Contribution from the Chemical Physics Program, Washington State University, Pullman, Washington 99163, U.S.A.

The Crystal Structure of μ_4-Oxo-hexa-μ-bromotetrakis-[pyridine copper(II)], $Cu_4Br_6O(C_5H_5N)_4$

D. D. Swank, D. O. Nielson, and R. D. Willett

Received January 18, 1972

The crystal structure of the tetranuclear copper cluster complex, $Cu_4Br_6O(C_5H_5N)_4$ has been determined from single crystal X-ray diffraction data. The cluster consists of trigonal bipyramidally coordinated Cu^{2+} ions, each of which share a common oxygen atom, are bridged to the other three copper ions by bromide ions, and the fifth coordination site is occupied by a pyridine molecule. The compound crystallizes in the space group C2/c, with lattice constants a = 30.64(1), b = 12.43(2), and c = 20.17(1) A, with β = 129.56(20)°. A total of 4070 unique reflections were collected on a Picker fullcircle diffractometer. The structure was refined to an R value of 0.086.

Introduction

The preparation of the compound $Cu_4Br_6O(C_5H_5N)_4$ was first reported by Harris and Sinn[1] in their attempts to prepare $CuBr_2(C_5H_5N)$. In interpreting the physical properties of the compound, they proposed a structure involving an unusual chain type polymeric species. However, the data could equally well be interpreted in terms of structures of the cluster compound first reported by Bertrand and Kelley[2] for the compound $Cu_4Cl_6O[(C_6H_5)_3PO]_4$. For this reason, we decided to investigate the crystal structure of the compound.

Experimental Section

Preparation. Initial attempts to prepare the desired compound directly from stoichiometric $CuBr_2$-CuO, and pyridine solutions in water or alcohol solvents only gave deep purple needles of $CuBr_2(C_5H_5N)$. However, upon continued refluxing for extended periods of time, dark brown prisms of the tetramer crystallized out of solution.

Crystal Data. Examination of precession and Weissenberg photographs established the space group as C2/c or Cc [systematic extinctions: $h+k = 2n+1$ extinct for all reflections, $l = 2n+1$ extinct for h0l reflections]. The lattice constants, determined from least squares refinement of the 2θ values of twenty high angle reflections obtained on the full-circle diffractometer, are a = 30.64(1), b = 12.43(2), c = 20.17(1) A, with β = 129.56 (20)°.[3] The crystal density was observed to be 2.31 g/cc (flotation in a mixture of ethyl iodide and methylene bromide and the calculated value for 8 molecules per unit cell is 2.39 g/cc. A total of 4070 reflections were measured on a Picker full-circle diffractometer, 3028 of which were considered to be observed (measured intensity greater than 2σ above background).[4] A 60 second θ-2θ scan with 20 second background counts before and after was used with Ni filtered CuKα radiation. Absorption corrections were made ($\mu = 141.3\ cm^{-1}$).[5] The crystal size was 0.15×0.46×0.40 mm and the absorption corrections ranged from .05 to .17.

Structure Analyses. The structure solution was straight forward. Analysis of the distribution of intensities indicated that the structure was centrosymmetric. Phases for the largest 468 reflections were calculated by direct methods[6] and the positions of the copper, bromine, oxygen, nitrogen, and approximately 1/2 of the carbon atoms were recognizable on the first E-map. Supsequent electron density maps with more complete data sets, using phases calculated from the positions of the known atoms, revealed the remaining carbon atoms. Least squares refinement of the position and thermal (anisotropic for Cu, Br, and O, isotropic for C and N) parameters proceeded in a reasonably straight forward manner. A difference Fourier revealed peaks in the general area expected for hydrogen atoms, but resolution was not good enough to locate them accurately. Their positions were calculated from the location of the atoms in the pyridine ring, and included in the last structure factor calculation. A final value of R = 0.086 for observed reflections was obtained ($R = \Sigma|(|F_{obs}| - |F_{calc}|)|/\Sigma|F_{obs}|$). The final parameters are reported in Table I and the observed and calculated structure factors are listed in Table II. Pertinent

---

[1] C. M. Harris and E. Sinn, *Inorg. Nucl. Chem. Letters*, *5*, 125 (1969).

[2] J. A. Bertrand and J. A. Kelley, *JACS*, *88*, 4746 (1966).

