precession photographs available to them. All computations have been carried out with the IBM 360 system using a compatible set of programs written for that computer in FORTRAN IV by Ahmed, Hall, Pippy & Huber (1966). Grateful acknowledgement is made to Mrs M. E. Pippy of this laboratory for assistance with the computations, and to the staff of the NRC Computation Centre for their cooperation.

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The Crystal Structure of Cryptopine, $C_{21}H_{23}O_5N$

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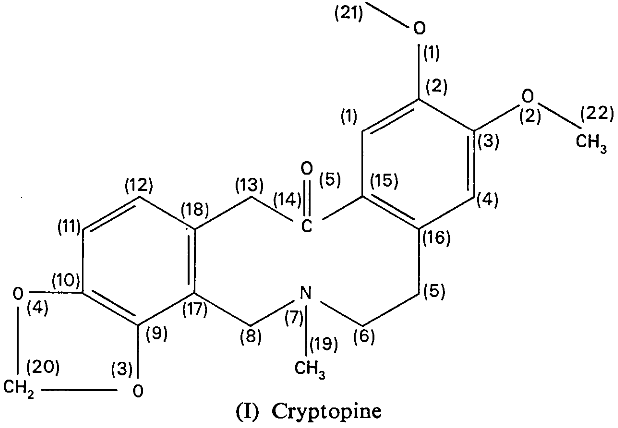
The structure of cryptopine, $C_{21}H_{23}O_5N$, has been determined by the symbolic addition procedure, and has been refined by least squares to an R index of 0·042 for 1948 observed reflexions measured with a scintillation counter. The space group is $P2_1/n$ and the cell dimensions are $a=14{\cdot}438$, $b=8{\cdot}702$, $c=14{\cdot}369$ Å, $\beta=91°22'$. The presence of two methoxyl groups in the cryptopine molecule in place of one of the five-membered rings of the protopine molecule has resulted in significant differences in the angles at the two oxygen atoms and at four carbon atoms of the benzene ring in that part of the two molecules. The short distance between the C atom of the carbonyl group and the nitrogen atom across the ten-membered ring is 2·581 Å in cryptopine as compared with 2·555 Å in protopine. In both structures, the nitrogen atom is well buried in the molecule and has the three C–N bonds and the short C···N distance across the ten-membered ring tetrahedrally arranged around it. The carbon–oxygen double bond has ketonic character and is well off the planes of the aromatic rings.

Introduction

Cryptopine, $C_{21}H_{23}O_5N$, is the dimethyl analogue of protopine, $C_{20}H_{19}O_5N$, whose X-ray crystal structure analysis has been reported by Hall & Ahmed (1968). Reference should be made to the introduction of that paper where the purpose of the X-ray analysis of these two compounds has been discussed. The schematic formula of cryptopine is shown in (I), and the numbering of the atoms is basically the same as that adopted for protopine for ease of comparison of the two molecules.



(I) Cryptopine

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The compound cryptocavine, $C_{21}H_{23}O_5N$, has been described in the literature (*e.g.* Manske & Holmes, 1954, p. 155) to be different from but isomeric with and closely related to cryptopine. Since then, it has been proven by Thomas, Marion & Manske (1955) that cryptocavine is identical with cryptopine and it has been suggested that the designation cryptocavine should be deleted from the literature.

Crystal data

Crystals of cryptopine, $C_{21}H_{23}O_5N$, are monoclinic, space group $P2_1/n$, with unit-cell constants $a=14\cdot438$ ($\sigma=0\cdot004$), $b=8\cdot702$ ($\sigma=00\cdot05$), $c=14\cdot369$ Å ($\sigma=0\cdot004$), $\beta=91°22'$ ($\sigma=3'$); $U=1804\cdot8$ Å^3, mol. wt. 369·42, $D_c=1\cdot359$ g.cm^{-3}; D_m (by flotation at 20°C) $=1\cdot350$ g.cm^{-3} (Barnes, 1967); $\mu(\text{Cu})=8\cdot09$ cm^{-1}, $F(000)=784$. The space-group absences are $h0l$ with $h+l=2n+1$, and $0k0$ when k is odd.

Experimental

For this X-ray analysis, a small prismatic crystal of dimensions 0·07 mm × 0·13 mm in cross section and 0·20 mm in length was mounted with its length (the a axis) along the direction of a glass fibre. Precession photographs were taken for the preliminary examination of the crystal and the space group, but the cell dimensions and intensity data were measured on the General Electric XRD 5 diffractometer using Cu radiation ($\lambda K\alpha_1=1\cdot54050$ Å, $K\alpha_2=1\cdot54434$ Å). Take-off angles of 1° and 2°, and slits of 0·02° and 0·05° were employed during measurements of the 2θ-values of the axial reflexions from which the unit-cell constants were calculated. The β-angle was deduced from the χ-settings of the $h00$ and $00l$ reflexions after they had been centred with the top/bottom device. The intensity data were collected with the goniostat set at a 3° take-off angle, and with Ni filters inserted just before the open counter window. Each lattice site was scanned with the moving-crystal moving-counter method and the background was measured at the beginning and at the end of each scan. The 2θ scan was varied from 3° for the low-angle reflexions to 5° for the high-angle reflexions. All reflexions were first measured with the same tube-current setting, then the exceedingly strong reflexions were remeasured with a lower current setting. Also, most of the very weak reflexions were remeasured prior to the final stages of refinement. The intensity of the 004 reflexion was recorded at short intervals of time during the data collection and was employed for scaling of the data. The net counts of the observed reflexions were reduced to the same relative scale, and the corresponding 1/Lp corrections were applied to them. Errors due to absorption were considered to be negligible.

The number of non-equivalent lattice sites within the range of the instrument was 3914, but only 1948 reflexions were observed above threshold.

Structure determination by symbolic addition

The crystal structure of cryptopine was determined by the symbolic addition procedure for phase determination of centrosymmetric structures, using the same computer programs and the same scattering factor curves as for the protopine structure (Hall & Ahmed, 1968). All the necessary operations were carried out by the program, and without any adjustments by the authors. The statistics of the normalized structure factor amplitudes $|E|$ for cryptopine and those calculated by Karle, Hauptman, Karle & Wing (1958), given in parentheses, were as follows: $\langle|E|\rangle=0\cdot798$ (0·798); $\langle|E^2|\rangle=0\cdot963$ (1·000); $\langle|E^2-1|\rangle=0\cdot962$ (0·968); reflexions with $|E|>3$ were 0·49% (0·3%); reflexions with $|E|>2$ were 4·27% (5%); and reflexions with $|E|>1$ were 30·35% (32%).

The procedure of sign determination was confined to the 458 reflexions with $|E|>1\cdot500$. For each of these reflexions a separate list was assembled containing all the pairs of reflexions with $|E|>2\cdot0$ which if combined with the original reflexion would satisfy the Σ_2 relationship. The three reflexions 11,1,1; 458; 12,2,1 which were selected by the program as the origin-defining reflexions, had the largest $|E|$ values in the data. The 12,1,3 reflexion, which had the fourth largest $|E|$ value, was also selected by the program for defining the symbol A, and it was not necessary to assume any other symbol. The first stage of sign determination was performed on the 167 reflexions with $|E|>2\cdot0$, and this operation was successful in fixing the signs of 163 of these reflexions. All these signs were found later to be correct. Correlation of the symbol A with corresponding positive and negative signs for each of these reflexions showed 283 coincidences in favour of A being a negative value, as compared with only 40 coincidences against. The symbol A was therefore taken as negative, and the signs of the remaining reflexions with $|E|>1\cdot500$ were determined directly from the Σ_2 relationship. Altogether, the signs were fixed for 449 out of the 458 reflexions, and only two of these reflexions were found later to be incorrectly signed.

The E map which was computed with the 449 reflexions gave the complete structure (with the exception of the hydrogen atoms). A composite drawing of the cryptopine molecule as deduced from the E map is shown in Fig. 1. The peak heights for the atoms, on a relative scale, varied between 3·5 and 9·3, and the highest spurious peak was only 2·5. The atomic positions for the trial model were taken from the E map, and their isotropic temperature factors were assumed between 2·9 and 4·6 Å^2 depending on their peak heights. The R index corresponding to these starting parameters was 0·24.

Refinement

The assumed structure was refined by successive cycles of block-diagonal least-squares. The R index was reduced to 0·15 after the first two cycles of refinement with isotropic temperature factors, and it was reduced to 0·09 after four cycles with anisotropic thermal parameters. A difference map was computed at this stage and positions of all the hydrogen atoms were derived from it. The peak heights for the hydrogen atoms were between 0·35 and 0·60 e.Å^{-3}, and the residual electron density elsewhere was within ±0·20 e.Å^{-3}. One more cycle of refinement was carried out with the hydrogen atoms included, assuming isotropic temperature factors for them. Consequently, the *R* index was reduced to 0·053. The refinement was interrupted at this stage until most of the weak reflexions were remeasured in order to improve on their counting statistics. The final three cycles of this refinement were carried out with the modified data, assuming the thermal vibration to be anisotropic for the C, N, and O atoms and isotropic for the hydrogen atoms. The *R* index was reduced very slowly to 0·045. A final difference map which was evaluated with all the atoms subtracted showed a residual electron density within ±0·15 e.Å^{-3}.

Throughout this refinement, the weights were calculated by the expression

$$w=1/\sigma^2(|F_o|)\,, \quad \text{or}$$
$$w=4\{(\text{net count})^2/[|F_o|^2\,.\,\sigma^2(\text{net count})]\}\,, \qquad (1)$$

where σ^2(net count) = (total count + background count). These weights were based on the counting statistics of the intensity data, and the expression was derived assuming the time spent in measuring the total count to be the same as that spent in measuring the background. However, in order to examine the effect of this weighting scheme on the final parameters, the last three cycles of refinement were repeated, starting with the same parameters of that stage, but this time the weights were calculated by the expression

$$w=1/\{1+[(|F_o|-60)/40]^2\} \qquad (2)$$

which had been employed in the refinement of the protopine structure. The *R* index this time was reduced to 0·042.

The average shifts in the final cycles of both refinements were about 0·2 of the e.s.d.'s, and the maximum shifts were within 0·7 of the e.s.d.'s.

Results

The final parameters as derived from the least-squares refinement with weighting scheme (2) are given in Table 1 for the C, N, and O atoms and in Table 2 for the H atoms. The e.s.d.'s for these parameters were calculated from expression 6.4.3(6) of *International Tables for X-ray Crystallography* (1959, p. 330) and increased by 50% in order to allow for the omission of the unobserved reflexions. The observed structure amplitudes and the structure factors calculated with the parameters in Tables 1 and 2 are listed in Table 3. Each of the 1948 observed reflexions has $|\Delta F|/|F_o| \leq$ 0·10 or $|\Delta F| \leq |F_{\rm th}|$. The $|F_c|$ values for the unobserved reflexions are $\leq |F_{\rm th}|$ for 1846 reflexions, $1{\cdot}5|F_{\rm th}| \geq |F_c| > |F_{\rm th}|$ for 119 reflexions, and $|F_c| > 2|F_{\rm th}|$ for only one reflexion, namely the $15,4,\bar{9}$, for which $|F_c| = 6{\cdot}0$ and $|F_{\rm th}| = 2{\cdot}7$. The observed structure amplitudes are within the range $3{\cdot}2 \leq |F_o| \leq 161{\cdot}5$, and the threshold amplitudes are between 2·0 and 8·8.

The bond lengths and their e.s.d.'s (Ahmed & Cruickshank, 1953), and the bond angles and their e.s.d.'s (*International Tables for X-ray Crystallography*. 1959, p. 331) are presented in Fig. 2. All values in Fig. 2 do not include the correction for thermal vibration. The following angles have been excluded from this figure for simplicity: C(16)–C(5)–H(4), 110·0° (2·3); C(6)–C(5)–H(3), 109·6° (2·2); N(7)–C(6)–H(5), 108·7° (2·5); C(5)–C(6)–H(6), 109·7° (2·0); N(7)–C(8)–H(8), 107·8° (2·1); C(17)–C(8)–H(7), 113·1° (2·3); C(18)–C(13)–H(12), 109·5° (2·2); C(14)–C(13)–H(11), 105·4° (2·1); N(7)–C(19)–H(14), 112·2° (2·3); H(13)–C(19)–H(15), 102·9° (3·6); O(3)–C(20)–H(17), 109·7° (2·5); O(4)–C(20)–H(16), 112·8° (2·8); O(1)–C(21)–H(19), 111·5° (2·7); H(18)–C(21)–H(20), 105·2° (3·5); O(2)–C(22)–H(22), 107·7° (2·5); H(21)–C(22)–H(23), 117·3° (3·5).

The distance N(7)···C(14) across the ten-membered ring is 2·581 Å, and it makes angles of 108·6, 108·6, and 102·7° with the bonds N(7)–C(6), N(7)–C(8), and

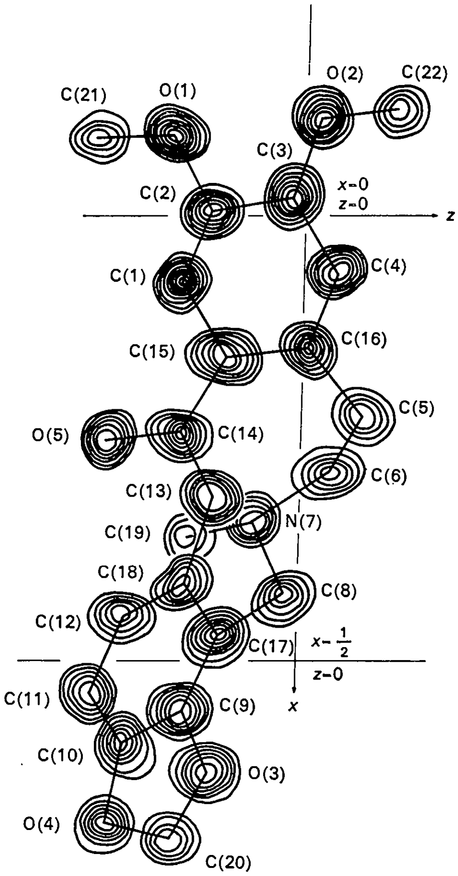

Fig. 1. Composite drawing of the cryptopine molecule from the *E*-map.

