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The Crystal and Molecular Structure of a Europium Shift Reagent Complex, the Dipyridine Adduct of Tris-(2,2,6,6-tetramethylheptane-3,5-dionato)europium(III), $Eu(dpm)_3(py)_2$

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The crystal structure of the dipyridine adduct of tris-(2,2,6,6-tetramethylheptane-3,5-dionato)europium(III), $Eu(dpm)_3(py)_2$, has been determined so that the principal features of its paramagnetically shifted n.m.r. spectrum could be calculated. The crystals form as triclinic parallelepipeds in space group $P\bar{1}$ with $a=13{\cdot}611$ (5), $b=17{\cdot}306$ (4), $c=10{\cdot}493$ (7) Å, $\alpha=93{\cdot}33$ (3), $\beta=105{\cdot}20$ (5), and $\gamma=94{\cdot}75$ (4)°, with two molecules per unit cell. All unique reflections for which $2\theta<50°$ were observed using graphite monochromatized Mo $K\alpha$ radiation and a pulse-height analyzer. The structure was refined by large-block diagonal least-squares methods, using 6840 observed reflections, to an R index of 0·039. Most hydrogen atoms were located, and the remainder have been included at their calculated positions. The $Eu(dpm)_3(py)_2$ molecule contains a near twofold axis, and the coordination sphere is best described as a square antiprism. Eu(III) lies 0·3 to 0·4 Å out of the molecular planes of four of the five ligands. Because of the low symmetry of the complex, *two* geometric factors are needed to account for the observed n.m.r. shifts.

Introduction

Since the discovery by Hinckley (1969) of lanthanide shift reagents, their use has become widespread. The potential for deducing the structural details of substrate molecules coordinated to $Ln(dpm)_3$ complexes (Ln is lanthanide; dpm is dipivalomethanato or 2,2,6,6-tetramethylheptane-3,5-dionato) has led several authors to postulate various correlations between the induced shifts and various structural parameters (Sievers, 1972). The most successful treatments have been those which relate the observed shifts to a geometric factor $G(r,\theta)$ given as $(3\cos^2\theta-1)/r^3$ (Horrocks & Sipe, 1971). This geometric factor occurs in one form of the dipolar shift equation, which is valid only for molecules with axial (n-fold, $n\geq 3$) symmetry. Consideration of the known crystal structures of pertinent lanthanide complexes (Horrocks, Sipe & Luber, 1971; Erasmus & Boeyens, 1971; Cunningham, Sands & Wagner, 1967; Phillips, Sands & Wagner, 1968) argues against threefold symmetry, and illustrates the need for accurate structural information for shift reagent adducts. Since the most widely used complexes have been those of $Eu(dpm)_3$ and since the crystallization of the dipyridine adduct had been reported, $Eu(dpm)_3(py)_2$ (py is pyridine) was selected for study by X-ray diffraction techniques (Cramer & Seff, 1972).

Collection and reduction of intensity data

Clear colorless crystals of $Eu(dpm)_3(py)_2$ formed readily from a saturated pyridine solution of $Eu(dpm)_3$. A single crystal, a parallelepiped with the dimensions $0{\cdot}028\times0{\cdot}020\times0{\cdot}033$ cm, was selected and was lodged and sealed in a thin-walled capillary tube. A volume of mother liquor approximately equal to that of the crystal was included in such a way that the crystal was entirely bathed in liquid throughout data collection.

A Syntex four-circle computer-controlled diffractometer with graphite-monochromatized Mo $K\alpha$ radiation ($K\alpha_1$, $\lambda=0{\cdot}70926$ Å; $K\alpha_2$, $\lambda=0{\cdot}71354$ Å) and with a pulse-height analyzer was used for preliminary experiments and for the measurement of diffraction intensities. The cell constants were determined three times during the course of data collection by least-squares methods from the centered angular coordinates of fifteen intense reflections with 2θ values up to 11·7. Each time, under computer control, the angular coordinates for the center of each peak were determined. The cell constants at 20°C are: $a=13{\cdot}611$ (5), $b=17{\cdot}306$ (4), $c=10{\cdot}493$ (7) Å, $\alpha=98{\cdot}33$ (3), $\beta=105{\cdot}20$ (5) and $\gamma=94{\cdot}75$ (4)°; $V=2333$ (2) Å^3 and $\varrho_c=1{\cdot}224$ g.cm^{-3}. The density was not successfully measured by flotation because of the pronounced instability of the complex. Still, the density measurements indicated that $Z=2$. Hinckley (1971) had previously determined b and had assigned the space group $P\bar{1}$.

Diffraction intensities were collected for 997 consecutive hours by the θ–2θ scan technique at a scan rate which varied from 0·5° per min (in 2θ) to 24° per min in such a way that more time was spent on weaker reflections to improve their standard deviations. Most reflections were observed at the slowest scan rate. All 8312 unique reciprocal lattice points for which $2\theta<50°$ were examined. The scan range varied from 1·63° at $2\theta=3°$ to 1·92° at $2\theta=50°$. A time equal to half the scan time for each reflection was spent counting the background at each end of the scan range. Two check reflections, which were measured periodically during data collection, showed an average total decrease in intensity of 8·2%, and an approximate correction for this effect was made.

Standard deviations were assigned according to the formula

$$\sigma(I)=[CT+(B_1+B_2)+(pI)^2]^{1/2}$$

where CT is the total integrated count, B_1 and B_2 are the background counts and the intensity is $I=CT-(B_1+B_2)$. A value of 0·02 was assigned to the empirical parameter p to account for instrument instability. The recorded counts were then corrected for Lorentz and polarization effects. All reflections (6841) for which the net count exceeded three times its standard deviation were used throughout, except for 12,6,−4 for which a gross error was apparent.

Solution and refinement of the structure

The position of the europium ion was determined from a three-dimensional Patterson function. Successive cycles of Fourier refinement using the 'fast Fourier' computer program *ALFF* (Hubbard, Quicksall & Jacobson, 1971) with phases based initially on Eu(III) served to reveal the locations of all the remaining non-hydrogen atoms in the molecule. Full-matrix least-squares refinement with anisotropic thermal parameters for the Eu(III) ion and isotropic parameters for the remaining fifty-one atoms had nearly converged at $R_1=0{\cdot}074$ and $R_2=0{\cdot}076$ $\{R_1=(\sum|F_o-|F_c||)/\sum F_o$ and $R_2=[\sum w(F_o-|F_c|)^2/\sum wF_o^2]^{1/2}\}$.

The parameters of the 28 methyl and pyridine carbon atoms, which had the largest temperature factors, were allowed to refine anisotropically for two cycles and, in two subsequent cycles, the parameters of the remaining 24 atoms were further refined, isotropically. At this point the positions of 37 hydrogen atoms were determined from a difference Fourier synthesis, and these were included in two cycles of anisotropic least-squares refinement of the parameters of the 24 central non-hydrogen atoms and in a final cycle of refinement of the methyl carbon atom parameters. An ensuing difference function revealed seven more methyl hydrogen atoms, and with these the approximate positions for the remaining 23 hydrogens, all of which were methyl hydrogen atoms bonded to carbon atoms with large thermal parameters, could be calculated assuming tetrahedral geometry and 1·08 Å C–H bond lengths. All but two [H(20*A*) and H(29*A*)] of the 44 observed hydrogen atoms exhibited bond lengths between 0·67 and 1·22 Å (37 lay between 0·80 and 1·15 Å) and angles which did not deviate by more than 20° from the expected angle (tetrahedral or trigonal, as appropriate).

Table 1. *Observed and calculated structure factors*

The running index is l; values of h and k for each group immediately precede that group. The central column is $10|F_o|$; the right-hand column is $10F_c$. All but one of the X-ray diffraction intensities which were observed to be greater than three times their standard deviations were used in structure refinement and are listed in this table.

H=	0, K=	0
1	743	719
2	1030	-987
3	251	-283
4	346	318
5	903	827
7	614	-570
8	212	-215
9	327	315
10	204	210
11	129	-113
H=	0, K=	1
-11	219	210
-10	261	257
-9	266	-233
-8	411	-422
-7	280	261
-6	627	640
-5	370	-318
-4	822	-807
-3	605	-570
-2	764	735
-1	1916	1776
0	50	12
1	1887	-1847
2	247	252
3	290	340
4	1008	935
5	241	-239
6	674	-664
7	164	-163
8	386	400
9	306	299
10	156	-170
11	225	-221
H=	0, K=	2
-12	140	140
-11	110	127
-10	241	-241
-9	338	-341
-8	210	219
-7	447	416
-5	1171	-1083
-4	536	-555
-3	348	277
-2	615	627
-1	454	-439
0	1812	-1723
1	763	-763
2	1737	1678
3	720	695
4	1002	-944
5	543	-543
7	514	509
8	377	377
9	265	-267
10	330	-326
H=	0, K=	3
-11	257	-255
-10	198	-199
-9	288	281
-8	364	360
-7	184	-161
-6	847	-848
-4	842	814
-3	374	347
-2	273	-302
-1	365	-308
0	205	-241
1	1417	1409
2	456	468
3	1066	-1051
4	539	-531
5	224	218
6	632	637
7	183	177
8	393	-384
9	280	-284
10	146	155
11	180	192
H=	0, K=	4
-12	209	-199
-11	95	-87
-10	265	242
-9	277	285
-8	80	-75
-7	797	-791
-5	960	875
-4	442	356
-3	101	-93
-2	79	-69
-1	1829	1700
0	1831	1806
1	774	696
2	770	-770
3	455	-432
4	659	655
5	679	650
7	471	-464
8	283	-294
9	167	183
10	191	196
H=	0, K=	5
-11	266	263
-10	234	233
-9	219	-221
-8	546	-528
-7	108	130
-6	777	747
-5	177	167
-4	515	-509
-3	903	-933
-2	214	163
-1	582	606
0	218	-176
1	1243	-1247
2	360	-360
3	1149	1119
4	769	826
5	182	-195
6	491	-486
7	97	-102
8	283	291
9	179	168
10	110	-109
11	143	-159
H=	0, K=	6
-10	300	-305
-9	308	-374
-8	195	188
-7	631	619
-5	1001	-1003
-4	831	-787
-3	574	536
-2	607	504
-1	757	-719
0	1168	-1057
1	87	-70
2	1112	1087
3	735	660
4	393	-405
5	508	-495
7	398	394
8	169	168
9	182	-168
10	195	-189
H=	0, K=	7
-11	203	-216
-10	142	-138
-9	202	196
-8	466	460
-7	287	-285
-6	595	-605
-5	85	-77
-4	722	676
-3	703	606
-2	524	-452
-1	1019	-1014
0	241	-294
1	700	751
2	608	596
3	541	-543
4	476	-480
5	110	102
6	288	310
7	124	126
8	222	-230
9	208	-201
H=	0, K=	8
-10	218	225
-9	303	306
-8	310	-304
-7	405	-405
-6	86	88
-5	522	525
-4	272	275
-3	358	-401
-2	577	-598
-1	565	588
0	1029	988
1	507	477
2	571	-564
3	535	-517
4	294	276
5	443	443
6	105	167
7	492	-480
8	251	-243
9	127	132
10	205	208
H=	0, K=	9
-11	207	204
-10	166	168
-9	141	-134
-8	313	-303
-7	115	91
-6	443	442
-5	196	189
-4	554	-555
-3	207	-269
-2	182	153
-1	774	727
1	744	-680
2	180	-205
3	452	445
4	536	528
6	536	-533
8	254	269
9	213	216
H=	0, K=	10
-10	235	-228
-9	264	-262
-7	481	482
-6	164	-160
-5	649	-629
-4	284	-270
-3	393	387
-2	435	440
0	650	-662
2	513	508
3	286	283
4	256	-254
5	541	-543
6	97	94
7	363	370
8	196	189
H=	0, K=	11
-11	147	-153
-10	184	-180
-9	143	141
-8	262	254
-6	475	-463
-5	181	-186
-4	446	430
-3	397	381
-2	276	-282
-1	573	-579
0	206	-201
1	536	521
2	203	217
3	325	-310
4	446	-462
5	146	141
6	324	335
9	173	-179
H=	0, K=	12
-10	198	189
-9	252	232
-8	168	-161
-7	415	-402
-6	133	-118
-5	541	545
-4	324	321
-3	433	-420
-2	273	-276
-1	89	102
0	641	641
1	182	178
2	441	-436
3	298	-292
4	205	206
5	356	358
7	253	-245
8	170	-161
H=	0, K=	13
-9	181	-174
-8	229	-230
-6	430	413
-5	269	248
-4	315	-309
-3	262	-247
-1	390	369
0	95	93
1	402	-391
2	261	-240
3	170	188
4	341	351
6	225	-242
7	94	-90
H=	0, K=	14
-10	173	-177
-9	183	-174
-8	114	92
-7	291	290
-6	101	115
-5	437	-438
-4	317	-304
-3	156	163
-2	381	385
0	411	-420
1	188	-176
2	286	293
3	377	376
4	133	-127
5	275	-278
7	238	231
H=	0, K=	15
-9	126	131
-8	208	204
-6	352	-347
-5	144	-131
-4	305	296
-3	257	248
-2	241	-223
-1	449	-455
1	376	380
2	319	317
3	182	-173
4	299	-294
6	198	203
H=	0, K=	16
-9	150	127
-7	236	-227
-5	278	273
-4	122	133
-3	270	-265
-2	374	-352
-1	235	237
0	342	339
1	185	173
2	234	-228
3	283	-277
5	218	210
H=	0, K=	17
-8	185	-168
-6	231	229
-5	127	120
-4	248	-245
-3	320	-310
-2	174	178
-1	252	259
1	211	-210
2	235	-222
3	153	167
4	209	207
H=	0, K=	18
-7	194	189
-5	229	-229
-4	231	-235
-3	194	184
-2	268	260
0	227	-213
2	165	172
3	176	152
H=	0, K=	19
-6	181	-174
-5	121	-100
-4	119	118
-3	223	224
-1	218	-218
1	167	179
H=	0, K=	20
-4	167	152
-2	196	-197
0	200	202
H=	1, K=	-20
-1	202	200
1	199	-202
3	162	163
H=	1, K=	-19
-2	117	113
0	258	-255
2	208	204
3	109	117
4	138	-140
5	104	-115
H=	1, K=	-18
-4	159	163
-3	116	121
-2	142	-145
-1	214	-193
1	273	249
2	95	81
3	266	-270
4	197	-200
6	225	224
H=	1, K=	-17
-5	185	199
-3	210	-202
-2	208	-203
-1	142	149
0	293	303
1	96	95
2	362	-364
3	186	-199
4	208	195
5	247	246
7	206	-204
8	105	-97
H=	1, K=	-16
-6	172	170
-4	258	-255
-3	200	-202
-2	232	221
-1	265	267
1	467	-453
2	270	-275
3	250	242
4	253	251
5	92	-84
6	284	-285
8	151	143
H=	1, K=	-15
-5	209	-208
-4	109	-124
-3	305	299
-2	136	144
-1	218	-219
0	535	-534
1	218	-212
2	532	529
3	318	305
4	127	-145
5	317	-316
6	117	101
7	298	299
8	131	118
9	127	-125
H=	1, K=	-14
-6	223	-220
-4	334	343
-3	151	134
-2	234	-235
-1	364	-355
1	451	445
3	301	-351
4	312	-328
5	215	205
6	364	356
8	213	-194
9	172	-169
H=	1, K=	-13
-8	130	-132
-7	229	-231
-5	347	357
-4	125	134
-3	285	-287
-2	292	-304
-1	153	137
0	335	330
2	330	-314
3	299	-292
4	348	348
5	451	430
6	192	-175
7	343	-324
8	177	-168
9	176	169
10	192	197
H=	1, K=	-12
-8	179	-181
-6	305	308
-4	400	-397
-3	317	-323
-2	162	153
-1	456	441
1	389	-380
2	419	-397
3	413	412
4	394	390
5	292	-276
6	479	-463
8	254	257
9	180	181
10	127	-124
H=	1, K=	-11
-9	122	-109
-8	150	141
-7	300	299
-6	103	98
-5	569	-562
-4	215	-223
-3	261	269
-2	407	416
-1	291	-291
0	729	-736
2	532	528
3	534	511
4	418	-394
5	476	-464
7	453	466
8	99	110
9	213	-211
10	155	-154
H=	1, K=	-10
-9	200	186
-8	258	252
-6	467	-467
-5	116	-109
-4	468	486
-3	353	372
-2	189	-199
-1	687	-651
1	517	504
2	221	252
3	472	-441
4	670	-661
5	100	99
6	418	426
7	115	111
8	301	-293
9	157	-163
10	150	154
11	183	174
H=	1, K=	-9
-9	138	140
-8	184	-169
-7	405	-412
-5	573	584
-4	331	342
-3	543	-533
-2	736	-705
-1	175	141
0	784	805
1	240	258
2	653	-675
3	424	-397
4	476	509
5	534	519
7	428	-420
8	189	-188
9	285	286
10	196	199
H=	1, K=	-8
-9	224	-221
-8	247	-251
-7	141	156
-6	448	460
-5	88	79
-4	561	-571
-3	430	-436
-2	748	736
-1	540	559
1	744	-743
2	540	-442
3	253	254
4	531	533
5	199	-166
6	395	-384
7	211	-213
8	302	299
9	236	237
10	95	-87
11	201	-197
H=	1, K=	-7
-10	212	-221
-9	173	-168
-8	201	203
-7	394	378
-6	83	-77
-5	469	-454
-4	153	-187
-3	510	514
-2	187	213
-1	572	-533
0	770	-740
1	722	-726
2	822	812
3	807	814
4	683	-680
5	687	-666
7	427	420
8	385	362
9	265	-258
10	248	-296
H=	1, K=	-6
-10	158	-145
-9	186	197
-8	405	401
-6	406	-400
-5	189	-178
-4	551	550
-3	355	334
-2	783	-739
-1	935	-785
0	276	-302
1	988	951
2	639	625
3	1194	-1133
4	612	-575
5	189	185
6	623	596
7	123	132
8	491	-484
9	284	-291
10	138	138
11	231	239
H=	1, K=	-5
-10	228	218
-9	236	230
-8	206	-184
-7	365	-363
-5	807	802
-4	340	353
-3	816	-756
-2	935	-992
-1	154	183
0	827	845
1	569	525
2	390	-383
3	101	-41
4	818	790
5	759	747
6	136	-143
7	731	-730
9	201	212
10	318	309
H=	1, K=	-4
-11	191	184
-10	170	170
-9	215	-218
-8	360	-355
-7	218	227
-6	664	645
-5	487	465
-4	457	-487
-3	789	-760
-2	614	653
-1	502	502
0	103	73
1	876	-799
2	843	-866
3	175	159
4	869	805
5	275	-292
6	811	-797
8	359	344
9	332	325
10	113	-129
11	253	-259
H=	1, K=	-3
-10	294	-287
-9	205	-199
-8	342	341
-7	470	470
-6	123	133
-5	584	-577
-4	1144	-1122
-3	559	528
-2	804	752
-1	1817	-1674
0	211	-162
1	1185	-1081
2	497	525
3	375	307
4	312	-308
5	843	-792
6	88	76
7	602	570
8	240	228
9	220	-230
10	323	-327
11	95	72
H=	1, K=	-2
-11	258	-257
-9	370	362
-8	442	460
-7	155	-152
-6	594	-604
-5	782	-675
-4	581	602
-3	379	368
-2	222	177
-1	368	-417
0	322	-238
1	387	441
2	812	764
3	692	-638
4	1183	-1176
5	358	-321
6	683	680
7	115	80
8	504	-498
9	284	-275
10	149	144
11	218	216
H=	1, K=	-1
-10	299	308
-9	243	227
-8	257	-252
-7	617	-587
-6	147	157
-5	728	721
-4	868	815
-3	570	-546
-2	1147	-1073
-1	239	157
0	2149	1995
1	107	-50
2	365	-314
3	366	-398
5	771	764
6	90	99
7	564	-563
8	229	-226
9	295	299
10	264	264
H=	1, K=	0
-11	283	265
-10	162	151
-9	271	-265
-8	273	-287
-7	163	150
-6	726	755
-5	534	509
-4	434	-389
-3	693	-650
-2	489	447
-1	2107	2000
0	118	-69
1	1669	-1539
2	1836	-1688
3	615	613
4	1428	1330
5	118	-128
6	554	-543
7	174	-176
8	536	524
9	212	213
10	164	-160
11	182	-177
H=	1, K=	1
-12	190	186
-11	92	122
-10	260	-257
-9	260	-258
-8	198	191
-7	535	518
-5	1257	-1160
-4	281	-219
-3	956	892
-2	845	801
-1	505	-506
0	2171	-2104
1	440	-427
2	956	932
3	786	790
4	585	-573
5	399	-437
7	511	523
8	317	301
9	352	-351
10	273	-281
H=	1, K=	2
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-10	137	-145
-9	294	294
-8	250	252
-7	84	-60
-6	774	-720
-5	183	-153
-4	285	347
-3	1295	1233
-2	1060	1008
-1	1696	-1577
0	402	-435
1	849	781
2	442	436
3	964	-944
4	1123	-1098
6	484	468
7	160	155
8	562	-547
9	376	-376
10	161	167
11	225	223
H=	1, K=	3
-12	154	-159
-11	150	-147
-10	243	230
-9	208	219
-8	189	-191
-7	555	-543
-6	134	159
-5	1069	1032
-4	802	821
-3	518	-469
-2	1556	-1374
-1	414	324
0	1149	1080
1	701	674
2	438	-468
3	464	-439
4	440	441
5	605	656
7	546	-566
8	353	-356
9	343	352
10	238	249
H=	1, K=	4
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-10	185	185
-9	270	-280
-8	303	-293
-7	139	156
-6	920	893
-5	525	498
-4	334	-283
-3	843	-815
-2	433	469
-1	1420	1362
0	820	705
1	579	-587
2	175	-193
3	945	919
4	698	663
6	545	-569
7	225	-229
8	317	322
9	251	242
10	105	-109
11	174	-174
H=	1, K=	5
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-11	92	85
-10	230	-228
-9	317	-302
-8	110	113
-7	690	640
-5	877	-809
-4	834	-808
-3	464	517
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0	1054	-1037
1	308	-349
2	1234	1149
3	844	838
4	269	-263
5	691	-705
7	392	385
8	177	167
9	225	-226
10	181	-181
H=	1, K=	6
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-10	205	-214
-9	197	199
-8	610	614
-7	255	-241
-6	939	-882
-5	321	-312
-4	638	620
-3	1152	1139
-2	985	-918
-1	1317	-1317
0	159	-168
1	1019	1029
2	713	673
3	970	-973
4	689	-658
6	271	265
8	236	-248
9	190	-201
H=	1, K=	7
-12	204	-197
-10	163	153
-9	366	350
-8	365	-365
-7	374	-347
-6	191	179
-5	833	800
-4	455	415
-3	750	-716
-2	1004	-914
-1	403	404
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1	890	804
2	611	-570
3	668	-632
4	328	306
5	352	346
7	389	-391
8	123	-143
9	168	162
10	151	160
H=	1, K=	8
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-10	157	162
-9	101	-85
-8	351	-350
-7	200	186
-6	602	621
-5	332	314
-4	685	-671
-3	294	-319
-2	655	625
-1	1425	1370
0	517	488
1	741	-788
2	512	-503
3	564	574
4	606	593
6	542	-540
7	147	-125
8	220	216
9	204	197
H=	1, K=	9
-10	179	-170
-9	255	-260
-7	409	409
-6	152	-144
-5	633	-605
-4	243	-229
-3	358	356
-2	431	414
-1	233	-208
0	903	-899
1	113	-122
2	851	833
3	556	518
4	193	-177
5	458	-449
7	389	394
8	162	159
9	106	-116
H=	1, K=	10
-11	178	-179
-10	173	-183
-9	123	116
-7	347	322
-6	543	-531
-5	219	-213
-4	516	499
-3	414	403
-2	450	-435
-1	720	-720
0	161	-171
1	711	659
2	157	149
3	340	-351
4	391	-389
6	427	420
7	102	95
8	233	-229
9	199	-199
H=	1, K=	11
-11	118	-117
-10	177	176
-9	225	212
-7	353	-358
-6	88	77
-5	573	574
-4	324	311
-3	389	-393
-2	383	-376
-1	156	152
0	658	645
1	99	91
2	496	-484
3	267	-264
4	181	177
5	367	365
7	252	-251
8	153	-160
H=	1, K=	12
-11	195	198
-10	176	177
-9	159	-150
-8	283	-278
-6	512	499
-5	213	211
-4	360	-356
-3	280	-287
-2	368	338
-1	650	613
1	500	-500
2	215	-226
3	301	307
4	372	367
5	137	-128
6	256	-245
7	131	-141
8	130	134
H=	1, K=	13
-10	212	-213
-9	196	-206
-8	107	106
-7	307	306
-5	504	-499
-4	248	-251
-3	144	158
-2	250	238
0	409	-406
2	416	413
3	435	414
4	125	-131
5	207	-213
7	186	182
H=	1, K=	14
-9	153	153
-8	245	235
-6	446	-435
-5	178	-171
-4	298	287
-3	252	257
-1	441	-461
0	143	-148
1	429	431
2	344	326
3	214	-214
4	337	-335
5	223	222
H=	1, K=	15
-9	152	152
-7	260	-270
-5	394	400
-4	164	152
-3	169	-181
-2	382	-382
-1	135	132
0	363	348
1	139	151
2	327	-317
3	361	-365
4	98	98
5	214	220
H=	1, K=	16
-8	166	-180
-6	258	244
-4	254	-246
-3	178	-178
-2	296	276
-1	321	321
1	238	-252
2	298	-302
3	179	185
4	240	242
H=	1, K=	17
-7	195	173
-5	245	-247
-4	196	-199
-3	216	221
-2	249	242
0	194	-193
2	257	248
3	213	214
H=	1, K=	18
-6	234	-220
-4	229	225
-3	239	237
-1	203	-219
1	203	196
2	126	114
3	99	-102
H=	1, K=	19
-5	139	161
-4	182	180
-3	94	-104
-2	206	-200
0	171	175
2	151	-139
H=	1, K=	20
-4	99	-107
-3	172	-178
-1	163	185
H=	2, K=	-20
-1	107	-82
0	230	-237
2	181	174
3	111	83
4	159	-139
H=	2, K=	-19
-3	137	132
-2	101	-115