[3] These transform to a = 23.50, b = 12.43, c = 20.17, and β = 91° in the space group I2/a, in agreement with the lattice constants reported by Bertrand and Kelley.[2]

[4] Except where specific reference is given, all computations were made utilizing locally written computer programs.

[5] W. Busing and H. A. Levy, *Acta Cryst.*, *10*, 180 (1957).

[6] Robert Dewar and Allen Stone, "FORTRAN Program for Automatic Manufacturing of E's," University of Chicago.

[7] W. Busing, K. O. Martin, and H. A. Levyfi "ORFFE, A FORTRAN Crystallographic Function and Error Program," Oak National Laboratory, Report ORNL-TM-306 (1964).

Table I. Final parameters for $Cu_4Br_6O(C_5H_5N)_4$. Standard deviations are in parenthesis. Hydrogen position are calculated, and thermal parameters assumed.

ATOM	X	Y	Z	U(1,1)	U(2,2)	U(3,3)	U(1,2)	U(1,3)	U(2,3)
CU1	0.3802(1)	0.2031(3)	0.2140(2)	0.0486(19)	0.0696(24)	0.0407(18)	0.0009(18)	0.0249(16)	−0.0020(18)
CU2	0.4832(1)	0.2580(3)	0.4078(2)	0.0404(18)	0.0787(25)	0.0385(17)	−0.0067(18)	0.0199(15)	0.0008(18)
CU3	0.3585(1)	0.3046(3)	0.3341(2)	0.0550(20)	0.0765(25)	0.0419(18)	0.0036(19)	0.0319(17)	0.0003(18)
CU4	0.4140(1)	0.4422(3)	0.2742(2)	0.0613(22)	0.0771(25)	0.0436(19)	−0.0007(20)	0.0336(18)	0.0031(18)
BR1	0.3313(1)	0.4923(2)	0.2718(2)	0.0650(18)	0.0654(19)	0.0623(17)	0.0158(16)	0.0428(16)	0.0142(16)
BR2	0.4670(1)	0.0875(2)	0.3250(1)	0.0383(15)	0.0696(19)	0.0367(14)	0.0066(14)	0.0142(13)	−0.0039(14)
BR3	0.3019(1)	0.1539(2)	0.2183(1)	0.0346(14)	0.0838(20)	0.0417(14)	−0.0046(14)	0.0216(12)	−0.0108(15)
BR4	0.4363(1)	0.2280(2)	0.4780(1)	0.0438(15)	0.1009(24)	0.0313(13)	0.0111(16)	0.0217(12)	0.0147(15)
BR5	0.3747(1)	0.3592(2)	0.1319(2)	0.1528(32)	0.0720(22)	0.0604(18)	−0.0163(21)	0.0799(22)	−0.0072(17)
BR6	0.4883(1)	0.4457(2)	0.0868(2)	0.0519(18)	0.0753(21)	0.0789(21)	0.0110(17)	0.0177(17)	−0.0072(19)
OXY	0.4084(4)	0.3021(11)	0.3072(7)	0.0072(67)	0.0663(101)	0.0179(68)	0.0087(71)	0.0058(59)	0.0010(72)
N1	0.3534(7)	0.1106(14)	0.1127(10)	0.0448(50)					
C11	0.2969(11)	0.1021(20)	0.0464(16)	0.0691(79)					
C12	0.2767(10)	0.0462(20)	−0.0290(16)	0.0709(79)					
C13	0.3162(9)	−0.0070(20)	−0.0315(14)	0.0534(66)					
C14	0.3707(10)	0.0058(21)	0.0351(15)	0.0666(75)					
C15	0.3903(9)	0.0627(18)	0.1083(14)	0.0533(68)					
N2	0.0591(6)	0.2973(13)	0.0100(9)	0.0375(44)					
C21	0.1091(13)	0.2501(23)	0.0433(18)	0.0971(99)					
C22	0.1600(11)	0.3005(23)	0.1124(17)	0.0811(87)					
C23	0.1646(11)	0.3833(21)	0.1520(16)	0.0659(78)					
C24	0.1150(10)	0.4300(19)	0.1191(15)	0.0625(73)					
C25	0.0622(9)	0.3852(18)	0.0516(14)	0.0474(64)					
N3	0.3085(7)	0.3202(15)	0.3693(11)	0.0503(53)					
C31	0.2674(10)	0.2505(19)	0.3418(14)	0.0566(68)					
C32	0.2336(12)	0.2728(25)	0.3702(19)	0.1040(107)					
C33	0.2466(11)	0.3521(22)	0.4222(16)	0.0768(86)					
C34	0.2920(10)	0.4185(20)	0.4487(15)	0.0669(78)					
C35	0.3196(9)	0.4005(19)	0.4199(15)	0.0589(72)					
N4	0.0791(7)	0.0890(13)	0.2568(10)	0.0388(46)					
C41	0.0805(11)	0.1069(23)	0.3201(18)	0.0830(93)					
C42	0.0757(12)	0.2066(27)	0.3420(19)	0.1030(104)					
C43	0.0685(11)	0.3001(24)	0.2921(18)	0.0919(95)					
C44	0.0681(10)	0.2744(20)	0.2206(15)	0.0653(76)					
C45	0.0723(10)	0.1674(21)	0.2038(16)	0.0679(78)					
H11	0.2672	0.1356	0.0533	0.0507					
H12	0.2316	0.0474	−0.0854	0.0507					
H13	0.3020	−0.0582	−0.0859	0.0507					
H14	0.4013	−0.0306	0.0315	0.0507					
H15	0.4357	0.0679	0.1621	0.0507					
H21	0.1090	0.1768	0.0153	0.0507					
H22	0.1988	0.2602	0.1341	0.0507					
H23	0.2056	0.4147	0.2072	0.0507					
H24	0.1156	0.5059	0.1467	0.0507					
H25	0.0235	0.4230	0.0342	0.0507					
H31	0.2574	0.1820	0.3006	0.0507					
H32	0.1974	0.2210	0.3471	0.0507					
H33	0.2228	0.3658	0.4446	0.0507					
H34	0.3043	0.4854	0.4928	0.0507					
H35	0.3534	0.4539	0.4404	0.0507					
H41	0.0859	0.0389	0.3578	0.0507					
H42	0.0772	0.2163	0.3968	0.0507					
H43	0.0634	0.3814	0.3064	0.0507					
H44	0.0649	0.3392	0.1812	0.0507					
H45	0.0699	0.1470	0.1492	0.0507					