Table 1. *Fractional coordinates, vibration tensor components* (Å^2) *for the expression* $T=\exp[-2\pi^2(U_{11}a^{*2}h^2+\ldots+2U_{23}b^*c^*kl+\ldots)]$, *and their e.s.d.'s* (*all quantities* × 10^4)

	x	y	z	U_{11}	U_{22}	U_{33}	$2U_{23}$	$2U_{13}$	$2U_{12}$
C(1)	−4223 (3)	3781 (5)	3636 (3)	293 (21)	411 (27)	297 (20)	−17 (42)	72 (33)	−11 (41)
C(2)	−5092 (3)	3506 (5)	3986 (3)	285 (21)	440 (28)	322 (22)	−56 (43)	−32 (35)	−11 (42)
C(3)	−5169 (3)	2825 (5)	4859 (3)	285 (22)	451 (30)	413 (25)	−7 (46)	196 (36)	18 (42)
C(4)	−4372 (3)	2492 (6)	5367 (3)	343 (22)	553 (31)	293 (22)	1 (46)	156 (35)	28 (47)
C(5)	−2668 (3)	2383 (6)	5673 (3)	343 (22)	657 (34)	254 (20)	94 (47)	−2 (35)	60 (49)
C(6)	−2076 (3)	1113 (6)	5254 (3)	355 (24)	442 (30)	384 (25)	198 (46)	−74 (38)	−17 (44)
N(7)	−1543 (2)	1733 (4)	4486 (2)	295 (17)	375 (22)	345 (19)	118 (34)	4 (28)	4 (34)
C(8)	−678 (3)	2459 (6)	4827 (3)	287 (21)	470 (29)	385 (23)	56 (46)	−106 (35)	26 (45)
C(9)	580 (3)	3446 (5)	3791 (3)	247 (21)	384 (27)	452 (25)	−86 (45)	−72 (36)	67 (40)
C(10)	919 (3)	4397 (6)	3119 (3)	311 (22)	503 (31)	403 (25)	−18 (46)	73 (38)	−151 (44)
C(11)	392 (3)	5507 (6)	2704 (3)	413 (27)	557 (34)	454 (28)	219 (52)	52 (42)	−235 (51)
C(12)	−522 (3)	5649 (6)	3023 (3)	380 (25)	422 (31)	593 (31)	177 (51)	−122 (46)	−22 (47)
C(13)	−1845 (3)	4923 (5)	4045 (3)	304 (22)	356 (28)	515 (28)	17 (45)	38 (39)	147 (41)
C(14)	−2535 (3)	3780 (5)	3628 (3)	264 (21)	508 (30)	303 (22)	125 (44)	−13 (33)	107 (43)
C(15)	−3409 (3)	3452 (5)	4156 (3)	256 (21)	410 (28)	305 (22)	−86 (42)	−25 (33)	−32 (40)
C(16)	−3487 (3)	2834 (5)	5042 (3)	285 (21)	485 (30)	305 (22)	−60 (43)	−36 (35)	67 (42)
C(17)	−315 (3)	3536 (5)	4110 (3)	257 (21)	389 (27)	370 (23)	−6 (42)	−24 (33)	−38 (40)
C(18)	−862 (3)	4701 (5)	3707 (3)	293 (21)	391 (28)	418 (25)	−39 (44)	−44 (36)	−44 (41)
C(19)	−1374 (3)	617 (6)	3761 (3)	512 (28)	481 (32)	472 (28)	−120 (50)	173 (46)	25 (52)
C(20)	2077 (3)	2853 (6)	3623 (3)	305 (24)	582 (36)	692 (34)	−5 (58)	103 (46)	2 (49)
C(21)	−5858 (3)	4681 (7)	2685 (3)	324 (24)	812 (42)	506 (30)	389 (60)	−232 (44)	45 (54)
C(22)	−6143 (3)	1805 (7)	6030 (3)	404 (25)	846 (44)	465 (28)	141 (58)	302 (44)	−267 (57)
O(1)	−5912 (2)	3831 (4)	3522 (2)	249 (14)	673 (24)	444 (17)	221 (35)	−88 (25)	17 (32)
O(2)	−6049 (2)	2523 (4)	5138 (2)	278 (14)	775 (26)	463 (17)	222 (38)	131 (27)	−78 (34)
O(3)	1243 (2)	2388 (4)	4074 (2)	273 (14)	584 (24)	695 (22)	259 (39)	134 (28)	127 (32)
O(4)	1827 (2)	4007 (4)	2947 (2)	292 (16)	741 (27)	673 (22)	95 (41)	261 (30)	−37 (34)
O(5)	−2491 (2)	3373 (4)	2826 (2)	297 (14)	729 (24)	293 (16)	0 (33)	33 (25)	8 (33)

N(7)–C(19), respectively. It also makes angles of 85·0, 95·2, and 102·3° with C(14)–C(13), C(14)–C(15), and C(14)–O(5), respectively.

Discussion

Effect of the weighting scheme

The mean differences in the final parameters of the two refinements with different weighting schemes as described previously were about 0·5 of the corresponding e.s.d.'s, and the largest differences were below 1·8 times the e.s.d.'s. The mean and the maximum changes in the bond lengths and angles were as follows: 0·002 and 0·006 Å in bonds not involving hydrogen atoms, 0·02 and 0·06 Å in the C–H bonds, 0·13 and 0·4° in angles not involving C–H bonds, and 0·9 and 4·2° in angles involving C–H bonds. The largest difference of 4·2° was observed for the H(16)–C(20)–H(17) angle which was 120·3° for the results of weighting scheme (1), and 116·1° for those of weighting scheme (2). The latter value was obviously closer to that for the tetrahedral angle which was to be expected there.

The second weighting scheme, therefore, resulted in a slight improvement in the overall agreement between the observed structure amplitudes and calculated structure factors, and also in the general dimensions for the bond lengths and angles, although the individual differences in these dimensions were always well below the significance level.

Bond lengths and angles

Comparison of the lengths of the individual C–C, C–N, and C–O bonds in the protopine and cryptopine molecules by means of the t test shows that $P > 5\%$ for 21 bonds, $5\% \geq P > 1\%$ for six bonds, and $1\% > P$ for three bonds, namely C(1)–C(2), C(2)–C(3), and C(13)–C(18), for which the bond lengths in the two structures differ by 0·020, 0·019, and 0·020 Å, respectively. A significant difference of 0·026 Å is also observed in the N(7)···C(14) distance across the ten-

Table 2. *Fractional coordinates* (× 10^3) *and isotropic temperature factors* (Å^2) *of the hydrogen atoms, and their e.s.d.'s*

	x	y	z	B
H(1)	−417 (3)	416 (5)	296 (3)	2·8 (0·9)
H(2)	−442 (2)	199 (4)	597 (2)	1·7 (0·7)
H(3)	−225 (3)	336 (5)	582 (3)	3·9 (1·0)
H(4)	−289 (3)	203 (5)	628 (3)	3·2 (0·9)
H(5)	−247 (3)	25 (5)	501 (3)	4·3 (1·0)
H(6)	−162 (2)	64 (5)	578 (3)	2·7 (0·8)
H(7)	−22 (3)	159 (5)	500 (3)	3·4 (0·9)
H(8)	−83 (2)	309 (5)	541 (3)	2·9 (0·9)
H(9)	61 (3)	617 (5)	216 (3)	3·5 (0·9)
H(10)	−92 (3)	647 (5)	273 (3)	3·5 (0·9)
H(11)	−207 (2)	598 (5)	383 (2)	2·4 (0·8)
H(12)	−184 (3)	490 (5)	475 (3)	3·0 (0·9)
H(13)	−199 (3)	30 (5)	345 (3)	4·7 (1·1)
H(14)	−102 (3)	107 (5)	323 (3)	4·0 (1·0)
H(15)	−109 (3)	−43 (6)	399 (3)	5·1 (1·2)
H(16)	232 (3)	189 (6)	333 (3)	5·9 (1·3)
H(17)	252 (3)	339 (5)	410 (3)	4·8 (1·1)
H(18)	−553 (3)	576 (5)	278 (3)	3·7 (1·0)
H(19)	−552 (3)	408 (6)	219 (3)	5·5 (1·2)
H(20)	−649 (3)	491 (5)	249 (3)	4·7 (1·1)
H(21)	−590 (3)	255 (5)	651 (3)	3·4 (0·9)
H(22)	−677 (3)	169 (5)	614 (3)	3·6 (0·9)
H(23)	−580 (3)	67 (6)	600 (3)	6·0 (1·3)

Table 3. *Observed structure amplitudes and calculated structure factors* (×10)

* indicates unobserved reflexion and $|F_{\rm th}|$ in place of $|F_o|$.