Table 1 (*cont.*)

-1	141	-187
1	226	229
3	136	-138
6	193	183
H= 2, K=-18		
-4	126	107
-3	133	-126
-2	176	-174
-1	159	162
0	274	274
2	235	-243
3	149	-146
4	160	165
5	223	209
7	186	-172
H= 2, K=-17		
-4	168	-197
-3	214	-212
-2	226	224
-1	264	274
1	339	-343
2	101	-109
3	271	272
4	207	215
6	238	-237
H= 2, K=-16		
-5	267	-272
-4	140	-135
-3	244	254
-2	201	204
-1	177	-192
0	469	-470
1	134	-132
2	459	445
3	227	227
4	98	-105
5	243	-254
7	201	206
H= 2, K=-15		
-6	229	-235
-4	308	304
-3	156	147
-2	201	-258
-1	458	-460
1	682	676
2	189	199
3	246	-249
4	303	-317
5	141	127
6	315	319
8	164	-165
9	143	-153
H= 2, K=-14		
-7	187	-192
-6	123	124
-5	318	319
-4	86	63
-3	325	-325
-2	217	-220
-1	208	202
0	476	484
2	380	-388
3	198	-205
4	226	224
5	397	395
7	237	-218
8	105	-118
9	154	148
H= 2, K=-13		
-8	199	-195
-7	123	130
-6	264	282
-4	386	-387
-3	175	-178
-2	158	141
-1	355	369
1	332	-329
2	142	-151
3	329	336
4	347	337
5	232	-228
6	439	-427
8	196	192
9	202	202
H= 2, K=-12		
-8	117	114
-7	187	193
-5	516	-514
-4	138	-157
-3	202	188
-2	245	243
-1	189	-205
0	539	-537
2	402	376
3	327	312
4	314	-320
5	418	-415
6	86	74
7	376	382
8	150	148
9	152	-143
10	167	-173
H= 2, K=-11		
-9	159	152
-8	230	226
-6	465	-465
-4	412	427
-3	224	222
-2	285	-314
-1	659	-631
1	576	567
2	366	375
3	473	-488
4	358	-378
5	201	209
6	519	518
7	111	105
8	264	-277
9	172	-169
H= 2, K=-10		
-9	137	153
-8	109	-102
-7	337	-342
-6	90	97
-5	533	527
-4	283	280
-3	305	-293
-2	441	-454
-1	234	211
0	605	607
2	700	-710
3	422	-421
4	404	408
5	504	471
6	111	115
7	393	-397
9	214	215
10	163	166
H= 2, K=-9		
-9	195	-205
-8	264	-265
-7	94	89
-6	578	574
-5	149	141
-4	464	-452
-3	521	-546
-2	508	477
-1	828	834
1	791	-731
2	559	-504
3	249	277
4	551	560
5	274	-251
6	492	-501
7	171	-158
8	337	351
9	165	174
10	118	-113
11	203	-196
H= 2, K=-8		
-10	233	-234
-9	171	-175
-8	133	107
-7	328	313
-6	245	-238
-5	527	-533
-4	351	-361
-3	457	479
-2	391	384
-1	572	-587
0	827	-805
1	446	-431
2	535	554
3	709	673
4	333	-345
5	466	-449
6	96	94
7	348	348
8	296	286
9	240	-230
10	212	-195
H= 2, K=-7		
-10	103	-105
-9	218	203
-8	281	270
-7	128	-137
-6	385	-387
-5	125	-105
-4	432	444
-3	230	223
-2	827	-730
-1	698	-732
1	842	834
2	945	918
3	385	-381
4	502	-443
5	182	170
6	606	591
7	270	251
8	475	-477
9	316	-315
11	214	212
H= 2, K=-6		
-10	251	243
-9	254	260
-8	87	-96
-7	258	-268
-5	698	677
-4	401	421
-3	663	-668
-2	240	-278
-1	133	148
0	714	750
2	1082	-1008
3	761	-699
4	560	511
5	768	726
6	94	-91
7	576	-566
8	129	-123
9	252	262
10	278	272
H= 2, K=-5		
-11	210	207
-10	175	183
-9	231	-230
-8	358	-371
-7	166	164
-6	740	703
-5	152	143
-4	672	-655
-3	549	-528
-2	1072	1086
-1	524	443
1	1181	-1100
2	696	-709
3	490	509
4	431	406
5	360	-346
6	674	-642
7	99	86
8	348	348
9	293	299
10	121	-110
11	253	-236
H= 2, K=-4		
-10	230	-234
-9	291	-301
-8	209	190
-7	315	312
-5	932	-889
-4	643	-611
-3	365	353
-2	938	943
-1	654	-582
0	452	-486
1	334	-367
2	766	784
3	624	644
4	188	-187
5	715	-674
6	188	170
7	559	545
8	150	163
9	192	-190
10	266	-260
H= 2, K=-3		
-11	216	-222
-10	183	-178
-9	285	288
-8	459	449
-7	208	-223
-6	723	-697
-5	486	-477
-4	673	641
-3	720	687
-2	481	-496
-1	1417	-1317
0	347	332
1	1682	1545
2	740	655
3	234	-238
4	843	-773
5	161	157
6	780	736
7	113	-117
8	314	-311
9	354	-337
11	212	202
H= 2, K=-2		
-10	350	341
-9	271	205
-8	336	-314
-7	447	-439
-5	696	685
-4	770	746
-3	338	-294
-2	906	-787
-1	531	-499
0	164	128
1	1172	-1035
2	819	-792
3	873	-748
4	156	-99
5	705	902
6	102	80
7	429	-428
8	226	-223
9	216	229
10	295	287
H= 2, K=-1		
-11	281	290
-9	300	-245
-8	327	-355
-7	117	125
-6	644	613
-5	933	857
-4	970	-970
-3	322	-309
-2	439	467
-1	679	657
1	1940	-1810
2	741	-665
3	449	414
4	1240	1190
5	177	182
6	630	-629
8	402	414
9	244	241
11	186	-181
H= 2, K= 0		
-12	215	222
-10	286	-287
-9	249	-247
-8	152	155
-7	431	434
-5	1021	-948
-3	1312	1439
-2	91	11
-1	273	-217
0	1468	-1350
1	121	-102
2	922	843
3	1090	1039
4	96	-114
5	627	-622
6	121	-102
7	562	571
8	172	164
9	176	-177
10	210	-206
H= 2, K= 1		
-11	294	-307
-10	180	-185
-9	230	233
-8	362	352
-6	477	-562
-5	182	-185
-4	765	751
-3	787	745
-2	1774	-1719
-1	1402	-1319
0	430	407
1	921	888
2	436	456
3	537	-482
4	935	-897
5	197	185
6	544	549
7	128	143
8	462	-464
9	297	-307
11	173	182
H= 2, K= 2		
-12	207	-210
-11	105	-113
-10	340	329
-9	176	178
-8	217	-200
-7	374	-366
-5	645	644
-4	641	617
-3	682	-638
-2	1588	-1513
-1	265	257
0	1214	-1108
1	97	99
2	830	-809
3	905	-852
4	444	412
5	555	526
7	607	-615
8	261	-249
9	301	314
10	229	242
H= 2, K= 3		
-11	309	313
-10	149	151
-9	296	-302
-8	212	-220
-7	99	84
-6	722	698
-5	667	632
-4	414	-370
-3	1021	-959
-2	184	145
-1	1144	1128
0	120	87
1	635	-632
2	259	-220
3	690	674
4	662	673
6	578	-568
7	238	-232
8	515	518
9	313	313
10	102	-118
H= 2, K= 4		
-12	255	250
-11	103	100
-10	321	-315
-9	130	-123
-8	151	131
-7	541	541
-5	401	-400
-4	918	-823
-3	178	236
-2	1128	1090
-1	203	157
0	678	-649
1	356	-346
2	589	586
3	379	360
4	146	-157
5	598	-595
7	502	498
8	498	296
9	218	-222
10	199	-199
H= 2, K= 5		
-11	266	-272
-10	225	-214
-9	310	313
-8	498	506
-7	99	-117
-6	605	-579
-5	419	-388
-3	1034	980
-2	311	-306
-1	1023	-973
0	193	-198
1	553	546
2	277	300
3	631	-642
4	711	-684
6	468	455
7	261	255
8	349	-347
9	263	-266
10	140	108
H= 2, K= 6		
-12	191	-206
-11	93	-74
-10	243	254
-9	409	390
-8	386	-370
-7	468	-457
-5	519	510
-4	874	841
-3	490	-445
-2	1259	-1152
-1	153	139
0	820	760
2	944	-923
3	697	-680
4	393	400
7	336	-351
8	135	-125
9	174	185
10	170	169
H= 2, K= 7		
-11	218	226
-10	155	154
-9	278	-288
-8	404	-397
-7	318	312
-6	637	620
-5	284	297
-4	703	-653
-3	544	-484
-2	529	564
-1	1111	1073
0	240	197
1	555	-515
2	707	-677
3	262	274
4	539	542
6	404	-393
8	255	245
9	182	193
H= 2, K= 8		
-12	158	151
-11	97	82
-10	116	-119
-9	268	-252
-8	178	162
-7	330	314
-5	547	-516
-4	403	-411
-3	434	452
-2	848	851
-1	175	184
0	996	-968
1	572	-581
2	634	623
3	671	690
5	360	-383
7	385	392
8	176	166
9	131	-148
H= 2, K= 9		
-11	186	-193
-10	166	-167
-9	207	205
-8	352	353
-6	481	-476
-5	317	-300
-4	658	655
-3	435	466
-2	319	-311
-1	834	-833
0	314	-289
1	856	827
2	262	253
3	413	-401
4	457	-450
6	523	510
8	300	-287
9	204	-202
H= 2, K= 10		
-11	95	-75
-10	175	165
-9	199	199
-8	86	-64
-7	376	-369
-5	447	426
-4	450	424
-3	345	-330
-2	599	-552
-1	207	-172
0	610	592
1	84	81
2	605	-591
3	400	-403
5	417	413
7	284	-289
8	158	-147
H= 2, K= 11		
-11	173	167
-10	154	160
-9	196	-180
-8	293	-295
-7	122	120
-6	471	474
-5	263	267
-4	434	-430
-3	588	-567
-2	258	266
-1	673	689
0	90	95
1	544	-541
2	173	-189
3	337	345
4	409	409
5	101	-99
6	269	-273
7	101	-98
8	160	162
H= 2, K= 12		
-10	195	-180
-9	186	-197
-8	149	152
-7	312	308
-6	84	54
-5	438	-432
-4	331	-319
-3	388	384
-2	405	406
0	511	-509
2	487	488
3	400	390
5	210	-197
7	160	165
H= 2, K= 13		
-10	104	-108
-9	185	201
-8	277	264
-6	445	-430
-5	120	-136
-4	358	352
-3	311	325
-2	99	-100
-1	512	-501
0	131	-121
1	459	447
2	218	222
3	234	-238
4	275	-279
6	220	220
H= 2, K= 14		
-10	170	167
-9	165	163
-7	331	-331
-6	90	-80
-5	383	395
-4	255	250
-3	144	-150
-2	555	-523
0	340	332
1	91	123
2	365	-362
3	330	-394
4	96	99
5	225	229
H= 2, K= 15		
-9	126	-123
-8	204	-204
-6	349	359
-5	92	102
-4	275	-279
-3	339	-326
-2	248	238
-1	438	431
1	317	-318
2	305	-299
3	249	248
4	270	272
H= 2, K= 16		
-9	126	-149
-7	201	209
-5	235	-229
-4	95	-104
-3	242	237
-2	353	344
-1	110	-118
0	263	-258
1	98	-138
2	264	274
3	280	274
5	176	-182
H= 2, K= 17		
-8	175	172
-6	204	-196
-4	222	226
-3	196	198
-2	156	-160
-1	293	-299
1	215	210
2	162	158
3	159	-149
4	175	-168
H= 2, K= 18		
-7	187	-185
-5	216	211
-4	147	141
-3	203	-169
-2	215	-214
0	192	182
2	192	-180
3	141	-142
H= 2, K= 19		
-6	179	188
-4	147	-152
-3	171	-151
-1	213	195
1	182	-184
H= 2, K= 20		
-4	134	-128
-2	185	183
H= 3, K=-20		
-1	199	-198
1	234	220
3	169	-165
H= 3, K=-19		
-3	140	-147
-2	182	-187
-1	98	80
0	217	210
2	172	-164
3	124	-121
4	102	131
5	157	166
H= 3, K=-18		
-4	174	-158
-3	180	-195
-2	198	180
-1	215	223
1	255	-243
2	126	-104
3	216	222
4	194	195
6	218	-232
H= 3, K=-17		
-5	217	-221
-4	149	-148
-3	228	228
-2	247	248
-1	122	-130
0	289	-284
2	303	311
3	123	123
4	190	-179
5	268	-264
7	163	175
H= 3, K=-16		
-6	224	-231
-4	275	282
-3	250	255
-2	238	-235
-1	357	-364
1	511	514
2	114	126
3	270	-258
4	269	-262
6	235	244
8	171	-180
H= 3, K=-15		
-7	171	-177
-5	307	293
-4	160	164
-3	290	-300
-2	298	-308
-1	265	259
0	632	630
1	94	86
2	431	-424
3	229	-222
4	178	181
5	309	325
7	213	-215
H= 3, K=-14		
-7	122	129
-6	285	292
-4	317	-323
-3	155	-153
-2	336	336
-1	617	618
1	489	-492
3	297	295
4	265	282
5	191	-201
6	270	-284
8	251	231
9	145	159
H= 3, K=-13		
-8	124	136
-7	187	174
-6	118	-116
-5	421	-424
-4	87	-96
-3	202	212
-2	441	467
0	506	-505
2	205	219
3	189	191
4	263	-245
5	364	-369
7	235	234
8	136	129
9	215	-214
H= 3, K=-12		
-8	160	169
-7	168	-178
-6	447	-460
-5	93	-89
-4	446	449
-3	262	260
-2	153	-147
-1	602	-579
0	109	102
1	502	490
2	219	217
3	418	-408
4	238	-250
5	209	205
6	384	382
8	253	-253
9	192	-193
10	134	121
H= 3, K=-11		
-9	151	160
-8	166	-150
-7	282	-298
-5	560	569
-4	117	123
-3	293	-287
-2	260	-272
-1	199	204
0	790	813
1	146	124
2	560	-565
3	284	-265
4	297	300
5	265	258
7	298	-298
9	148	157
10	160	153
H= 3, K=-10		
-9	191	-198
-8	307	-300
-7	134	140
-6	584	586
-4	495	-495
-3	216	-218
-2	457	463
-1	701	703
1	822	-798
2	170	-187
3	523	493
4	458	458
5	134	-144
6	350	-360
7	107	-90
8	258	259
9	175	155
10	97	-108
H= 3, K=-9		
-10	215	-215
-9	230	-214
-8	145	130
-7	433	434
-6	323	-304
-5	569	-581
-4	336	-328
-3	389	399
-2	532	518
-1	407	-395
0	768	-753
1	362	-353
2	926	901
3	602	596
4	281	-277
5	354	-351
7	214	202
8	110	103
9	200	-199
10	174	-178
H= 3, K=-8		
-9	209	206
-8	234	245
-7	398	-396
-6	526	-527
-4	529	519
-3	306	284
-2	765	-718
-1	746	-710
0	91	100
1	864	880
2	700	669
3	453	-448
4	450	-476
5	134	140
6	398	399
7	228	217
8	359	-353
9	211	-209
H= 3, K=-7		
-10	224	231
-9	181	193
-8	101	-97
-7	284	-279
-5	422	435
-4	329	307
-3	572	-571
-2	244	-290
-1	407	420
0	770	751
1	303	291
2	935	-885
3	905	-881
4	248	213
5	542	534
6	102	92
7	406	-411
8	240	-233
9	203	198
10	236	248
H= 3, K=-6		
-11	220	221
-10	159	141
-9	217	-216
-8	283	-280
-7	154	165
-6	516	529
-4	515	-526
-3	270	-270
-2	763	726
-1	692	648
0	95	-92
1	856	-742
2	484	-437
3	852	810
4	618	577
5	197	-196
6	599	-596
7	147	-136
8	455	446
9	302	282
10	106	-96
11	218	-221
H= 3, K=-5		
-10	239	-238
-9	315	-316
-8	146	138
-7	332	336
-6	108	-116
-5	744	-747
-4	560	-495
-3	553	535
-2	661	655
-1	634	-624
0	571	-581
1	366	379
2	1098	1047
3	421	422
4	223	-232
5	645	-637
7	436	420
8	95	111
9	180	-191
10	255	-251
H= 3, K=-4		
-11	238	-236
-10	224	-219
-9	200	219
-8	253	255
-7	390	-387
-6	809	-798
-4	560	569
-3	618	611
-2	459	-427
-1	823	-803
0	83	99
1	667	593
2	181	170
3	527	-482
4	670	-614
5	285	253
6	659	642
8	244	-253
9	289	-295
10	100	108
11	192	196
H= 3, K=-3		
-10	285	283
-9	348	342
-8	254	-242
-7	569	-570
-6	79	51
-5	752	745
-4	518	504
-3	237	-233
-2	1189	-1194
0	771	766
1	235	-268
2	1405	-1329
3	640	-599
4	305	283
5	776	752
7	308	-320
8	263	-276
9	215	216
10	256	249
H= 3, K=-2		
-11	272	276
-10	119	125
-9	296	-295
-8	354	-353
-7	235	240
-6	854	830
-5	321	272
-4	790	-720
-3	111	-60
-2	304	-230
-1	1289	1172
0	241	169
1	846	-740
2	469	-476
3	766	681
4	719	676
5	123	-131
6	584	-555
7	86	-104
8	356	352
9	251	264
10	108	-108
11	185	-191
H= 3, K=-1		
-12	150	150
-10	276	-275
-9	287	-287
-8	155	152
-7	578	542
-6	122	134
-5	1020	-989
-4	376	-364
-3	182	199
-2	462	549
-1	1494	1382
0	1729	-1726
1	249	179
2	713	709
3	1191	1077
4	320	-358
5	841	-809
6	79	-72
7	355	358
8	248	253
9	195	-200
10	246	-235
H= 3, K= 0		
-11	322	-318
-10	217	-214
-9	153	159
-8	248	235
-7	197	-209
-6	869	-836
-4	969	999
-3	575	532
-2	866	-803
-1	1601	-1496
0	665	633
1	1338	1220
2	507	436
3	387	-399
4	943	-855
5	277	274
6	560	547
7	113	103
8	294	-300
9	229	-229
10	102	95
11	175	159
H= 3, K= 1		
-12	193	-198
-10	300	290
-9	292	297
-8	152	-143
-7	378	-392
-6	132	-142
-5	862	818
-4	158	-148
-3	1041	-1011
-2	924	-865
-1	648	650
0	809	755
1	218	-230
2	255	-224
3	868	-818
4	357	308
5	613	589
7	453	-455
8	210	-219
