2}{60}+\frac{2}{60}=\frac{6}{60}=\frac{1}{10}.$

D7e $P(\text{K}\leq1)=P(\text{K}=0)+P(\text{K}=1)=P(\bar{\text{K}}\,\bar{\text{K}}\,\bar{\text{K}})+P(\underline{\underline{\text{K}\,\bar{\text{K}}\,\bar{\text{K}}}})=P(\bar{\text{K}}\,\bar{\text{K}}\,\bar{\text{K}})+P(\text{K}\,\bar{\text{K}}\,\bar{\text{K}})+P(\bar{\text{K}}\,\text{K}\,\bar{\text{K}})+P(\bar{\text{K}}\,\bar{\text{K}}\,\text{K})$

$=\frac{3}{5}\cdot\frac{2}{3}\cdot\frac{3}{4}+\frac{2}{5}\cdot\frac{2}{3}\cdot\frac{3}{4}+\frac{3}{5}\cdot\frac{1}{3}\cdot\frac{3}{4}+\frac{3}{5}\cdot\frac{2}{3}\cdot\frac{1}{4}=\frac{18}{60}+\frac{12}{60}+\frac{9}{60}+\frac{6}{60}=\frac{45}{60}=\frac{3}{4}.$

D8a $P(60\,60\,60\,40)=\frac{9}{12}\cdot\frac{8}{11}\cdot\frac{7}{10}\cdot\frac{3}{9}\approx0{,}127.$

D8b $P(60\,40\,60\,40\,60\,40\,60)=\frac{9}{12}\cdot\frac{3}{11}\cdot\frac{8}{10}\cdot\frac{2}{9}\cdot\frac{7}{8}\cdot\frac{1}{7}\cdot\frac{6}{6}\approx0{,}005.$

```
9*8*7*3/12/11/10
/9
        .1272727273
9*3*8*2*7*1*6/12
/11/10/9/8/7/6
       .0045454545
```

D9a $P(\text{wedstrijd duurt vier partijen})=P(\underline{\underline{\text{J J B}}}\,\text{J})+P(\underline{\underline{\text{J B B}}}\,\text{B})=\binom{3}{2}\cdot0{,}7^2\cdot0{,}3\cdot0{,}7+\binom{3}{1}\cdot0{,}7\cdot0{,}3^2\cdot0{,}3=0{,}365.$

```
3 nCr 2*0.7^3*0.
3+3 nCr 1*0.7*0.
3^3
             .3654
```

D9b $P(\text{Jan wint})=P(\text{J J J})+P(\underline{\underline{\text{J J B}}}\,\text{J})+P(\underline{\underline{\text{J J B B}}}\,\text{J})=0{,}7^3+\binom{3}{2}\cdot0{,}7^2\cdot0{,}3\cdot0{,}7+\binom{4}{2}\cdot0{,}7^2\cdot0{,}3^2\cdot0{,}7=0{,}837.$

```
0.7^3+3 nCr 2*0.
7^3*0.3+4 nCr 2*
0.7^3*0.3^2
            .83692
```

D10a $P(\text{r r})=\frac{x}{10}\cdot\frac{x+2}{15}=\frac{x\cdot(x+2)}{150}=\frac{x^2+2x}{150}.$

```
Plot1 Plot2 Plot3
\Y1=(X²+2X)/150
\Y2=0.32
\Y3=
```

X	Y1	Y2
2	.05333	.32
3	.1	.32
4	.16	.32
5	.23333	.32
6	.32	.32
7	.42	.32
8	.53333	.32

X=6

D10b $\frac{x^2+2x}{150}=0{,}32$ (met $x\leq15$ en x een heel aantal $\Rightarrow$ TABLE).
Dit geeft $P=0{,}32$ voor $x=6$.
Dus bij 6 rode knikkers in vaas I en 8 rode knikkers in vaas II.

D11a Iedere docent kan maar één keer gekozen worden, dus zonder terugleggen.