K	FO	FC
H=	0, L=	0
2	897	-909
4	48*	-12
6	133	-112
8	150	147
10	127	-131
H=	0, L=	1
1	847	867
2	1311	1339
3	291	-300
4	235	-243
5	57*	29
6	211	-215
7	146	156
8	88	86
9	68*	49
10	90	78
11	57	-56
H=	0, L=	2
0	724	732
1	1371	1396
2	1615	-1640
3	661	666
4	582	577
5	299	-299
6	64*	-56
7	70*	34
8	174	170
9	140	148
10	56*	-10
11	33*	-6
H=	0, L=	3
1	1314	-1325
2	665	674
3	326	322
4	115	-117
5	320	334
6	125	-120
7	153	-153
8	114	107
9	67*	18
10	77	68
H=	0, L=	4
0	385	-390
1	297	-301
2	284	-281
3	170	-178
4	482	488
5	94	-104
6	236	-249
7	163	161
8	72*	-58
9	67*	20
10	53*	24
H=	0, L=	5
1	194	200
2	369	-364
3	106	102
4	84	79
5	98	81
6	68*	36
7	379	-386
8	72*	-26
9	65*	-29
10	50*	-30
H=	0, L=	6
0	125	-115
1	409	-395
2	158	-145
3	163	-163
4	66	65
5	159	-159
6	325	-323
7	117	126
8	71*	26
9	121	-113
10	62	72
H=	0, L=	7
1	228	-221
2	323	-300
3	216	-211
4	297	303
5	67	80
6	70*	25
7	72*	-38
8	155	-153
9	134	137
10	40*	18
H=	0, L=	8
0	555	546
1	263	-246
2	77	-78
3	103	97
4	91	87
5	77	81
6	72*	-13
7	71*	29
8	76	82
9	88	-82
H=	0, L=	9
1	349	334
2	62*	35
3	171	-175
4	77	72
5	154	136
6	77	-64
7	78	70
8	84	-82
9	48*	-17
H=	0, L=	10
0	356	358
1	97	98
2	115	-92
3	73	57
4	92	75
5	73*	-5
6	72*	4
7	66*	18
8	56*	-23
9	40*	13
H=	0, L=	11
1	91	-85
2	167	147
3	72*	-25
4	90	-74
5	72*	68
6	69*	-42
7	61*	-11
8	46	41
H=	0, L=	12
0	131	-123
1	114	-101
2	133	-129
3	100	-100
4	124	129
5	114	116
6	65*	14
7	55*	25
8	41*	36
H=	0, L=	13
1	119	101
2	74*	-2
3	125	-125
4	71*	-12
5	66*	52
6	59*	21
7	47*	19
H=	0, L=	14
0	163	161
1	73*	1
2	71*	-55
3	115	-116
4	66*	-42
5	60*	-26
6	50*	-28
7	36*	-18
H=	0, L=	15
1	68*	48
2	170	167
3	84	-72
4	59	-68
5	51	-43
6	56	-60
H=	0, L=	16
0	62*	-47
1	75	77
2	59*	35
3	55*	36
4	50*	57
5	38*	-22
H=	0, L=	17
1	63	-56
2	49*	40
3	66	78
4	35*	35
H=	0, L=	18
0	55	-60
1	38*	-36
2	33*	-33
H=	1, L=	0
1	145	-141
2	232	227
3	417	-431
4	362	364
5	56*	-20
6	63*	37
7	70*	-5
8	116	-117
9	137	117
10	57*	-48
11	35*	-12
H=	1, L=	1
0	69	68
1	658	-670
2	484	-484
3	185	189
4	157	-160
5	57*	34
6	173	169
7	70*	-72
8	71*	46
9	67*	-48
10	56*	24
11	35*	5
H=	1, L=	-1
0	32	-33
1	273	-281
2	727	-743
3	623	-628
4	170	172
5	169	170
6	320	-313
7	68*	-17
8	72	68
9	67*	-40
10	55*	53
11	34*	-28
H=	1, L=	2
1	412	408
2	565	568
3	109	-109
4	289	-294
5	89	80
6	128	-120
7	70*	-19
8	72*	-26
9	68*	53
10	55*	-25
11	45	-40
H=	1, L=	-2
1	284	279
2	436	-440
3	280	-280
4	129	-114
5	57*	18
6	64*	-15
7	306	-297
8	104	98
9	92	-95
10	54*	-2
H=	1, L=	3
0	995	997
1	1190	-1209
2	710	708
3	221	221
4	276	280
5	359	-356
6	65*	4
7	70*	-45
8	135	-120
9	67*	-13
10	54*	-25
H=	1, L=	-3
0	251	244
1	124	128
2	762	-772
3	126	-135
4	542	552
5	225	228
6	302	-307
7	164	156
8	84	-66
9	100	101
10	53*	-51
H=	1, L=	4
1	281	287
2	189	199
3	187	195
4	91	-98
5	218	229
6	66*	-44
7	72*	-36
8	72*	31
9	91	99
10	52*	23
H=	1, L=	-4
1	329	-323
2	130	121
3	265	-266
4	312	325
5	449	448
6	165	-178
7	70*	15
8	71*	41
9	63*	-59
10	54	59
H=	1, L=	5
0	41*	-28
1	424	-425
2	586	-589
3	544	549
4	318	306
5	197	205
6	190	193
7	190	200
8	71*	3
9	65*	6
10	49*	10
H=	1, L=	-5
0	223	228
1	116	112
2	44*	-41
3	123	123
4	430	434
5	62*	-24
6	162	-162
7	171	-182
8	169	157
9	62*	45
10	48*	15
H=	1, L=	6
1	47*	5
2	111	112
3	349	-354
4	60*	-33
5	65*	52
6	127	132
7	72*	-27
8	114	107
9	60*	47
10	45*	-22
H=	1, L=	-6
1	171	174
2	383	371
3	53*	-42
4	62	56
5	64*	-11
6	191	-195
7	71*	42
8	69*	-56
9	96	98
10	44*	6
H=	1, L=	7
0	207	199
1	130	141
2	363	-357
3	220	-217
4	63*	68
5	210	-229
6	117	-124
7	114	120
8	68*	-18
9	57*	-25
10	39*	-8
H=	1, L=	-7
0	725	718
1	281	271
2	53	55
3	310	-316
4	200	-208
5	67*	-44
6	122	-113
7	71*	39
8	67*	53
9	59	44
10	39*	32
H=	1, L=	8
1	143	141
2	85	-92
3	124	113
4	66*	-19
5	256	-274
6	132	-131
7	138	-133
8	65*	-25
9	62	68
H=	1, L=	-8
1	205	195
2	183	-178
3	130	-124
4	65*	47
5	69*	53
6	94	90
7	78	-82
8	64*	54
9	52*	21
H=	1, L=	9
0	60*	44
1	74	79
2	163	-167
3	65*	59
4	88	75
5	80	-83
6	72	-71
7	69*	-54
8	61*	-15
9	47*	-12
H=	1, L=	-9
0	58*	-44
1	94	83
2	134	-122
3	322	-311
4	69*	-59
5	117	103
6	188	178
7	68*	8
8	60*	-34
9	46*	16
H=	1, L=	10
1	147	-150
2	67*	-35
3	69*	-30
4	281	288
5	73*	19
6	71*	-25
7	66*	26
8	55*	-39
9	46	50
H=	1, L=	-10
1	231	-236
2	173	-168
3	114	99
4	133	133
5	178	179
6	115	-120
7	80	-79
8	55*	11
9	39*	6
H=	1, L=	11
0	119	105
1	69*	-6
2	106	-119
3	81	76
4	143	146
5	88	-72
6	69*	71
7	61*	9
8	76	-74
H=	1, L=	-11
0	124	-110
1	297	305
2	69*	-7
3	71*	18
4	99	-110
5	71*	67
6	107	104
7	61*	-12
8	70	-74
H=	1, L=	12
1	72	66
2	151	-155
3	73*	62
4	73*	-56
5	70*	42
6	64*	-4
7	55*	-18
8	40*	-16
H=	1, L=	-12
1	71*	24
2	72*	7
3	73*	-82
4	128	136
5	69*	36
6	71	-68
7	54*	-34
8	41*	33
H=	1, L=	13
0	109	90
1	135	-139
2	74*	21
3	72*	51
4	79	82
5	66*	-23
6	58*	-12
7	59	59
H=	1, L=	-13
0	199	202
1	72*	-3
2	72*	79
3	72*	-43
4	129	-143
5	66*	72
6	58*	18
7	94	-91
H=	1, L=	14
1	102	102
2	71*	-61
3	92	-91
4	66*	29
5	60*	3
6	83	77
7	35*	18
H=	1, L=	-14
1	71*	-19
2	127	-130
3	69*	22
4	66*	28
5	60*	-10
6	50*	-15
7	35*	-23
H=	1, L=	15
0	68*	-22
1	68*	-25
2	58	-55
3	107	117
4	59*	-14
5	50*	-42
6	38*	23
H=	1, L=	-15
0	68*	-72
1	100	-102
2	66*	10
3	63*	-55
4	58*	-3
5	51*	22
6	60	-56
H=	1, L=	16
1	61*	41
2	59*	35
3	55*	-58
4	49*	-26
5	38*	1
H=	1, L=	-16
1	97	-96
2	59	56
3	55*	44
4	49*	-28
5	39*	9
H=	1, L=	17
0	78	-73
1	51*	-7
2	49*	28
3	43*	27
4	33*	22
H=	1, L=	-17
0	52*	-9
1	50*	-8
2	48*	-41
3	43*	55
4	52	48
H=	1, L=	18
1	37*	-2
H=	1, L=	-18
1	37*	18
2	32*	33
H=	2, L=	0
0	307	304
1	28*	28
2	106	105
3	195	202
4	100	106
5	57*	13
6	78	-94
7	158	143
8	72*	-25
9	67*	32
10	120	-121
11	33*	30
H=	2, L=	1
1	385	389
2	878	-888
3	486	-488
4	117	127
5	203	-201
6	71	-62
7	70*	-44
8	72*	59
9	75	-79
10	73	69
11	33*	-43
H=	2, L=	-1
1	350	351
2	414	-418
3	47	-39
4	212	198
5	100	89
6	75	64
7	77	73
8	71*	-71
9	67*	17
10	54*	52
H=	2, L=	2
0	129	127
1	465	460
2	1393	-1404
3	180	179
4	91	-94
5	168	-151
6	65*	-28
7	70*	-52
8	72*	72
9	67*	43
10	54*	-38
H=	2, L=	-2
0	83	-81
1	250	262
2	72	-75
3	82	74
4	97	101
5	129	120
6	82	87
7	69*	-9
8	71*	46
9	107	-107
10	53*	5
H=	2, L=	3
1	146	-145
2	777	778
3	435	-445
4	116	112
5	73	74
6	75	-72
7	70*	-2
8	102	94
9	66*	1
10	98	-84
H=	2, L=	-3
1	34*	3
2	438	-446
3	91	-99
4	259	267
5	59*	-3
6	65*	53
7	69*	-40
8	131	-126
9	174	175
10	52*	-9
H=	2, L=	4
0	38*	31
1	843	835
2	201	-202
3	227	-239
4	452	452
5	60*	-10
6	192	-196
7	130	-126
8	72*	16
9	70	60
10	51*	3
H=	2, L=	-4
0	196	207
1	232	-233
2	42*	-10
3	503	-497
4	526	523
5	70	52
6	182	-183
7	70*	-42
8	71*	-38
9	63*	37
10	50*	24
H=	2, L=	5
1	43*	10
2	346	-337
3	233	226
4	275	-282
5	86	88
6	68*	-26
7	105	-110
8	71*	54
9	64*	22
10	48*	-46
H=	2, L=	-5
1	86	82
2	143	145
3	564	557
4	70	-61
5	62*	-18
6	115	-104
7	173	-170
8	138	135
9	65	73
10	47*	-29
H=	2, L=	6
0	55	74
1	48*	-28
2	305	307
3	484	-491
4	145	133
5	150	165
6	166	-173
7	246	-249
8	70*	8
9	59*	32
10	44*	32
H=	2, L=	-6
0	180	172
1	483	482
2	757	-734
3	54*	-35
4	274	272
5	105	-104
6	70*	37
7	75	-68
8	68*	47
9	79	75
10	43*	-12
H=	2, L=	7
1	246	247
2	55*	-48
3	102	-96
4	64*	45
5	127	130
6	71*	42
7	72*	49
8	68*	15
9	56*	28
10	40	-41
H=	2, L=	-7
1	66	-64
2	350	345
3	143	-130
4	63	76
5	162	-172
6	179	-172
7	88	86
8	82	78
9	55*	20
10	38*	-41
H=	2, L=	8
0	75	-52
1	220	212
2	94	95
3	322	321
4	79	79
5	315	322
6	102	90
7	71*	-13
8	64*	45
9	52*	-5
H=	2, L=	-8
0	580	577
1	55*	59
2	405	-394
3	61*	-19
4	66*	5
5	244	258
6	72*	-5
7	70*	-10
8	64*	21
9	51*	56
H=	2, L=	9
1	92	-82
2	90	-92
3	66	59
4	70*	79
5	67	59
6	125	115
7	69*	-7
8	56	50
9	46*	-27
H=	2, L=	-9
1	113	100
2	110	-114
3	130	131
4	70*	-3
5	109	-103
6	72*	-5
7	68*	11
8	63	59
9	45*	-34
H=	2, L=	10
0	65*	5
1	209	-212
2	214	-213
3	129	-120
4	154	-164
5	73*	-36
6	71*	40
7	65*	-47
8	55*	10
9	38*	26
H=	2, L=	-10
0	204	200
1	65*	-17
2	66*	-53
3	186	-181
4	118	113
5	72*	26
6	70*	-31
7	65*	-36
8	64	-51
9	38*	29
H=	2, L=	11
1	70*	-2
2	107	-94