9	142	157
10	207	204
H= 3, K= 2		
-11	336	331
-10	190	210
-9	191	-201
-8	279	-271
-7	107	129
-6	581	557
-5	124	86
-4	1005	-983
-3	716	-728
-2	959	960
-1	832	962
1	863	-868
2	404	-406
3	375	369
4	536	524
5	224	-218
6	596	-610
8	378	385
9	273	262
10	94	-93
H= 3, K= 3		
-12	207	218
-11	109	88
-10	325	-323
-9	164	-147
-8	130	123
-7	552	523
-5	757	-727
-4	760	-788
-3	825	787
-2	1165	1126
-1	173	-184
0	425	-345
1	366	-332
2	670	609
3	437	449
4	314	-324
5	514	-499
7	924	524
8	243	246
9	192	-199
10	211	-204
H= 3, K= 4		
-11	309	-316
-10	216	-220
-9	172	172
-8	298	300
-7	210	-203
-6	533	-542
-5	185	-187
-4	439	422
-3	1221	1175
-2	125	-145
-1	386	-376
0	171	-166
1	961	974
2	461	457
3	470	-494
4	505	-485
5	120	126
6	591	575
7	193	198
8	363	-365
9	198	-192
H= 3, K= 5		
-12	226	-225
-10	327	320
-9	385	385
-8	239	-244
-7	594	-586
-6	104	-88
-5	251	252
-4	638	570
-3	294	-281
-2	1220	-1227
-1	231	225
0	508	673
2	736	-741
3	570	-564
4	124	93
5	547	562
6	110	98
7	405	-427
8	189	-188
9	127	125
10	172	165
H= 3, K= 6		
-11	276	285
-10	173	181
-9	298	-297
-8	524	-531
-7	179	179
-6	402	383
-4	372	-376
-3	682	-675
-2	247	231
-1	680	678
0	637	-571
1	791	-777
2	547	-531
3	333	314
4	564	562
6	317	-317
8	247	235
9	185	180
H= 3, K= 7		
-12	175	180
-10	221	-225
-9	336	-332
-8	385	366
-7	452	456
-5	523	-524
-4	113	-98
-3	551	498
-2	900	892
-1	159	-174
0	778	-764
1	180	-163
2	465	495
3	541	542
5	248	-250
6	118	-127
7	320	323
8	165	179
9	124	-122
H= 3, K= 8		
-11	234	-233
-10	148	-159
-9	190	200
-8	241	248
-7	99	-118
-6	317	-321
-4	666	654
-3	401	396
-1	658	-650
1	867	853
2	266	300
3	237	-241
4	430	-424
5	94	-99
6	449	449
7	117	116
8	250	-251
9	163	-157
H= 3, K= 9		
-10	214	219
-9	260	260
-7	469	-468
-6	132	-127
-5	379	370
-4	187	184
-3	416	-432
-2	790	-775
-1	104	-98
0	649	638
2	575	-559
3	404	-410
5	475	476
7	349	-345
8	140	-151
H= 3, K= 10		
-11	161	175
-10	146	135
-9	235	-234
-8	341	-340
-6	325	329
-5	148	136
-4	391	-400
-3	538	-502
-1	429	445
1	509	-497
2	187	-183
3	262	264
4	413	425
5	93	-108
6	294	-304
8	203	206
H= 3, K= 11		
-11	105	106
-10	163	-160
-9	178	-193
-8	138	134
-7	394	390
-6	154	155
-5	366	-358
-4	336	-335
-3	301	302
-2	531	532
-1	256	241
0	483	-469
1	108	-106
2	395	399
3	329	340
4	147	-152
5	341	-339
7	224	211
H= 3, K= 12		
-11	192	-194
-10	141	-133
-9	183	192
-8	241	243
-6	409	-409
-5	124	-110
-4	394	405
-3	307	332
-1	374	-377
1	413	416
2	116	136
3	259	-250
4	317	-317
6	196	205
7	141	125
H= 3, K= 13		
-10	147	203
-9	186	175
-8	122	-119
-7	308	-302
-6	138	-135
-5	290	295
-4	206	188
-3	244	-227
-2	466	-442
-1	128	-130
0	353	344
1	130	142
2	288	-273
3	321	-323
4	93	81
5	235	235
H= 3, K= 14		
-10	105	86
-9	198	-187
-8	252	-241
-6	357	361
-5	165	160
-4	295	-293
-3	451	-467
-1	375	392
0	100	99
1	307	-307
2	230	-234
3	206	197
4	242	239
6	192	-197
H= 3, K= 15		
-9	152	-149
-8	114	115
-7	266	267
-5	271	-279
-4	207	-198
-3	188	201
-2	503	512
0	324	-317
1	149	-157
2	264	259
3	259	254
4	101	-74
5	206	-208
H= 3, K= 16		
-8	185	192
-6	193	-186
-4	194	200
-3	289	300
-2	159	-153
-1	354	-339
1	261	246
2	198	205
3	158	-154
4	180	-172
H= 3, K= 17		
-7	200	-198
-5	146	147
-4	103	129
-3	222	-222
-2	279	-288
0	253	255
1	95	112
2	201	-206
3	144	-140
H= 3, K= 18		
-6	195	189
-4	189	-189
-3	177	-180
-1	201	214
0	111	74
1	206	-202
H= 3, K= 19		
-5	171	-168
-4	100	-104
-3	125	107
-2	194	203
0	186	-187
H= 4, K=-20		
0	212	205
2	163	-193
3	117	-106
H= 4, K=-19		
-3	179	-172
-2	125	122
-1	190	184
1	204	-211
3	187	178
4	150	164
H= 4, K=-18		
-4	122	-144
-3	158	161
-2	198	198
-1	94	-86
0	225	-228
2	225	224
3	173	156
4	162	-168
5	271	-273
H= 4, K=-17		
-4	204	212
-3	194	198
-2	197	-202
-1	199	-213
1	300	302
2	119	102
3	243	-254
4	259	-271
6	222	232
H= 4, K=-16		
-5	233	243
-4	167	173
-3	310	-317
-2	222	-245
-1	157	136
0	367	368
2	362	-374
3	244	-245
4	138	134
5	329	333
7	239	-235
H= 4, K=-15		
-6	250	249
-4	309	-333
-3	188	-196
-2	297	296
-1	417	416
0	131	-138
1	562	-567
3	266	274
4	372	368
6	275	-283
8	245	245
H= 4, K=-14		
-7	244	244
-5	254	-265
-4	110	-110
-3	306	311
-2	460	451
-1	254	-269
0	588	-592
2	305	303
3	181	181
4	213	-218
5	372	-373
6	131	124
7	294	302
8	106	100
H= 4, K=-13		
-8	186	175
-7	101	-111
-6	278	-284
-5	87	-58
-4	328	330
-3	367	371
-2	147	-156
-1	526	-549
0	104	107
1	282	298
2	132	141
3	398	-401
4	297	-303
5	89	114
6	305	305
8	346	-345
9	179	-182
H= 4, K=-12		
-9	131	134
-8	160	-159
-7	244	-248
-5	474	475
-4	240	306
-3	140	-167
-2	563	-581
0	629	622
2	487	-489
3	287	-288
4	323	316
5	262	255
7	412	-409
8	135	-142
9	233	236
H= 4, K=-11		
-9	169	-185
-8	221	-221
-6	548	524
-4	371	-367
-3	371	-378
-2	205	206
-1	608	612
0	139	-136
1	543	-546
3	570	574
4	345	365
5	98	-100
6	270	-280
8	300	310
9	161	171
H= 4, K=-10		
-9	183	-180
-8	206	193
-7	522	525
-5	483	-508
-4	196	-198
-3	401	421
-2	696	680
-1	150	-150
0	740	-738
1	83	-101
2	713	675
3	400	393
4	408	-382
5	295	-284
7	277	276
8	123	121
9	213	-209
10	167	-162
H= 4, K=-9		
-9	250	246
-8	345	346
-7	208	-277
-6	625	-629
-4	687	657
-3	433	425
-2	418	-398
-1	606	-627
1	846	869
2	118	132
3	711	-686
4	573	-566
5	97	95
6	158	158
8	294	-294
9	110	-125
10	116	133
H= 4, K=-8		
-10	175	200
-9	204	207
-8	221	-228
-7	487	-486
-6	145	145
-5	690	696
-4	251	250
-3	806	-817
-2	504	-472
-1	273	275
0	971	917
1	342	298
2	799	-788
3	635	-621
4	228	223
5	314	309
7	267	-267
8	156	-143
9	195	192
10	150	194
H= 4, K=-7		
-11	187	192
-10	143	146
-9	198	-202
-8	294	-295
-7	294	299
-6	435	429
-5	88	76
-4	664	-653
-3	408	-406
-2	643	622
-1	698	675
0	482	487
1	698	-706
2	349	-353
3	959	927
4	591	611
5	117	-109
6	393	-391
8	353	368
9	208	203
10	121	-99
H= 4, K=-6		
-10	230	-224
-9	270	-269
-8	270	259
-7	460	455
-5	551	-552
-4	350	-363
-3	1055	1006
-2	864	874
-1	336	-340
0	689	-665
1	176	-171
2	936	922
3	405	418
4	360	-363
5	516	-490
7	493	476
8	98	109
9	190	-203
10	234	-250
H= 4, K=-5		
-11	241	-242
-10	168	-166
-9	236	236
-8	242	247
-7	320	-315
-6	658	-666
-5	74	-82
-4	542	510
-3	669	572
-2	652	-620
-1	718	-658
0	91	-91
1	751	790
2	99	-50
3	681	-664
4	590	-573
5	128	125
6	415	425
8	220	-238
9	190	-201
10	102	112
H= 4, K=-4		
-10	261	252
-9	310	325
-8	306	-304
-7	560	-557
-6	223	219
-5	774	773
-4	120	114
-3	747	-702
-2	1320	-1298
-1	673	705
0	680	737
1	202	186
2	865	-801
3	295	-269
4	95	106
5	535	545
7	310	-312
8	185	-185
9	153	150
10	227	215
H= 4, K=-3		
-11	255	258
-10	170	170
-9	250	-258
-8	288	-292
-7	403	401
-6	699	671
-5	140	169
-4	1097	-1029
-3	283	-311
-2	238	162
-1	1131	1044
0	273	329
1	740	-646
3	782	749
4	542	558
5	143	-159
6	412	-400
7	95	-91
8	219	211
9	170	199
H= 4, K=-2		
-12	206	200
-10	328	-333
-9	275	-278
-8	329	313
-7	798	780
-5	831	-819
-4	122	-133
-3	1068	1047
-2	211	161
-1	430	415
0	1015	-1010
1	683	-570
2	1022	1045
3	654	580
4	383	-345
5	627	-598
7	307	319
8	256	246
9	196	-210
10	225	-228
H= 4, K=-1		
-11	265	-276
-10	126	-111
-9	197	190
-8	268	249
-7	212	-216
-6	977	-934
-5	237	-217
-4	727	631
-3	161	217
-2	65	-81
-1	957	-1016
0	240	-159
1	1093	1056
2	977	957
3	862	-777
4	744	-745
5	138	123
6	326	322
7	216	200
8	306	-318
9	197	-184
10	96	100
H= 4, K= 0		
-12	209	-211
-10	273	269
-9	334	337
-8	138	-125
-7	616	-615
-5	858	852
-4	280	-255
-3	987	-950
-2	757	-777
-1	438	376
0	1219	1165
1	340	364
2	1021	-906
3	1275	-1181
4	474	491
5	621	621
6	84	57
7	384	-390
8	215	-226
9	155	164
10	170	181
H= 4, K= 1		
-11	309	309
-10	201	204
-9	146	-149
-8	228	-227
-7	77	76
-6	623	598
-5	361	-362
-4	917	-851
-3	309	-320
-2	747	731
-1	850	824
0	607	-595
1	583	-580
2	836	-771
3	613	619
4	550	538
5	295	-275
6	337	-322
7	166	-154
8	209	209
9	246	246
H= 4, K= 2		
-12	209	214
-10	342	-341
-9	208	-207
-8	102	114
-7	589	587
-6	132	149
-5	565	-559
-3	1097	1091
-2	708	699
-1	251	-234
0	486	-503
1	478	-466
2	548	553
3	668	699
4	537	-513
5	538	-554
7	365	365
8	270	272
9	226	-222
10	226	-218
H= 4, K= 3		
-11	261	-272
-10	189	-183
-9	148	148
-8	238	240
-7	136	-131
-6	755	-760
-5	261	-235
-4	916	916
-3	925	822
-2	619	-565
-1	267	-227
1	917	882
2	447	421
3	501	-490
4	456	-441
5	162	156
6	430	414
8	307	-304
9	167	-173
H= 4, K= 4		
-12	232	-222
-10	296	294
-9	227	238
-8	149	-188
-7	617	-614
-6	125	-123
-5	553	504
-4	678	641
-3	845	-769
-2	710	-713
0	277	319
1	268	273
2	607	-572
3	607	-585
4	266	265
5	732	756
7	382	-402
8	163	-157
9	137	130
H= 4, K= 5		
-11	229	236
-10	185	185
-9	135	-158
-8	517	-492
-6	555	547
-5	315	310
-4	533	-564
-3	1045	-1024
-2	387	434
-1	382	350
0	179	-196
1	527	-542
2	581	-570
3	523	499
4	653	681
5	126	-137
6	470	-474
8	183	180
9	151	153
H= 4, K= 6		
-12	219	209
-10	274	-204
-9	392	-378
-8	432	418
-7	599	601
-6	244	248
-5	453	-462
-4	253	-259
-3	808	774
-2	682	617
-1	257	-229
0	497	-509
1	136	-155
2	560	569
3	509	510
4	255	-265
5	505	-495
6	149	-136
7	305	298
8	109	111
9	124	-125
H= 4, K= 7		
-11	227	-228
-10	115	-131
-9	191	202
-8	276	272
-7	170	-153
-6	413	-412
-5	206	-197
-4	712	661
-3	476	460
-2	344	-349
-1	460	-479
0	202	196
1	787	801
2	440	413
3	173	-173
4	397	-405
5	203	-201
6	331	334
8	181	-175
9	114	-114
H= 4, K= 8		
-12	178	-186
-10	214	216
-9	176	179
-8	214	-210
-7	391	-391
-5	514	519
-4	150	163
-3	602	-616
-2	745	-740
-1	222	224
0	753	735
1	199	186
2	434	-415
3	328	-330
4	144	133
5	437	448
7	316	-302
8	144	-124
H= 4, K= 9		
-11	179	197
-10	170	157
-9	136	-151
-8	305	-302
-6	276	286
-5	87	73
-4	521	-501
-3	534	-547
-2	243	224
-1	541	545
1	586	-592
2	141	-148
3	283	287
4	348	349
6	350	-348
7	105	-97
8	171	175
H= 4, K= 10		
-10	148	-207
-9	186	-198
-8	123	139
-7	460	455
-5	401	-402
-4	246	-239
-3	390	371
-2	629	605
0	548	-533
2	337	324
3	167	165
4	243	-244
5	408	-410
7	235	246
H= 4, K= 11		
-11	187	-189
-10	141	-140
-9	128	130
-8	274	267
-6	368	-380
-5	134	-141
-4	361	371
-3	414	404
-1	368	-368
1	400	406
2	207	209
3	198	-210
4	361	-362
6	223	223
7	119	117
H= 4, K= 12		
-10	203	191
-9	152	168
-8	100	-110
-7	302	-305
-5	387	387
-4	236	225
-3	318	-309
-2	276	-294
-1	97	59
0	392	400
1	133	141
2	223	-220
3	251	-259
4	204	199
5	257	204
H= 4, K= 13		
-10	107	95
-9	176	-187
-8	194	-205
-6	276	270
-4	311	-305
-3	273	-291
-1	246	241
0	98	72
1	248	-242
2	234	-217
3	153	150
4	255	251
6	200	-194
H= 4, K= 14		
-10	160	-160
-9	142	-146
-7	281	279
-5	290	-298
-4	183	-187
-3	153	142
-2	483	479
-1	101	-83
0	310	-316
1	164	-165
2	173	171
3	201	217
5	218	-228
H= 4, K= 15		
-9	141	129
-8	217	226
-6	233	-232
-4	216	219
-3	359	357
-2	118	-134
-1	322	-318
1	259	260
2	199	208
3	124	-122
4	200	-186
H= 4, K= 16		
-7	173	-179
-5	150	150
-4	156	162
-3	131	-174
-2	206	-270
0	310	312
1	136	137
2	184	-180
3	157	-130
H= 4, K= 17		
-8	184	-198
-6	121	119
-4	185	-162
-3	209	-209
-1	244	241
1	199	-210
3	109	109
H= 4, K= 18		
-7	173	157
-5	145	-139
-4	102	-169
-3	125	117
-2	154	181
0	200	-201
H= 4, K= 19		
-5	99	-77
-3	152	160
-1	167	-165
H= 5, K=-20		
1	207	-211
H= 5, K=-19		
-2	181	200
0	233	-239
2	188	206
3	149	142
4	146	-136
H= 5, K=-18		
-4	183	201
-3	182	192
-2	150	-146
-1	225	-215
1	249	244
2	127	130
3	228	-225
4	205	-219
H= 5, K=-17		
-5	214	218
-4	139	148
-3	255	-247
-2	185	-175
-1	100	108
0	273	275
2	274	-294
3	206	-220
4	150	157
5	263	273
H= 5, K=-16		
-6	200	201
-4	312	-315
-3	186	-179
-2	175	191
-1	225	239
1	414	-419
2	132	-134
3	195	201
4	389	397
6	217	-224
H= 5, K=-15		
-7	186	203
-5	290	-287
-3	346	344
-2	263	279
-1	290	-276
0	468	-466
2	371	368
3	296	301
4	123	-128
5	373	-385
7	241	247
8	100	99
H= 5, K=-14		
-6	234	-230
-4	361	365
-3	132	136
-2	320	-320
-1	436	-444
0	164	172
1	365	363
2	107	115
3	222	-241
4	365	-365
5	117	91
6	289	296
8	250	-235
H= 5, K=-13		
-8	118	-143
-7	227	-216
-5	337	347
-4	153	144
-3	309	-325
-2	502	-502
0	469	471
2	339	-344
3	246	-261
4	198	183
5	361	359
7	377	-393
8	116	-123
H= 5, K=-12		
-8	156	-158
-6	297	309
-5	112	108
-4	360	-370
-3	524	-525
-1	440	457
0	99	-88
1	391	-406
2	210	-222
3	463	468
4	445	437
6	373	-364
8	311	328
9	148	151
H= 5, K=-11		
-9	130	-122
-8	170	179
-7	370	367
-5	345	-336
-4	345	-333
-3	294	300
-2	569	578
-1	161	-168
0	507	-502
2	639	621
3	316	328
4	331	-332
5	371	-387
7	443	448
8	153	172
9	166	-169
H= 5, K=-10		
-9	189	212
-8	283	297
-6	381	-374
-5	106	-95
-4	281	283