$P(\textit{vrouwen}=3)=P(\underline{\underline{\text{v v v m m}}})=\frac{\binom{7}{3}\cdot\binom{9}{2}}{\binom{16}{5}}\approx0{,}288.$

```
7 nCr 3*9 nCr 2/
16 nCr 5
       .2884615385
```

D11b Iedere docent kan maar meerdere keren gekozen worden, dus met terugleggen.

$P(\textit{vrouwen}=3)=P(\underline{\underline{\text{v v v m m}}})=\binom{5}{3}\cdot P(\text{v v v m m})=\binom{5}{3}\cdot(\frac{7}{16})^3\cdot(\frac{9}{16})^2\approx0{,}265.$

```
5 nCr 3*(7/16)^3
*(9/16)²
       .2649593353
```

D12a $P(\text{"}\textit{hoog}\text{ of }\textit{middelbaar}\text{"}=9)=P(\text{s s s s s s s s s})=0{,}74^9\approx0{,}067.$ ($\text{s}=\textit{succes}$)

```
0.74^9
       .0665404108
```

D12b $P(\textit{hoog}=2)=P(\underline{\underline{\text{H H}\,\bar{\text{H}}\,\bar{\text{H}}\,\bar{\text{H}}\,\bar{\text{H}}\,\bar{\text{H}}\,\bar{\text{H}}\,\bar{\text{H}}}})=\binom{9}{2}\cdot P(\text{H H}\,\bar{\text{H}}\,\bar{\text{H}}\,\bar{\text{H}}\,\bar{\text{H}}\,\bar{\text{H}}\,\bar{\text{H}}\,\bar{\text{H}})=\binom{9}{2}\cdot0{,}45^2\cdot0{,}55^7\approx0{,}111.$

```
9 nCr 2*0.45²*0.
55^7
       .1109855286
```

D12c $P(\textit{middelbaar}\leq2)=P(\textit{middelbaar}=0)+P(\textit{middelbaar}=1)+P(\textit{middelbaar}=2)$

$=P(\bar{\text{M}}\,\bar{\text{M}}\,\bar{\text{M}}\,\bar{\text{M}}\,\bar{\text{M}}\,\bar{\text{M}}\,\bar{\text{M}}\,\bar{\text{M}}\,\bar{\text{M}})+P(\underline{\underline{\text{M}\,\bar{\text{M}}\,\bar{\text{M}}\,\bar{\text{M}}\,\bar{\text{M}}\,\bar{\text{M}}\,\bar{\text{M}}\,\bar{\text{M}}\,\bar{\text{M}}}})+P(\underline{\underline{\text{M M}\,\bar{\text{M}}\,\bar{\text{M}}\,\bar{\text{M}}\,\bar{\text{M}}\,\bar{\text{M}}\,\bar{\text{M}}\,\bar{\text{M}}}})$

$=0{,}71^9+\binom{9}{1}\cdot0{,}29\cdot0{,}71^8+\binom{9}{2}\cdot0{,}29^2\cdot0{,}71^7\approx0{,}490.$

```
0.71^9+9 nCr 1*0
.29*0.71^8+9 nCr
 2*0.29²*0.71^7
       .4897540303
```

D12d $P(\textit{laag}\geq2)=1-P(\textit{laag}<2)=1-\left(P(\textit{laag}=0)+P(\textit{laag}=1)\right)$

$=1-\left(P(\bar{\text{L}}\,\bar{\text{L}}\,\bar{\text{L}}\,\bar{\text{L}}\,\bar{\text{L}}\,\bar{\text{L}}\,\bar{\text{L}}\,\bar{\text{L}}\,\bar{\text{L}})+P(\underline{\underline{\text{L}\,\bar{\text{L}}\,\bar{\text{L}}\,\bar{\text{L}}\,\bar{\text{L}}\,\bar{\text{L}}\,\bar{\text{L}}\,\bar{\text{L}}\,\bar{\text{L}}}})\right)=1-\left(0{,}74^9+\binom{9}{1}\cdot0{,}26\cdot0{,}74^8\right)\approx0{,}723.$

```
1-(0.74^9+9 nCr
1*0.26*0.74^8)
         .72304802
```

Gemengde opgaven 8. De normale verdeling

G1a Geef iemand uit de goep "0 tot 10" aan met A, iemand uit "10 tot 25" met B en iemand uit "25 of meer" met C.