3	123	-115
4	146	-151
5	121	-116
6	68*	-25
7	60*	-8
8	48*	12
H=	2, L=	-11
1	69*	-59
2	69*	39
3	162	-161
4	73*	-9
5	71*	59
6	125	-124
7	60*	14
8	48*	-21
H=	2, L=	12
0	230	220
1	152	138
2	82	-63
3	73	70
4	131	-146
5	89	-91
6	63*	34
7	54*	-44
8	39*	-23
H=	2, L=	-12
0	86	-94
1	142	-141
2	72*	-23
3	73*	-16
4	73*	-61
5	70	70
6	63*	13
7	108	-90
8	40*	20
H=	2, L=	13
1	101	-103
2	219	224
3	187	187
4	70*	-1
5	65*	-20
6	57*	15
7	45*	-27
H=	2, L=	-13
1	72*	65
2	72*	-1
3	72*	-31
4	161	172
5	65*	2
6	57*	-10
7	46*	-22
H=	2, L=	14
0	132	-114
1	72*	27
2	103	88
3	68*	8
4	65*	18
5	59*	38
6	49*	-14
7	61	-61
H=	2, L=	-14
0	210	-207
1	117	-111
2	159	162
3	68*	1
4	65*	-21
5	79	67
6	49*	-3
7	37	21
H=	2, L=	15
1	106	-95
2	147	-155
3	94	74
4	50*	-9
5	49*	27
6	37*	-16
H=	2, L=	-15
1	66*	33
2	65*	5
3	62*	44
4	58*	-22
5	50*	35
6	37*	-36
H=	2, L=	16
0	60*	37
1	60*	5
2	58*	53
3	90	-77
4	75	-61
5	82	82
H=	2, L=	-16
0	68	-74
1	64	-66
2	71	79
3	54*	17
4	48*	-9
5	37*	-24
H=	2, L=	17
1	66	57
2	47*	-23
3	41*	-17
H=	2, L=	-17
1	50*	-6
2	48*	-10
3	42*	30
4	32*	30
H=	2, L=	18
0	36*	-10
1	100	106
H=	2, L=	-18
0	37*	-30
1	36*	-36
H=	3, L=	0
1	260	-263
2	346	349
3	194	188
4	56	66
5	59*	49
6	56	-65
7	71*	10
8	77	71
9	139	126
10	77	-74
H=	3, L=	1
0	111	119
1	924	925
2	70	71
3	198	198
4	208	209
5	208	208
6	97	-102
7	61	-60
8	71*	-11
9	67*	-35
10	76	70
H=	3, L=	-1
0	907	901
1	107	-104
2	344	351
3	142	-149
4	50*	-7
5	250	-243
6	65*	44
7	77	-72
8	71*	31
9	66*	26
10	53*	27
H=	3, L=	2
1	495	-501
2	689	-690
3	625	626
4	211	204
5	183	180
6	66*	26
7	71*	-68
8	102	-104
9	66*	27
10	53*	45
H=	3, L=	-2
1	285	287
2	261	-257
3	134	135
4	219	-216
5	59*	10
6	65*	-14
7	69*	29
8	71*	50
9	65*	-38
10	52*	-36
H=	3, L=	3
0	534	535
1	129	-142
2	150	149
3	529	-527
4	86	-86
5	230	209
6	193	186
7	71*	26
8	71	-76
9	65*	-26
10	52*	-35
H=	3, L=	-3
0	934	-933
1	488	-496
2	70	-61
3	347	346
4	160	-152
5	61*	0
6	66*	6
7	70*	-60
8	71*	25
9	64*	-4
10	51*	27
H=	3, L=	4
1	42*	39
2	440	-433
3	117	-111
4	87	-83
5	129	-130
6	164	168
7	72*	46
8	71*	-8
9	72	-73
10	87	80
H=	3, L=	-4
1	168	-174
2	389	377
3	49*	34
4	232	-238
5	118	-115
6	191	189
7	70*	-54
8	66	70
9	62*	-2
10	48*	-26
H=	3, L=	5
0	165	-154
1	45*	32
2	219	-220
3	225	228
4	617	-616
5	64*	-22
6	69*	27
7	157	-138
8	71*	64
9	61*	-20
10	46*	7
H=	3, L=	-5
0	43*	-55
1	80	-82
2	129	124
3	381	375
4	114	-105
5	63*	15
6	91	94
7	71*	49
8	70*	-61
9	60*	-3
10	45*	11
H=	3, L=	6
1	71	-68
2	419	431
3	154	-161
4	217	220
5	172	-169
6	70*	0
7	72*	10
8	73	-81
9	77	-77
10	42*	7
H=	3, L=	-6
1	128	131
2	94	-84
3	84	-76
4	204	-198
5	167	186
6	70*	-22
7	71*	-20
8	68*	40
9	57*	-37
10	41*	-9
H=	3, L=	7
0	80	93
1	86	-94
2	56*	40
3	154	155
4	65*	-1
5	247	-254
6	71*	-39
7	72*	-32
8	67*	-4
9	54	-59
10	35*	-18
H=	3, L=	-7
0	223	-224
1	133	-135
2	178	175
3	132	126
4	64	-60
5	79	-61
6	71*	39
7	122	-109
8	99	-83
9	54*	11
10	35*	-31
H=	3, L=	8
1	60*	-9
2	61*	15
3	64*	-29
4	222	-218
5	228	233
6	111	-111
7	76*	65
8	63*	-33
9	81	-67
H=	3, L=	-8
1	60	-66
2	59*	-38
3	238	-244
4	86	83
5	70	-66
6	114	-103
7	69*	43
8	63*	28
9	50*	23
H=	3, L=	9
0	63*	-56
1	177	168
2	92	85
3	170	-165
4	137	148
5	158	-147
6	77	-71
7	129	131
8	59*	55
9	44*	-7
H=	3, L=	-9
0	56	-57
1	146	151
2	164	166
3	67*	-30
4	155	-165
5	71*	-61
6	72*	-14
7	67*	-36
8	59*	41
9	44*	6
H=	3, L=	10
1	67*	-21
2	68*	59
3	120	112
4	73*	-39
5	73*	34
6	70*	60
7	64*	24
8	53*	12
9	35*	13
H=	3, L=	-10
1	266	271
2	189	-189
3	150	-154
4	124	123
5	72*	-9
6	78	80
7	69	86
8	54*	28
9	35*	-31
H=	3, L=	11
0	70*	-56
1	117	128
2	229	239
3	73*	-16
4	74*	57
5	199	209
6	92	-93
7	59*	33
8	46*	33
H=	3, L=	-11
0	186	-189
1	70*	-54
2	70*	39
3	117	-107
4	73*	75
5	168	176
6	67*	38
7	59*	-11
8	47*	18
H=	3, L=	12
1	73*	46
2	74*	16
3	73*	30
4	72*	40
5	69*	4
6	62*	-2
7	52*	-1
8	36*	-29
H=	3, L=	-12
1	71*	-41
2	167	-156
3	84	84
4	81	90
5	69*	29
6	62*	17
7	52*	-16
8	37*	-8
H=	3, L=	13
0	132	-132
1	74*	47
2	73*	-37
3	175	-161
4	89	-77
5	87	76
6	56*	9
7	43*	-41
H=	3, L=	-13
0	231	-241
1	111	105
2	96	105
3	71*	18
4	128	126
5	64*	7
6	56*	-23
7	44	-45
H=	3, L=	14
1	104	-100
2	70*	75
3	67*	-45
4	64*	-49
5	57*	-26
6	47*	-5
H=	3, L=	-14
1	70*	45
2	69*	18
3	67*	68
4	64*	-30
5	58*	-15
6	123	-109
H=	3, L=	15
0	66*	-55
1	66*	3
2	64*	4
3	120	-112
4	56*	3
5	119	108
6	40	-51
H=	3, L=	-15
0	67*	-49
1	65*	52
2	91	92
3	61*	23
4	72	-77
5	49*	-29
6	55	42
H=	3, L=	16
1	59*	29
2	56*	28
3	52*	6
4	45*	30
5	32*	-4
H=	3, L=	-16
1	82	-70
2	57*	-9
3	53*	-23
4	67	69
5	48	-60
H=	3, L=	17
0	124	110
1	48*	7
2	45*	-41
3	83	-87
H=	3, L=	-17
0	156	-163
1	48*	20
2	67	69
3	41*	-13
H=	3, L=	-18
1	33*	24
H=	4, L=	0
0	478	-464
1	560	556
2	50	-46
3	218	-221
4	352	-357
5	129	128
6	132	145
7	71*	-62
8	71*	30
9	65*	51
10	52*	6
H=	4, L=	1
1	167	-164
2	572	566
3	196	-200
4	473	-476
5	140	149
6	66*	-42
7	71*	49
8	71*	-20
9	65*	-52
10	52*	22
H=	4, L=	-1
1	508	513
2	316	313
3	476	-471
4	203	213
5	60*	42
6	81	83
7	70*	-54
8	70*	-20
9	65*	-61
10	51*	13
H=	4, L=	2
0	608	-596
1	39*	33
2	521	524
3	466	-472
4	55*	-6
5	235	-227
6	67*	59
7	71*	36
8	71*	19
9	65*	5
10	51*	41
H=	4, L=	-2
0	68	-41
1	168	160
2	316	301
3	283	-280
4	198	-197
5	401	402
6	127	-133
7	78	-57
8	71*	49
9	64*	6
10	50*	8
H=	4, L=	3
1	41*	4
2	356	349
3	407	393
4	56*	-23
5	97	-94
6	68	79
7	71*	29
8	71*	-33
9	65	73
10	49*	-10
H=	4, L=	-3
1	202	-201
2	95	-91
3	49*	-26
4	167	-157
5	88	75
6	84	-88
7	70*	-8
8	70*	21
9	83	-76
10	48*	-43
H=	4, L=	4
0	422	414
1	92	-93
2	373	372
3	211	222
4	65	-35
5	171	174
6	69*	14
7	73*	16
8	90	-79
9	63*	1
10	64	60
H=	4, L=	-4
0	66	69
1	328	317
2	46*	33
3	407	-385
4	57*	-33
5	70	60
6	68*	-52
7	71*	-21
8	70*	-27
9	60*	32
10	54	-57
H=	4, L=	5
1	174	-182
2	212	200
3	287	281
4	223	-226
5	66*	8
6	70*	-53
7	72*	-51
8	70*	-56
9	63	57
10	43	46
H=	4, L=	-5
1	325	-321
2	161	-169
3	54*	-67
4	143	134
5	65*	25
6	70*	-27
7	83	85
8	69*	-57
9	59*	-49
10	43*	29
H=	4, L=	6
0	405	-402
1	79	84
2	54*	32
3	376	-383
4	133	142
5	137	130
6	109	125
7	72*	-60
8	105	-108
9	56*	-7
10	38*	32
H=	4, L=	-6
0	172	180
1	142	141
2	57	56
3	200	-218
4	62*	-47
5	67*	-5
6	66	-61
7	71*	-31
8	75	66
9	56*	-22
10	38*	26
H=	4, L=	7
1	154	-144
2	115	-100
3	159	157
4	67*	5
5	65	-58
6	192	180
7	87	-76
8	100	-96
9	52*	33
H=	4, L=	-7
1	144	-132
2	73	-66
3	175	175
4	136	143
5	69*	12
6	72*	70
7	70*	-43
8	64*	-65
9	52*	30
H=	4, L=	8
0	147	-158
1	133	128
2	73	82
3	279	-292
4	313	-316
5	501	514
6	151	161
7	70*	-15
8	75	-78
9	47*	-2
H=	4, L=	-8
0	58*	-40
1	193	192
2	61*	6
3	119	113
4	69*	6
5	71*	-59
6	72*	-1
7	134	126
8	61*	38
9	47*	-7
H=	4, L=	9
1	186	195
2	66*	58
3	355	-355
4	98	105
5	141	-124
6	113	116
7	66*	43
8	78	-90
9	41*	-28
H=	4, L=	-9
1	94	90
2	88	-64
3	68*	34
4	99	116
5	124	132
6	71*	27
7	66*	-70
8	57*	10
9	41*	-9
H=	4, L=	10
0	96	-105
1	383	401
2	89	86
3	318	-325
4	340	-340
5	123	-120
6	195	197
7	88	-94
8	72	-60
H=	4, L=	-10
0	66*	51
1	82	-92
2	104	98
3	106	113
4	72*	-17
5	72*	-55
6	69*	21
7	62*	-20
8	52*	26
H=	4, L=	11
1	72*	14
2	103	100
3	73*	-68
4	169	-167
5	70*	5
6	114	-123
7	96	79
8	43*	-15
H=	4, L=	-11
1	70	-69
2	135	-134
3	112	126
4	82	-91
5	70*	-12
6	97	-101
7	57*	-15
8	45*	-5
H=	4, L=	12
0	106	-117
1	334	344
2	185	194
3	109	-106
4	71*	53
5	67*	-41
6	67	75
7	50*	9
H=	4, L=	-12
0	72*	-13
1	72*	69
2	72*	14
3	71*	18
4	72*	-42
5	68*	-55
6	60*	-43
7	51*	-25
8	34*	-16
H=	4, L=	13
1	73*	58
2	72*	64
3	129	116
4	68*	44
5	62*	19
6	53*	29
7	40*	-35
H=	4, L=	-13
1	116	-116
2	137	133
3	70*	-35
4	68*	-22
5	70	-66
6	54*	33
7	57	42
H=	4, L=	14
0	70*	-67
1	235	230
2	69*	56
3	70	-64
4	126	124
5	63	59
6	44*	-33
H=	4, L=	-14
0	181	182
1	69*	36
2	132	-134
3	66*	-19
4	70	-79
5	56*	42
6	45*	32
H=	4, L=	15
1	64*	-48
2	63*	-41
3	88	86
4	54*	-44
5	44*	-36
H=	4, L=	-15
1	64*	-6
2	77	-74
3	60*	-6
4	55*	11
5	64	-53
H=	4, L=	16
0	154	-161
1	56*	9
2	54*	-26
3	107	-104
4	68	67
H=	4, L=	-16
0	58*	21
1	57*	-35
2	55*	-26
3	51*	-54
4	44*	18