Table II. Observed and calculated structure factors for $Cu_4Bi_6O(C_5H_5N)_4$. Unobserved reflections are designated by a negative FO.

L = 0

H	K	FO	FC
0	2	2317	-3059
0	4	2338	2069
0	6	1365	-1308
0	8	558	-560
0	10	-341	82
0	12	-336	293
0	14	493	573
1	1	2795	2717
-1	1	2899	2717
1	3	2545	2568
-1	3	2536	2568
1	5	631	636
-1	5	637	636
1	7	1185	1226
-1	7	1209	1226
1	9	1855	-1821
-1	9	1862	-1821
1	11	792	-765
-1	11	802	-765
1	13	-303	-93
-1	13	-297	-93
2	0	4550	4900
-2	0	4537	4900
2	2	1238	-1120
-2	2	1251	-1120
2	4	2142	2215
-2	4	2143	2215
2	6	5649	-5741
-2	6	5707	-5741
2	8	1409	-1396
-2	8	1437	-1396
2	10	654	-608
-2	10	631	-608
2	12	-326	-140
3	1	885	-893
-3	1	864	-893
3	3	-240	-205
-3	3	-238	-205
3	5	725	-582
-3	5	726	-582
3	7	912	-937
-3	7	915	-937
3	9	1741	-1652
-3	9	1819	-1652
3	11	1258	-1318
-3	11	1240	-1318
3	13	-301	-256
-3	13	-296	-256
4	0	3776	-3614
-4	0	3758	-3614
4	2	1612	1516
-4	2	1585	1516
4	4	427	486
-4	4	421	486
4	6	3833	-3949
-4	6	4067	-3950
4	8	377	314
-4	8	-322	314
4	10	1487	-1606
-4	10	1565	-1606
4	12	780	745
-4	12	861	745
5	1	1240	-1234
-5	1	1235	-1234
5	3	4177	4010
-5	3	4219	4010
5	5	2975	3131
-5	5	2987	3131
5	7	2115	-2042
-5	7	2129	-2042
5	9	1348	1215
-5	9	1328	1215
5	11	-339	-80
-5	11	-339	-80
5	13	-291	-236
-5	13	323	-236
6	0	1850	1786
-6	0	1846	1786
6	2	3901	3652
-6	2	3913	3652
6	4	655	777
-6	4	634	777
6	6	1609	1630
-6	6	1608	1630
6	8	1409	1307
-6	8	1373	1307
6	10	408	454
-6	10	-349	454
-6	12	672	534
7	1	2891	2679
-7	1	3001	2679
7	3	2444	-2445
-7	3	2562	-2445
7	5	2697	2661
-7	5	2719	2661
7	7	718	688
-7	7	756	688
7	9	-345	287
-7	9	512	287
7	11	803	-924
-7	11	723	-924
7	13	342	331
-7	13	537	331
8	0	563	-506
-8	0	596	-506
8	2	598	-764
-8	2	660	-764
8	4	-289	129
-8	4	292	129
8	6	786	-615
-8	6	803	-615
8	8	864	-965
-8	8	929	-965
8	10	494	-586
-8	10	573	-586
8	12	601	-696
-8	12	637	-656
9	1	-282	200
-9	1	-282	200
9	3	1762	-1592
-9	3	1774	-1592
9	5	2020	-1919
-9	5	1980	-1919
9	7	1565	-1495
-9	7	1570	-1495
9	9	595	-523
-9	9	665	-523
9	11	1208	-1144
-9	11	1277	-1144
9	13	-275	-26
-9	13	-285	-26
10	0	1571	1634
-10	0	1571	1634
10	2	1466	1418
-10	2	1425	1418
10	4	1022	-881
-10	4	1057	-881
10	6	381	127
-10	6	-341	127
10	8	959	-988
-10	8	985	-988
10	10	1792	-1742