$P(C \le 2) = P(C=0) + P(C=1) + P(C=2) = P(\bar{C}\,\bar{C}\,\bar{C}\,\bar{C}\,\bar{C}\,\bar{C}\,\bar{C} \ldots \bar{C}) + P(\underline{\underline{C\,\bar{C}\,\bar{C}\,\bar{C}\,\bar{C}\,\bar{C}\,\bar{C} \ldots \bar{C}}}) + P(\underline{\underline{C\,C\,\bar{C}\,\bar{C}\,\bar{C}\,\bar{C}\,\bar{C} \ldots \bar{C}}})$

$$= \frac{\binom{120-21}{12}}{\binom{120}{12}} + \frac{\binom{21}{1}\cdot\binom{120-21}{11}}{\binom{120}{12}} + \frac{\binom{21}{2}\cdot\binom{120-21}{10}}{\binom{120}{12}} \approx 0{,}649.$$

```
99 nCr 12+21 nCr
 1*99 nCr 11+21
nCr 2*99 nCr 10
  6.843080061E15
Ans/120 nCr 12
       .6490724857
```

G1b $P(\bar{C} \ge 10) = P(C \le 2) \approx 0{,}649$ (zie G1a).

G1c $P(succes = 3) = P(\underline{\underline{s\,s\,s\,\bar{s}\,\bar{s}\,\bar{s} \ldots \bar{s}}}) = \dfrac{\binom{32}{3}\cdot\binom{120-32}{9}}{\binom{120}{12}} \approx 0{,}269.$

```
32 nCr 2*88 nCr
9/120 nCr 12
       .0268797831
```

G2a $P(\mathrm{w}) = 1 - 0{,}3 - 0{,}5 = 0{,}2 \Rightarrow P(\bar{w}\,\bar{w}\,\bar{w}\,\bar{w}\,\bar{w}\,\bar{w}\,\bar{w}\,\bar{w}\,\bar{w}\,\bar{w}) = 0{,}8^{10} \approx 0{,}107.$

G2b $P(\underline{\underline{\mathrm{p\,p\,p\,p\,p\,p\,w\,w\,w\,w}}}) = \binom{10}{6}\cdot P(\mathrm{p\,p\,p\,p\,p\,p\,w\,w\,w\,w}) = \binom{10}{6}\cdot 0{,}5^6 \cdot 0{,}2^4 \approx 0{,}005.$

```
0.8^10
       .1073741824
10 nCr 6*0.5^6*0
.2^4
           .00525
```

G2c $P(rood \ge 2) = 1 - P(rood < 2) = 1 - \left(P(rood = 0) + P(rood = 1)\right)$

$$= 1 - \left(P(\bar{r}\,\bar{r}\,\bar{r}\,\bar{r}\,\bar{r}\,\bar{r}\,\bar{r}\,\bar{r}\,\bar{r}\,\bar{r}) + P(\underline{\underline{r\,\bar{r}\,\bar{r}\,\bar{r}\,\bar{r}\,\bar{r}\,\bar{r}\,\bar{r}\,\bar{r}\,\bar{r}}})\right) = 1 - \left(0{,}7^{10} + \binom{10}{1}\cdot 0{,}3 \cdot 0{,}7^9\right) \approx 0{,}851.$$

G2d $P(\underline{\underline{\mathrm{p\,p\,p\,p\,p}\,\bar{p}\,\bar{p}\,\bar{p}\,\bar{p}\,\bar{p}}}) = \binom{10}{5}\cdot P(\mathrm{p\,p\,p\,p\,p}\,\bar{p}\,\bar{p}\,\bar{p}\,\bar{p}\,\bar{p}) = \binom{10}{5}\cdot 0{,}5^5 \cdot 0{,}5^5 \approx 0{,}246.$

```
1-(0.7^10+10 nCr
 1*0.3*0.7^9)
       .8506916541
10 nCr 5*0.5^10
         .24609375
```