Table 3 (*cont.*)

K	FO	FC
H= 4, L= 17		
1	45*	13
2	63	-77
3	34*	-33
H= 4, L= -17		
1	46*	4
2	44*	-22
3	42	49
H= 5, L= 0		
1	277	-268
2	238	-241
3	97	-88
4	163	-177
5	77	83
6	151	144
7	72*	15
8	83	-81
9	95	-102
10	49*	25
H= 5, L= 1		
0	390	-385
1	283	-270
2	107	-111
3	69	67
4	56*	7
5	78	-75
6	68*	-61
7	301	295
8	70*	-24
9	90	-79
10	49*	-43
H= 5, L= -1		
0	351	-339
1	111	-117
2	44*	-10
3	384	384
4	321	321
5	277	-280
6	68*	59
7	125	126
8	130	-129
9	101	-101
10	61	-79
H= 5, L= 2		
1	621	614
2	47*	-23
3	316	-319
4	97	-99
5	197	-199
6	103	111
7	72*	-59
8	70*	53
9	63*	32
10	48*	19
H= 5, L= -2		
1	49	41
2	608	604
3	91	-93
4	176	-168
5	63*	25
6	68*	-47
7	70*	32
8	161	-151
9	62*	39
10	85	88
H= 5, L= 3		
0	433	-425
1	461	450
2	191	182
3	53*	35
4	59*	-4
5	149	-147
6	166	-161
7	72*	37
8	102	91
9	62*	4
10	57	61
H= 5, L= -3		
0	728	717
1	296	-285
2	387	-379
3	63	67
4	248	-237
5	237	-232
6	163	166
7	71*	55
8	70*	-32
9	64	-62
10	45*	40
H= 5, L= 4		
1	128	-123
2	74	80
3	177	-160
4	110	122
5	65*	17
6	70*	-41
7	73*	-65
8	101	-103
9	120	101
10	67	67
H= 5, L= -4		
1	237	230
2	208	-211
3	246	-243
4	254	251
5	112	-118
6	95	100
7	71*	-39
8	69*	-52
9	127	124
10	64	53
H= 5, L= 5		
0	597	-593
1	275	268
2	115	107
3	251	-248
4	63*	-19
5	101	93
6	87	81
7	181	-186
8	72	-75
9	57*	-27
10	39*	30
H= 5, L= -5		
0	49*	26
1	342	-342
2	52*	48
3	77	-86
4	62*	51
5	161	166
6	92	91
7	93	109
8	68*	-21
9	56*	-21
10	56	40
H= 5, L= 6		
1	170	164
2	80	79
3	64	-62
4	70	-67
5	147	154
6	136	141
7	71*	-18
8	97	-88
9	53*	-20
10	33*	-7
H= 5, L= -6		
1	62	64
2	74	68
3	508	504
4	114	122
5	68*	26
6	71*	-6
7	99	-96
8	65*	39
9	53*	60
10	34*	4
H= 5, L= 7		
0	90	-101
1	222	223
2	445	446
3	169	-163
4	68*	28
5	177	179
6	127	119
7	74	-72
8	86	-91
9	49*	-15
H= 5, L= -7		
0	135	-135
1	205	219
2	59	55
3	79	-80
4	71	77
5	70*	-53
6	72*	68
7	69*	57
8	63*	0
9	49*	-30
H= 5, L= 8		
1	64*	1
2	76	-74
3	67*	32
4	244	-247
5	72*	61
6	148	141
7	80	70
8	59*	8
9	44*	19
H= 5, L= -8		
1	98	-94
2	118	102
3	127	-126
4	228	-227
5	71*	29
6	119	-111
7	67*	4
8	59*	-15
9	44*	15
H= 5, L= 9		
0	151	-148
1	66*	-67
2	87	-80
3	153	-150
4	72*	-73
5	169	159
6	94	82
7	68*	-71
8	69	68
9	36*	38
H= 5, L= -9		
0	63*	53
1	103	-108
2	74	-79
3	69*	-22
4	71*	-13
5	72*	-1
6	70*	-40
7	65*	-7
8	61	-53
9	37*	-14
H= 5, L= 10		
1	163	165
2	71*	41
3	186	-198
4	110	-111
5	67	-73
6	72	90
7	60*	-1
8	47*	41
H= 5, L= -10		
1	69*	-32
2	233	233
3	91	-81
4	72*	-31
5	71*	38
6	68*	28
7	60*	-55
8	49*	-23
H= 5, L= 11		
0	282	283
1	320	332
2	107	-94
3	73*	31
4	73*	-31
5	69*	54
6	93	-92
7	63	-55
8	39*	7
H= 5, L= -11		
0	70*	72
1	162	-157
2	71*	-18
3	106	121
4	75*	-53
5	69*	-36
6	63*	-56
7	55*	7
8	41*	8
H= 5, L= 12		
1	73*	-37
2	233	216
3	72*	66
4	70*	-46
5	66*	-57
6	58*	14
7	84	-90
H= 5, L= -12		
1	72*	25
2	96	96
3	173	-171
4	71*	-51
5	67*	3
6	58*	36
7	48*	3
H= 5, L= 13		
0	135	-147
1	200	200
2	180	-175
3	140	-121
4	99	107
5	59*	9
6	50*	-57
7	109	-113
H= 5, L= -13		
0	72*	-20
1	272	-277
2	71*	-22
3	69*	-28
4	67*	-64
5	61*	4
6	51*	32
7	46	42
H= 5, L= 14		
1	195	-198
2	134	-128
3	92	68
4	60*	-49
5	51*	46
6	63	51
H= 5, L= -14		
1	68*	36
2	79	-71
3	112	108
4	60*	21
5	54*	60
6	61	63
H= 5, L= 15		
0	184	185
1	62*	58
2	60*	-25
3	127	-125
4	51	52
5	69	72
H= 5, L= -15		
0	68	-77
1	62*	23
2	118	114
3	58*	62
4	86	85
5	43*	18
H= 5, L= 16		
1	94	99
2	51*	-34
3	61	69
4	50	-50
H= 5, L= -16		
1	54*	-19
2	83	75
3	48*	32
4	40*	-14
H= 5, L= 17		
0	118	127
1	80	78
2	37*	17
H 5, L= -17		
0	45*	37
1	86	84
2	40*	-2
3	33*	-11
H= 6, L= 0		
0	785	-777
1	197	-199
2	69	54
3	54*	-15
4	79	-62
5	65*	-16
6	193	191
7	72*	-28
8	104	-103
9	64	66
10	53	53
H= 6, L= 1		
1	142	-143
2	351	-350
3	144	-146
4	174	-175
5	252	248
6	70*	68
7	72*	-52
8	69*	7
9	94	98
10	46	-42
H= 6, L= -1		
1	210	-195
2	424	425
3	141	140
4	71	-80
5	118	113
6	120	118
7	71*	-18
8	111	109
9	60*	15
10	44*	7
H= 6, L= 2		
0	295	294
1	216	206
2	398	395
3	178	-164
4	434	-429
5	66*	-33
6	247	258
7	72*	-12
8	136	-142
9	60*	-27
10	44*	29
H= 6, L= -2		
0	677	656
1	101	91
2	79	-66
3	448	449
4	59*	22
5	70	-72
6	209	223
7	119	-125
8	69*	-32
9	59*	22
10	43*	-16
H= 6, L= 3		
1	246	229
2	111	94
3	185	-194
4	223	-218
5	79	74
6	100	86
7	101	-120
8	68*	31
9	76	66
10	42*	5
H= 6, L= -3		
1	739	726
2	188	192
3	55*	13
4	61*	-17
5	104	-92
6	70*	24
7	71*	61
8	120	-104
9	58*	23
10	41*	30
H= 6, L= 4		
0	357	-358
1	797	781
2	368	357
3	144	141
4	371	-374
5	133	-132
6	71*	8
7	106	101
8	96	-91
9	58*	22
10	78	87
H= 6, L= -4		
0	637	618
1	388	-393
2	266	-262
3	178	171
4	66	-64
5	105	101
6	83	-75
7	71*	-36
8	95	108
9	104	-103
10	38*	38
H= 6, L= 5		
1	201	-200
2	57*	44
3	276	278
4	66*	30
5	98	-107
6	72*	-32
7	181	-177
8	66*	-55
9	53*	49
10	64	83
H= 6, L= -5		
1	53*	-46
2	503	-511
3	202	-206
4	213	-216
5	68*	-38
6	203	201
7	70*	-51
8	66*	-36
9	125	117
10	48*	-42
H= 6, L= 6		
0	462	-458
1	134	120
2	60*	49
3	63*	33
4	68*	25
5	71*	-33
6	71*	50
7	90	-78
8	72	-68
9	50*	-35
H= 6, L= -6		
0	218	-207
1	428	-413
2	182	-180
3	80	-75
4	278	284
5	70*	-16
6	127	-125
7	107	104
8	77	-81
9	87	-84
H= 6, L= 7		
1	293	-284
2	187	-173
3	166	158
4	174	185
5	158	169
6	97	107
7	69*	-52
8	102	-101
9	45*	-40
H= 6, L= -7		
1	116	-131
2	124	-129
3	82	-78
4	69*	14
5	257	262
6	72*	8
7	199	-182
8	60*	-17
9	46*	-42
H= 6, L= 8		
0	65*	10
1	94	-89
2	98	-95
3	215	-220
4	72*	22
5	178	170
6	71*	-1
7	66*	45
8	56*	-30
9	71	-64
H= 6, L= -8		
0	414	-424
1	63*	50
2	65*	14
3	210	207
4	265	267
5	72*	-60
6	176	-162
7	89	-79
8	116	-94
9	40*	37
H= 6, L= 9		
1	133	119
2	290	-300
3	110	-107
4	73*	-25
5	72*	40
6	161	151
7	62*	29
8	59	-54
H= 6, L= -9		
1	67*	-43
2	318	327
3	106	-102
4	72*	63
5	72*	-9
6	80	-72
7	80	-73
8	63	62
H= 6, L= 10		
0	443	442
1	71*	-4
2	96	95
3	170	-172
4	185	-177
5	87	79
6	66*	7
7	57	-50
8	79	92
H= 6, L= -10		
0	69*	17
1	299	313
2	96	-101
3	72*	-33
4	72*	28
5	114	-109
6	66*	-18
7	58*	-13
8	119	114
H= 6, L= 11		
1	209	223
2	133	139
3	252	-260
4	89	-87
5	89	102
6	61*	-62
7	134	133
8	32*	-22
H= 6, L= -11		
1	357	359
2	72*	66
3	148	-152
4	105	-106
5	68*	33
6	61*	-22
7	55	66
8	56	52
H= 6, L= 12		
0	73*	-15
1	273	279
2	73*	36
3	118	130
4	108	-87
5	63*	-66
6	72	67
7	42*	9
H= 6, L= -12		
0	425	435
1	62	55
2	108	-102
3	90	-96
4	69*	40
5	123	104
6	70	59
7	44*	30
H= 6, L= 13		
1	71*	-70
2	257	270
3	67*	31
4	93	-90
5	74	79
6	46*	-42
H= 6, L= -13		
1	82	83
2	152	-152
3	68*	-51
4	76	75
5	58*	30
6	48*	39
H= 6, L= 14		
0	215	-234
1	66*	9
2	76	84
3	61*	2
4	53	57
5	47*	-40
6	65	-78
H= 6, L= -14		
0	68*	39
1	66*	-30
2	134	-120
3	85	-68
4	86	92
5	50*	34
6	37*	-6
H= 6, L= 15		
1	93	-96
2	57*	-22
3	74	60
4	46*	-20
5	33*	39
H= 6, L= -15		
1	108	-102
2	82	-71
3	55*	-9
4	49*	0
5	69	65
H= 6, L= 16		
0	83	-63
1	116	-113
2	47*	-43
3	71	-71
H= 6, L= -16		
0	53*	8
1	51*	-10
2	87	-79
3	44*	-10
4	61	52
H= 6, L= 17		
1	52	-38
H= 6, L= -17		
1	39*	-10
2	63	56
H= 7, L= 0		
1	350	333
2	300	306
3	211	-199
4	211	-209
5	301	315
6	71*	-21
7	102	-106
8	68*	-43
9	107	-92
10	40*	-5
H= 7, L= 1		
0	50*	-32
1	351	-343
2	54*	53
3	58*	-13
4	167	172
5	69*	-47
6	71*	44
7	71*	64
8	67*	10
9	57*	-7
10	39*	0
H= 7, L= -1		
0	440	435
1	387	-366
2	58	-60
3	356	357
4	181	-188
5	67*	-22
6	90	95
7	71*	-40
8	67*	-11
9	56*	-54
10	39*	14
H= 7, L= 2		
1	146	153
2	82	80
3	55	-54
4	64*	-42
5	154	165
6	197	208
7	72*	26
8	75	86
9	57*	-17
10	38*	-15
H= 7, L= -2		
1	51*	-37
2	290	-292
3	302	-294
4	182	179
5	193	194
6	71*	-38
7	70*	-40
8	103	-95
9	56*	32
10	38*	20
H= 7, L= 3		
0	491	480
1	218	-219
2	180	-174
3	77	-63
4	106	-106
5	95	79
6	72*	-48
7	95	97
8	132	136
9	56*	42
10	35*	33
H= 7, L= -3		
0	286	-288
1	425	-406
2	54*	16
3	85	81
4	64*	-28
5	69*	-22
6	163	-163
7	70*	-10
8	66*	26
9	104	-90
10	56	53
H= 7, L= 4		
1	56*	-26
2	286	284
3	201	-200
4	118	-113
5	69*	-37
6	157	-150
7	76*	86
8	65*	35
9	74	63
H= 7, L= -4		
1	357	-363
2	213	-205
3	61*	24
4	65*	38
5	69*	-11
6	72*	-35
7	148	-144
8	89	-73
9	53	50
H= 7, L= 5		
0	270	266