-10	10	1834	-1742
10	12	-313	-15
-10	12	-318	-15
11	1	4146	4090
-11	1	4149	4090
11	3	2748	2636
-11	3	2743	2636
11	5	-337	-265
-11	5	-338	-265
11	7	2089	-2088
-11	7	2116	-2088
11	9	-359	97
-11	9	-364	97
11	11	-334	188
-11	11	-340	188
12	0	-323	-130
-12	0	342	-130
12	2	3055	2979
-12	2	3039	2979
12	4	3349	3221
-12	4	3377	3221
12	6	-359	-308
-12	6	419	-308
12	8	-366	390
-12	8	-373	390
12	10	-359	-204
-12	10	395	-204
12	12	-298	-41
-12	12	-307	-41
13	1	4571	4418
-13	1	4592	4418
13	3	-350	-89
-13	3	-351	-89
13	5	-364	182
-13	5	459	182
13	7	1138	-1093
-13	7	1134	-1093
13	9	656	-609
-13	9	641	-609
13	11	-335	531
-13	11	512	531
14	0	1340	1337
-14	0	1356	1337
14	2	2359	-2356
-14	2	2328	-2356
14	4	572	649
-14	4	637	649
14	6	-375	-65
-14	6	-382	-65
14	8	-382	-514
-14	8	571	-514
14	10	604	-555
-14	10	548	-555
15	1	-385	-124
-15	1	-383	-124
15	3	-387	223
-15	3	-390	223
15	5	2408	-2481
-15	5	2487	-2481
15	7	1192	-1187
-15	7	1317	-1187
15	9	614	-778
-15	9	636	-778
15	11	-314	249
16	0	1482	1578
-16	0	1455	1578
16	2	2895	-2782
-16	2	2892	-2782
16	4	585	677
-16	4	675	677
16	6	1078	1141
-16	6	-401	1141
16	8	428	329
-16	8	-383	329
16	10	533	-533
-16	10	553	-533
17	1	847	708
-17	1	806	708
-17	3	1158	1075
17	5	1927	-1999
-17	5	1988	-1999
17	7	-396	2000
-17	7	2048	2000
17	9	-358	-347
-17	9	-364	-347
18	0	1572	-1628
-18	0	1429	-1628
18	2	-439	306
-18	2	-445	306
18	4	2458	2347
-18	4	2422	2347
18	6	435	336
-18	6	-414	336
18	8	762	807
-18	8	729	807
18	10	-309	157
-18	10	-319	157
19	1	-448	27
-19	1	-455	27
19	3	909	896
-19	3	844	896
19	5	-417	-192
-19	5	-420	-192
19	7	-383	306
-19	7	-395	306
19	9	-331	274
-19	9	365	274
20	0	1028	-1043
-20	0	1111	-1043
20	2	-460	-413
-20	2	678	-413
20	4	917	-984
-20	4	941	-984
20	6	894	845
-20	6	864	845
20	8	-341	-248
-20	8	-352	-248
21	1	-469	-43
-21	1	-474	-43
21	3	1115	-1000
-21	3	1127	-1000
21	5	644	517
-21	5	628	517
21	7	1276	-1488
-21	7	1348	-1489
22	0	1767	-1560
-22	0	1755	-1560
22	2	1271	1227
-22	2	1361	1227
22	4	-423	-197
-22	4	-431	-197
22	6	-343	242
-22	6	-349	242
23	1	1393	1292
-23	1	1371	1292
23	3	526	-653
-23	3	-397	-653
23	5	374	409
-23	5	424	409
24	0	-382	-290
-24	0	506	-290
24	2	1456	1571
-24	2	1423	1571
-24	4	423	-496
25	1	612	-532
-25	1	652	-532
-25	3	989	1031