Table 1 (*cont.*)

-3	499	496
-2	255	-278
-1	640	-640
1	572	566
2	110	117
3	570	-590
4	532	-540
6	367	374
7	94	100
8	292	-297
9	135	-134
H= 5, K= -9		
-10	174	195
-9	166	183
-8	205	-210
-7	516	-517
-6	86	81
-5	473	473
-4	318	324
-3	574	-572
-2	790	-758
-1	343	333
0	666	623
2	680	-684
3	534	-516
4	333	314
5	422	418
7	371	-370
8	160	-167
9	205	201
10	131	139
H= 5, K= -8		
-10	117	138
-9	226	-221
-8	306	-315
-7	194	195
-6	377	376
-5	135	144
-4	621	-595
-3	600	-561
-2	446	425
-1	703	679
0	218	-248
1	736	-741
2	380	-380
3	725	695
4	628	620
5	80	-74
6	261	-273
8	294	312
9	145	149
10	96	-109
H= 5, K= -7		
-11	102	98
-10	196	-203
-9	222	-223
-8	240	238
-7	407	403
-6	111	117
-5	506	-510
-4	319	-333
-3	925	925
-2	655	640
0	935	-907
1	85	-117
2	726	651
3	523	488
4	434	-424
5	592	-580
6	122	102
7	564	567
8	203	206
9	220	-226
10	183	-185
H= 5, K= -6		
-11	195	-193
-10	184	-179
-9	231	225
-8	443	441
-6	523	-531
-5	168	-172
-4	492	466
-3	859	848
-2	386	-379
-1	976	-976
0	184	-234
1	888	868
2	112	-111
3	742	-744
4	556	-550
5	268	256
6	609	609
8	309	-322
9	211	-214
H= 5, K= -5		
-11	106	-123
-10	231	228
-9	345	350
-8	330	-336
-7	510	-516
-5	670	649
-4	294	273
-3	414	-398
-2	1180	-1083
-1	134	182
0	827	722
2	771	-721
3	208	-229
4	262	243
5	535	536
6	255	-256
7	535	-530
8	140	-130
9	188	204
10	189	194
H= 5, K= -4		
-11	221	227
-10	214	204
-9	302	-294
-8	443	-424
-7	157	149
-6	549	577
-5	298	283
-4	823	-804
-3	937	-908
-2	197	177
-1	885	868
1	945	-911
2	190	95
3	454	465
4	443	457
5	87	-118
6	403	-457
8	143	194
9	210	214
10	107	-129
H= 5, K= -3		
-11	94	98
-10	340	-340
-9	264	-267
-8	343	380
-7	606	618
-5	924	-852
-4	100	-91
-3	1030	957
-2	1120	1078
-1	274	281
0	763	-765
1	120	79
2	405	749
3	353	316
4	315	-277
5	472	-460
6	144	138
7	365	388
8	166	166
9	190	-199
10	164	-141
H= 5, K= -2		
-11	245	-231
-10	105	-89
-9	409	401
-8	538	553
-7	106	-124
-6	731	-705
-5	411	-426
-4	1098	1021
-3	662	614
-2	332	-346
-1	1171	-1145
0	86	-43
1	795	734
3	355	-345
4	426	-441
5	86	89
6	353	368
7	144	128
8	292	-298
9	185	-181
10	145	138
H= 5, K= -1		
-12	233	-227
-10	327	325
-9	284	274
-8	360	-369
-7	652	-638
-6	99	-81
-5	956	925
-4	295	258
-3	1001	-1024
-2	1188	-1110
0	1394	1316
1	136	188
2	911	-829
3	714	-696
4	219	216
5	436	420
6	96	-74
7	446	-438
9	187	204
10	157	154
H= 5, K= 0		
-11	256	256
-10	125	136
-9	321	-305
-8	471	-480
-7	101	96
-6	774	748
-4	1078	-1067
-3	637	-653
-2	490	440
-1	1137	1110
0	276	-233
1	1096	-1039
2	579	-530
3	564	519
4	580	550
6	294	-310
7	139	-147
8	209	237
9	190	200
10	108	-110
H= 5, K= 1		
-12	247	251
-10	314	-315
-9	237	-253
-8	231	221
-7	575	568
-6	84	-78
-5	411	-408
-4	364	280
-3	1030	1005
-2	1046	1025
-1	230	-236
0	733	-726
1	310	-270
2	1180	1085
3	617	591
4	421	-425
5	283	-279
7	316	322
8	179	161
9	168	-167
10	175	-176
H= 5, K= 2		
-11	221	-228
-10	145	-134
-9	332	330
-8	470	465
-7	156	-139
-6	498	-496
-4	687	668
-3	379	295
-2	802	-793
-1	777	-776
0	580	-579
1	539	544
2	499	505
3	520	-488
4	337	-344
6	298	305
7	175	187
8	258	-270
9	180	-194
H= 5, K= 3		
-12	243	-234
-10	278	295
-9	106	119
-8	217	-234
-7	630	-645
-6	150	156
-5	467	467
-4	245	272
-3	919	-935
-2	849	-933
0	447	501
1	395	353
2	784	-777
3	447	-424
4	343	354
5	407	404
6	99	-82
7	246	-252
8	101	-118
9	158	151
H= 5, K= 4		
-11	165	195
-10	140	126
-9	217	-227
-8	422	-419
-7	162	175
-6	633	701
-5	95	103
-4	714	-700
-3	805	-789
-2	257	275
-1	498	460
0	69	40
1	474	-449
2	486	-484
3	425	409
4	564	575
5	161	-145
6	328	-327
7	134	-140
8	144	140
9	147	146
H= 5, K= 5		
-12	202	210
-10	144	-143
-9	295	-306
-8	307	288
-7	607	626
-6	239	230
-5	508	-519
-4	402	-398
-3	591	619
-2	670	654
-1	75	-54
0	565	-601
2	622	669
3	407	466
4	346	-325
5	630	-617
7	292	250
8	108	97
9	100	-114
H= 5, K= 6		
-11	201	-209
-10	139	-130
-9	322	326
-8	445	446
-6	582	-576
-5	341	-329
-4	761	746
-3	355	339
-2	537	-492
-1	786	-798
1	429	448
2	337	329
3	309	-301
4	556	-549
6	399	409
8	130	-136
H= 5, K= 7		
-12	190	-197
-10	191	204
-9	125	135
-8	292	-295
-7	295	-301
-6	140	-136
-5	558	538
-4	208	229
-3	652	-649
-2	403	-381
-1	171	183
0	613	575
1	252	255
2	386	-366
3	457	-469
5	417	437
7	212	-202
H= 5, K= 8		
-11	173	192
-10	139	153
-9	191	-169
-8	172	-180
-6	332	336
-5	172	165
-4	643	-659
-3	402	-391
-2	366	388
-1	605	597
0	181	166
1	686	-696
2	384	-393
3	219	245
4	371	383
6	369	-365
7	118	-107
8	141	140
H= 5, K= 9		
-10	207	-204
-9	141	-149
-8	114	137
-7	310	314
-5	440	-437
-4	149	-171
-3	449	455
-2	502	491
-1	114	-91
0	665	-662
1	101	-125
2	324	332
3	122	136
4	190	-202
5	419	-424
7	216	218
H= 5, K= 10		
-11	187	-180
-10	134	-131
-9	153	161
-8	324	332
-6	290	-298
-5	131	-140
-4	440	447
-3	428	425
-2	157	-165
-1	637	-631
0	113	-108
1	380	359
2	152	151
3	233	-218
4	333	-333
5	135	128
6	265	272
H= 5, K= 11		
-11	105	-107
-10	180	180
-9	137	160
-8	165	-157
-7	341	-332
-5	431	419
-4	370	367
-3	355	-362
-2	283	-294
0	443	453
1	98	127
2	233	-249
3	202	-222
4	206	229
5	250	264
H= 5, K= 12		
-10	129	131
-9	164	-167
-8	216	-212
-6	300	303
-5	131	121
-4	346	-355
-3	299	-287
-2	167	164
-1	304	296
1	339	-329
2	215	-231
3	194	200
4	280	274
6	196	-203
H= 5, K= 13		
-10	170	-165
-9	134	-142
-7	262	251
-6	90	73
-5	280	-270
-4	161	-178
-3	176	171
-2	326	330
-1	135	-149
0	288	-297
1	138	-157
2	139	147
3	208	220
4	105	-114
5	231	-230
H= 5, K= 14		
-9	164	158
-8	224	249
-6	214	-223
-4	201	210
-3	370	361
-2	154	-165
-1	379	-370
1	220	207
2	209	216
3	152	-138
4	220	-226
H= 5, K= 15		
-7	237	-241
-5	239	244
-4	185	182
-3	130	-151
-2	278	-288
-1	198	193
0	308	316
1	129	137
2	166	-165
3	148	-154
H= 5, K= 16		
-8	188	-192
-6	135	153
-4	155	-177
-3	176	-179
-2	140	149
-1	265	268
1	212	-216
2	149	-121
3	119	122
H= 5, K= 17		
-7	163	157
-5	151	-141
-4	143	-137
-3	144	145
-2	141	150
0	213	-225
2	161	140
H= 5, K= 18		
-6	125	-127
-4	137	142
-3	124	131
-1	183	-186
H= 6, K=-19		
-2	143	-152
-1	233	-236
1	187	198
3	192	-193
H= 6, K=-18		
-4	128	115
-3	197	-206
-2	208	-207
0	244	258
2	249	-201
3	166	-164
4	151	165
5	213	210
H= 6, K=-17		
-5	103	69
-4	219	-212
-3	171	-177
-2	158	165
-1	263	269
1	302	-322
2	130	-130
3	215	223
4	263	270
6	201	-207
H= 6, K=-16		
-5	225	-242
-3	247	261
-2	223	241
0	360	-358
2	349	367
3	288	298
4	103	-126
5	272	-288
H= 6, K=-15		
-6	254	-250
-4	315	327
-3	135	130
-2	243	-248
-1	391	-382
1	425	434
2	114	133
3	272	-258
4	373	-381
6	251	248
H= 6, K=-14		
-7	219	-219
-5	322	328
-3	302	-313
-2	297	-301
-1	249	257
0	406	423
2	279	-284
3	237	-224
4	193	208
5	297	315
7	210	-210
8	101	-102
H= 6, K=-13		
-8	144	-152
-6	300	310
-4	389	-393
-3	252	-260
-2	241	265
-1	488	503
1	259	-249
2	266	-260
3	300	290
4	294	299
5	148	-145
6	320	-311
8	221	217
H= 6, K=-12		
-8	97	125
-7	268	201
-5	506	-506
-4	201	-216
-3	369	370
-2	448	472
0	358	-362
2	450	452
3	325	323
4	256	-264
5	307	-318
7	326	336
H= 6, K=-11		
-9	157	155
-8	186	201
-6	403	-412
-5	93	-112
-4	402	416
-3	418	419
-2	188	-186
-1	532	-505
1	530	534
2	169	178
3	350	-360
4	436	-432
6	448	452
7	113	112
8	207	-206
9	103	-111
H= 6, K=-10		
-9	122	135
-8	192	-190
-7	404	-411
-5	332	341
-4	285	273
-3	407	-400
-2	514	-507
-1	238	223
0	407	448
1	120	131
2	473	-476
3	317	-330
4	244	251
5	491	501
7	355	-361
8	146	-156
H= 6, K= -9		
-9	245	-237
-8	305	-302
-7	173	180
-6	198	221
-5	174	181
-4	545	-533
-3	493	-490
-2	498	480
-1	592	593
1	646	-644
2	390	-378
3	385	380
4	422	414
6	366	-369
7	189	-185
8	225	240
9	123	116
H= 6, K= -8		
-10	223	-212
-9	140	-139
-8	217	235
-7	240	247
-6	171	-161
-5	337	-326
-4	398	-374
-3	681	675
-2	486	469
-1	345	-324
0	660	-618
1	116	-133
2	671	649
3	551	544
5	345	-360
7	382	387
8	136	157
9	153	-162
H= 6, K= -7		
-10	150	-149
-9	194	198
-8	338	330
-6	247	-243
-4	435	428
-3	691	704
-2	607	-598
-1	968	-947
0	77	94
1	700	725
2	474	469
3	452	-465
4	517	-501
5	100	117
6	538	527
7	207	213
8	295	-291
9	176	-169
H= 6, K= -6		
-11	128	-109
-10	174	186
-9	244	251
-8	211	-219
-7	367	-369
-5	352	367
-4	324	312
-3	436	-405
-2	992	-907
-1	136	138
0	833	800
2	764	-701
3	343	-354
4	395	375
5	550	559
6	118	-141
7	520	-521
8	171	-175
9	163	192
H= 6, K= -5		
-11	198	204
-10	184	186
-9	278	-262
-8	486	-475
-7	131	-141
-6	513	525
-4	520	-521
-3	616	-585
-2	172	180
-1	955	929
1	945	-911
2	258	-243
3	358	353
4	520	496
5	191	-199
6	607	-607
8	255	256
9	207	215
H= 6, K= -4		
-11	94	90
-10	198	-197
-9	263	-270
-8	139	152
-7	453	455
-5	606	-579
-4	256	-232
-3	113	118
-2	852	819
-1	130	104
0	915	-893
2	909	814
3	587	591
4	173	-159
5	536	-524
6	185	174
7	338	354
8	213	212
9	179	-183
H= 6, K= -3		
-11	197	-207
-10	161	-170
-9	366	371
-8	584	577
-6	457	-434
-5	163	-162
-4	708	725
-3	517	576
-2	254	-327
-1	916	-897
1	812	750
2	324	332
3	573	-550
4	609	-605
5	128	143
6	553	556
7	239	220
8	251	-253
9	161	-159
H= 6, K= -2		
-12	203	-201
-10	262	277
-9	200	194
-8	275	-271
-7	497	-495
-6	217	-233
-5	642	650
-4	469	443
-3	479	-460
-2	793	-749
-1	103	-108
0	1046	951
1	212	-175
2	648	-681
3	525	-529
4	323	308
5	459	443
7	365	-307
8	175	-173
9	172	198
H= 6, K= -1		
-11	237	239
-10	95	91
-9	419	-410
-8	617	-620
-7	142	-138
-6	769	769
-5	301	266
-4	582	-571
-3	687	-666
-2	257	262
-1	1440	1461
0	229	-276
1	929	-948
2	429	-408
3	522	494
4	633	593
5	203	-192
6	527	-534
7	151	-146
8	296	312
9	172	148
H= 6, K= 0		
-12	208	209
-10	240	-239
-9	356	-345
-8	207	214
-7	517	512
-6	102	102
-5	742	-766
-4	415	-418
-3	450	442
-2	1177	1162
-1	540	-569
0	1278	-1211
1	426	367
2	972	879
3	632	613
4	342	-345
5	281	-291
7	351	353
8	144	137
9	198	-193
H= 6, K= 1		
-11	234	-239
-10	193	-177
-9	409	409
-8	622	629
-6	405	-393
-5	186	-185
-4	517	486
-3	635	628
-2	527	-475
-1	826	-812
1	914	864
2	247	235
3	613	-631
4	477	-465
5	187	190
6	525	535
7	159	161
8	223	-223
9	131	-164
H= 6, K= 2		
-12	215	-217
-11	159	-172
-10	272	279
-9	258	273
-8	174	-186
-7	594	-589
-5	397	395
-4	435	411
-3	528	-576
-2	785	-797
-1	127	152
0	568	539
1	303	252
2	658	-657
3	241	-265
4	381	366
5	308	314
7	281	-294
8	169	-161
9	165	161
H= 6, K= 3		
-11	178	191
-10	130	129
-9	324	-329
-8	635	-596
-7	268	260
-6	635	629
-4	462	-462
-3	758	-780
-2	280	249
-1	604	640
0	554	534
1	671	-637
2	260	-288
3	470	461
4	285	274
5	231	-253
6	391	-391
7	137	-127
8	228	221
9	172	141
H= 6, K= 4		
-12	185	190
-10	173	-175
-9	332	-351
-8	225	235
-7	630	645
-6	247	-232
-5	682	-717
-4	554	-542
-3	237	234
-2	717	683
0	560	-566
1	147	-157
2	624	610
3	255	230
4	170	-190
5	305	-307
7	264	269
8	101	94
9	101	-113
H= 6, K= 5		
-11	165	-170
-10	120	-121
-9	339	348
-8	619	636
-7	137	-160
-6	742	-725
-5	145	-161
-4	602	592
-3	660	694
-2	142	-161
-1	847	-856
1	479	496
2	215	201
3	429	-428
4	371	-383
5	243	230
6	386	410
7	106	101
8	128	-131
H= 6, K= 6		
-12	152	-174
-10	190	216
-9	343	350
-8	269	-276
-7	558	-566
-5	624	624
-4	307	312
-3	463	-464
-2	581	-599
-1	150	149
0	555	528
1	150	162
2	420	-425
3	322	-329
4	252	253
5	306	300
7	190	-185
8	101	-90
H= 6, K= 7		
-11	191	181
-10	101	106
-9	313	-311
-8	323	-332
-7	98	94
-6	492	501
-4	645	-649
-3	362	-369
-2	279	277
-1	656	645
0	161	169
1	603	-596
2	398	-407
3	202	212
4	283	285
6	266	-268
7	99	-98
8	120	131
H= 6, K= 8		
-10	183	-181
-9	160	-169
-7	314	308
-5	522	-516
-4	79	-65
-3	274	258
-2	438	453
-1	116	-120
0	666	-684
1	280	-288
2	321	346
3	394	390
5	328	-329
7	192	190
H= 6, K= 9		
-11	149	-156
-9	180	184
-8	323	326
-6	347	-365
-4	523	549
-3	284	267
-2	236	-232
-1	671	-664
0	104	-126
1	362	370
2	203	220
3	191	-176
4	318	-316
5	148	142
6	252	273
H= 6, K= 10		
-10	187	187
-9	150	155
-8	118	-109
-7	336	-343
-5	394	392
-4	188	207
-3	387	-382
-2	345	-348
0	377	378
1	165	157
2	203	-204
3	241	-242
4	149	162
5	250	259
H= 6, K= 11		
-11	142	164
-10	113	108
-9	161	-189
-8	246	-250
-6	397	394
-5	181	167
-4	449	-457
-3	312	-304
-2	161	175
-1	418	406
1	336	-341
2	217	-227
3	185	189
4	245	246
5	111	-100
6	171	-175
H= 6, K= 12		
-10	160	-174
-9	147	-146
-8	135	136
-7	275	280
-5	271	-265
-4	207	-231
-3	204	216
-2	216	237
-1	137	-138
0	324	-335
1	121	-127
2	191	198
3	260	252
5	200	-191
H= 6, K= 13		
-9	149	163
-8	210	209
-6	242	-250
-5	112	-106
-4	181	173
-3	300	296
-2	201	-191
-1	362	-363
1	212	212
2	171	183
3	154	-162
4	230	-238
H= 6, K= 14		
-9	119	121
-8	103	-105
-7	260	-272
-5	222	228
-4	172	171
-2	363	-365
0	284	275
1	141	139
2	197	-180
3	202	-203
H= 6, K= 15		
-8	182	-188
-6	229	229
-4	166	-177
-3	213	-213
-2	187	184
-1	299	304
1	241	-234
2	173	-179
H= 6, K= 16		
-7	186	193
-5	166	-167
-4	141	-159
-3	173	161
-2	146	143
0	227	-237
1	131	-128
2	170	152
H= 6, K= 17		
-6	173	-164
-4	146	164
-3	117	118
-1	191	-198
1	128	145
H= 6, K= 18		
-5	141	161
-4	124	112
-2	137	-142
H= 7, K=-19		
0	160	174
2	187	-194
H= 7, K=-18		
-3	158	-153
-2	162	177
-1	247	249
1	213	-214
2	98	-81
3	194	190
4	181	180
H= 7, K=-17		
-4	160	-135
-3	227	228
-2	231	233
0	267	-259
2	266	274
3	172	174
4	102	-125
5	193	-206
H= 7, K=-16		
-4	225	237
-3	161	151
-2	130	-157
-1	341	-350
1	396	396
2	102	117
3	211	-212
4	288	-292
6	214	215
H= 7, K=-15		
-5	238	243
-3	227	-234
-2	293	-307
-1	108	93
0	387	396
2	354	-362
3	269	-268
4	129	139
5	265	281
H= 7, K=-14		
-6	249	266
-4	267	-257
-3	105	-108
-2	268	256
-1	419	431
1	307	-303
2	199	-212
3	296	296
4	227	227
5	119	-144
6	254	-254
H= 7, K=-13		
-8	107	113
-7	234	228
-5	336	-336
-3	324	330
-2	361	355
0	313	-325
1	177	-181
2	292	302
3	253	259
4	223	-234
5	212	-224
7	214	217
H= 7, K=-12		
-8	179	167
-6	439	-442
-4	436	438
-3	391	384
-2	275	-264
-1	490	-480
1	363	366
2	290	303
3	374	-369
4	254	-262
5	165	181
6	315	314
8	175	-185
H= 7, K=-11		
-9	112	110
-8	100	-105
-7	373	-384
-5	489	485
-4	190	194
-3	382	-379
-2	438	-439
-1	143	132
0	304	316
1	154	154
2	431	-433
3	419	-401
4	308	313
5	371	377
7	232	-238
H= 7, K=-10		
-9	173	-164
-8	275	-280
-7	94	64
-6	455	456
-5	220	217
-4	512	-518
-3	313	-304
-2	382	376
-1	508	500
1	507	-492
2	273	-268
3	345	350
4	399	415
5	214	-205
6	434	-444
7	150	-131
8	165	169
H= 7, K= -9		
-10	211	-198
-9	158	-153
-8	205	202
-7	365	366
-5	375	-373
-4	239	-242
-3	570	549
-2	411	405
-1	197	-183
0	521	-516
2	351	361
3	442	465
4	160	-174
5	447	-446
7	249	252
8	108	98
9	133	-120
H= 7, K= -8		
-10	117	-99
-9	226	234
-8	254	252
-7	200	-201
-6	193	-201
-5	101	-98
-4	608	603
-3	398	404
-2	566	-555
-1	529	-510
0	89	95
1	632	624
2	441	410
3	229	-212
4	461	-430
6	369	359
8	183	-200
9	136	-132
H= 7, K= -7		
-10	216	212
-9	151	152
-8	259	-256
-7	243	-247
-6	109	-63
-5	306	280
-4	327	299
-3	581	-574
-2	462	-471
-1	210	200
0	725	744
1	234	249
2	590	-570
3	342	-328
4	152	143
5	451	458
6	113	97
7	323	-347
9	138	144
H= 7, K= -6		
-11	194	193
-10	131	127
-9	250	-248
-8	309	-327
-6	450	459
-4	515	-510
-3	462	-468
-2	513	501
-1	820	809
0	152	160
1	748	-718
2	107	-95
3	346	344
4	339	327
5	199	-189
6	592	-591
8	215	223
9	115	140
H= 7, K= -5		
-11	108	63
-10	177	-191
-9	241	-234
-8	202	213
-7	501	492
-5	518	-478
-4	346	-341
-3	291	272
-2	807	791
-1	225	-220
0	617	-599
1	264	-241
2	479	487
3	228	225
4	219	-210
5	462	-470
7	308	319
8	132	136
9	149	-158
H= 7, K= -4		
-11	191	-211
-10	121	-148
-9	284	280
-8	373	359
-7	108	-101
-6	432	-415
-5	159	-150
-4	690	726
-3	446	447
-2	336	-364
-1	643	-617
0	87	-84
1	691	668
2	481	485
3	319	-307
4	494	-495
5	159	150
6	444	448
7	166	159
8	218	-217
9	115	-138
H= 7, K= -3		
-10	219	212
-9	113	114
-8	160	-169
-7	494	-497
-6	96	-92
-5	620	618
-4	357	358
-3	346	-340
-2	398	-373
-1	75	34
0	713	724
1	320	335
2	487	-473
3	494	-461
4	195	184
5	566	559
6	129	139
7	237	-249
8	195	-192
9	104	100
H= 7, K= -2		
-11	209	206
-9	293	-282
-8	339	-340
-6	583	566
-4	471	-432
-3	255	-285
-2	154	160
-1	1002	1008
0	96	77
1	574	-570
2	528	-476
3	453	429
4	513	516
5	140	-142
6	461	-464
7	254	-250
8	205	224
9	103	100
H= 7, K= -1		
-12	158	164
-11	98	42
-10	190	-195
-9	201	-194
-8	174	189
-7	424	427
-6	86	90
-5	742	-733
-4	483	-457
-3	245	274
-2	683	668
-1	182	-202
0	1026	-1007
1	455	-445
2	439	450
3	537	534
4	237	-236
5	452	-455
6	138	-133
7	342	343
8	141	151
9	192	-192
H= 7, K= 0		
-11	256	-250
-10	111	-115
-9	279	264
-8	337	332
-6	512	-508
-5	131	-130
-4	565	572
-3	497	563
-2	472	-466
-1	958	-967
0	339	304
1	956	915
2	621	613
3	590	-560
4	418	-390
5	177	177
6	470	459
7	157	143
8	200	-202
9	113	-100
H= 7, K= 1		
-12	218	-197
-11	130	-131
-10	227	237
-9	241	250
-7	382	-381
-5	437	444
-4	523	537
-3	378	-356
-2	510	-480
-1	490	-462
0	760	731
1	326	318
2	501	-482
3	534	-519
4	363	348
5	450	464
6	99	101
7	261	-296
8	200	-205
9	163	175
H= 7, K= 2		
-11	207	205
-10	162	175
-9	193	-198
-8	407	-401
-6	304	317
-5	231	237
-4	309	-311
-3	663	-647
-2	588	569
-1	637	652
0	205	187
1	700	-700
2	356	-330
3	478	466
4	350	350
5	214	-220
6	480	-482
7	178	-185
8	214	222
H= 7, K= 3		
-12	175	168
-11	136	128
-10	208	-219
-9	315	-309
-7	326	341
-6	110	-123
-5	556	-538
-4	580	-537
-3	342	350
-2	633	643
0	760	-742
1	387	-392
2	379	354
3	281	275
4	165	-153
5	445	-461
7	327	324
8	151	145
H= 7, K= 4		
-11	169	-161
-10	148	-150
-9	175	173
-8	415	429
-6	505	-515
-5	202	-214
-4	447	449
-3	644	658
-2	96	-114
-1	607	-600
1	712	691
2	268	266
3	263	-261
4	316	-329
5	186	170
6	412	421
8	131	-153
H= 7, K= 5		
-12	140	-163
-10	186	199
-9	401	460
-8	184	-188
-7	470	-469
-5	554	566
-4	548	537
-3	305	-317
-2	481	-463
0	700	692
1	212	208
2	524	-530
3	269	-283
4	272	277
5	359	358
7	226	-246
8	119	-112
H= 7, K= 6		
-11	175	168
-10	156	167
-9	319	-323
-8	475	-483
-6	447	522
-5	241	248
-4	425	-437
-3	380	-395
-2	260	274
-1	539	543
1	622	-627
2	137	-149
3	410	406
4	149	165
6	311	-317
H= 7, K= 7		
-10	232	-238
-9	345	-347
-7	369	382
-5	499	-490
-4	196	-200
-3	224	244
-2	493	512
-1	94	-90
0	667	-650
1	270	-260
2	455	444
3	306	304
4	123	-117
5	255	-256
7	194	191
H= 7, K= 8		
-11	122	-150
-10	113	-113
-9	132	140
-8	331	336
-6	435	-441
-5	108	-106
-4	338	336
-3	213	214
-2	216	-237
-1	493	-478
1	590	595
2	330	343
3	193	-198
4	224	-250
6	236	248
7	101	62
H= 7, K= 9		
-10	190	188
-9	218	236
-7	369	-378
-6	111	-92
-5	377	401
-4	100	122
-3	286	-305
-2	349	-358
0	488	486
1	209	217
2	293	-281
3	235	-255
4	180	155
5	252	262
H= 7, K= 10		
-11	131	154
-9	135	-140
-8	297	-281
-6	429	445
-5	199	193
-4	408	-405
-3	219	-234
-2	162	148
-1	356	362
1	206	-213
2	149	-169
3	151	158
4	193	209
5	144	-151
6	176	-167
H= 7, K= 11		
-10	189	-198
-9	182	-190
-7	320	330
-5	352	-363
-4	330	-328
-3	288	286
-2	295	292
0	257	-273
1	136	-129
2	196	178
3	231	237
4	150	-151
5	141	-162
H= 7, K= 12		
-9	190	176
-8	171	168
-6	394	-396
-5	158	-175
-4	185	198
-3	230	234
-2	196	-185
-1	218	-234
1	236	242
2	167	184
3	123	-135
4	148	-165
H= 7, K= 13		
-10	141	152
-9	152	146
-7	244	-259
-5	216	230
-4	161	162
-2	324	-321
0	245	245
1	104	108
2	190	-177
3	215	-199
H= 7, K= 14		
-8	185	-179
-6	289	281
-5	108	115
-4	157	-147
-3	251	-260
-1	283	279
1	230	-224
2	151	-169
3	126	107
H= 7, K= 15		
-7	185	197
-5	177	-207
-4	162	-168
-3	174	156
-2	209	212
0	232	-233
1	132	-141
2	140	154
H= 7, K= 16		
-6	186	-188
-4	150	158
-3	110	129
-1	182	-175
1	194	173
H= 7, K= 17		
-5	168	163
-4	106	108
-3	117	-126
-2	152	-146
H= 8, K=-18		
-2	185	186
0	201	-200
2	191	194
H= 8, K=-17		
-4	220	232
-3	145	156
-2	143	-147
-1	223	-229
1	276	291
3	149	-144
4	152	-171
H= 8, K=-16		
-5	233	235
-3	218	-226
-2	278	-285
0	326	330
2	295	-288
3	159	-175
4	113	104
5	198	210
H= 8, K=-15		
-6	223	233
-4	247	-244
-3	120	-131
-2	165	161
-1	333	344
1	373	-382
3	214	225
4	195	206
5	93	-106
6	193	-207
H= 8, K=-14		
-7	201	221
-5	221	-223
-3	205	216
-2	296	291
0	331	-324
2	288	281
3	175	182
4	156	-158
5	219	-222
H= 8, K=-13		
-6	280	-282
-4	266	256
-3	201	208
-2	146	-154
-1	337	-352
1	209	272
2	226	226
3	230	-230
4	113	-123
5	110	132
6	220	233
H= 8, K=-12		
-8	133	-136
-7	286	-289
-5	330	343
-4	94	91
-3	386	-379
-2	421	-429
0	297	292
1	256	254
2	356	-366
3	226	-225
4	204	190
5	198	192
7	200	-221
H= 8, K=-11		
-9	151	-156
-8	238	-228
-7	116	108
-6	441	441
-4	441	-440
-3	363	-353
-2	233	224
-1	317	322
1	444	-442
2	205	-234
3	325	327
4	194	219
5	111	-114
6	256	-276
H= 8, K=-10		
-9	133	-148
-8	168	168
-7	434	440
-5	334	-334
-4	272	-263
-3	436	444
-2	404	457
-1	164	-161
0	397	-391
1	199	-208
2	339	361
3	370	376
4	294	-299
5	395	-393
7	213	210
H= 8, K= -9		
-9	202	197
-8	284	287
-7	155	-151
-6	367	-366
-5	185	-180
-4	499	496
-3	360	352
-2	430	-419
-1	347	-407
0	85	79
1	304	369
2	425	429
3	295	-303
4	385	-379
5	160	148
6	258	262
8	187	-182
H= 8, K= -8		
-10	203	199
-9	141	144
-8	180	-173
-7	305	-304
-5	311	308
-4	108	123
-3	576	-572
-2	397	-404
-1	167	159
0	655	645
1	224	222
2	321	-312
3	534	-540
4	135	128
5	392	396
7	183	-212
H= 8, K= -7		
-9	171	-177
-8	175	-184
-6	430	433
-4	418	-407
-3	293	-288
-2	348	340
-1	579	546
0	91	-62
1	648	-629
2	335	-340
3	161	157
4	476	480
6	376	-371
8	165	174
H= 8, K= -6		
-10	196	-205
-9	194	-194
-8	255	247
-7	416	410
-6	157	160
-5	448	-446
-4	155	-168
-3	447	452
-2	552	548
-1	236	-241
0	776	-761
1	172	-171
2	326	329
3	201	218
4	279	-264
5	555	-555
7	242	253
H= 8, K= -5		
-11	204	-208
-10	140	-120
-9	244	251
-8	231	235
-7	144	-130
-6	466	-479
-5	203	-200
-4	621	627
-3	467	448
-2	318	-317
-1	503	-466
1	634	615
3	191	-185
4	345	-349
5	134	140
6	402	406
8	158	-172
H= 8, K= -4		
-10	273	262
-9	209	201
-8	208	-202
-7	473	-482
-6	136	-109
-5	582	561
-4	420	398
-3	427	-398
-2	551	-574
-1	270	260
0	736	727
1	186	176
2	338	-354
3	317	-325
4	217	202
5	522	533
7	232	-239
8	129	-122
H= 8, K= -3		
-11	191	200
-10	123	113
-9	230	-232
-8	221	-228
-7	171	188
-6	479	469
-5	286	278
-4	528	-527
-3	467	-473
-2	292	290
-1	500	523
0	171	-177
1	586	-589
2	291	-278
3	252	254
4	466	469
6	312	-316
7	158	-156
8	170	182
H= 8, K= -2		
-10	245	-255
-9	146	-137
-8	270	262
-7	417	410
-6	202	197
-5	619	-624
-4	380	-382
-3	300	286
-2	482	466
-1	138	-117
0	606	-671
1	307	-301
2	313	324
3	324	326
4	271	-279
5	521	-525
6	188	-187
7	285	284
8	129	117
H= 8, K= -1		
-11	225	-228
-9	206	206
-8	226	232
-7	95	-104
-6	551	-556
-5	114	-106
-4	624	632
-3	424	433
-2	147	-143
-1	738	-725
0	94	102
1	517	505
2	422	421
3	234	-231
4	403	-394
6	312	317
8	183	-189
H= 8, K= 0		
-12	175	-179
-10	260	262
-9	234	225
-8	190	-209
-7	416	-416
-6	87	109
-5	536	527
-4	374	364
-3	436	-421
-2	583	-559
-1	434	397
0	697	685
1	410	387
2	404	-393
3	410	-398
4	298	301
5	399	396
7	246	-254
8	106	-102
H= 8, K= 1		
-11	229	231
-10	149	145
-9	192	-202
-8	267	-286
-7	174	164
-6	338	351
-5	140	156
-4	374	-379
-3	428	-441
-2	608	611
-1	364	386
1	533	-506
2	394	-373
3	315	291
4	321	328
6	296	-310
7	124	-124
8	182	199
H= 8, K= 2		
-12	213	203
-10	201	-209
-9	172	-165
-7	395	375
-5	345	-352
-4	436	-437
-3	405	429
-2	638	654
-1	101	-172
0	614	-588
1	379	-347
2	328	308
3	231	241
4	191	-208
5	471	-496
7	281	285
8	124	118
H= 8, K= 3		
-11	205	-205
-10	119	-122
-9	108	122
-8	224	228
-6	345	-347
-5	101	-160
-4	351	389
-3	550	541
-2	288	-277
-1	657	-669
1	421	402
2	281	273
3	113	-99
4	371	-362
6	318	313
8	207	-215
H= 8, K= 4		
-12	164	-163
-10	195	187
-9	220	216
-8	140	-151
-7	246	-246
-5	432	427
-4	496	528
-3	313	-298
-2	607	-619
0	732	740
1	266	255
2	254	-257
3	267	-280
4	100	96
5	386	406
7	230	-240
H= 8, K= 5		
-11	144	152
-10	129	151
-9	237	-248
-8	230	-247
-7	103	99
-6	432	439
-5	341	349
-4	227	-219
-3	313	-299
-2	160	185
-1	654	655
1	514	-513
2	205	-202
3	211	211
4	321	324
6	288	-295
H= 8, K= 6		
-10	227	-236
-9	248	-254
-8	234	240
-7	313	322
-5	415	-429
-4	277	-287
-3	226	233
-2	463	489
-1	86	-77
0	621	-625
1	93	-105
2	333	346
3	196	204
4	161	-164
5	322	-325
7	168	164
H= 8, K= 7		
-11	146	-163
-10	151	-163
-9	166	183
-8	191	201
-6	405	-410
-5	183	-195
-4	180	184
-3	162	162
-2	160	-141
-1	474	-473
1	551	570
2	250	277
3	198	-214
4	257	-256
6	218	221
H= 8, K= 8		
-10	146	169
-9	218	223
-7	240	-246
-5	393	423
-3	173	-181
-2	321	-311
0	712	705
1	232	236
2	375	-393
3	241	-257
5	265	285
H= 8, K= 9		
-11	145	140
-10	113	122
-8	223	-225
-6	338	346
-5	229	252
-4	198	-201
-3	104	-107
-2	153	146
-1	441	439
1	400	-412
2	188	-211
3	177	181
4	241	247
6	178	-182
H= 8, K= 10		
-10	120	-141
-9	174	-197
-7	251	256
-5	332	-332
-4	339	-338
-3	267	277
-2	313	310
0	339	-321
1	127	-122
2	206	210
3	182	195
4	173	-183
5	184	-200
H= 8, K= 11		
-10	148	-138
-9	104	107
-8	160	148
-6	332	-381
-5	223	-221
-4	202	211
-3	270	280
-2	125	-112
-1	230	-227
1	244	242
2	159	175
3	142	-150
4	148	-157
H= 8, K= 12		
-10	121	153
-9	165	179
-7	230	-230
-5	286	291