1	182	168
2	147	-136
3	64*	51
4	134	146
5	125	-108
6	133	-149
7	110	-114
8	63*	19
9	49*	1
H= 7, L= -5		
0	249	239
1	110	111
2	86	-84
3	106	99
4	114	106
5	208	-202
6	319	-315
7	171	170
8	63*	-31
9	50*	-33
H= 7, L= 6		
1	154	-154
2	87	87
3	290	288
4	70*	24
5	72*	55
6	157	-150
7	97	-113
8	61*	-12
9	45*	10
H= 7, L= -6		
1	60*	-16
2	62*	-20
3	66*	-25
4	77	73
5	130	120
6	146	151
7	129	-139
8	64	78
9	46*	11
H= 7, L= 7		
0	178	180
1	65	-63
2	131	-128
3	81	-70
4	159	161
5	205	202
6	71*	7
7	66*	10
8	94	-77
9	40	45
H= 7, L= -7		
0	168	160
1	118	-117
2	359	-368
3	222	227
4	383	386
5	262	-263
6	71*	-75
7	161	163
8	112	109
9	41*	28
H= 7, L= 8		
1	70*	-56
2	69*	-28
3	71*	-34
4	73*	-26
5	72*	2
6	70*	51
7	71	-65
8	52*	-11
H= 7, L= -8		
1	66*	-22
2	124	132
3	70	55
4	141	-131
5	220	230
6	85	-89
7	63*	8
8	53*	39
9	34*	24
H= 7, L= 9		
0	71*	-50
1	71*	17
2	127	-129
3	143	-140
4	104	-91
5	71*	7
6	67*	47
7	59*	27
8	46*	-24
H= 7, L= -9		
0	592	600
1	69*	-2
2	290	-288
3	393	402
4	124	128
5	274	-272
6	67*	12
7	60*	27
8	71	76
H= 7, L= 10		
1	72*	-33
2	116	105
3	78	69
4	73*	17
5	69*	-60
6	63*	43
7	53*	-29
8	39	-50
H= 7, L= -10		
1	337	339
2	71*	34
3	185	-187
4	72*	2
5	69*	-39
6	64*	-12
7	54*	37
8	40*	-21
H= 7, L= 11		
0	73*	-14
1	116	-96
2	101	105
3	73*	-23
4	71*	-1
5	64*	40
6	57*	-7
7	46*	16
H= 7, L= -11		
0	551	569
1	258	-261
2	213	-204
3	72*	62
4	79	-92
5	66	82
6	58*	-16
7	48*	-8
H= 7, L= 12		
1	81	69
2	72*	-66
3	69*	-57
4	66*	64
5	60*	-1
6	50*	-11
7	35*	27
H= 7, L= -12		
1	157	-172
2	325	-319
3	69*	-26
4	67*	12
5	61*	-9
6	83	73
7	39*	-8
H= 7, L= 13		
0	69*	45
1	69*	21
2	67*	-17
3	64*	-47
4	60*	-8
5	53*	-39
6	41*	40
H= 7, L= -13		
0	116	-110
1	84	-92
2	170	-179
3	118	-118
4	153	150
5	47	42
6	53	-47
H= 7, L= 14		
1	63*	36
2	61*	13
3	67	-51
4	52*	15
5	42*	46
H= 7, L= -14		
1	90	-100
2	63*	38
3	63	56
4	54*	54
5	49	55
H= 7, L= 15		
0	56*	-26
1	111	108
2	53*	24
3	48*	-15
4	88	86
H= 7, L= -15		
0	58*	52
1	96	85
2	75	-59
3	98	86
4	105	110
H= 7, L= 16		
1	59	65
2	41*	-25
3	33*	-15
H= 7, L= -16		
1	74	64
2	50	46
3	39*	-11
H= 7, L= -17		
0	34*	-5
1	32*	0
H= 8, L= 0		
0	122	-95
1	55*	-22
2	460	-456
3	61*	-22
4	65*	19
5	71*	-37
6	72*	37
7	71*	64
8	65*	-42
9	53*	-33
H= 8, L= 1		
1	55*	-11
2	98	-75
3	90	-70
4	66*	-42
5	71*	-62
6	76	-102
7	71*	32
8	65*	-12
9	53*	-4
H= 8, L= -1		
1	357	-370
2	57*	-46
3	146	-138
4	121	138
5	69*	-67
6	91	-81
7	70*	-45
8	93	-76
9	52*	43
H= 8, L= 2		
0	65	61
1	57*	-11
2	189	194
3	63*	32
4	67	73
5	71*	-51
6	95	-97
7	71*	15
8	64*	-12
9	52*	-16
H= 8, L= -2		
0	373	364
1	175	-157
2	76	-81
3	78	74
4	66*	-5
5	153	-154
6	76	-77
7	88	94
8	104	-83
9	52*	5
H= 8, L= 3		
1	264	264
2	52	-65
3	64*	-53
4	136	142
5	72*	-31
6	114	-125
7	86	-88
8	63*	-36
9	51*	-20
H= 8, L= -3		
1	226	231
2	117	104
3	62*	47
4	138	126
5	71*	6
6	72*	14
7	98	-101
8	63*	40
9	87	76
H= 8, L= 4		
0	290	-291
1	135	-136
2	62*	21
3	107	112
4	92	102
5	71*	-44
6	72*	60
7	70*	19
8	62*	-43
9	49*	3
H= 8, L= -4		
0	111	104
1	259	-241
2	67	-58
3	118	119
4	96	-95
5	103	-88
6	237	249
7	187	177
8	62*	18
9	47*	-11
H= 8, L= 5		
1	114	106
2	94	95
3	152	-173
4	71*	55
5	189	196
6	98	104
7	68*	17
8	59*	26
9	44*	6
H= 8, L= -5		
1	61*	-28
2	85	-77
3	66*	-51
4	172	173
5	190	177
6	72*	3
7	67*	1
8	60*	-13
9	70	71
H= 8, L= 6		
0	278	-274
1	121	-116
2	171	175
3	69*	34
4	72*	48
5	77	-87
6	70*	64
7	151	149
8	57*	11
9	39*	-19
H= 8, L= -6		
0	82	-73
1	276	-287
2	190	185
3	80	78
4	71*	14
5	72*	35
6	79	79
7	65*	-13
8	56*	-37
9	40*	-39
H= 8, L= 7		
1	69*	-38
2	69*	-26
3	71*	-55
4	73*	-63
5	72*	-60
6	69	75
7	63*	41
8	52*	-17
H= 8, L= -7		
1	138	150
2	59	50
3	231	220
4	137	-132
5	72*	26
6	92	-86
7	144	-152
8	53*	-17
9	34*	19
H= 8, L= 8		
0	132	-122
1	240	-242
2	98	103
3	109	115
4	110	-107
5	92	-93
6	67*	-23
7	60*	-35
8	47*	-20
H= 8, L= -8		
0	229	231
1	68*	-50
2	70*	-40
3	72*	-10
4	73*	49
5	67	-62
6	97	-96
7	60*	1
8	54	-50
H= 8, L= 9		
1	114	117
2	73*	4
3	73*	-40
4	89	-80
5	82	-78
6	64*	-53
7	54*	2
8	39*	-19
H= 8, L= -9		
1	251	-259
2	165	165
3	206	-206
4	93	-104
5	75	76
6	65*	-39
7	56*	-2
8	42*	33
H= 8, L= 10		
0	73*	39
1	87	-75
2	73*	28
3	167	169
4	71*	46
5	66*	-32
6	59*	53
7	48*	-8
H= 8, L= -10		
0	166	170
1	143	-144
2	388	-391
3	72	80
4	71*	48
5	67*	-8
6	60*	-37
7	50*	-24
8	36	45
H= 8, L= 11		
1	73*	-29
2	72*	64
3	71*	42
4	68*	-5
5	61*	-18
6	53*	28
7	39*	-14
H= 8, L= -11		
1	73*	12
2	62	73
3	71*	-33
4	73	82
5	63*	12
6	54*	7
7	43*	-29
H= 8, L= 12		
0	127	-131
1	75	-72
2	110	-112
3	66*	49
4	62*	4
5	55*	30
6	45*	2
H= 8, L= -12		
0	362	368
1	78	-91
2	78	-80
3	67*	38
4	72	77
5	58*	-8
6	121	-110
H= 8, L= 13		
1	66*	-12
2	64*	-45
3	60*	-37
4	56*	1
5	47*	-35
H= 8, L= -13		
1	108	97
2	80	-68
3	62*	-32
4	58*	18
5	53	44
6	37*	23
H= 8, L= 14		
0	101	99
1	59*	5
2	57*	4
3	53*	-5
4	46*	0
5	40	-54
H= 8, L= -14		
0	62*	41
1	61*	-39
2	118	-130
3	55*	-20
4	99	96
5	40*	29
H= 8, L= 15		
1	50*	-1
2	47*	-12
3	55	58
H= 8, L= -15		
1	53*	-42
2	87	-86
3	46*	3
4	38*	32
H= 8, L= 16		
0	38*	-19
1	37*	-12
H= 8, L= -16		
0	43*	37
1	82	76
2	39*	14
H= 9, L= 0		
1	231	231
2	391	-403
3	65*	65
4	68*	20
5	126	-129
6	88	97
7	69*	42
8	61*	41
9	48*	23
H= 9, L= 1		
0	624	626
1	169	-176
2	104	-95
3	57	-53
4	218	-219
5	73*	-51
6	72*	68
7	73	-65
8	61*	-34
9	58	47
H= 9, L= -1		
0	105	-108
1	94	-86
2	89	-90
3	200	-192
4	246	250
5	264	274
6	72*	52
7	68*	-14
8	60*	41
9	47*	12
H= 9, L= 2		
1	63	-65
2	363	359
3	194	-185
4	70*	-55
5	100	-100
6	72*	15
7	69*	23
8	60*	54
9	46*	52
H= 9, L= -2		
1	147	-149
2	125	128
3	275	280
4	111	106
5	85	83
6	143	135
7	67*	30
8	60*	28
9	46*	35
H= 9, L= 3		
0	217	-218
1	240	220
2	200	-211
3	323	326
4	71*	-2
5	86	-70
6	72*	-23
7	68*	-22
8	59*	-47
9	45*	4
H= 9, L= -3		
0	173	173
1	266	283
2	180	-168
3	66*	29
4	389	388
5	81	81
6	72*	-53
7	125	-122
8	59*	61
9	45*	-24
H= 9, L= 4		
1	249	-248
2	121	-108
3	120	123
4	120	-111
5	72*	-28
6	71*	9
7	67*	-62
8	91	-75
9	42*	3
H= 9, L= -4		
1	291	284
2	64*	-33
3	67*	-12
4	215	-217
5	72*	-15
6	157	-159
7	66*	-65
8	57*	-44
9	41*	20
H= 9, L= 5		
0	67*	47
1	66*	-45
2	68*	4
3	74	-74
4	73	79
5	72*	-35
6	70*	-7
7	72	-68
8	55*	-16
9	42	-37
H= 9, L= -5		
0	154	147
1	162	-168
2	116	-118
3	68*	-1
4	187	196
5	88	-88
6	264	-275
7	64*	-45
8	55*	0
9	38*	15
H= 9, L= 6		
1	171	163
2	202	-202
3	71*	39
4	73*	15
5	72*	-20
6	68*	27
7	62*	21
8	51*	-10
H= 9, L= -6		
1	153	-150
2	147	158
3	221	-210
4	72*	-84
5	72*	-53
6	69*	12
7	62*	-5
8	95	100
H= 9, L= 7		
0	80	73
1	183	199
2	72*	-30
3	72*	-32
4	74*	-15
5	71*	14
6	66*	12
7	59*	33
8	46*	51
H= 9, L= -7		
0	165	-156
1	69*	-38
2	213	-224
3	199	203
4	73*	32
5	83	-83
6	67*	-12
7	89	87
8	48*	29
H= 9, L= 8		
1	74*	-10
2	97	-76
3	73*	20
4	139	138
5	70*	-5
6	64*	19
7	55*	39
8	39*	56
H= 9, L= -8		
1	93	113
2	134	129
3	190	-198
4	73*	29
5	70*	28
6	65*	-9
7	55	63
8	42*	22
H= 9, L= 9		
0	83	95
1	166	154
2	73*	-2
3	73*	-60
4	71*	-5
5	67*	30
6	60*	-25
7	46	-49
H= 9, L= -9		
0	157	160
1	175	-182
2	72*	15
3	73*	-48
4	72*	3
5	67*	-25
6	61*	35
7	51*	14
8	34*	-5
H= 9, L= 10		
1	73*	-9
2	73*	16
3	71*	-37
4	68*	24
5	62*	50
6	54*	-35
7	41*	28
H= 9, L= -10		
1	143	150
2	124	-108
3	71*	16
4	84	79
5	64*	-7
6	56*	12
7	44*	-39
H= 9, L= 11		
0	72*	-31
1	151	170
2	70*	22
3	68*	-24
4	65*	18
5	56*	-6
6	47*	-55
H= 9, L= -11		
0	71*	1
1	72*	-4
2	86	-79
3	69*	28
4	98	89
5	59*	10
6	49*	1
7	35*	47
H= 9, L= 12		
1	107	-94
2	66*	-13
3	86	85
4	76	-88
5	50*	5
6	37*	-16
H= 9, L= -12		
1	68*	0
2	67*	-62
3	64*	-19
4	80	71
5	67	63
6	60	-52
H= 9, L= 13		
0	122	-123
1	91	-90
2	79	81
3	56*	-22
4	50*	31
5	59	56
H= 9, L= -13		
0	123	140
1	88	-86
2	79	-73
3	58*	26
4	113	107
5	44*	-14
H= 9, L= 14		
1	54*	11
2	52*	-60
3	47*	21
4	54	46
H= 9, L= -14		
1	56*	-27
2	69	-70
3	56	57
4	49	57
H= 9, L= 15		
0	44*	32
1	87	-96
2	40*	-7
H= 9, L= -15		
0	49*	30
1	47*	-41
2	65	-65
3	39*	9
H= 9, L= -16		
1	70	-63
H= 10, L= 0		
0	63*	-30
1	147	135
2	135	148
3	255	254
4	79	74
5	179	-182
6	75	-78
7	66*	13
8	66	65
9	40*	-23