L = 1

H	K	FO	FC
0	2	384	346
0	4	1166	1154
0	6	2442	2487
0	8	1390	1460
0	10	691	766
0	12	467	-302
0	14	330	-477
1	1	5967	6893
-1	1	4956	5996
1	3	543	438
-1	3	4624	4869
1	5	3498	3685
-1	5	724	825
1	7	939	883
-1	7	975	1006
1	9	1036	-963
-1	9	-331	162
1	11	409	-228
-1	11	494	-336
1	13	-300	15
-1	13	374	-518
2	2	1347	1263
-2	2	1765	-1313
2	4	827	-780
-2	4	885	-660
2	6	1601	1642
-2	6	-424	-672
2	8	1037	1027
-2	8	2148	2121
2	10	377	-359
-2	10	1567	945
2	12	-325	-227
3	1	2742	-2648
-3	1	4728	-4498
3	3	483	-799
-3	3	3909	3560
3	5	5433	5644
-3	5	2209	2001
3	7	2932	-2887
-3	7	1877	-1765
3	9	671	-745
-3	9	-368	-211
3	11	692	-744
-3	11	888	-783
3	13	363	342
-3	13	-309	-85
4	2	5401	-5433
-4	2	274	-143
4	4	-245	-12
-4	4	-307	-142
4	6	611	666
-4	6	2013	2048
4	8	-316	10
-4	8	1355	-1311
4	10	-341	428
-4	10	582	249
4	12	-327	93
-4	12	-336	-119
5	1	5309	5348
-5	1	2895	-2747
5	3	-246	62
-5	3	3495	3140
5	5	847	731
-5	5	1082	-924
5	7	2848	-2790
-5	7	1153	1167
5	9	1611	1530
-5	9	-351	31
5	11	899	-936
-5	11	-346	-250
5	13	734	834
-5	13	626	735
6	2	682	-160
-6	2	442	-102
6	4	1600	-1621
-6	4	-291	-151
6	6	1114	-1052
-6	6	3014	3098
6	8	982	951
-6	8	1548	-1378
6	10	969	813
-6	10	-356	183
6	12	365	389
-6	12	683	610
7	1	4746	4997
-7	1	1038	1010
7	3	1896	-2106
-7	3	659	-624
7	5	1225	1340
-7	5	818	-311
7	7	1508	-1406
-7	7	756	822
7	9	-344	-296
-7	9	702	-762
7	11	620	543
-7	11	951	978
7	13	-280	215
-7	13	-299	-313
8	2	1135	1131
-8	2	4606	4236
8	4	3125	-3114
-8	4	2284	2051
8	6	1512	-1538
-8	6	1479	-1534
8	8	924	885
-8	8	1270	1211
8	10	356	264
-8	10	929	-903
8	12	462	-529
-8	12	811	-919
9	1	3456	3424
-9	1	3383	3274
9	3	2076	-2068
-9	3	596	651
9	5	435	-459
-9	5	-318	-48
9	7	-340	-311
-9	7	1120	1173
9	9	-351	-204
-9	9	-363	193
9	11	426	-368
-9	11	-351	-74
-9	13	947	-863
10	2	2345	-2256
-10	2	1069	930
10	4	1768	1628
-10	4	5840	5669
10	6	1789	1796
-10	6	592	-587
-10	8	424	158
10	10	-350	185
-10	10	653	-728
10	12	-302	-112
-10	12	-325	-120