G3a $P(\text{twee keer 4 ogen}) = P(\underline{\underline{4\,4\,\bar{4}\,\bar{4}\,\bar{4}\,\bar{4}\,\bar{4}\,\bar{4}\,\bar{4}\,\bar{4}}}) = \binom{10}{2}\cdot P(4\,4\,\bar{4}\,\bar{4}\,\bar{4}\,\bar{4}\,\bar{4}\,\bar{4}\,\bar{4}\,\bar{4}) = \binom{10}{2}\cdot(\tfrac{1}{6})^2\cdot(\tfrac{5}{6})^8 \approx 0{,}291.$

G3b $P(\text{8 keer } succes) = P(\underline{\underline{s\,s\,s\,s\,s\,s\,s\,s\,\bar{s}\,\bar{s}\,\bar{s}\,\bar{s}}}) = \binom{10}{8}\cdot P(s\,s\,s\,s\,s\,s\,s\,s\,\bar{s}\,\bar{s}\,\bar{s}\,\bar{s}) = \binom{12}{8}\cdot(\tfrac{2}{6})^8\cdot(\tfrac{4}{6})^4 \approx 0{,}015.$

```
10 nCr 2*(1/6)²*
(5/6)^8
       .2907100492
12 nCr 8*(2/6)^8
*(4/6)^4
       .0149028773
```

G3c $P(\underline{\underline{\text{vijf keer } minder\ dan \text{ 3 ogen en twee keer 6}}}) = \binom{7}{5}\cdot P(\mathrm{m\,m\,m\,m\,m}\,6\,6) = \binom{7}{5}\cdot(\tfrac{2}{6})^5\cdot(\tfrac{1}{6})^2 \approx 0{,}002.$

```
7 nCr 5*(2/6)^5*
(1/6)²
       .0024005487
```

G4a $P(\text{in één beurt 6 punten}) = P(1\ \mathrm{k}) + P(6\ \mathrm{m}) = \frac{1}{6}\cdot\frac{1}{2} + \frac{1}{6}\cdot\frac{1}{2} = \frac{1}{12} + \frac{1}{12} = \frac{2}{12} = \frac{1}{6}\ (\approx 0{,}167).$

```
1/6*1/2+1/6*1/2
       .1666666667
Ans▸Frac
               1/6
```

G4b Zie eerst de tabel hiernaast.
(ga na dat de som van deze kansen 1 is)

aantal punten per beurt	1	2	3	4	5	6	7	8	9	10	11
manier(en) om te bereiken	1m	2m	3m	4m	5m	6m 1k	2k	3k	4k	5k	6k
kans hierop	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{2}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$

In twee beurten 10 punten:
$1+9,\ 9+1,\ 2+8,\ 8+2,\ 3+7,\ 7+3,\ 4+6,\ 6+4$ of $5+5$.

$P(\text{in twee beurten 10 punten}) = \frac{1}{12}\cdot\frac{1}{12}\cdot 2 + \frac{1}{12}\cdot\frac{1}{12}\cdot 2 + \frac{1}{12}\cdot\frac{1}{12}\cdot 2 + \frac{1}{12}\cdot\frac{2}{12}\cdot 2 + \frac{1}{12}\cdot\frac{1}{12}\cdot 1 = \frac{11}{144}\ (\approx 0{,}067).$

```
1/12*1/12*(2+2+2
+4+1)
       .0763888889
Ans▸Frac
            11/144
```

G4c In drie beurten meer dan 30 punten betekent 31 of 32 of 33 punten.
31 punten betekent $11+10+10$ of $10+11+10$ of $10+10+11$.
32 punten betekent $11+11+10$ of $11+10+11$ of $10+11+11$.
33 punten betekent $11+11+11$.