Table 3 (*cont.*)

K	FO	FC
H= 10, L= 1		
1	72	87
2	270	272
3	315	328
4	101	89
5	115	134
6	115	106
7	66*	-61
8	56*	-21
9	40*	-2
H= 10, L= -1		
1	64*	44
2	65*	3
3	121	-122
4	359	-363
5	73*	-6
6	146	-140
7	65*	0
8	55*	14
9	40*	-4
H= 10, L= 2		
0	65*	30
1	66*	-37
2	68*	18
3	70*	-2
4	211	210
5	122	121
6	71*	-20
7	65*	-1
8	55*	23
9	38*	5
H= 10, L= -2		
0	64*	-21
1	64*	52
2	90	86
3	97	-87
4	265	-274
5	278	-283
6	71*	14
7	64*	60
8	55*	-17
9	39*	11
H= 10, L= 3		
1	116	-120
2	68*	-35
3	159	140
4	173	-177
5	73*	32
6	96	105
7	64*	-4
8	54*	-6
9	36*	-18
H= 10, L= -3		
1	61	-69
2	97	-104
3	267	-282
4	72*	52
5	73*	76
6	90	98
7	84	86
8	54*	-22
9	93	-95
H= 10, L= 4		
0	68	-64
1	87	-79
2	69*	3
3	263	-260
4	74*	-11
5	125	131
6	104	-105
7	71	-67
8	52*	43
H= 10, L= -4		
0	230	-243
1	232	223
2	67*	28
3	105	109
4	144	-154
5	156	164
6	69*	24
7	62*	-9
8	52*	-5
9	41	-37
H= 10, L= 5		
1	83	-93
2	71*	-23
3	72*	33
4	101	108
5	72*	-33
6	99	90
7	60*	40
8	48*	-35
H= 10, L= -5		
1	68*	-27
2	69*	31
3	130	-117
4	103	108
5	71*	-27
6	145	137
7	60*	29
8	74	-77
H= 10, L= 6		
0	203	209
1	72*	-44
2	98	-84
3	73*	17
4	122	-117
5	246	259
6	65*	-7
7	57*	-55
8	44*	21
H= 10, L= -6		
0	220	223
1	82	90
2	71*	-50
3	197	-208
4	73*	7
5	71*	40
6	66*	-22
7	58*	-34
8	45*	-20
H= 10, L= 7		
1	74*	-29
2	73*	-16
3	161	-174
4	73*	-82
5	68*	-14
6	62*	-47
7	53*	43
8	38*	-40
H= 10, L= -7		
1	147	146
2	275	-280
3	148	149
4	72*	-22
5	69*	18
6	64*	53
7	54*	-57
8	40*	4
H= 10, L= 8		
0	199	206
1	84	89
2	149	-140
3	106	-103
4	71*	-83
5	101	-129
6	59*	9
7	48*	-11
H= 10, L= -8		
0	72*	27
1	72*	15
2	72*	-58
3	73*	-9
4	176	171
5	67*	59
6	61*	31
7	50*	-30
8	33*	-17
H= 10, L= 9		
1	73*	39
2	106	118
3	135	137
4	97	-96
5	63*	-40
6	54*	-39
7	41*	17
H= 10, L= -9		
1	162	-165
2	72*	14
3	197	189
4	69*	36
5	64*	-32
6	87	-65
7	44*	14
H= 10, L= 10		
0	137	134
1	71*	22
2	70*	-18
3	59	54
4	82	94
5	57*	-26
6	48*	-2
H= 10, L= -10		
0	71*	-38
1	195	197
2	70*	0
3	94	95
4	65*	-46
5	78	-86
6	51*	25
7	36*	9
H= 10, L= 11		
1	68*	-63
2	95	89
3	88	103
4	60*	55
5	50*	-32
6	69	51
H= 10, L= -11		
1	69*	51
2	67*	3
3	65*	-40
4	61*	-57
5	60	-51
6	43*	4
H= 10, L= 12		
0	64*	52
1	63*	-32
2	111	-95
3	57*	18
4	52*	35
5	100	-99
H= 10, L= -12		
0	65	54
1	64*	-28
2	74	61
3	59*	-40
4	67	-70
5	47*	-11
H= 10, L= 13		
1	57*	-51
2	54*	38
3	75	72
4	42*	-35
H= 10, L= -13		
1	59*	-25
2	57*	-21
3	53*	-34
4	47*	12
5	36*	16
H= 10, L= 14		
0	48*	-11
1	48	-50
2	44*	27
3	38*	32
H= 10, L= -14		
0	166	-163
1	51*	-24
2	49*	-17
3	44*	33
4	34*	24
H= 10, L= 15		
1	33*	-10
H= 10, L= -15		
1	40*	30
2	61	71
H= 11, L= 0		
1	68*	-6
2	166	170
3	173	-178
4	73*	-56
5	73*	-41
6	77	-72
7	62*	35
8	61	-71
H= 11, L= 1		
0	72	-78
1	628	635
2	75	-60
3	414	-433
4	82	-70
5	74*	6
6	68*	5
7	78	-85
8	49*	-4
H= 11, L= -1		
0	419	424
1	408	419
2	191	-200
3	183	-190
4	222	-222
5	240	239
6	68*	-24
7	60*	-7
8	49*	-1
H= 11, L= 2		
1	180	-185
2	71*	38
3	72*	2
4	69	-77
5	73*	-22
6	125	-133
7	61*	0
8	48*	-40
H= 11, L= -2		
1	68*	56
2	73	-82
3	185	-165
4	214	225
5	73*	-76
6	212	208
7	60*	-12
8	91	-72
H= 11, L= 3		
0	134	-142
1	399	398
2	62	54
3	209	-216
4	87	79
5	171	161
6	67*	12
7	59*	-40
8	47*	-38
H= 11, L= -3		
0	69*	-23
1	182	-179
2	69*	22
3	278	-283
4	73*	61
5	162	150
6	67*	-8
7	59*	45
8	47*	24
H= 11, L= 4		
1	158	163
2	110	110
3	156	168
4	74*	-19
5	70	82
6	66*	47
7	58	-47
8	44*	-8
H= 11, L= -4		
1	89	-83
2	78	-69
3	355	362
4	203	-219
5	122	114
6	66*	43
7	57*	-45
8	45*	-26
H= 11, L= 5		
0	63	-66
1	80	71
2	120	114
3	258	-268
4	213	226
5	112	117
6	64*	-57
7	54*	32
8	58	54
H= 11, L= -5		
0	131	-132
1	86	77
2	71*	69
3	72*	-41
4	112	111
5	69*	-21
6	123	108
7	55*	-45
8	49	-47
H= 11, L= 6		
1	74*	17
2	73*	-50
3	73*	-31
4	72*	-33
5	68*	-32
6	113	114
7	51*	37
8	41	-38
H= 11, L= -6		
1	76	-89
2	298	306
3	73*	63
4	72*	-50
5	68*	-4
6	62*	-7
7	52*	3
8	59	-59
H= 11, L= 7		
0	74*	47
1	75*	-42
2	82	-97
3	111	-111
4	70*	-6
5	123	120
6	111	-102
7	71	-57
H= 11, L= -7		
0	154	158
1	165	173
2	72*	-12
3	72*	33
4	155	-144
5	134	135
6	59*	-8
7	94	-82
H= 11, L= 8		
1	105	96
2	144	142
3	134	-150
4	68*	27
5	62*	-39
6	53*	23
7	45	37
H= 11, L= -8		
1	72*	-9
2	72*	33
3	71*	34
4	95	-102
5	63*	-51
6	55*	2
7	43*	5
H= 11, L= 9		
0	72*	29
1	131	127
2	70*	-37
3	68*	57
4	75	76
5	57*	40
6	47*	-5
H= 11, L= -9		
0	185	180
1	95	96
2	70*	-14
3	231	-228
4	66*	-25
5	59*	10
6	50*	-31
7	35*	-11
H= 11, L= 10		
1	80	-83
2	67*	40
3	64*	-18
4	96	-83
5	51*	8
6	39*	11
H= 11, L= -10		
1	69*	-52
2	67*	-22
3	80	-77
4	61*	12
5	54*	35
6	43*	40
H= 11, L= 11		
0	135	-118
1	64*	-54
2	88	-97
3	105	-109
4	53*	1
5	43*	4
H= 11, L= -11		
0	66*	-42
1	66*	46
2	84	-77
3	61*	-25
4	56*	4
5	92	91
H= 11, L= 12		
1	87	79
2	56*	-38
3	51*	-35
4	98	-110
H= 11, L= -12		
1	60*	8
2	58*	-6
3	54*	14
4	48*	24
5	38*	17
H= 11, L= 13		
0	119	113
1	66	55
2	60	64
3	41*	-9
H= 11, L= -13		
0	55*	-41
1	53*	46
2	51*	48
3	46*	-15
4	62	57
H= 11, L= 14		
1	38*	43
2	140	142
H= 11, L= -14		
1	44*	23
2	41*	20
3	34*	-31
H= 12, L= 0		
0	279	271
1	343	342
2	77	81
3	140	-131
4	143	-135
5	71*	-16
6	116	110
7	56*	-20
8	41*	45
H= 12, L= 1		
1	137	138
2	489	495
3	73*	40
4	73*	54
5	110	-119
6	64*	22
7	81	-72
8	86	75
H= 12, L= -1		
1	264	250
2	97	-93
3	184	-178
4	246	-247
5	70*	36
6	64*	17
7	140	125
8	41*	-9
H= 12, L= 2		
0	134	-136
1	329	338
2	124	-113
3	160	159
4	195	201
5	70*	-53
6	151	-143
7	54*	-27
8	112	-116
H= 12, L= -2		
0	84	-80
1	103	116
2	71*	34
3	374	-380
4	72*	-23
5	191	181
6	158	147
7	80	-79
8	47	37
H= 12, L= 3		
1	437	-443
2	86	-81
3	195	196
4	73*	-43
5	69*	7
6	62*	13
7	126	-117
8	62	-71
H= 12, L= -3		
1	104	105
2	71*	50
3	128	-123
4	89	-79
5	85	76
6	135	145
7	53*	-9
8	38*	-42
H= 12, L= 4		
0	73*	-7
1	141	-134
2	368	-372
3	235	-232
4	244	257
5	85	89
6	60*	-29
7	51*	-4
8	32*	-33
H= 12, L= -4		
0	71*	39
1	72*	65
2	71*	-6
3	72*	-69
4	71*	57
5	274	290
6	61*	25
7	65	-47
8	77	-85
H= 12, L= 5		
1	73*	25
2	241	-249
3	72*	-29
4	103	-84
5	86	-79
6	191	196
7	47*	16
H= 12, L= -5		
1	72*	-51
2	72*	-16
3	72*	-44
4	71*	-10
5	66*	62
6	59*	-1
7	48*	-25
H= 12, L= 6		
0	401	400
1	102	113
2	128	-115
3	71*	-63
4	69*	-4
5	92	94
6	81	-85
7	42*	21
H= 12, L= -6		
0	237	-240
1	72*	-69
2	72*	30
3	72*	-62
4	69*	65
5	64*	-16
6	56*	-30
7	79	-80
H= 12, L= 7		
1	223	225
2	71*	-10
3	69*	-17
4	66*	-14
5	122	-104
6	50*	15
7	36*	36
H= 12, L= -7		
1	76	-67
2	157	161
3	69*	50
4	67*	7
5	71	-80
6	53*	-2
7	39	-40
H= 12, L= 8		
0	129	127
1	146	137
2	69*	-24
3	67*	21
4	73	59
5	74	-60
6	45*	26
H= 12, L= -8		
0	66	-66
1	122	127
2	110	111
3	68*	28
4	107	-114
5	67	-59
6	48*	-39
H= 12, L= 9		
1	67*	13
2	66*	50
3	63*	-57
4	58*	51
5	122	120
6	37*	6
H= 12, L= -9		
1	128	144
2	67*	16
3	69	-83
4	60*	-42
5	53*	-10
6	98	83
H= 12, L= 10		
0	64*	-37
1	153	163
2	61*	-45
3	58*	28
4	64	75
5	42*	-22
H= 12, L= -10		
0	103	-109
1	65*	-34
2	63*	53
3	116	-116
4	55*	-6
5	69	-58
6	51	50
H= 12, L= 11		
1	58	-61
2	56*	-24
3	51*	-13
4	45*	-33
H= 12, L= -11		
1	57	-57
2	58*	-48
3	55*	-6
4	49*	-54
5	127	124
H= 12, L= 12		
0	51*	0
1	50*	39
2	48*	-14
3	65	-58
H= 12, L= -12		
0	97	-87
1	81	87
2	52*	6
3	57	54
4	39*	18
H= 12, L= 13		
1	40*	6
2	58	-57
H= 12, L= -13		
1	46*	12
2	110	115
3	61	-58
H= 12, L= -14		
0	176	175
1	33*	6
H= 13, L= 0		
1	280	283
2	119	-106
3	191	-188
4	74*	59
5	67*	15
6	59*	25
7	59	63
H= 13, L= 1		
0	238	240
1	215	215
2	196	-189
3	73*	-6
4	70*	-20
5	67*	-11
6	94	98
7	127	-119
H= 13, L= -1		
0	157	142
1	72*	-29
2	124	134
3	72*	-76
4	81	-73
5	193	198
6	126	-118
7	47*	-28
H= 13, L= 2		
1	74*	-10
2	147	150
3	131	-123
4	160	-160
5	176	170
6	57*	-58
7	96	83
H= 13, L= -2		
1	85	-74
2	218	-214
3	67	-81
4	70*	-39
5	66*	-4
6	151	155
7	46*	-23
H= 13, L= 3		
0	74*	49
1	310	305
2	73*	27
3	133	-117
4	105	108
5	64*	-37
6	56*	11
7	44*	-24
H= 13, L= -3		
0	338	-355
1	127	110
2	71*	16
3	204	-208
4	70*	24
5	120	115
6	57*	31
7	47	-62
H= 13, L= 4		
1	73	76
2	137	140
3	183	192
4	69*	-58
5	62*	28
6	91	91
7	98	-110
H= 13, L= -4		
1	114	-124
2	71*	0
3	71*	53
4	68*	36
5	99	109
6	55*	44
7	76	-77
H= 13, L= 5		
0	73*	-46
1	72*	76
2	103	105
3	69*	-53
4	66	-57
5	121	104
6	59	-56
7	36*	-20
H= 13, L= -5		
0	124	-129
1	320	319
2	106	-104
3	98	-100
4	67*	16
5	91	74
6	52*	4
7	90	-105
H= 13, L= 6		
1	248	-252
2	69*	35
3	67*	-46
4	84	-83
5	56*	5
6	43	44
H= 13, L= -6		
1	71*	56
2	70*	50
3	69*	31
4	65*	19
5	58*	-45
6	49*	-40
7	115	-119
H= 13, L= 7		
0	218	-210
1	71*	-42
2	67*	-27
3	64*	-36
4	104	-95
5	58	60
6	41*	-11
H= 13, L= -7		
0	69*	-5
1	287	290
2	68*	-9
3	101	-118
4	90	-89
5	54*	-21
6	63	66
H= 13, L= 8		
1	68*	-15
2	64*	-59
3	61*	58
4	56*	-25
5	47*	12
6	33*	32
H= 13, L= -8		
1	67*	54
2	93	-86
3	63*	-69
4	58*	-30
5	50*	31
6	38*	-32
H= 13, L= 9		
0	153	158
1	85	-71
2	63	63
3	56*	-19
4	50*	-46
5	87	80
H= 13, L= -9		
0	64*	-3
1	64*	63
2	62*	31
3	59*	-30
4	53*	-23
5	44*	40
H= 13, L= 10		
1	56*	60
2	54*	-26
3	50*	-36
4	42*	13
H= 13, L= -10		
1	60*	-10
2	57*	9
3	53*	-16
4	47*	-21
5	36*	21
H= 13, L= 11		
0	82	92
1	59	57
2	62	-62
3	42	-44
H= 13, L= -11		
0	54*	3
1	54*	4
2	51*	2
3	46*	28
4	38*	19
H= 13, L= 12		
1	40*	-10
2	36*	46
H= 13, L= -12		
1	81	68
2	111	99
3	55	-56
H= 13, L= -13		
0	133	124
1	96	-97
H= 14, L= 0		
0	72*	-54
1	165	169
2	76	-84
3	70*	-17
4	70	56
5	61*	9
6	51*	-38
7	37*	12
H= 14, L= 1		
1	138	-127
2	71*	-28
3	70*	-22
4	66*	38
5	61*	33
6	50*	37
7	62	-72
H= 14, L= -1		
1	71*	-26
2	142	148
3	69*	-31
4	65*	4
5	60	55
6	51*	-50
7	36*	12
H= 14, L= 2		
0	72*	-4
1	72*	46
2	80	78
3	120	-113
4	73	-68
5	59*	21
6	74	-63
7	44	52
H= 14, L= -2		
0	355	357
1	71*	-13
2	160	-164
3	68*	-31
4	65*	-46
5	60*	-24
6	50*	-11
7	34*	-27
H= 14, L= 3		
1	71*	54
2	70	-74
3	68*	-5
4	64*	-24
5	57*	25
6	47*	-40
H= 14, L= -3		
1	71*	36
2	101	-111
3	67*	40
4	65*	48
5	66	-72
6	48*	29
H= 14, L= 4		
0	115	-113
1	70*	7
2	68*	47
3	67*	-5
4	63*	9
5	55*	-9
6	44	39
H= 14, L= -4		
0	70*	49
1	126	-120
2	76	-79
3	67*	-21
4	63*	47
5	62	54
6	46*	-25
H= 14, L= 5		
1	68*	-3
2	67*	-21
3	64*	7
4	127	106
5	58	55
6	40*	-17
H= 14, L= -5		
1	116	-125
2	67*	16
3	174	176
4	80	-70
5	53*	32
6	43*	-15
H= 14, L= 6		
0	166	156
1	79	-70
2	64*	-15
3	61	-55
4	56*	39
5	48*	28
6	34*	-11
H= 14, L= -6		
0	67*	32
1	103	109
2	66*	-5
3	63*	45
4	58*	-3
5	50*	-43
6	38*	36
H= 14, L= 7		
1	162	171
2	61*	54
3	57*	-55
4	52*	-7
5	42*	28
H= 14, L= -7		
1	65*	8
2	63*	56
3	94	-85
4	54*	-12
5	67	57
H= 14, L= 8		
0	94	81
1	96	90
2	57*	-47
3	53*	-43
4	54	56
5	35*	16
H= 14, L= -8		
0	61*	48
1	62*	-13
2	76	75
3	56*	21
4	73	-71
5	40*	39
H= 14, L= 9		
1	123	-127
2	120	117
3	67	-56
4	39*	1
H= 14, L= -9		
1	57*	56
2	55*	-11
3	51*	-34
4	44*	-9
H= 14, L= 10		
0	155	-156
1	48*	9
2	71	-77
3	39*	-34
H= 14, L= -10		
0	58	-50
1	52*	-35
2	81	77
3	44*	-7
4	35*	-19
H= 14, L= 11		
1	39*	26
2	34*	-28
H= 14, L= -11		
1	45*	26
2	41*	3
3	109	-103
H= 14, L= -12		
0	75	-75
1	86	-77
H= 15, L= 0		
1	68*	50
2	106	101
3	64*	41
4	75	-68
5	52*	-38
6	40*	31
H= 15, L= 1		
0	231	-231
1	141	-146
2	94	87
3	64*	28
4	69	-67
5	52*	-14
6	52	49
H= 15, L= -1		
0	88	-81
1	68	-73
2	127	124
3	64*	4
4	65	-62
5	52*	39
6	82	89
H= 15, L= 2		
1	76	-56
2	66*	-14
3	63*	-22
4	71	64
5	50*	-37
6	37*	-11
H= 15, L= -2		
1	67*	36
2	65*	41
3	63*	-24
4	58*	-47
5	51*	11
6	39*	-33
H= 15, L= 3		
0	67*	32
1	88	-89
2	65*	-12
3	62*	50
4	57*	-33
5	48*	-6
6	51	67
H= 15, L= -3		
0	96	-86
1	66*	-42
2	64*	53
3	62*	-13
4	57*	-50
5	77	75
6	36*	22
H= 15, L= 4		
1	65*	53
2	62*	-1
3	60*	-45
4	54*	4
5	45*	-51
H= 15, L= -4		
1	65*	-1
2	63*	8
3	60*	-10
4	55*	21
5	47*	19
6	33*	20
H= 15, L= 5		
0	64*	17
1	96	95
2	60*	-27
3	57*	-17
4	51*	-39
5	74	-73
H= 15, L= -5		
0	64*	7
1	63*	4
2	81	72
3	58*	-53
4	53*	42
5	43*	32
H= 15, L= 6		
1	60*	-62
2	57*	-13
3	65	58
4	47*	-16
5	75	-84
H= 15, L= -6		
1	61*	13
2	59*	-2
3	56*	3
4	49*	30
5	80	81
H= 15, L= 7		
0	132	-144
1	57*	40
2	53*	30
3	59	56
4	41*	38
H= 15, L= -7		
0	90	-93
1	58*	8
2	55*	13
3	51*	-29
4	45*	38
H= 15, L= 8		
1	52*	27
2	48*	-29
3	84	85
H= 15, L= -8		
1	54*	10
2	83	76
3	47*	-55
4	39*	-1
H= 15, L= 9		
0	46*	-58
1	75	-79
2	92	98
3	33*	12
H= 15, L= -9		
0	49*	-6
1	49*	34
2	45*	-44
3	40*	18
4	27*	-61
H= 15, L= 10		
1	34*	42
H= 15, L= -10		
1	41*	17
2	37*	-13
H= 16, L= 0		
0	62*	4
1	62*	61
2	60*	-57
3	87	76
4	50*	38
5	41*	8
H= 16, L= 1		
1	62*	-28
2	60*	34
3	56*	-1
4	78	-72
5	40*	-16
H= 16, L= -1		
1	61*	30
2	58*	-20
3	56*	25
4	49*	36
5	40*	-22
H= 16, L= 2		
0	106	-100
1	61*	34
2	59*	41
3	64	-48
4	147	136
5	37*	-13
H= 16, L= -2		
0	62*	18
1	60*	24
2	82	66
3	55*	14
4	84	74
5	39*	-25
H= 16, L= 3		
1	59*	38
2	90	-88
3	96	85
4	46*	-10
5	34*	9
H= 16, L= -3		
1	59*	-2
2	57*	8
3	53*	12
4	48*	-23
5	37*	-11
H= 16, L= 4		
0	77	-64
1	57*	-36
2	54*	36
3	50*	-9
4	43*	-16
H= 16, L= -4		
0	58*	-13
1	79	64
2	55*	-33
3	51*	0
4	45*	-36
H= 16, L= 5		
1	54*	-37
2	51*	-1
3	47*	-54
4	45	38
H= 16, L= -5		
1	68	60
2	53	-53
3	100	-97
4	42*	30
H= 16, L= 6		
0	52*	-16
1	51	-43
2	58	59
3	46	39
H= 16, L= -6		
0	70	-73
1	52*	-35
2	50*	-13
3	45*	22
4	36*	-25
H= 16, L= 7		
1	46*	2
2	61	-51
3	34*	27
H= 16, L= -7		
1	47*	-37
2	45*	-25
3	40*	-24
H= 16, L= 8		
0	40*	51
1	68	-73
H= 16, L= -8		
0	44*	-18
1	43*	11
2	56	-42
3	32*	37
H= 16, L= -9		
1	35*	43
H= 17, L= 0		
1	103	-90
2	50*	-29
3	55	58
4	36*	-15
H= 17, L= 1		
0	102	87
1	52*	-43
2	49*	21
3	44*	-24
4	35*	-31
H= 17, L= -1		
0	53*	2
1	55	60
2	67	-50
3	45*	-13
4	35*	-3
H= 17, L= 2		
1	51*	42
2	48*	44
3	43*	27
H= 17, L= -2		
1	51*	-32
2	48*	47
3	43*	28
4	34*	-33
H= 17, L= 3		
0	50*	-20
1	49*	-2
2	116	104
3	144	142
H= 17, L= -3		
0	108	102
1	77	88
2	103	-92
3	42*	-6
4	73	-94
H= 17, L= 4		
1	62	-58
2	63	65
3	60	59
H= 17, L= -4		
1	48*	-6
2	44*	-29
3	63	-61
H= 17, L= 5		
0	157	-164
1	117	-114
2	38*	47
H= 17, L= -5		
0	45*	39
1	45*	-20
2	41*	-7
3	34*	22
H= 17, L= 6		
1	36*	-31
H= 17, L= -6		
1	41*	24
2	36*	-43
H= 17, L= 7		
0	28*	-53
H= 17, L= -7		
0	35*	17
1	83	-81
H= 18, L= 0		
0	84	-82
1	39*	-50
2	104	-114
H= 18, L= 1		
1	38*	-39
2	34*	-30
H= 18, L= -1		
1	64	-67
2	113	130
H= 18, L= 2		
0	102	117
1	65	-65
H= 18, L= -2		
0	84	99
1	75	84
2	33*	-37
H= 18, L= 3		
1	33*	43
H= 18, L= -3		
1	87	89
H= 18, L= 4		
0	28*	-40
H= 18, L= -4		
0	95	106