Table 1 (*cont.*)

-4	203	195
-3	102	-104
-2	248	-250
-1	116	100
0	261	255
2	179	-182
3	162	-160
4	118	116
H= 8, K= 13		
-8	173	-174
-6	275	291
-5	97	135
-4	97	-85
-3	225	-219
-1	213	203
1	211	-213
2	138	-140
3	150	136
H= 8, K= 14		
-7	198	207
-5	236	-221
-4	160	-171
-3	111	116
-2	262	255
0	205	-204
1	103	-96
2	189	184
H= 8, K= 15		
-8	116	128
-6	211	-205
-5	99	-81
-4	173	164
-3	185	182
-2	106	-87
-1	144	-172
1	188	189
H= 8, K= 16		
-5	146	146
-4	108	98
-3	132	-145
-2	131	-147
0	157	165
H= 8, K= 17		
-4	116	-133
-3	130	-102
H= 9, K=-17		
-3	198	-203
-2	215	-217
-1	103	94
0	299	292
2	203	-201
3	125	-121
H= 9, K=-16		
-4	256	-263
-3	192	-166
-2	155	149
-1	300	293
0	128	-113
1	363	-369
3	174	160
4	199	181
H= 9, K=-15		
-5	241	-257
-3	215	221
-2	270	265
-1	200	-201
0	413	-416
2	296	302
3	165	159
4	153	-169
5	226	-222
H= 9, K=-14		
-6	214	-222
-4	213	211
-3	146	156
-2	210	-189
-1	301	-294
0	165	170
1	349	346
2	152	143
3	221	-228
4	154	-157
H= 9, K=-13		
-7	226	-217
-5	283	268
-3	234	-235
-2	304	-302
-1	101	110
0	345	346
1	118	127
2	297	-303
3	111	-125
4	208	205
5	206	203
H= 9, K=-12		
-8	200	-204
-6	321	313
-4	306	-317
-3	233	-243
-2	128	141
-1	291	304
1	407	-408
2	155	-147
3	218	209
4	128	118
6	213	-225
H= 9, K=-11		
-8	186	186
-7	322	321
-5	367	-357
-4	183	-171
-3	300	286
-2	347	340
-1	141	-128
0	402	-404
2	385	382
3	109	124
4	227	-228
5	223	-238
7	197	197
H= 9, K=-10		
-9	214	211
-8	317	321
-7	224	-222
-6	365	-364
-5	179	-189
-4	356	354
-3	254	260
-2	156	-157
-1	249	-244
1	485	497
2	150	153
3	313	-311
4	190	-201
5	137	134
6	242	250
H= 9, K= -9		
-9	201	210
-8	233	-222
-7	372	-367
-5	318	311
-4	273	260
-3	390	-391
-2	299	-303
-1	138	140
0	505	497
1	113	116
2	417	-414
3	188	-180
4	271	271
5	278	290
7	215	-214
H= 9, K= -8		
-10	100	80
-9	214	-200
-8	263	-263
-7	120	134
-6	341	344
-4	361	-352
-3	289	-301
-2	177	192
-1	272	288
1	470	-486
2	411	-413
3	259	258
4	274	282
6	235	-241
H= 9, K= -7		
-10	181	-176
-9	143	-176
-8	109	122
-7	317	317
-5	422	-431
-4	154	-139
-3	373	379
-2	297	299
-1	165	-173
0	552	-546
1	302	-304
2	400	399
3	327	316
4	205	-212
5	326	-329
7	246	250
H= 9, K= -6		
-10	99	-81
-9	142	167
-8	230	231
-6	580	-577
-4	422	430
-3	324	317
-2	121	-114
-1	378	-360
1	450	434
2	263	265
3	207	-200
4	285	-284
5	137	135
6	314	317
8	196	-191
H= 9, K= -5		
-10	229	235
-9	203	206
-8	147	-149
-7	431	-435
-6	111	83
-5	569	574
-4	200	202
-3	376	-368
-2	559	-563
-1	123	107
0	492	507
1	102	85
2	176	-165
3	202	-212
4	242	256
5	372	368
7	208	-198
8	135	-127
H= 9, K= -4		
-11	196	204
-10	99	113
-9	240	-243
-8	268	-254
-7	136	140
-6	456	470
-5	122	108
-4	564	-567
-3	573	-572
-2	88	87
-1	437	420
1	459	-444
2	288	-288
3	193	178
4	321	337
5	123	-117
6	229	-236
8	195	203
H= 9, K= -3		
-10	282	-276
-9	164	-158
-8	207	206
-7	343	354
-5	589	-599
-4	255	-262
-3	341	337
-2	443	457
-1	143	-136
0	737	-722
1	130	-136
2	368	374
3	305	306
4	231	-218
5	342	-347
7	225	225
8	117	131
H= 9, K= -2		
-11	212	-195
-10	98	-87
-9	200	211
-8	216	220
-7	90	-62
-6	460	-487
-5	159	-160
-4	447	457
-3	414	416
-1	666	-650
1	462	452
2	372	372
3	270	-271
4	401	-399
6	255	265
8	181	-195
H= 9, K= -1		
-10	222	226
-9	230	236
-8	217	-221
-7	342	-341
-5	523	534
-4	300	286
-3	484	-461
-2	618	-627
-1	219	223
0	603	619
1	254	262
2	351	-350
3	429	-417
4	268	267
5	276	278
7	235	-226
H= 9, K= 0		
-11	209	202
-10	142	135
-9	203	-209
-8	291	-313
-7	143	152
-6	360	364
-4	524	-525
-3	437	-452
-2	464	467
-1	451	469
1	467	-456
2	432	-436
3	276	257
4	347	344
6	205	-210
H= 9, K= 1		
-10	235	-226
-9	214	-207
-8	187	187
-7	473	479
-6	85	-39
-5	333	-340
-4	217	-241
-3	466	465
-2	337	332
-1	447	-435
0	487	-468
1	216	-209
2	313	314
3	312	317
4	166	-189
5	314	-306
7	203	204
H= 9, K= 2		
-11	214	-209
-10	166	-151
-9	155	148
-8	345	356
-7	112	-123
-6	325	-348
-5	142	-146
-4	329	340
-3	402	384
-2	461	-438
-1	419	-420
0	136	-147
1	374	391
2	220	234
3	209	-225
4	399	-394
6	222	229
H= 9, K= 3		
-10	182	178
-9	205	201
-8	168	-156
-7	356	-358
-5	427	417
-4	374	387
-3	381	-381
-2	447	-470
-1	148	163
0	490	487
1	187	182
2	305	-302
3	220	-204
4	98	99
5	312	313
7	213	-229
H= 9, K= 4		
-11	162	173
-10	105	136
-9	138	-149
-8	260	-264
-7	130	116
-6	352	349
-5	224	231
-4	287	-310
-3	423	-433
-2	181	199
-1	632	622
1	382	-374
2	204	-223
3	160	148
4	351	361
6	211	-221
H= 9, K= 5		
-10	147	-160
-9	173	-165
-8	288	285
-7	375	386
-5	344	-363
-4	400	-402
-3	185	175
-2	416	410
-1	260	-256
0	457	-460
1	96	-97
2	248	253
3	245	250
4	123	-108
5	276	-273
H= 9, K= 6		
-11	171	-183
-10	109	-139
-9	258	256
-8	197	201
-7	96	-102
-6	422	-427
-5	153	-167
-4	207	204
-3	285	300
-2	177	-164
-1	415	-428
1	304	295
2	156	158
3	213	-208
4	266	-276
6	168	169
H= 9, K= 7		
-10	183	197
-8	165	-168
-7	242	-254
-5	471	472
-4	144	157
-3	88	-84
-2	300	-301
-1	105	96
0	429	412
2	256	-254
3	218	-223
5	215	236
H= 9, K= 8		
-11	160	177
-10	129	123
-8	190	-189
-6	280	282
-5	105	130
-4	235	-231
-3	165	-172
-2	151	137
-1	465	465
1	368	-380
2	207	-213
3	149	141
4	286	288
H= 9, K= 9		
-10	116	-120
-9	127	-119
-7	214	235
-5	278	-275
-4	224	-222
-3	215	213
-2	262	274
0	390	-389
1	109	-99
2	214	210
3	217	213
4	102	-87
5	189	-194
H= 9, K= 10		
-10	144	-140
-8	168	154
-6	219	-235
-5	137	-145
-4	227	227
-3	307	309
-1	360	-353
1	199	210
2	176	144
3	160	-151
4	206	-209
H= 9, K= 11		
-9	138	134
-8	112	-100
-7	180	-183
-5	278	277
-4	217	225
-3	142	-130
-2	314	-302
0	246	242
2	155	-164
3	116	-153
H= 9, K= 12		
-8	146	-152
-6	229	229
-4	109	-121
-3	208	-207
-1	239	238
1	198	-195
2	112	-117
3	123	133
H= 9, K= 13		
-7	186	196
-5	168	-167
-4	107	-106
-2	216	216
0	191	-193
2	170	173
H= 9, K= 14		
-8	166	170
-6	178	-184
-4	127	127
-3	180	200
-1	182	-186
1	188	182
H= 9, K= 15		
-7	143	-143
-5	143	135
-4	115	108
-3	162	-155
-2	162	-168
0	195	175
H= 9, K= 16		
-4	111	-128
H= 10, K=-17		
-2	108	116
-1	226	233
1	241	-247
H= 10, K=-16		
-3	168	163
-2	205	218
-1	108	-126
0	326	-337
2	195	203
3	153	147
H= 10, K=-15		
-4	232	228
-3	177	165
-2	200	-203
-1	333	-331
0	100	118
1	308	308
2	147	148
3	208	-199
4	188	-192
H= 10, K=-14		
-5	268	268
-4	146	134
-3	189	-186
-2	216	-220
-1	231	233
0	358	373
2	256	-264
3	162	-162
4	172	178
H= 10, K=-13		
-6	253	253
-4	239	-252
-3	272	-261
-2	230	230
-1	345	345
1	326	-331
2	187	-194
3	236	227
4	191	195
H= 10, K=-12		
-7	202	190
-5	360	-363
-4	216	-214
-3	265	256
-2	336	341
-1	198	-191
0	402	-413
1	134	-153
2	290	298
3	151	150
4	160	-181
5	216	-210
H= 10, K=-11		
-8	242	224
-7	137	-142
-6	292	-306
-4	338	341
-3	282	280
-2	216	-227
-1	378	-383
1	454	448
2	153	158
3	241	-235
4	200	-209
5	96	69
6	222	231
H= 10, K=-10		
-8	202	-205
-7	307	-292
-6	136	138
-5	419	413
-4	273	267
-3	201	-213
-2	269	-268
-1	267	258
0	532	521
2	345	-351
3	153	-163
4	228	238
5	257	252
H= 10, K= -9		
-9	217	-227
-8	311	-309
-7	197	194
-6	320	320
-4	357	-358
-3	204	-211
-2	202	208
-1	398	411
0	129	-128
1	522	-531
2	117	-126
3	310	320
4	269	279
5	119	-123
6	217	-221
H= 10, K= -8		
-9	228	-232
-8	129	142
-7	218	224
-6	106	-113
-5	433	-431
-4	148	-144
-3	321	316
-2	199	194
-1	168	-177
0	586	-595
1	89	-86
2	490	477
3	193	183
4	165	-179
5	262	-270
7	175	199
H= 10, K= -7		
-10	139	-159
-9	158	145
-8	249	257
-6	372	-372
-4	373	363
-3	171	175
-2	202	-218
-1	408	-406
1	676	675
2	216	211
3	283	-286
4	287	-299
6	302	312
H= 10, K= -6		
-10	168	168
-9	219	219
-7	331	-328
-6	105	105
-5	502	490
-4	184	185
-3	300	-315
-2	218	-230
-1	227	240
0	444	450
1	140	133
2	389	-394
3	144	-140
4	188	191
5	304	293
7	214	-216
H= 10, K= -5		
-10	131	118
-9	191	-176
-8	308	-317
-7	102	79
-6	467	464
-4	476	-484
-3	331	-339
-2	219	214
-1	296	300
1	357	-345
2	119	-120
3	305	304
4	242	238
5	171	-146
6	230	-244
H= 10, K= -4		
-10	249	-249
-9	195	-196
-8	106	91
-7	374	386
-6	113	-108
-5	584	-589
-4	159	-162
-3	312	308
-2	277	268
-1	118	-127
0	342	-350
1	117	-98
2	298	308
3	186	178
4	194	-195
5	240	-241
7	203	207
H= 10, K= -3		
-11	236	-238
-9	213	218
-8	273	285
-6	527	-531
-5	134	-131
-4	410	395
-3	236	246
-2	100	-98
-1	443	-443
1	363	380
2	245	246
3	354	-351
4	275	-290
5	104	114
6	219	216
H= 10, K= -2		
-10	235	229
-9	188	185
-8	172	-169
-7	340	-349
-5	506	513
-4	207	224
-3	192	-197
-2	247	-255
-1	148	140
0	454	463
1	203	190
2	364	-359
3	304	-300
4	177	196
5	242	240
7	207	-227
H= 10, K= -1		
-11	235	225
-10	104	103
-9	184	-194
-8	275	-283
-6	462	477
-5	113	117
-4	450	-444
-3	430	-448
-2	153	145
-1	546	539
1	397	-380
2	317	-312
3	376	363
4	283	296
6	239	-230
H= 10, K= 0		
-10	213	-213
-9	205	-195
-8	152	147
-7	365	373
-6	116	-83
-5	408	-406
-4	254	-262
-3	319	322
-2	302	318
-1	273	-274
0	452	-437
1	198	-198
2	282	278
3	312	324
4	134	-129
5	205	-208
7	190	186
H= 10, K= 1		
-11	205	-211
-10	119	-124
-9	162	169
-8	278	286
-6	383	-397
-5	160	-162
-4	349	353
-3	367	352
-2	399	-382
-1	304	-318
0	95	-107
1	348	364
2	250	240
3	260	-245
4	280	-260
6	200	202
H= 10, K= 2		
-10	196	191
-9	161	175
-8	131	-143
-7	362	-359
-5	442	429
-4	278	299
-3	264	-258
-2	154	-154
0	407	414
1	173	162
2	302	-286
3	237	-228
4	116	85
5	224	235
H= 10, K= 3		
-11	181	192
-10	128	136
-9	99	-103
-8	275	-283
-6	377	380
-5	125	141
-4	491	-519
-3	424	-427
-2	89	98
-1	397	398
0	108	115
1	366	-366
2	132	-134
3	180	196
4	306	302
6	208	-201
H= 10, K= 4		
-10	133	-113
-9	194	-208
-8	147	150
-7	303	317
-5	422	-425
-4	378	-377
-3	242	225
-2	288	293
0	407	-410
1	177	-165
2	287	286
3	280	286
4	98	-83
5	222	-210
H= 10, K= 5		
-11	149	-145
-10	152	-148
-9	161	171
-8	258	242
-6	422	-423
-5	119	-140
-4	424	423
-3	384	382
-2	164	-159
-1	356	-366
1	335	341
2	160	166
3	245	-234
4	262	-257
6	182	190
H= 10, K= 6		
-10	164	166
-9	99	116
-8	159	-166
-7	306	-311
-5	459	475
-4	238	233
-3	129	-133
-2	237	-240
0	254	252
2	278	-269
3	209	-217
5	176	172
H= 10, K= 7		
-9	138	-138
-8	185	-188
-6	295	297
-4	422	-423
-3	316	-322
-2	122	131
-1	255	258
1	244	-245
2	148	-143
3	160	154
4	245	240
H= 10, K= 8		
-10	142	-155
-9	109	-101
-7	196	193
-5	297	-299
-4	179	-196
-3	253	243
-2	252	261
-1	113	-104
0	286	-278
2	213	208
3	216	226
H= 10, K= 9		
-10	119	-101
-9	118	98
-8	200	204
-6	143	-152
-4	312	310
-3	269	272
-2	189	-189
-1	355	-361
1	174	181
2	119	117
3	119	-123
4	225	-210
H= 10, K= 10		
-7	188	-198
-5	211	197
-4	231	229
-3	173	-177
-2	302	-320
0	207	200
2	139	-135
3	177	-173
H= 10, K= 11		
-9	132	-129
-8	146	-150
-6	193	197
-4	222	-225
-3	271	-264
-2	110	73
-1	275	279
1	157	-141
2	105	-90
3	126	121
H= 10, K= 12		
-8	114	94
-7	151	172
-5	177	-176
-4	99	-87
-3	108	87
-2	219	216
0	175	-167
2	118	129
H= 10, K= 13		
-8	170	173
-6	168	-152
-3	179	159
-1	187	-186
1	151	142
H= 10, K= 14		
-5	130	120
-4	132	125
-2	162	-159
H= 10, K= 15		
-4	144	-131
H= 11, K=-16		
-2	109	-122
-1	237	-248
H= 11, K=-15		
-4	122	99
-3	153	-149
-2	176	-157
-1	151	157
0	258	261
2	205	-211
H= 11, K=-14		
-4	200	-195
-3	172	-169
-2	201	207
-1	255	256
1	217	-216
2	140	-146
3	215	209
H= 11, K=-13		
-5	259	-258
-4	235	-222
-3	192	185
-2	251	253
-1	111	-137
0	256	-256
1	102	-123
2	241	250
3	182	181
H= 11, K=-12		
-6	227	-219
-4	297	295
-3	334	329
-2	215	-225
-1	372	-377
1	274	272
2	127	145
3	219	-221
4	222	-230
H= 11, K=-11		
-7	182	-167
-5	328	328
-4	324	324
-3	220	-220
-2	338	-339
-1	133	132
0	361	361
2	230	-233
3	207	-208
4	124	101
5	230	232
H= 11, K=-10		
-8	210	-208
-7	155	160
-6	277	288
-5	152	150
-4	289	-298
-3	323	-326
-2	241	241
-1	429	432
1	299	-300
2	98	-126
3	259	263
4	242	259
H= 11, K= -9		
-8	182	180
-7	244	243
-5	380	-383
-4	259	-262
-3	231	237
-2	329	328
-1	145	-140
0	415	-415
2	280	293
3	224	226
4	142	-148
5	218	-218
H= 11, K= -8		
-9	188	187
-8	211	207
-6	311	-318
-4	316	324
-3	204	256
-2	281	-275
-1	578	-590
1	411	420
2	105	129
3	272	-287
4	306	-305
6	196	210
H= 11, K= -7		
-9	202	196
-7	222	-228
-5	394	400
-4	163	174
-3	241	-245
-2	405	-406
-1	148	156
0	633	638
1	102	96
2	352	-357
3	273	-276
4	139	132
5	261	263
H= 11, K= -6		
-10	169	161
-9	125	-129
-8	233	-234
-7	120	87
-6	385	391
-4	322	-331
-3	264	-260
-2	334	333
-1	638	639
1	548	-543
3	238	243
4	281	292
6	212	-222
H= 11, K= -5		
-10	176	-184
-9	192	-191
-8	107	104
-7	284	292
-5	457	-456
-4	212	-198
-3	295	294
-2	425	427
-1	90	-72
0	523	-517
1	99	-81
2	307	298
3	193	195
4	144	-135
5	267	-249
H= 11, K= -4		
-10	134	-142
-9	181	179
-8	235	238
-7	140	-143
-6	425	-436
-5	102	-116
-4	463	460
-3	239	242
-2	327	-332
-1	467	-471
1	392	399
2	109	97
3	296	-300
4	268	-273
6	155	173
H= 11, K= -3		
-10	199	196
-9	187	187
-8	144	-144