$P(\text{in drie beurten meer dan 30 punten}) = \frac{1}{12}\cdot\frac{1}{12}\cdot\frac{1}{12}\cdot 3 + \frac{1}{12}\cdot\frac{1}{12}\cdot\frac{1}{12}\cdot 3 + \frac{1}{12}\cdot\frac{1}{12}\cdot\frac{1}{12}\cdot 1 = \frac{7}{17284}\ (\approx 0{,}004).$

```
1/12*1/12*1/12*(
3+3+1)
       .0040509259
Ans▸Frac
            7/1728
```

G5a $Div(1) = P(\underline{\underline{g\ s}}) = P(g\ s) + P(s\ g) = 0{,}9\cdot 0{,}1 + 0{,}1\cdot 0{,}9 = 0{,}18.$
$Div(2) = P(\underline{\underline{g\ s}}) = P(g\ s) + P(s\ g) = 0{,}5\cdot 0{,}5 + 0{,}5\cdot 0{,}5 = 0{,}5.$
Dus er geldt inderdaad $Div(2) > Div(1)$.

```
0.9*0.1*2
               .18
0.5²*2
                .5
```

G5b $P(\text{gelijksoortig}) = P(\mathrm{g\ g}) + P(\mathrm{h\ h}) + P(\mathrm{l\ l}) = 0{,}3^2 + 0{,}5^2 + 0{,}2^2 = 0{,}38.$
$Div(4) = P(\text{verschillende soorten}) = 1 - P(\text{niet verschillende soorten}) = 1 - P(\text{gelijksoortig}) = 1 - 0{,}38 = 0{,}62.$

```
0.3²+0.5²+0.2²
               .38
1-Ans
               .62
```

G5c Als van elk soort evenveel, dan elk 25%.
$Div(4) = 1 - P(\text{gelijksoortig}) = 1 - \left(0{,}25^2 + 0{,}25^2 + 0{,}25^2 + 0{,}25^2\right) = 0{,}75.$

```
1-0.25²*4
               .75
```

G5d Bij maximale Div is de kans op elk soort $\frac{1}{n}$.

$$Div = 1 - P(\text{gelijksoortig}) = 1 - \underbrace{\left((\tfrac{1}{n})^2 + (\tfrac{1}{n})^2 + (\tfrac{1}{n})^2 + (\tfrac{1}{n})^2 + (\tfrac{1}{n})^2\right)}_{n \text{ keer}} = 1 - n\cdot\frac{1}{n^2} = 1 - \frac{1}{n}.$$

```
1-0.118
              .882
1-0.096
              .904
0.882*0.904
           .797328
```

G6a $P(\text{beide partners } rechtshandig) = P(\mathrm{r\ r}) = (1 - 0{,}118)\cdot(1 - 0{,}096) \approx 0{,}797$. Dus ongeveer 79,7%.

G6b $P(linkshandig \ge 2) = 1 - P(linkshandig < 2) = 1 - \left(P(linkshandig = 0) + P(linkshandig = 1)\right) = 1 - \left(P(\mathrm{R\,R\,R} \ldots \mathrm{R}) + P(\underline{\mathrm{L\,R\,R} \ldots \mathrm{R}})\right)$

$$= 1 - \left(0{,}882^{23} + \binom{23}{1}\cdot 0{,}118 \cdot 0{,}882^{22}\right) \approx 0{,}773 > 0{,}75.$$ De trainer heeft dus gelijk.

```
1-(0.882^23+23 n
Cr 1*0.118*0.882
^22)
       .7729463144
```

G6c $P(\textit{linkshandig meisje} \text{ met beide ouders rechtshandig}) = \frac{72}{32+72} = \frac{9}{13}$.
$P(\textit{linkshandige jongen} \text{ met beide ouders rechtshandig}) = \frac{96}{40+96} = \frac{12}{17}$.
$P(\textit{linkshandig stel} \text{ met vier rechtshandige ouders}) = \frac{9}{13} \cdot \frac{12}{17} \approx 0{,}49$ of wel 49%. Dit is niet uitzonderlijk.

```
72/(32+72)▸Frac
            9/13
96/(40+96)▸Frac
           12/17
9/13*12/17
     .4886877828
```