membered ring of each structure. The *t* test on corresponding angles in the protopine and cryptopine molecules, excluding those involving C–H bonds, shows significant differences varying between 2·2° and 12·0° in the ten angles at atoms O(1), O(2), C(1), C(2), C(3), and C(4). These differences appear to be due mainly to the presence of the two methoxyl groups in cryptopine in place of one of the five-membered rings of

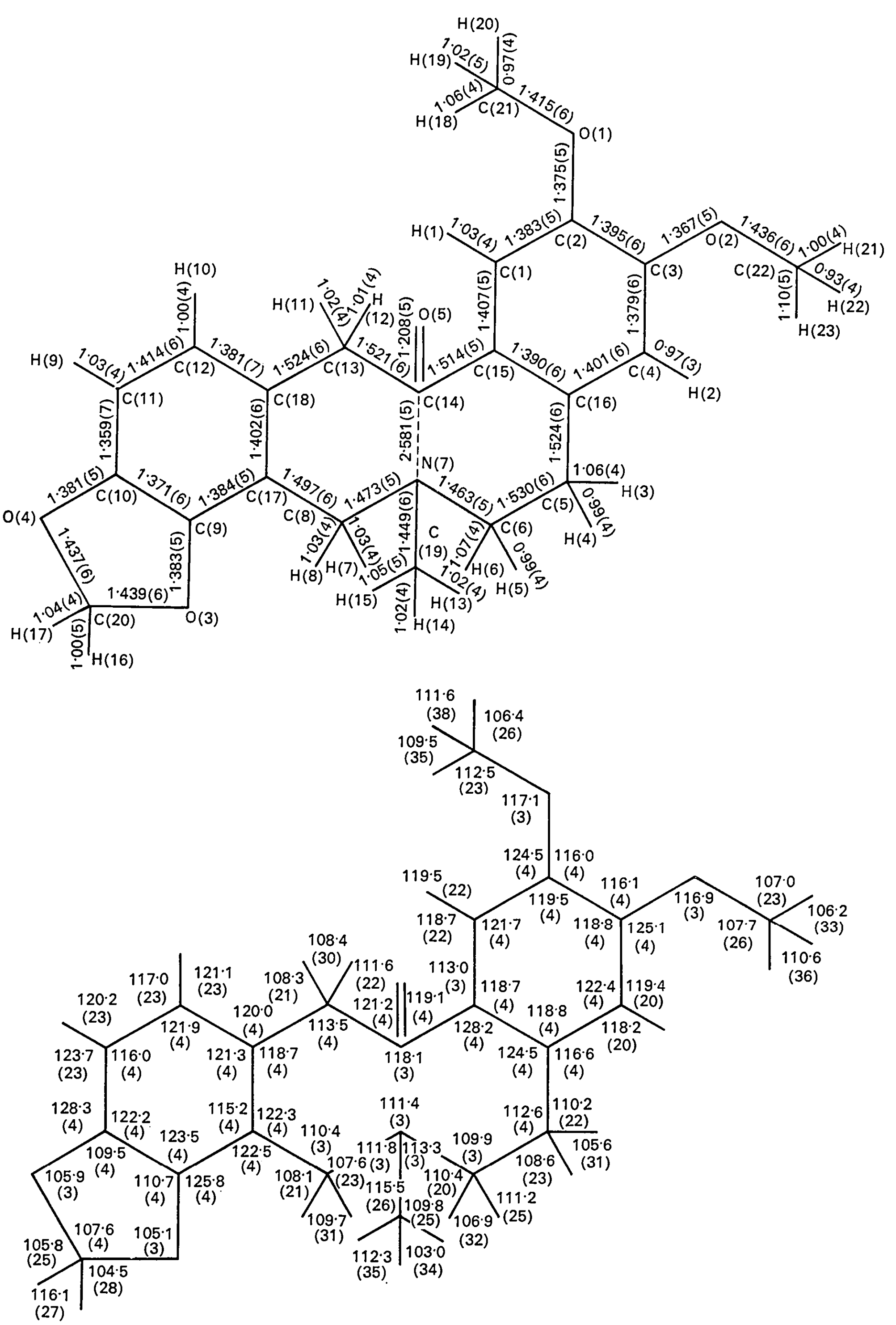

Fig. 2. Bond lengths (Å) and angles (°), and their e.s.d.'s in parentheses. The e.s.d.'s are × 10^2 for the C–H bonds, × 10^3 for the other bonds, and × 10 for the angles.

protopine. The differences for the remaining 33 angles are all within 2·0°, and the t test shows that $P>5\%$ for 19 angles, $5\% \geq P > 1\%$ for seven angles, $1\% \geq P > 0{\cdot}1\%$ for three angles, and $0{\cdot}1\% > P$ for four angles, namely, C(1)–C(15)–C(16), C(5)–C(6)–N(7), C(8)–C(17)–C(18), and C(17)–C(9)–O(3), which show differences of 2·0, 1·9, 2·0, and 2·0°, respectively.

The mean values for the various types of bond in cryptopine are listed in Table 4 together with the corresponding mean values for protopine, and the corresponding average values calculated by Sutton (1965). The e.d.s.'s of these mean values have not been included in the Table since there is strong indication that the lengths of the individual bonds of the same type are affected to a certain extent by the character of the adjoining bonds. This is most significant in the aromatic C–C bonds which range from 1·363 to 1·418 Å ($\sigma_{\text{r.m.s.}}=0{\cdot}003$ Å) in protopine, and from 1·359 Å to 1·407 Å ($\sigma_{\text{r.m.s.}}=0{\cdot}006$ Å) in cryptopine. However, the overall mean values for the different types of bond as listed in Table 4 are about the same in the two structures, and the largest difference of 0·010 Å in the carbon–oxygen double bond is not significant since it involves only one observation in each case.

In cryptopine, the three bonds at each of the carbon atoms of the benzene rings are very nearly coplanar, since the mean angle at each of these atoms varies from 119·95° to 120·00°. The mean angle at C(14) is 119·5° as compared with 119·3° in protopine. The mean angle at each of the other carbon atoms is between 109·27° and 109·47° thus showing that the four bonds at each of these atoms conform closely to a tetrahedral arrangement. Also, as found in protopine, the three C–N bonds and the N(7)···C(14) distance across the ten-membered ring are tetrahedrally arranged around the nitrogen atom, and the mean angle between them is 109·39°.

Intermolecular distances

The shortest intermolecular distance between the different types of atom in this structure are H···H, 2·39; H···O, 2·46; H···C, 2·71; O···O, 3·35; O···C, 3·03; and C···C, 3·58 Å. The nearest intermolecular contact to the nitrogen atom is from a hydrogen atom which is at a distance of 3·908 Å away from it, thus showing that the nitrogen atom is well buried in the cryptopine molecule, as is the case in the protopine molecule.

Planarity of the rings

Each of the aromatic six-membered rings is slightly non-planar and has a slight boat form. The equation of the mean plane of the first ring through atoms C(1), C(2), ... C(15), referred to the orthogonal set of axes $X'=ax+cz\cos\beta$, $Y'=by$, $Z'=cz\sin\beta$, and calculated according to the procedure described by Blow (1960) is

$$0{\cdot}0351X'-0{\cdot}9129Y'-0{\cdot}4067Z'+5{\cdot}3577=0\,, \quad (1)$$

$\chi^2=65$, $P<0{\cdot}1\%$, and these atoms lie within $+0{\cdot}015$ and $-0{\cdot}022$ Å from that plane. Similarly, the equation of the mean plane of the second ring through atoms C(9), C(10), ... C(18) is

$$0{\cdot}2953X'+0{\cdot}6457Y'+0{\cdot}7042Z'-5{\cdot}9780=0\,, \quad (2)$$

$\chi^2=14{\cdot}8$, $1\%>P>0{\cdot}1\%$, and the deviations of these atoms from their mean plane are within $+0{\cdot}010$ and $-0{\cdot}008$ Å. The angle between the normals to these two planes is 30·1° as compared to 27·8° in protopine.

The carbon–oxygen double bond C(14)–O(5) makes angles of 41·1 and 33·1° with planes (1) and (2), respectively, as compared with 37·4 and 35·0°, respectively, in protopine. The ten-membered ring has a similar shape to that in protopine with atoms O(5) and C(19) lying on the same side of the ring. The two bonds N(7)–C(19) and C(14)–O(5) are skew with respect to each other, the angle between them is 26·5°, and the distance C(19)···O(5) is 3·17 Å. The corresponding values in protopine are 27·9° and 3·19 Å respectively. The mean plane of the four atoms N(7), C(19), C(14), and O(5) makes angles of 69·1° and 63·0° with planes (1) and (2) respectively, while in protopine these two angles are both equal to 60·7°.

Table 4. *Mean values for the various types of bond in protopine and cryptopine and the corresponding averages given by Sutton* (1965)

Bond type	Protopine	Cryptopine	Sutton's average
C–C aromatic	1·388 Å	1·389 Å	1·394 ± 0·005 Å
C–C single	1·512	1·518	1·506 ± 0·005$^{(a)}$ 1·53 ± 0·01$^{(b)}$
C–N	1·462	1·462	1·472 ± 0·005$^{(c)}$
C–O double	1·218	1·208	1·215 ± 0·005$^{(d)}$
C–O single, type (*a*)	1·381	1·377	1·371 ± 0·016$^{(e)}$
C–O single, type (*b*)	1·425	1·432	1·426 ± 0·005$^{(f)}$
C–H	1·02	1·02	1·06 to 1·09

(*a*) in the presence of a carbon-oxygen double bond
(*b*) in the presence of an aromatic bond
(*c*) for a trivalent nitrogen
(*d*) for a ketone group
(*e*) in conjugated heterocyclic compounds
(*f*) in saturated heterocyclic compounds

Conclusions

The X-ray analyses of protopine and cryptopine have shown conclusively their molecular structures in the crystalline form. In both molecules, the ten-membered ring is severely buckled, with the nitrogen atom N(7) well buried within it, and is held very close to the C(14) atom which lies across the ring from it. The distance N(7)···C(14) is only 2·57 ± 0·01 Å, which is much shorter than the sum of the van der Waals radii of these two atoms. The three C–N bonds and the C(14) ···N(7) distance across the ring are very nearly tetrahedrally arranged around the nitrogen atom. Therefore, in forming derivatives of protopine and cryptopine in which the nitrogen atom is tetravalent, it would be necessary to invert the nitrogen atom so that a fourth atom other than C(14) may be attached to N(7). This inversion would also be accompanied by a considerable increase in the N(7)···C(14) distance. On the other hand, no inversion would be required if the fourth bond is formed between N(7) and C(14) thus transforming the ten-membered ring into two six-membered rings with N(7)–C(14) shared between them.

The carbon–oxygen double bond has ketonic character, makes about 39° ± 2° with the plane of the aromatic six-membered ring nearest to it, and about 34° ± 1° with the other. Each six-membered ring has a very slight boat form, and the angle between them is 152·2° in protopine and 149·9° in cryptopine. The atoms C(19) and O(5) are separated by a distance of 3·18 ± 0·01 Å which is just about the sum of the van der Waals radii of these two atoms.

The authors take great pleasure in acknowledging the receipt of some unpublished data on cryptopine from Dr W. H. Barnes. All computations have been carried out with the IBM 360 computer using programs by Ahmed, Hall, Pippy & Huber (1966). The assistance of Mrs M. E. Pippy in the computations involved, and the cooperation of the staff of the NRC Computation Centre, are deeply appreciated.

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Al-O and Si-O Tetrahedral Distances in Aluminosilicate Framework Structures

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A new determinative curve has been derived for estimating tetrahedral aluminum from the observed tetrahedral bond lengths in aluminosilicate framework structures. The end values of Si–O, 1·603 Å, and Al–O, 1·761 Å, derived from 13 feldspar analyses only, do not differ significantly from those obtained by considering an additional 19 other framework structures.

Introduction

Smith & Bailey (1963) in their second review of aluminum and silicon to oxygen tetrahedral distances, after examining the available information for framework structures, recommended the use of a straight line relationship of aluminum content *versus* tetrahedral distance. Their actual line based on accurately determined feldspar structures extended from 1·606 Å for Si–O to 1·757 Å for Al–O, but because of various uncertainties they recommended the use of the rounded off figures 1·61 and 1·75.

In the case of the feldspars this rounding off has the effect of placing the line above the majority of the mean T–O distances for frameworks of composition $AlSi_3O_8$ and below the means for those with compositions close to $Al_2Si_2O_8$. Since Smith & Bailey's review four new feldspar determinations have become available and the structures of a number of other frameworks have been completed.