-7	282	-287
-5	485	495
-4	149	162
-3	289	-297
-2	217	-219
-1	203	206
0	426	426
1	170	171
2	396	-397
3	243	-250
4	199	180
5	216	210
H= 11, K= -2		
-10	137	141
-9	134	-150
-8	262	-259
-7	101	107
-6	497	500
-5	187	175
-4	357	-351
-3	150	-137
-2	316	304
-1	431	435
0	102	-121
1	391	-390
2	217	-221
3	337	348
4	292	299
6	206	-217
H= 11, K= -1		
-10	187	-183
-9	226	-231
-8	106	89
-7	333	331
-5	367	-379
-4	251	-258
-3	278	293
-2	387	379
-1	272	-274
0	400	-399
1	127	-131
2	381	380
3	344	338
4	156	-168
5	238	-232
H= 11, K= 0		
-11	226	-221
-10	169	-148
-9	121	143
-8	248	244
-7	152	-153
-6	397	-387
-5	93	-80
-4	346	329
-3	337	322
-2	386	-377
-1	329	-330
0	101	107
1	363	368
2	189	184
3	266	-276
4	258	-260
6	184	193
H= 11, K= 1		
-10	218	210
-9	178	180
-8	97	-86
-7	282	-274
-5	257	260
-4	217	219
-3	217	-237
-2	247	-257
-1	150	170
0	399	384
1	93	80
2	312	-300
3	199	-206
5	213	220
H= 11, K= 2		
-11	226	232
-10	139	131
-9	127	-139
-8	251	-235
-7	126	137
-6	320	329
-5	144	139
-4	280	-278
-3	274	-263
-2	122	127
-1	295	287
1	313	-307
3	187	191
4	253	238
6	192	-196
H= 11, K= 3		
-10	173	-184
-9	215	-226
-7	240	246
-5	311	-317
-4	260	-259
-3	216	196
-2	298	307
0	304	-312
2	272	266
3	212	202
4	106	-91
5	188	-196
H= 11, K= 4		
-10	144	-152
-9	129	139
-8	205	210
-6	380	-378
-4	357	371
-3	287	292
-1	336	-337
1	281	274
2	111	117
3	216	-202
4	237	-234
H= 11, K= 5		
-10	164	155
-9	192	193
-8	102	-84
-7	304	-307
-5	372	378
-4	149	137
-3	183	-191
-2	311	-302
0	300	296
2	249	-243
3	206	-212
4	120	103
5	190	182
H= 11, K= 6		
-9	168	-175
-8	152	-160
-6	374	375
-4	347	-347
-3	214	-222
-1	210	209
0	101	77
1	207	-215
2	105	-119
3	175	174
4	207	182
H= 11, K= 7		
-10	155	-175
-9	131	-124
-7	201	198
-6	105	125
-5	337	-332
-4	150	-150
-3	200	195
-2	228	234
0	214	-217
2	196	197
3	190	193
H= 11, K= 8		
-9	102	91
-8	193	177
-6	183	-173
-5	98	-101
-4	285	281
-3	209	203
-2	154	-149
-1	275	-278
1	184	193
H= 11, K= 9		
-9	114	144
-7	195	-194
-5	150	143
-4	172	178
-3	207	-212
-2	235	-263
0	231	224
2	143	-129
3	187	-170
H= 11, K= 10		
-8	155	-152
-6	188	184
-5	112	85
-4	190	-208
-3	238	-219
-2	157	117
-1	259	257
1	129	-135
H= 11, K= 11		
-7	171	169
-5	235	-216
-4	143	-156
-3	125	123
-2	225	231
0	140	-156
H= 11, K= 12		
-6	166	-165
-4	134	130
-3	171	165
-1	175	-164
H= 11, K= 13		
-5	121	124
-4	150	138
-2	132	-153
H= 12, K=-15		
-1	205	203
H= 12, K=-14		
-4	107	-103
-3	175	173
-2	166	160
-1	103	-110
0	183	-182
2	200	217
H= 12, K=-13		
-4	227	233
-3	204	189
-2	176	-171
-1	209	-217
1	227	224
2	109	105
3	190	-191
H= 12, K=-12		
-5	260	249
-4	175	170
-3	243	-237
-2	301	-299
0	244	244
1	99	91
2	235	-240
3	176	-185
H= 12, K=-11		
-6	199	198
-4	283	-278
-3	246	-253
-2	165	178
-1	336	336
1	235	-243
2	138	-118
3	159	172
4	229	224
H= 12, K=-10		
-7	213	198
-5	258	-256
-4	233	-241
-3	244	232
-2	275	278
0	281	-282
2	227	230
3	243	222
H= 12, K= -9		
-8	173	156
-6	249	-247
-5	120	-131
-4	249	256
-3	213	216
-2	191	-203
-1	325	-328
1	223	223
2	113	103
3	194	-193
4	220	-236
H= 12, K= -8		
-7	205	-211
-5	240	251
-4	192	190
-3	258	-251
-2	324	-337
0	300	313
2	304	-307
3	238	-233
5	222	226
H= 12, K= -7		
-9	114	-122
-8	166	-175
-6	293	302
-4	174	-183
-3	248	-242
-2	246	246
-1	482	480
1	366	-369
2	138	-134
3	208	213
4	237	229
H= 12, K= -6		
-9	170	-173
-7	302	296
-5	285	-276
-4	210	-204
-3	183	174
-2	480	488
0	470	-475
2	318	303
3	242	243
5	206	-210
H= 12, K= -5		
-9	157	155
-8	219	205
-7	100	-113
-6	364	-363
-4	212	214
-3	320	326
-2	130	-139
-1	499	-502
1	339	330
2	131	126
3	224	-213
4	224	-228
H= 12, K= -4		
-9	187	174
-8	167	-153
-7	246	-259
-5	403	407
-4	209	215
-3	213	-214
-2	516	-504
-1	126	-112
0	388	383
2	327	-325
3	238	-242
4	156	139
5	183	183
H= 12, K= -3		
-10	110	114
-9	168	-172
-8	188	-189
-7	124	131
-6	396	404
-5	153	162
-4	275	-275
-3	211	-211
-2	102	122
-1	435	429
1	335	-338
2	178	-176
3	247	251
4	236	234
H= 12, K= -2		
-10	162	-152
-9	198	-212
-8	125	133
-7	304	317
-5	367	-388
-4	239	-239
-3	291	285
-2	458	456
0	346	-333
2	372	370
3	291	287
4	150	-149
5	193	-196
H= 12, K= -1		
-10	137	-127
-9	108	133
-8	251	253
-7	102	-117
-6	401	-400
-5	112	-126
-4	342	330
-3	312	323
-2	295	-281
-1	379	-382
1	379	375
2	202	204
3	265	-275
4	230	-239
H= 12, K= 0		
-10	145	142
-9	209	214
-7	295	-298
-5	339	349
-4	186	189
-3	449	-448
-2	502	-499
0	333	315
1	99	65
2	356	-356
3	238	-245
4	133	100
5	203	194
H= 12, K= 1		
-10	118	125
-9	134	-112
-8	237	-233
-7	167	160
-6	274	264
-5	108	113
-4	274	-262
-3	250	-251
-2	293	281
-1	330	338
1	348	-343
2	138	-140
3	191	188
4	203	205
H= 12, K= 2		
-10	141	-145
-9	210	-211
-8	102	115
-7	268	258
-5	227	-235
-4	163	-149
-3	358	355
-2	401	407
0	295	-300
2	285	281
3	179	159
5	168	-184
H= 12, K= 3		
-10	124	-121
-9	131	114
-8	232	226
-7	139	-126
-6	288	-276
-4	226	237
-3	214	220
-2	101	-96
-1	355	-364
1	291	276
3	149	-163
4	185	-187
H= 12, K= 4		
-10	121	124
-9	205	203
-7	277	-277
-5	258	262
-4	95	63
-3	306	-299
-2	413	-410
0	263	265
2	248	-242
3	170	-176
4	122	108
H= 12, K= 5		
-10	136	134
-9	140	-145
-8	172	-168
-6	353	339
-4	209	-229
-3	149	-146
-2	167	181
-1	285	287
1	254	-233
2	144	-127
3	194	180
4	135	142
H= 12, K= 6		
-9	160	-141
-7	228	239
-5	277	-287
-3	264	234
-2	273	245
0	216	-209
2	201	194
3	153	144
H= 12, K= 7		
-8	160	160
-6	233	-232
-5	113	-98
-4	180	170
-3	126	132
-2	101	-106
-1	220	-212
1	196	190
2	138	142
3	124	-103
H= 12, K= 8		
-9	152	141
-7	189	-186
-5	142	142
-3	185	-178
-2	204	-208
0	232	218
2	157	-148
H= 12, K= 9		
-8	155	-157
-6	159	158
-5	108	83
-4	127	-127
-3	108	-108
-2	108	94
-1	221	207
1	165	-154
H= 12, K= 10		
-7	165	168
-5	175	-164
-4	117	-110
-3	115	131
-2	178	174
0	175	-159
H= 12, K= 11		
-6	179	-168
-4	169	150
-3	147	150
-1	141	-129
H= 12, K= 12		
-5	131	141
-4	112	119
-2	145	-147
H= 13, K=-13		
-3	177	-174
-2	169	-189
0	196	187
H= 13, K=-12		
-4	245	-237
-3	183	-176
-2	134	126
-1	209	212
1	239	-231
H= 13, K=-11		
-5	285	-271
-4	115	-122
-3	224	225
-2	244	242
0	267	-260
2	208	202
H= 13, K=-10		
-6	250	-249
-5	131	-107
-4	260	261
-3	179	176
-2	118	-112
-1	253	-244
1	218	213
2	123	134
3	113	-128
H= 13, K= -9		
-7	213	-194
-5	277	268
-4	147	146
-3	226	-230
-2	211	-227
0	221	216
2	190	-200
3	185	-194
H= 13, K= -8		
-6	231	227
-4	267	-261
-3	171	-171
-2	136	134
-1	240	244
1	257	-252
2	138	-122
4	226	212
H= 13, K= -7		
-7	213	213
-5	254	-247
-4	132	-142
-3	266	269
-2	280	281
-1	102	-91
0	294	-298
2	259	257
3	198	184
H= 13, K= -6		
-8	188	177
-6	258	-256
-4	244	241
-3	240	240
-2	205	-194
-1	301	-297
1	313	309
2	134	129
3	127	-109
4	171	-171
H= 13, K= -5		
-9	145	133
-8	134	-95
-7	233	-243
-5	274	284
-4	168	161
-3	269	-267
-2	367	-369
0	255	248
2	257	-260
3	187	-183
H= 13, K= -4		
-9	141	-148
-8	176	-166
-6	269	254
-4	261	-250
-3	285	-290
-1	328	323
1	220	-220
2	190	-184
3	182	166
4	189	181
H= 13, K= -3		
-9	154	-136
-8	145	134
-7	231	237
-5	259	-260
-4	162	-153
-3	179	179
-2	383	377
0	193	-197
2	282	267
3	204	222
4	118	-100
H= 13, K= -2		
-9	141	139
-8	207	204
-6	259	-264
-5	100	-106
-4	155	161
-3	270	271
-1	342	-350
1	250	252
2	188	180
3	175	-176
4	175	-180
H= 13, K= -1		
-9	162	160
-7	285	-293
-5	245	238
-4	149	161
-3	252	-254
-2	420	-425
0	257	262
2	281	-272
3	219	-215
H= 13, K= 0		
-9	129	-117
-8	228	-229
-6	225	225
-5	120	97
-4	243	-247
-3	275	-289
-2	176	191
-1	320	324
1	300	-304
2	171	-145
3	144	145
4	176	169
H= 13, K= 1		
-9	139	-157
-8	108	115
-7	249	245
-5	231	-230
-4	140	-128
-3	314	306
-2	325	332
-1	102	82
0	296	-292
2	230	233
3	175	155
H= 13, K= 2		
-8	237	249
-6	218	-229
-5	133	-133
-4	225	228
-3	203	203
-1	342	-340
0	117	-114
1	283	277
2	110	113
H= 13, K= 3		
-9	148	146
-7	282	-278
-5	229	236
-4	132	120
-3	233	-224
-2	318	-338
0	278	272
2	192	-188
3	156	-147
H= 13, K= 4		
-8	199	-185
-6	293	278
-4	229	-239
-3	206	-206
-1	286	292
1	267	-268
2	127	-128
3	107	113
H= 13, K= 5		
-9	135	-109
-8	106	107
-7	206	232
-5	263	-266
-4	102	-81
-3	230	232
-2	269	274
0	237	-242
2	192	201
H= 13, K= 6		
-9	134	124
-8	169	168
-6	226	-236
-4	204	197
-3	193	185
-2	120	-122
-1	199	-202
1	224	223
2	127	119
H= 13, K= 7		
-8	107	-95
-7	198	-202
-5	164	176
-4	123	94
-3	163	-170
-2	221	-270
0	203	209
H= 13, K= 8		
-8	175	-173
-6	150	164
-4	175	-155
-3	143	-148
-1	196	193
1	193	-191
H= 13, K= 9		
-7	176	176
-5	110	-128
-3	112	138
-2	149	164
0	159	-163
H= 13, K= 10		
-6	130	-149
-4	177	162
H= 14, K=-11		
-4	217	205
-3	153	144
-2	108	-120
-1	211	-216
H= 14, K=-10		
-5	204	221
-3	175	-176
-2	161	-170
0	224	226
H= 14, K= -9		
-6	232	228
-4	200	-203
-3	152	-143
-1	208	203
1	195	-194
2	122	-117
H= 14, K= -8		
-5	205	-202
-3	142	142
-2	174	185
0	213	-218
2	189	182
H= 14, K= -7		
-6	222	-214
-4	211	218
-3	171	178
-2	102	-112
-1	220	-217
1	234	236
H= 14, K= -6		
-7	219	-210
-5	231	236
-4	102	110
-3	215	-227
-2	212	-202
-1	100	86
0	247	244
2	156	-151
3	132	-134
H= 14, K= -5		
-8	176	-164
-6	224	217
-4	314	-320
-3	245	-246
-2	153	159
-1	228	233
1	188	-175
3	117	102
H= 14, K= -4		
-8	153	134
-7	181	187
-5	245	-265
-4	172	-169
-3	251	250
-2	272	255
0	176	-169
2	158	156
3	129	130
H= 14, K= -3		
-8	154	150
-6	211	-209
-5	106	-100
-4	271	263
-3	275	262
-2	108	-98
-1	258	-246
1	139	148
3	142	-126
H= 14, K= -2		
-8	131	-118
-7	223	-224
-5	160	157
-4	173	174
-3	131	-136
-2	277	-276
0	189	196
2	163	-153
3	134	-128
H= 14, K= -1		
-8	196	-194
-6	165	170
-4	192	-182
-3	270	-277
-2	153	158
-1	283	268
1	205	-197
2	159	-142
3	108	106
H= 14, K= 0		
-8	132	129
-7	186	190
-5	130	-137
-4	120	-130
-3	177	181
-2	230	229
-1	99	-90
0	255	-263
2	138	155
H= 14, K= 1		
-8	200	191
-6	132	-144
-4	194	199
-3	200	197
-1	265	-260
1	211	213
2	159	129
H= 14, K= 2		
-7	212	-206
-5	175	169
-4	131	125
-3	102	-118
-2	195	-200
0	264	255
2	106	-100
H= 14, K= 3		
-8	165	-163
-6	215	206
-4	197	-204
-3	191	-188
-1	233	239
1	173	-187
2	140	-133
H= 14, K= 4		
-7	183	185
-6	120	82
-5	209	-207
-4	113	-127
-2	203	205
0	213	-209
H= 14, K= 5		
-8	130	124
-6	187	-182
-4	183	164
-3	199	205
-1	173	-166
1	197	188
H= 14, K= 6		
-7	147	-159
-5	168	158
-4	116	120
-2	178	-180
0	184	178
H= 14, K= 7		
-6	138	139
-4	127	-136
-3	177	-191
-1	190	183
H= 14, K= 8		
-5	129	-111
-3	113	87
-2	178	178
H= 15, K= -9		
-3	170	159
-2	169	183
H= 15, K= -8		
-4	183	170
-3	121	116
-1	223	-218
H= 15, K= -7		
-5	156	150
-3	130	-140
-2	162	-158
0	263	244
H= 15, K= -6		
-6	167	188
-4	188	-183
-3	117	-117
-2	147	144
-1	191	207
1	160	-180
H= 15, K= -5		
-5	180	-190
-3	190	196
-2	182	166
0	226	-216
H= 15, K= -4		
-6	192	-193
-4	237	247
-3	151	152
-2	132	-136
-1	218	-217
1	168	150
H= 15, K= -3		
-7	172	-168
-5	187	193
-4	118	134
-3	134	-138
-2	171	-177
-1	120	105
0	201	197
H= 15, K= -2		
-6	172	182
-5	118	107
-4	159	-167
-3	192	-194
-2	136	123
-1	187	187
1	186	-180
H= 15, K= -1		
-7	168	188
-5	153	-136
-4	129	-152
-3	133	132
-2	141	152
-1	115	-114
0	218	-220
H= 15, K= 0		
-6	149	-135
-4	149	162
-3	152	156
-2	135	-137
-1	175	-171
1	220	203
H= 15, K= 1		
-7	177	-166
-5	138	144
-4	130	121
-3	126	-116
-2	127	-113
0	194	210
H= 15, K= 2		
-6	163	172
-4	157	-171
-3	134	-138
-1	195	191
H= 15, K= 3		
-7	176	177
-5	109	-176
-4	126	-129
-2	161	160
0	140	-162
H= 15, K= 4		
-6	162	-179
-4	132	149
-3	163	164
-1	159	-153
H= 15, K= 5		
-5	156	161
-4	114	117
-2	117	-124
H= 16, K= -5		
-3	128	105
H= 16, K= -4		
-3	155	-159
-2	178	-174
H= 16, K= -3		
-4	187	-172
-3	151	-133
-2	131	91
H= 16, K= -2		
-5	174	-183
-3	123	117
-2	160	173
H= 16, K= -1		
-4	117	144
-3	123	125
-2	130	-123
H= 16, K= 0		
-5	154	158
-3	128	-146
-2	121	-110
H= 16, K= 1		
-4	171	-152

All were well formed and showed a peak height of at least 0·3 e.Å^{-3}. The positions of the 13 pyridine and methine hydrogen atoms were calculated from the appropriate carbon atom coordinates assuming planar geometries and a 1·08 Å C–H bond length. These agreed well with the observed positions and were included in the final calculation of the structure factors and error functions. The latter, based on observed reflections only, are $R_1=0{\cdot}039$ and $R_2=0{\cdot}040$. The 'goodness of fit', $\{[\sum w(F_o-|F_c|)^2]/(m-s)\}^{1/2}$, is 0·96. The number of reflections (6840) is m, and s (469) is the total number of variables in the least-squares calculations. The standard deviation of the electron density on the final Fourier function was 0·1 e.Å^{-3}; difference peaks as large as 1·1 e.Å^{-3} appeared in the vicinity of those methyl groups with the largest thermal parameters.