G7a $P(\text{gelezen} = 0 \text{ bij 5 nummers}) = P(\bar{g}\,\bar{g}\,\bar{g}\,\bar{g}\,\bar{g}) = 0{,}7^5 \approx 0{,}17$.

```
0.7^5
          .16807
```

G7b $P(\text{gelezen} = 0 \text{ bij 2 nummers}) = P(\bar{g}\,\bar{g}) = 0{,}7^2 = 0{,}49$.
$P(\text{gelezen} = 1) = P(g\,\bar{g}) = P(g\,\bar{g}) + P(\bar{g}\,g) = 0{,}3 \cdot 0{,}7 + 0{,}7 \cdot 0{,}3 = 0{,}42$.
$P(\text{gelezen} = 2) = P(g\,g) = 0{,}3^2 = 0{,}09$.

```
0.7²
             .49
0.3*0.7+0.7*0.3
             .42
0.3²
             .09
```

G7c Bij 1 verschenen nummer horen 2 staven (0 of 1 gelezen).
Bij 2 nummers horen 3 staven (0 of 1 of 2 gelezen). Enz.
Dit geeft totaal $2 + 3 + 4 + 5 + 6 + 7 + \ldots + 11 = 65$ staven.

aantal verschenen	1	2	3	4	5	6	7	8	9	10
aantal staven	2	3	4	5	6	7	8	9	10	11

```
2+3+4+5+6+7+8+9+
10+11
              65
```

G7d $P(\text{gelezen} \geq 1 \text{ bij } n \text{ nummers}) = 1 - P(\text{gelezen} = 0 \text{ bij } n \text{ nummers}) = 1 - P(\bar{g}\,\bar{g}\,\bar{g} \ldots \bar{g}\,\bar{g}) = 1 - 0{,}7^n$.
$1 - 0{,}7^n > 0{,}999$ (met n een heel aantal $\Rightarrow$ TABLE) $\Rightarrow n \geq 20$. Dus minstens 20 nummers.

```
Plot1 Plot2 Plot3
\Y1=1-0.7^X
\Y2=0.999
\Y3=
```

X	Y1	Y2
17	.99767	.999
18	.99837	.999
19	.99886	.999
20	.9992	.999
21	.99944	.999
22	.99961	.999
23	.99973	.999

X=19

G8a Ja, als de een bloedgroep A heeft en de ander bloedgroep B.

G8b $P(\text{dezelfde bloedgroep}) = P(0\,0) + P(A\,A) + P(B\,B) + P(AB\,AB) = 0{,}46^2 + 0{,}43^2 + 0{,}08^2 + 0{,}03^2 = 0{,}4038$.

G8c $P(\text{"0"} \geq 1) = 1 - (\text{"0"} < 1) = 1 - (\text{"0"} = 0) = 1 - P(\bar{0}\,\bar{0}\,\bar{0}\,\bar{0} \ldots \bar{0}) = 1 - 0{,}54^{12} \approx 0{,}9994$.

```
0.46²+0.43²+0.08
²+0.03²
           .4038
1-0.46
             .54
1-0.54^12
     .9993852124
```

G8d $P(\text{dezelfde resusfactor}) = P(+\ +) + P(-\ -) = 0{,}85^2 + 0{,}15^2 = 0{,}745$.
$P(\text{dezelfde bloedgroep}) = 0{,}4038$ (zie G8b).
$P(\text{hetzelfde bloedtype}) = P(\text{dezelfde resusfactor en dezelfde bloedgroep}) = 0{,}745 \cdot 0{,}4038 \approx 0{,}301$.

```
0.85²+0.15²
            .745
Ans*0.4038
         .300831
```

G9a Nadat de eerste kaart is gedraaid, liggen er nog 15 met het plaatje naar beneden.
De kans dat de tweede kaart hetzelfde plaatje heeft is dus $\frac{1}{15}$.