11	1	2375	-2288
-11	1	973	735
11	3	868	823
-11	3	1045	968
11	5	829	737
-11	5	1895	1810
11	7	-356	149
-11	7	2220	2114
11	9	938	869
-11	9	1285	1490
11	11	340	-171
-11	11	611	-633
12	2	2309	2184
-12	2	4089	3670
12	4	590	-624
-12	4	2562	2595
12	6	-363	1728
-12	6	1969	1878
12	8	-366	-481
-12	8	-372	370
12	10	-350	336
-12	10	954	-768
12	12	-292	-310
-12	12	-315	322
13	1	2325	-2286
-13	1	3327	-3120
13	3	-362	-445
-13	3	1122	-977
13	5	817	812
-13	5	3150	3045
13	7	456	-428
-13	7	1029	1011
13	9	794	711
-13	9	-373	-40
13	11	-321	142
-13	11	-342	-143
14	2	928	802
-14	2	2377	2097
14	4	649	-582
-14	4	1267	1266
14	6	-385	580
-14	6	1359	1259
14	8	1224	-1202
-14	8	718	-764
14	10	-342	85
-14	10	1053	-1091
-15	1	611	86
15	3	2553	-2418
-15	3	498	469
15	5	1991	-1863
-15	5	1643	-1630
15	7	423	481
-15	7	1302	1344
15	9	417	489
-15	9	454	575
15	11	-299	-84
-15	11	-332	-185
16	2	-417	63
-16	2	462	-100
16	4	653	526
-16	4	2883	2809
16	6	1209	-1278
-16	6	834	-696
16	8	392	-429
-16	8	-383	-4
16	10	-326	-121
-16	10	-350	-175
17	1	-433	-169
-17	1	2723	-2476
17	3	3433	-3217
-17	3	988	705
17	5	550	519
-17	5	-411	-213
17	7	477	-313
-17	7	805	765
17	9	693	629
-17	9	538	489
17	11	454	374
18	2	-442	144
-18	2	1712	1777
18	4	741	647
-18	4	695	857
18	6	1712	-1816
-18	6	942	-870
18	8	-362	187
-18	8	679	579
-18	10	-326	119
19	1	512	-410
-19	1	1732	-1428
19	3	2351	-2311
-19	3	1480	1508
19	5	-409	-283
-19	5	625	-591
19	7	741	-788
-19	7	1230	1198
19	9	829	778
-19	9	523	-467
20	2	-460	-474
-20	2	505	82
20	4	-429	215
-20	4	-444	-260
20	6	-388	-212
-20	6	1527	1419
-20	8	890	-894
21	1	-459	506
-21	1	-475	59
21	3	1395	-1477
-21	3	2252	2171
21	5	-407	-406
-21	5	621	-687
-21	7	897	983
22	2	1429	1306
-22	2	1298	1042
22	4	969	-883
-22	4	-427	-148
-22	6	1039	1115
23	1	-417	-112
-23	1	1184	-1155
23	3	660	-851
-23	3	1767	1727
-23	5	855	925
-23	7	382	546
-24	2	-384	-250
-24	4	860	911
-24	6	333	-213
-25	1	644	736
-25	3	700	799
-26	2	915	-1184