Table 2. *Final nonhydrogen positional parameters and their standard deviations*

Values are given × 10^4. See Fig. 1 for the identities of the atoms. The e.s.d. is in the units of the least significant digit given for the corresponding parameter.

	$x,\sigma(x)$	$y,\sigma(y)$	$z,\sigma(z)$
Eu(1)	2493 (1)	2486 (1)	2080 (1)
O(2)	2635 (3)	3772 (2)	1717 (3)
O(3)	2997 (2)	3326 (2)	4177 (3)
O(4)	4082 (2)	2119 (2)	3211 (3)
O(5)	2572 (2)	1167 (2)	1148 (3)
O(6)	1318 (2)	2298 (2)	−0072 (3)
O(7)	0885 (2)	2709 (2)	2308 (3)
N(8)	1951 (3)	1530 (2)	3601 (4)
N(9)	3751 (3)	2616 (2)	0555 (4)
C(10)	3034 (8)	4992 (4)	0438 (7)
C(11)	2808 (9)	5934 (4)	2307 (10)
C(12)	1310 (5)	4991 (4)	0885 (9)
C(13)	2464 (5)	5096 (3)	1517 (6)
C(14)	2690 (3)	4456 (2)	2370 (4)
C(15)	2885 (4)	4616 (2)	3745 (5)
C(16)	3039 (3)	4052 (2)	4582 (4)
C(17)	3257 (5)	4313 (4)	6103 (5)
C(18)	3442 (15)	3629 (6)	6828 (8)
C(19)	2342 (12)	4667 (12)	6362 (9)
C(20)	4132 (15)	4976 (10)	6604 (10)
C(21)	6245 (7)	2300 (11)	3822 (17)
C(22)	5547 (7)	1878 (8)	5547 (8)
C(23)	6175 (9)	0905 (8)	4112 (12)
C(24)	5636 (5)	1638 (4)	4161 (7)
C(25)	4547 (3)	1525 (3)	3160 (4)
C(26)	4147 (4)	0814 (3)	2314 (5)
C(27)	3186 (4)	0663 (3)	1366 (5)
C(28)	2802 (6)	−0155 (3)	0498 (8)
C(29)	1770 (15)	−0407 (8)	0584 (24)
C(30)	3620 (14)	−0712 (6)	0657 (19)
C(31)	2633 (17)	−0040 (7)	−0976 (12)
C(32)	0703 (12)	1880 (10)	−2740 (7)
C(33)	−1022 (7)	2144 (10)	−2700 (8)
C(34)	0232 (13)	3247 (7)	−2374 (9)
C(35)	0087 (5)	2397 (4)	−2096 (5)
C(36)	0435 (3)	2462 (2)	−0561 (4)
C(37)	−0218 (3)	2711 (3)	0203 (4)
C(38)	0029 (3)	2817 (3)	1591 (4)
C(39)	−0725 (4)	3084 (4)	2372 (6)
C(40)	−0790 (7)	2499 (7)	3308 (9)
C(41)	−1808 (5)	3113 (6)	1493 (7)
C(42)	−0290 (7)	3906 (6)	3134 (12)
C(43)	1084 (7)	1040 (5)	3094 (11)
C(44)	0814 (8)	0459 (7)	3741 (13)
C(45)	1467 (9)	0355 (6)	4924 (11)
C(46)	2343 (9)	0859 (6)	5462 (11)
C(47)	2560 (7)	1441 (5)	4779 (8)
C(48)	3674 (6)	2106 (5)	−0546 (8)
C(49)	4411 (7)	2109 (6)	−1248 (7)
C(50)	5242 (7)	2671 (7)	−0784 (10)
C(51)	5323 (7)	3198 (7)	0336 (11)
C(52)	4563 (6)	3159 (5)	0989 (9)

The observed and calculated structure factors are presented in Table 1. Tables 2, 3 and 4 give the positional and thermal parameters of the structure and their standard deviations. Molecular dimensions are given in Table 5. The molecule, without hydrogen atoms, is shown in Fig. 1. Figs. 2 and 3 together demonstrate the entire molecule in stereoviews produced by *ORTEP* (Johnson, 1965).

The full-matrix least-squares program used (*UCLALS*4) was that of Gantzel, Sparks & Trueblood [ACA Library (old) no. 317, modified], which minimizes $\sum w(\Delta F)^2$; the weights used were the reciprocal squares of σ, the standard deviation for each observation. Atomic scattering factor for Eu^0, O^0, N^0, C^0 (valence) (*International Tables for X-ray Crystallography*, 1962), and H (bonded) (Stewart, Davidson & Simpson, 1965) were used. The first was decreased by 0·3 to 0·4 e to account for the real part of the anomalous dispersion correction. In the last cycle of least-squares refinement, nearly all shifts were less than their standard deviations. All parameters appeared to be converging well so that further refinement was not expected to significantly alter any parameter.

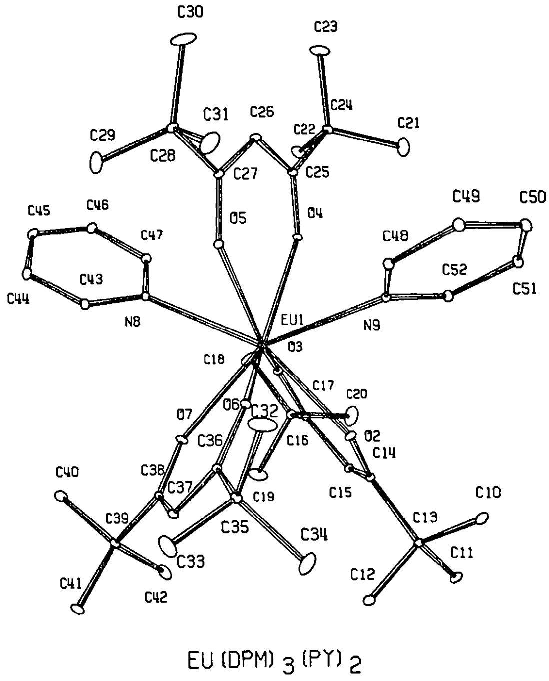

Fig. 1. Eu(dpm)$_3$(py)$_2$, with all nonhydrogen atoms shown and labelled. Ellipsoids of 1 % probability are used.

Discussion

Examination of Table 6 and Fig. 4 shows that the coordination polyhedron about the Eu(III) ion is best described as a square antiprism according to the criteria of Lippard & Russ (1968). The largest deviation from the plane of the square face formed by O(2), O(3), O(4) and N(9) is 0·022 Å at N(9) and the average deviation is 0·018 Å; for the other square face, formed by O(5), O(6), O(7) and N(8), the largest deviation from the plane is 0·073 Å at N(8) and the average deviation is 0·055 Å. The square faces are inclined with respect to each other at an angle of 4·2°. In contrast, the deviations from the best trapezoidal planes of a dodecahedron are much larger, ranging from 0·21 Å to 0·53 Å and averaging 0·44 Å for the O(2), O(7), N(8), N(9) least-squares plane and 0·329 Å for the O(3), O(4), O(5), O(6) plane, while the dihedral angle between them is 86·4°. The average length of the square edges of the antiprism is $s=2{\cdot}869$ Å and of the lateral edges

Table 3. *Thermal vibration parameters and their standard deviations*

The b are $\times 10^4$. See Fig. 1 for the identities of the atoms. The e.s.d. is in the units of the least significant digit given for the corresponding parameter. The temperature factor $=\exp\,[-(b_{11}h^2+b_{22}k^2+b_{33}l^2+b_{12}hk+b_{13}hl+b_{23}kl)]$.

	b_{11}	b_{22}	b_{33}	b_{12}	b_{13}	b_{23}
Eu(1)	51 (1)	28 (1)	80 (1)	21 (1)	29 (1)	11 (1)
O(2)	126 (3)	33 (1)	89 (3)	38 (3)	65 (5)	23 (3)
O(3)	78 (2)	34 (1)	88 (3)	26 (2)	34 (4)	17 (3)
O(4)	58 (2)	38 (1)	109 (3)	27 (2)	30 (4)	5 (3)
O(5)	69 (2)	30 (1)	120 (3)	15 (2)	38 (4)	3 (3)
O(6)	61 (2)	47 (1)	87 (3)	29 (2)	36 (4)	6 (3)
O(7)	62 (2)	74 (2)	97 (3)	62 (3)	44 (4)	33 (4)
N(8)	73 (3)	43 (1)	148 (5)	25 (3)	88 (6)	39 (4)
N(9)	64 (2)	40 (1)	129 (4)	12 (3)	62 (5)	30 (4)
C(10)	181 (8)	59 (3)	163 (7)	56 (8)	169 (13)	94 (8)
C(11)	142 (7)	35 (2)	178 (9)	11 (7)	44 (14)	45 (7)
C(12)	95 (4)	58 (3)	232 (11)	23 (6)	3 (11)	100 (9)
C(13)	82 (4)	33 (2)	123 (6)	12 (4)	29 (8)	31 (5)
C(14)	67 (3)	30 (1)	104 (4)	16 (3)	42 (5)	15 (4)
C(15)	86 (3)	31 (1)	107 (4)	20 (3)	42 (6)	8 (4)
C(16)	56 (2)	37 (2)	87 (4)	18 (3)	27 (5)	7 (4)
C(17)	93 (4)	47 (2)	90 (5)	26 (5)	31 (7)	3 (5)
C(18)	469 (24)	82 (4)	117 (7)	174 (17)	160 (21)	59 (9)
C(19)	275 (15)	233 (13)	132 (9)	310 (24)	193 (19)	70 (17)
C(20)	319 (20)	151 (10)	138 (9)	−195 (23)	−62 (21)	19 (15)
C(21)	73 (5)	200 (12)	509 (27)	−49 (12)	−85 (18)	−378 (32)
C(22)	103 (6)	139 (7)	156 (8)	81 (11)	−21 (11)	−14 (12)
C(23)	146 (8)	125 (7)	287 (16)	180 (13)	−78 (18)	−44 (16)
C(24)	66 (3)	68 (3)	139 (7)	54 (5)	38 (8)	32 (7)
C(25)	64 (3)	48 (2)	106 (4)	44 (4)	51 (6)	28 (4)
C(26)	90 (4)	44 (2)	146 (6)	62 (4)	48 (7)	17 (5)
C(27)	89 (3)	32 (1)	127 (5)	26 (4)	79 (7)	15 (4)
C(28)	19 (6)	35 (2)	173 (8)	28 (5)	83 (11)	− 1 (6)
C(29)	284 (18)	78 (5)	709 (50)	−167 (17)	572 (53)	−257 (28)
C(30)	306 (19)	72 (4)	562 (33)	163 (16)	−113 (40)	−189 (19)
C(31)	410 (25)	77 (5)	233 (13)	−57 (17)	167 (29)	−128 (14)
C(32)	312 (15)	206 (10)	103 (7)	354 (21)	6 (15)	−38 (12)
C(33)	104 (6)	225 (10)	111 (7)	− 1 (12)	− 7 (10)	57 (13)
C(34)	327 (17)	95 (5)	142 (9)	−67 (15)	100 (20)	89 (11)
C(35)	73 (4)	52 (2)	96 (5)	20 (5)	36 (7)	16 (5)
C(36)	59 (3)	34 (1)	91 (4)	6 (3)	23 (5)	15 (4)
C(37)	57 (3)	52 (2)	99 (4)	34 (4)	24 (5)	31 (4)
C(38)	51 (2)	43 (2)	104 (4)	22 (3)	37 (5)	27 (4)
C(39)	60 (3)	56 (2)	120 (6)	36 (4)	60 (7)	23 (6)
C(40)	136 (7)	133 (6)	228 (10)	139 (10)	239 (15)	194 (14)
C(41)	72 (4)	104 (5)	175 (8)	84 (7)	88 (9)	71 (10)
C(42)	103 (6)	99 (5)	353 (17)	21 (8)	178 (17)	−170 (16)
C(43)	84 (5)	51 (3)	241 (11)	− 3 (6)	113 (11)	26 (10)
C(44)	131 (6)	58 (4)	329 (15)	−19 (8)	230 (13)	37 (12)
C(45)	193 (7)	59 (3)	301 (10)	55 (8)	315 (11)	113 (9)
C(46)	143 (7)	70 (4)	227 (10)	42 (9)	166 (13)	113 (9)
C(47)	102 (5)	55 (3)	160 (7)	37 (6)	103 (10)	64 (8)
C(48)	92 (4)	51 (3)	138 (7)	13 (6)	100 (8)	15 (7)
C(49)	119 (6)	73 (4)	155 (5)	24 (8)	148 (8)	34 (7)
C(50)	95 (5)	87 (4)	193 (9)	37 (8)	136 (10)	88 (10)
C(51)	78 (4)	72 (4)	235 (11)	− 4 (7)	100 (11)	74 (11)
C(52)	71 (4)	53 (3)	175 (9)	−12 (6)	59 (10)	17 (8)

is l = 3·078 Å yielding an l/s ratio of 1·07 which is close to the value for an ideal square antiprism, 1·06, quoted by Hoard & Silverton (1963). The largest deviations of l and s values from their averages are found on the edges bounded by the chelate 'bites'.

Table 4. *Hydrogen atom positions and assigned thermal parameters*

The serial number used to designate a hydrogen atom is the same as that of the carbon atom to which it is bonded. Fractional coordinates × 10^4 are given. Atoms whose positions were calculated are indicated.

	x	*y*	*z*	*B*
H(10*A*)	2860	4425	0	7·5
H(10*B*)	2810	5310	− 260	7·5
H(10*C*)	3850	5230	1150	7·5
H(11*A*)	2750	6320	1725	6·7
H(11*B*)	3600	6010	2810	6·7
H(11*C*)	2390	5940	2810	6·7
H(12*A*)	1250	4460	475	7·5
H(12*B*)	940	5070	1550	7·5
H(12*C*)	940	5390	310	7·5
H(15)	3075	5230	4160	4·6
H(18*A*)	3440	3830	7810	11·3
H(18*B*)*	4145	3426	6701	11·3
H(18*C*)*	2863	3144	6284	11·3
H(19*A*)	2760	4840	7500	12·0
H(19*B*)*	2150	5131	5811	12·0
H(19*C*)*	1671	4232	6085	12·0
H(20*A*)	4060	4920	7500	13·5
H(20*B*)*	4789	4826	6269	13·5
H(20*C*)*	3945	5483	6142	13·5
H(21*A*)	6090	2660	3900	12·3
H(21*B*)*	6404	2083	2897	12·3
H(21*C*)	6775	2340	4590	12·3
H(22*A*)	5050	1360	5880	9·5
H(22*B*)	6200	1950	5990	9·5
H(22*C*)	5210	2270	5725	9·5
H(23*A*)	6875	1000	4850	10·4
H(23*B*)	6200	625	3125	10·4
H(23*C*)*	5723	468	4394	10·4
H(26)	4590	350	2550	5·6
H(29*A*)*	1241	9	291	14·7
H(29*B*)	2190	− 390	1560	14·7
H(29*C*)*	1422	− 949	−92	14·7
H(30*A*)	3390	−1170	0	16·2
H(30*B*)*	4326	− 371	673	16·2
H(30*C*)*	3818	− 787	1694	16·2
H(31*A*)	2198	− 625	−1562	12·7
H(31*B*)*	3371	115	−1135	12·7
H(31*C*)*	2231	467	−1120	12·7
H(32*A*)	310	1660	−3750	11·0
H(32*B*)*	1437	2221	−2598	11·0
H(32*C*)*	886	1429	−2135	11·0
H(33*A*)	−1200	2100	−3438	10·4
H(33*B*)	−1510	2270	−2350	10·4
H(33*C*)*	−1136	1599	−2606	10·4
H(34*A*)	260	3200	−3275	10·5
H(34*B*)*	883	3561	−1588	10·5
H(34*C*)*	− 363	3548	−2090	10·5
H(37)	− 840	2890	− 220	4·6
H(40*A*)	−1250	2580	3440	8·4
H(40*B*)*	−31	2524	3977	8·4
H(40*C*)*	− 568	1956	2887	8·4
H(41*A*)	−1975	2580	940	7·3
H(41*B*)	−2188	3280	2190	7·3
H(41*C*)	−1775	3360	675	7·3
H(42*A*)*	410	3750	3750	9·7
H(42*B*)	− 775	4060	3600	9·7
H(42*C*)*	− 179	4275	2426	9·7
H(43)	675	1170	2240	6·8
H(44)	312	156	3437	8·8
H(45)	1250	−80	5313	9·1
H(46)	2600	780	6300	8·1
H(47)	3125	1800	5050	6·0
H(48)	3125	1640	− 790	5·6
H(49)	4375	1640	−1925	7·2
H(50)	5675	2580	−1250	7·6
H(51)	5930	3590	940	7·4
H(52)	4525	3510	1600	6·1

The parameters of the least-squares planes of the β-diketonate chelate rings are given in Table 7. The sum of internal angles for the O(2)–O(3), O(4)–O(5), and O(6)–O(7) rings are respectively 717·8, 719·8 and 718·0° compared with 720·0° for planar six-membered rings. The Eu(III) ion lies in the plane of the chelate which bridges the square faces, but the other two chelates exhibit the often-noted folding about the O–O line (Cotton & Wood, 1964) such that the chelate plane makes an angle of 10·2° with the O(2)Eu(1)O(3) plane and 9·9° with the O(6)Eu(1)O(7) plane. The 'bite' distance, 2·767 Å, for the bridging chelate is somewhat larger than those of the non-bridging chelates: 2·738 for O(2)–O(3) and 2·730 Å for O(6)–O(7).

While the pyridine ring geometries are normal, the

Table 5. *Molecular dimensions*

Bond lengths

Eu(1)–O(2)	2·312 (3) Å	C(17)–C(18)	1·502 (12) Å
Eu(1)–O(3)	2·354 (3)	C(17)–C(19)	1·508 (18)
Eu(1)–O(4)	2·364 (3)	C(17)–C(20)	1·510 (20)
Eu(1)–O(5)	2·372 (3)	C(24)–C(21)	1·497 (18)
Eu(1)–O(6)	2·360 (3)	C(24)–C(22)	1·492 (11)
Eu(1)–O(7)	2·320 (3)	C(24)–C(23)	1·519 (15)
		C(28)–C(29)	1·466 (21)
Eu(1)–N(8)	2·647 (4)	C(28)–C(30)	1·524 (17)
Eu(1)–N(9)	2·651 (4)	C(28)–C(31)	1·548 (14)
		C(35)–C(32)	1·486 (16)
O(2)–C(14)	1·265 (5)	C(35)–C(33)	1·477 (11)
O(3)–C(16)	1·258 (5)	C(35)–C(34)	1·547 (13)
O(4)–C(25)	1·253 (6)	C(39)–C(40)	1·521 (12)
O(5)–C(27)	1·261 (6)	C(39)–C(41)	1·529 (9)
O(6)–C(36)	1·250 (5)	C(39)–C(42)	1·516 (12)
O(7)–C(38)	1·255 (5)		
		N(8)–C(43)	1·330 (10)
C(14)–C(15)	1·378 (6)	N(8)–C(47)	1·333 (10)
C(15)–C(16)	1·398 (6)	N(9)–C(48)	1·323 (9)
C(25)–C(26)	1·385 (7)	N(9)–C(52)	1·323 (9)
C(26)–C(27)	1·397 (8)		
C(36)–C(37)	1·398 (6)	C(43)–C(44)	1·370 (15)
C(37)–C(38)	1·387 (6)	C(44)–C(45)	1·370 (17)
		C(45)–C(46)	1·353 (16)
C(13)–C(14)	1·525 (7)	C(46)–C(47)	1·374 (14)
C(16)–C(17)	1·535 (6)	C(48)–C(49)	1·392 (12)
C(24)–C(25)	1·553 (8)	C(49)–C(50)	1·361 (14)
C(27)–C(28)	1·536 (8)	C(50)–C(51)	1·353 (15)
C(25)–C(36)	1·540 (6)	C(51)–C(52)	1·384 (13)
C(38)–C(39)	1·533 (7)		
C(13)–C(10)	1·530 (10)		
C(13)–C(11)	1·531 (10)		
C(13)–C(12)	1·520 (9)		

Table 5 (*cont.*)