G9b $P(\text{eerste twee kaarten pakken}) = \frac{1}{7}$. (na de eerste kaart liggen er nog 7 met het plaatje naar beneden)
$P(\text{volgende twee kaarten pakken}) = \frac{1}{5}$. Enzovoort.
De gevraagde kans is $\frac{1}{7} \cdot \frac{1}{5} \cdot \frac{1}{3} \cdot 1 = \frac{1}{105}$.

```
1/7*1/5*1/3▸Frac
           1/105
```

G9c Het viertal plaatjes op de niet omgedraaide kaarten is ● ■ ▲ ▲
er zijn 4 mogelijkheden voor de cirkel
er zijn dan nog drie mogelijheden voor het vierkant
de driehoeken liggen dan vast
$\Rightarrow$ aantal $= 4 \cdot 3 = 12$.
OF aantal $= \frac{4!}{2!} = 12$. OF aantal $= \binom{4}{2} \cdot \binom{2}{1} \cdot \binom{1}{1} = 12$.

```
4*3
              12
4!/2!
              12
4 nCr 2*2 nCr 1*
1 nCr 1
              12
```

```
4 nCr 1*3 nCr 1*
2 nCr 2
              12
4 nCr 1*3 nCr 2*
1 nCr 1
              12
```

G9d • strategie 1: $P(\text{succes}) = P(\text{de tweede kaart is een vierkant}) = \frac{1}{3}$.
• strategie 2: $P(\text{succes}) = P(\text{de eerste kaart is een vierkant}) + P(\text{eerste en tweede is een driehoek}) = \frac{1}{3} + \frac{2}{3} \cdot \frac{1}{2} = \frac{2}{3}$.

```
1/3+2/3*1/2▸Frac
             2/3
```

G10a r r b b b b heeft $\binom{6}{2} = 15$ volgordes.

```
6 nCr 2
              15
```

G10b $P(b\,b\,b\,b) = \frac{\binom{4}{4}}{\binom{6}{4}} \approx 0{,}067$. OF: $P(b\,b\,b\,b) = \frac{4}{6} \cdot \frac{3}{5} \cdot \frac{2}{4} \cdot \frac{1}{3} = \frac{1}{15}\ (\approx 0{,}067)$.

```
4 nCr 4/6 nCr 4
     .0666666667
4/6*3/5*2/4*1/3
     .0666666667
Ans▸Frac
            1/15
```

G10c $P(\text{A wint}) = P(\text{B wijst nog eens rood aan}) = 1 - P(b\,b\,b) = 1 - \frac{3}{4} \cdot \frac{2}{3} \cdot \frac{1}{2} = 1 - \frac{6}{24} = 1 - \frac{1}{4} = \frac{3}{4}$.

```
1-3/4*2/3*1/2▸Fr
ac
             3/4
```

G11a $P(K\,K\,K\,K\,K) = (\frac{1}{2})^5 = \frac{1}{32}$ en $P(K\,M\,M\,K\,M) = (\frac{1}{2})^5 = \frac{1}{32}$.

G11b K K M M M heeft $\binom{5}{2} = 10$ mogelijkheden.

G11c $P(?\ K\,M\,M\,M) = 1 \cdot (\frac{1}{2})^4 = \frac{1}{16}$.

G11d Als er eerst kop gegooid is kan Tom alleen winnen met KMMM, maar Herman wint al met KMM en wint dus eerder.

G11e $P(\text{Tom wint}) = P(M\,M\,M) = (\frac{1}{2})^3 = \frac{1}{8}$ en $P(\text{Herman wint}) = 1 - P(\text{Tom wint}) = 1 - \frac{1}{8} = \frac{7}{8}$.
De kans dat Herman wint is 7 keer zo groot als de kans dat Tom wint.