Bond angles

Eu(1)–O(2)–C(14)	137·9 (3)°
Eu(1)–O(3)–C(16)	135·8 (3)
Eu(1)–O(4)–C(25)	137·4 (3)
Eu(1)–O(5)–C(27)	136·9 (3)
Eu(1)–O(6)–C(36)	136·4 (3)
Eu(1)–O(7)–C(38)	138·7 (3)
Eu(1)–N(8)–C(43}	118·3 (5)
Eu(1)–N(8)–C(47)	123·4 (4)
Eu(1)–N(9)–C(48)	122·9 (4)
Eu(1)–N(9)–C(52)	118·7 (5)
O(2)–Eu(1)–O(3)	71·7 (1)
O(2)–Eu(1)–O(6)	81·6 (1)
O(2)–Eu(1)–O(7)	85·2 (1)
O(2)–Eu(1)–N(9)	71·9 (1)
O(3)–Eu(1)–O(4)	75·0 (1)
O(3)–Eu(1)–O(7)	80·8 (1)
O(3)–Eu(1)–N(8)	79·7 (1)
O(4)–Eu(1)–O(5)	71·7 (1)
O(4)–Eu(1)–N(8)	77·4 (1)
O(4)–Eu(1)–N(9)	72·3 (1)
O(5)–Eu(1)–O(6)	76·2 (1)
O(5)–Eu(1)–N(8)	70·8 (1)
O(5)–Eu(1)–N(9)	75·7 (1)
O(6)–Eu(1)–O(7)	71·2 (1)
O(6)–Eu(1)–N(9)	78·8 (1)
O(7)–Eu(1)–N(8)	70·9 (1)
N(8)–Eu(1)–N(9)	140·3 (1)
O(2)–C(14)–C(13)	115·0 (4)
O(3)–C(16)–C(17)	116·3 (4)
O(4)–C(25)–C(24)	114·3 (4)
O(5)–C(27)–C(28)	114·8 (4)
O(6)–C(36)–C(35)	116·2 (4)
O(7)–C(38)–C(39)	114·6 (4)
O(2)–C(14)–C(15)	123·3 (4)
O(3)–C(16)–C(15)	124·4 (4)
O(4)–C(25)–C(26)	124·5 (4)
O(5)–C(27)–C(26)	124·1 (5)
O(6)–C(36)–C(37)	123·9 (4)
O(7)–C(38)–C(37)	123·0 (4)
C(14)–C(15)–C(16)	124·7 (4)
C(25)–C(26)–C(27)	125·2 (5)
C(36)–C(37)–C(38)	124·8 (4)
C(13)–C(14)–C(15)	121·6 (4)
C(17)–C(16)–C(15)	119·3 (4)
C(24)–C(25)–C(26)	121·1 (4)
C(28)–C(27)–C(26)	121·1 (5)
C(35)–C(36)–C(37)	119·9 (4)
C(39)–C(38)–C(37)	122·3 (4)
C(43)–N(8)–C(47)	117·7 (6)°
C(48)–N(9)–C(52)	118·0 (6)
N(8)–C(43)–C(44)	122·0 (10)
N(8)–C(47)–C(46)	123·0 (8)
N(9)–C(48)–C(49)	123·0 (8)
N(9)–C(52)–C(51)	122·0 (8)
C(43)–C(44)–C(45)	119·5 (10)
C(44)–C(45)–C(46)	118·9 (10)
C(47)–C(46)–C(45)	118·7 (10)
C(48)–C(49)–C(50)	118·2 (9)
C(49)–C(50)–C(51)	119·2 (9)
C(52)–C(51)–C(50)	119·7 (9)
C(14)–C(13)–C(10)	108·7 (5)
C(14)–C(13)–C(11)	114·0 (6)
C(14)–C(13)–C(12)	106·9 (5)
C(16)–C(17)–C(18)	111·2 (6)
C(16)–C(17)–C(19)	108·7 (8)
C(16)–C(17)–C(20)	110·2 (7)
C(25)–C(24)–C(21)	106·7 (8)
C(25)–C(24)–C(22)	108·7 (7)
C(25)–C(24)–C(23)	113·5 (6)
C(27)–C(28)–C(29)	108·8 (9)
C(27)–C(28)–C(30)	113·0 (9)
C(27)–C(28)–C(31)	106·4 (10)
C(36)–C(35)–C(32)	110·8 (8)
C(36)–C(35)–C(33)	114·0 (7)
C(36)–C(35)–C(34)	106·0 (6)
C(38)–C(39)–C(40)	107·0 (6)
C(38)–C(39)–C(41)	114·3 (5)
C(38)–C(39)–C(42)	106·7 (6)
C(10)–C(13)–C(11)	107·2 (6)
C(10)–C(13)–C(12)	110·8 (5)
C(11)–C(13)–C(12)	109·3 (6)
C(18)–C(17)–C(19)	109·0 (9)
C(18)–C(17)–C(20)	112·7 (9)
C(19)–C(17)–C(20)	104·8 (6)
C(21)–C(24)–C(22)	108·5 (7)
C(21)–C(24)–C(23)	110·2 (8)
C(22)–C(24)–C(23)	109·0 (7)
C(29)–C(28)–C(30)	120·8 (13)
C(29)–C(28)–C(31)	104·0 (12)
C(30)–C(28)–C(31)	102·3 (12)
C(32)–C(35)–C(33)	110·8 (8)
C(32)–C(35)–C(34)	111·3 (9)
C(33)–C(35)–C(34)	103·5 (6)
C(40)–C(39)–C(41)	108·4 (7)
C(40)–C(39)–C(42)	112·1 (6)
C(41)–C(39)–C(42)	108·4 (7)

Table 6. *Edge lengths in the coordination polyhedron*

s Edges		*l* Edges	
N(9)–O(2)	2·926 Å	N(9)–O(6)	3·187 Å
N(9)–O(4)	2·973	N(9)–O(5)	3·095
O(2)–O(3)	2·738	O(2)–O(6)	3·055
O(3)–O(4)	2·867	O(2)–O(7)	3·145
N(8)–O(5)	2·913	O(3)–O(7)	3·030
N(8)–O(7)	2·888	O(3)–N(8)	3·215
O(5)–O(6)	2·916	O(4)–N(8)	3·133
O(6)–O(7)	2·730	O(4)–O(5)	2·767

Eu(III) ion does not lie in either of the pyridine planes (Table 7). This distortion, as measured by the Eu–N–*para* C angles amounts to about 8° [the Eu(1)–N(8)–C(45) angle is 171·2 (3)° and the Eu(1)–N(9)–C(50) angle is 172·5 (3)°]; it results from a close (3·13 Å) contact (see Fig. 5) between an oxygen atom [O(2) or O(7)] and an *ortho* pyridine carbon atom [C(52) or C(43) respectively] which displaces the pyridine rings toward the O(4)–O(5) chelate.

Table 7. *Deviations of atoms from least-squares planes* (Å × 10^3)

Boldface deviations indicate the atoms used to define the least-squares plane. A negative deviation from a plane indicates that the atom with the coordinates given in Table 3 lies between that plane and the origin. The direction cosines (× 10^4), q, are with respect to orthogonal axes. The r.m.s. deviation (Å × 10^3) of the boldface atoms from the plane is δ. D is the distance (in Å) from the plane to the origin.

Atoms	Plane 1	Atoms	Plane 2	Atoms	Plane 3	Atoms	Plane 4	Atoms	Plane 5
Eu(1)	−326	Eu(1)	33	Eu(1)	324	Eu(1)	−380	Eu(1)	335
O(2)	**6**	O(4)	**9**	O(6)	**− 5**	N(8)	**− 4**	N(9)	**2**
O(3)	**− 5**	O(5)	**− 9**	O(7)	**6**	C(43)	**1**	C(48)	**− 5**
C(13)	−114	C(24)	−76	C(35)	78	C(44)	**16**	C(49)	**4**
C(14)	**−10**	C(25)	**−25**	C(36)	**10**	C(45)	**−22**	C(50)	**2**
C(15)	**− 3**	C(26)	**2**	C(37)	**0**	C(46)	**− 2**	C(51)	**0**
C(16)	**12**	C(27)	**23**	C(38)	**−11**	C(47)	**11**	C(52)	**− 2**
C(17)	27	C(28)	87	C(39)	−36				
$q_{\mathbf{b}\times(\mathbf{a}\times\mathbf{b})}$	9945		−6339		3665		−6357		3507
$q_{\mathbf{b}}$	314		−3826		9293		6031		−7518
$q_{\mathbf{a}\times\mathbf{b}}$	995		6721		460		4818		5584
D	3·41		−1·82		4·23		1·85		−0·99
δ	8		16		8		12		3

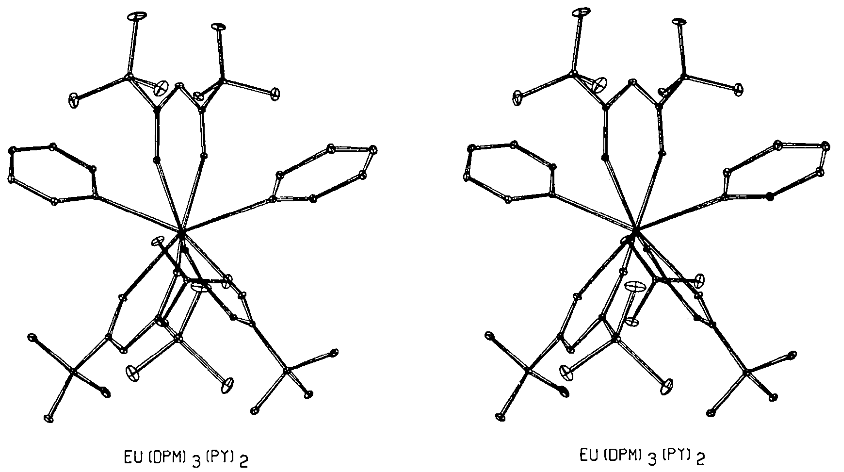

Fig. 2. Stereoview of the nonhydrogen atoms in one molecule. The view point for the right eye is the same as that used in Fig 1.

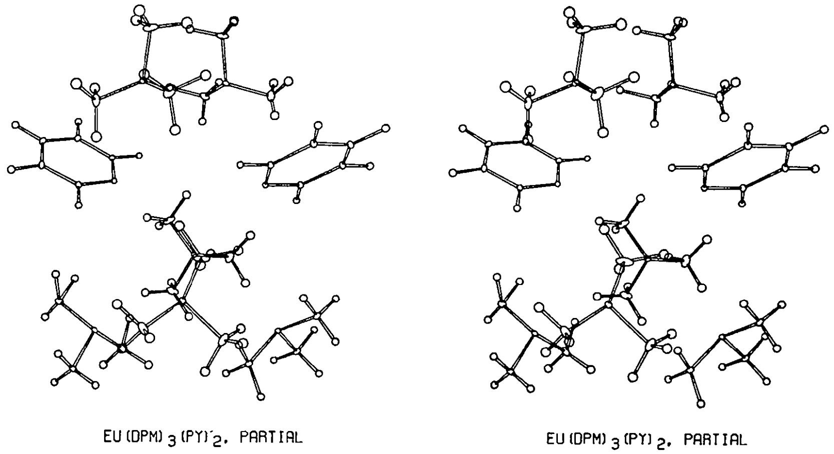

Fig. 3. Stereoview from the same point as the one shown in Fig. 2. The complete t-butyl groups and pyridine rings with 64 of the 67 hydrogen atoms [all but the methine hydrogen atoms: H(15), H(26), and H(37)] are shown.

The average Eu–O bond length is 2·347 Å, while the average Eu–N distance, 2·649 Å, is much longer. These values compare with the Ho–O and Ho–N distances of 2·27 and 2·53 Å in the structure of $Ho(dpm)_3(4\text{-pic})_2$ (4-pic is 4-picoline or 4-methylpyridine) (Horrocks, Sipe & Luber, 1971). The decrease in the bond length to oxygen by about 0·08 Å can be attributed to the lanthanide contraction (Shannon & Prewitt, 1969). The greater difference observed for the Eu–N bonds, 0·12 (1) Å, is in agreement with the observation that the Eu(III) complex is less stable with respect to loss of pyridine than are similar complexes of the other lanthanides (Hinckley, 1971).

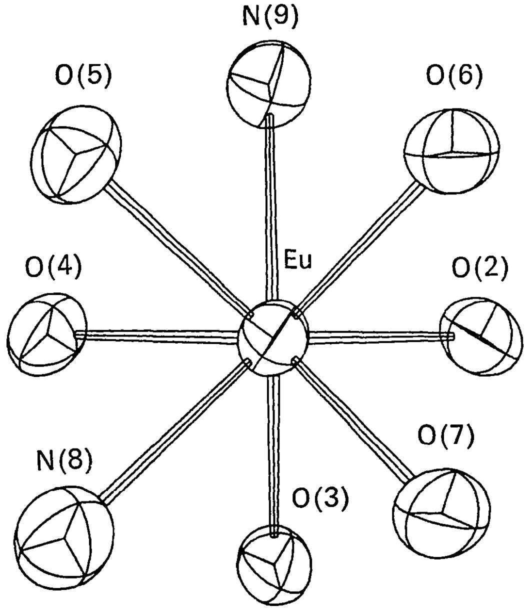

Fig. 4. The Eu(III) coordination sphere viewed along a line approximately normal to the square faces of the antiprism. Ellipsoids of 50% probability are shown.

The molecular structure of this complex closely resembles that of $Ho(dpm)_3(4\text{-pic})_2$ (Horrocks, Sipe & Luber, 1971), but the crystal structure is quite different. $Ho(dpm)_3(4\text{-pic})_2$ crystallizes in the orthorhombic space group *Pbcn* with the crystallographic C_2 axis passing through the Ho(III) ion. In the structure reported here the $Eu(dpm)_3(py)_2$ molecule lies at a site of no crystallographic symmetry. This molecule has an approximate twofold axis, *i.e.* rotation about a line which passes through the Eu(III) ion and bisects the O(4)–O(5) chelate ring carries one pyridine ring into the other and carries the O(2)–O(3) chelate into the O(6)–O(7) chelate. Examination of bond angles and distances in Table 5 reveals that a number of parameters which would be equal if the C_2 axis were exact, differ by several standard deviations from their average: for example, the angles O(4)–Eu(1)–N(8) and O(5)–Eu(1)–N(9) differ from their average by 8σ. Furthermore, a twofold axis would be required to lie in the N(8)Eu(1)N(9) plane and to pass through C(26), but C(26) is displaced from this plane by 0·28 Å. Still, the deviations from twofold symmetry are not great and appear to result from crystal packing (see Table 8 and Fig. 6). The results of n.m.r. experiments are probably best interpreted by considering the molecule to have twofold symmetry since these experiments are carried out in solution where solid phase distortions are absent. The fact that this molecular structure is similar to that of $Ho(dpm)_3(4\text{-pic})_2$, regardless of the different arrangement of the molecules within the crystal, increases the probability that this structure is maintained in solution.

Fig. 5 illustrates how a pyridine moiety fits into the molecule. The pyridine ring is severely constrained by many short intramolecular contacts, and has little free-

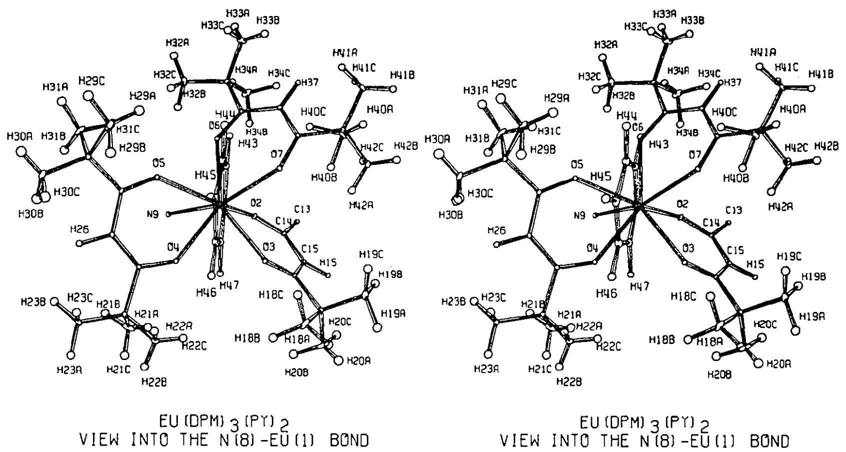

Fig. 5. Stereoview illustrating the intramolecular environment of a complexed pyridine molecule viewed along the Eu(III)–N(8) bond. The methyl groups attached to C(13), and the pyridine ring of N(9), are omitted since these are far from the pyridine ring which is shown. Ellipsoids of 1% probability are used.

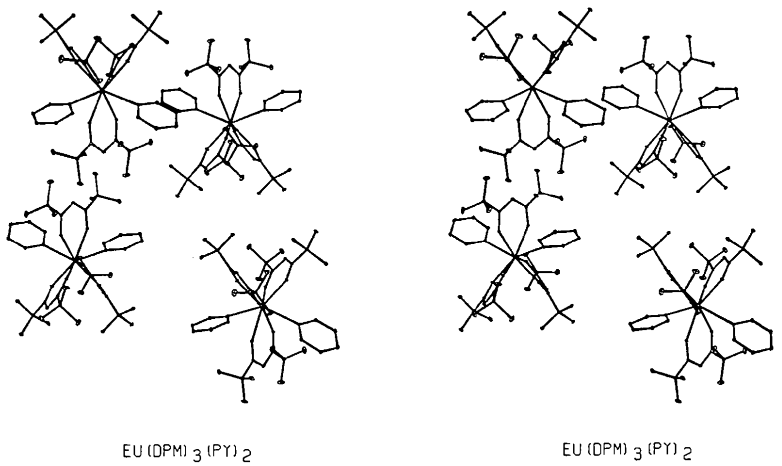

Fig. 6. Stereoview illustrating the packing of Eu(dpm)$_3$(py)$_2$ molecules in the crystal. Ellipsoids of 1 % probability are used.

dom in its choice of position. It exhibits intramolecular distances which are comparable to the sum of van der Waals radii with four chelate ring atoms: O(7)–C(43), 3·12; O(4)–C(47), 3·20; O(5)–C(43), 3·25 and C(25)–C(47), 3·56 Å. In addition, there are two such contacts with methyl groups: C(29)–C(43), 3·72; and C(40)–C(43), 3·77 Å. Furthermore, five other intramolecular contacts are within 0·25 Å of the sum of the van der Waals radii. The pyridine ring is thus relatively fixed in its position, and its thermal parameters are correspondingly small. Even in solution, free rotation on the n.m.r. time scale about the Eu–N bond is not expected.

Table 8. *Some non-bonded interatomic distances*

All intermolecular distances less than 4·0 Å are given, except for those involving hydrogen atoms.

The first atom of each pair has coordinates as given in Table 1. The second atom is related to the first by the symmetry operation given in the subheading.

$(x, y, -1+z)$	C(32)···C(45)	3·74 Å
	C(32)···C(46)	3·68
$(-1+x, y, z)$	C(41)···C(51)	3·80
$(1-x, -y, -z)$	C(30)···C(49)	3·75
	C(30)···C(50)	3·85
$(-x, 1-y, -z)$	C(12)···C(12)	3·57
$(x, y, 1+z)$	C(18)···C(49)	3·67
	C(18)···C(50)	3·70
$(-x, -y, 1-z)$	C(44)···C(45)	3·97
$(1-x, -y, 1-z)$	C(23)···C(46)	3·81
$(-x, 1-y, 1-z)$	C(19)···C(42)	3·96
$(1-x, 1-y, 1-z)$	C(20)···C(52)	3·78

Since the position occupied by the pyridine molecule is so crowded, it is unlikely that substrates with larger steric requirements can adopt this molecular structure. We would expect that donor groups such as primary and secondary alcohols and amines, as well as aldehydes, ketones, carboxylic acids and amides with primary or secondary alpha carbons might be accommodated in a structure of the type described here. However, we would not expect tertiary amines and alcohols, nor aldehydes, ketones, carboxylic acids and amides with tertiary alpha carbon atoms, to adopt this structure. Further structural work is in progress to test this hypothesis.

The low symmetry of Eu(dpm)$_3$(py)$_2$ found in this study does not support the various attempts to correlate observed dipolar shifts with molecular structure through the use of only the $G(\theta,r)$ geometric factor. The appropriate equation, for molecules of this symmetry, requires two geometric factors and is similar to the equation quoted originally by Hinckley (1969). However, a recent treatment of dipolar shifts (Kurland & McGarvey, 1970; McGarvey, 1970) suggests that for a metal ion such as Eu(III), which has multiple populated electronic states (Weissman, 1971), the equation quoted by Hinckley should be modified to yield $\Delta\nu/\nu_0 = D_1(3\cos^2\theta - 1)/r^3 + D_2\sin^2\theta\cos 2\Omega/r^3$. Accordingly, for molecules with less than threefold symmetry, such as Eu(dpm)$_3$(py)$_2$, *two* geometric factors $G(\theta,r)$ and $G(\theta,r,\Omega)$, are needed.

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Structure Cristalline et Moléculaire de la Testostérone Hydratée – Etude de l'Interaction Stéroïde–Eau pour Certains Derivés 17β-ol.

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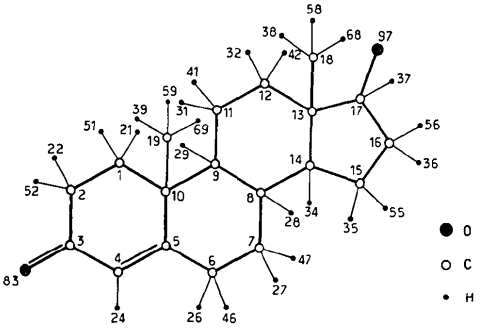
(*Reçu le* 16 *mai* 1972, *revu le* 24 *juin* 1972)

The crystal structure of hydrated testosterone ($P2_1$, $Z=2$; $C_{19}O_2H_{28}.H_2O$) ($a=9{\cdot}622$, $b=8{\cdot}099$, $c=11{\cdot}148$ Å, $\beta=97°49'$) was solved by simultaneous use of symbolic addition and multisolution methods. The final residual is $R=0{\cdot}045$. The molecular conformation of testosterone agrees with those previously described for androstanolone and androstendione. The molecular arrangement looks like that in androstanolone. The particular localization of the water molecule in the 17β ol steroid derivatives is discussed.

Parallèlement à l'étude des composés à action oestrogène (Busetta & Hospital, 1972; Busetta, Courseille, Geoffre & Hospital, 1972) nous avons entrepris un travail analogue sur les stéroïdes à action androgène. Nous présentons ici une structure hydratée de la testostérone. Nous avions remarqué une localisation particulière de la molécule d'eau dans les structures de l'oestradiol hémihydratée et de l'androstanolone (Busetta, Courseille, Fornies Marquina & Hospital, 1972); attribuant cette localisation à la présence du groupement 17β-ol dans ces molécules, nous avons cherché à obtenir également pour la testostérone une forme hydratée. Une forme orthorhombique avait déjà été cristallisée par Thakkar & Jones (1970) à partir d'une solution aqueuse; par évaporation d'une solution de testostérone dans l'éthanol (alcool 95°), nous avons obtenu une forme hydratée différente, appartenant au système monoclinique $P2_1$ relativement voisine de celle de l'androstanolone hydratée.

Les paramètres cristallins mesurés sur un diffractomètre Siemens avec la radiation Cu $K\alpha$ sont représentés ci-dessous:

Groupe spatial monoclinique $P2_1$ $Z=2$
$a=$ 9,622 Å
$b=$ 8,099 $\pm$ 0,005
$c=$ 11,149
$\beta=97{,}81° \pm 0{,}15°$
$V=859{,}3$ Å^3
Composition chimique, $C_{19}O_2H_{28}.H_2O$



I. Détermination de la structure

La structure a été déterminée par méthodes directes en utilisant simultanément l'addition symbolique et la multisolution (Germain, Main & Woolfson, 1970). L'origine a été déterminée par le processus de convergence:

409 $E=4{,}32$ $\Phi=0°$
$\bar{3}01$ $E=2{,}70$ $\Phi=0$
718 $E=2{,}28$ $\Phi=0$

Nous avons utilisé 3 symboles pour amorcer la génération de phases:

608 $E=3{,}05$ m (0 ou π)
237 $E=2{,}91$ a
$\bar{3}16$ $E=2{,}46$ b