L = 2

H	K	FO	FC
0	0	5493	-6008
0	2	1702	-1574
0	4	2016	2041
0	6	3094	-3035
0	8	1376	1260
0	10	1087	-1091
0	12	427	-408
0	14	-261	-407
1	1	2820	-2622
-1	1	728	-686
1	3	320	-142
-1	3	2195	-2250
1	5	3934	-3944
-1	5	546	491
1	7	527	440
-1	7	1110	-1049
1	9	485	-582
-1	9	577	-569
1	11	525	-588
-1	11	807	651
1	13	-298	57
-1	13	339	-226
2	0	1048	1154
-2	0	3506	4083
2	2	2362	-2408
-2	2	3173	-3378
2	4	316	-191
-2	4	5352	5701
2	6	2446	2415
-2	6	-277	357
2	8	2142	2193
-2	8	-311	189
2	10	1813	-1734
-2	10	-337	327
2	12	381	-377
-2	12	388	401
3	1	5546	5818
-3	1	1509	1490
3	3	3050	3118
-3	3	6187	6927
3	5	1453	-1396
-3	5	2664	2953
3	7	1037	1048
-3	7	955	-807
3	9	695	695
-3	9	655	653
3	11	487	500
-3	11	891	963
3	13	577	574
-3	13	-311	-244
4	0	4206	4258
-4	0	7293	7033
4	2	745	668
-4	2	1740	-1499
4	4	2900	2968
-4	4	1326	1272
4	6	1670	1726
-4	6	1095	-1147
4	8	1285	-1411
-4	8	776	-581
4	10	643	623
-4	10	-374	-229
4	12	730	-690
-4	12	-341	-226
5	1	5464	5651
-5	1	1518	1377
5	3	1659	-1609
-5	3	3533	-2844
5	5	1184	-1238
-5	5	3039	-2845
5	7	2865	-2902
-5	7	1266	1142
5	9	1066	-986
-5	9	2129	-1956
5	11	-332	297
-5	11	1827	-1625
5	13	-283	140
-5	13	428	434
6	0	3916	-3717
-6	0	4166	3834
6	2	1387	1257
-6	2	520	289
6	4	315	-109
-6	4	2543	-2254
6	6	653	-584
-6	6	3729	-3686
6	8	2976	-2953
-6	8	601	-451
6	10	956	-919
-6	10	1280	-1006
6	12	652	-603
-6	12	-348	-98
7	1	2573	2588
-7	1	420	261
7	3	994	913
-7	3	991	-727
7	5	1091	-1109
-7	5	-335	213
7	7	4883	-4952
-7	7	-356	-554
7	9	-341	-53
-7	9	-372	189
7	11	-341	-310
-7	11	1186	-1076
7	13	322	-404
-7	13	-306	-86
8	0	2333	-2218
-8	0	5889	5486
8	2	5589	5556
-8	2	2471	2315
8	4	1412	-1344
-8	4	1079	-1028
8	6	1318	1339
-8	6	939	881
8	8	351	-93
-8	8	923	885
8	10	1678	-1766
-8	10	445	-327
8	12	333	76
-8	12	1208	1127
9	1	5139	4936
-9	1	504	-546
9	3	-301	157
-9	3	-326	-535
9	5	473	452
-9	5	6298	6399
9	7	-344	49
-9	7	616	-654
9	9	-353	-55
-9	9	2181	2346
9	11	-334	90
-9	11	-358	129
-9	13	-298	-103
10	0	-306	-412
-10	0	3786	-3368
10	2	3223	3189
-10	2	1462	968
10	4	355	320
-10	4	1951	1926
10	6	1025	1107
-10	6	2535	-2484
10	8	-358	-47
-10	8	587	321
10	10	-349	314
-10	10	1185	1156
10	12	418	-303
-10	12	821	855
11	1	477	377
-11	1	4452	-4161
11	3	534	-332
-11	3	3620	-3355
11	5	1146	-1160
-11	5	1882	1727
11	7	-365	462
-11	7	-368	316
11	9	673	-725
-11	9	496	380
11	11	-322	-247
-11	11	769	-747
12	0	907	839
-12	0	524	-441
12	2	2765	-2564
-12	2	3824	-3561
12	4	1494	-1400
-12	4	1951	-1772
12	6	976	983
-12	6	1567	-1448
12	8	1792	-1712
-12	8	654	610
12	10	-345	-460
-12	10	-365	-44
-12	12	-324	157
13	1	1801	-1676
-13	1	4714	-4423
13	3	1734	1717
-13	3	2763	2491
13	5	1211	-1002
-13	5	593	-570
13	7	-380	-77
-13	7	1898	1801
13	9	606	-724
-13	9	611	491
13	11	-307	120
-13	11	658	-738
14	0	-393	24
-14	0	5267	4779
14	2	1906	1819
-14	2	1454	-1384
14	4	803	771
-14	4	1407	1319
14	6	703	-845
-14	6	-385	-298
14	8	-372	-535
-14	8	1654	1600
14	10	470	338
-14	10	-367	292
15	1	1336	1320
-15	1	951	917
15	3	1258	1225
-15	3	-386	-2
15	5	451	539
-15	5	1508	1505
15	7	1290	1302
-15	7	2133	2127
15	9	762	-866
-15	9	475	-233
-15	11	-339	-53
16	0	1864	1765
-16	0	2299	2244
16	2	2862	2768
-16	2	1837	-1663
16	4	435	-43
-16	4	2652	2331
16	6	913	-978
-16	6	1408	-1382
16	8	-367	133
-16	8	420	201
16	10	-308	65
-16	10	390	426
17	1	-439	-265
-17	1	1204	-988
17	3	1129	1083
-17	3	1512	-1458
17	5	-403	-65
-17	5	706	499
17	7	-377	-733
-17	7	1370	-1263
17	9	532	-515
-17	9	390	-423
-17	11	-294	194
18	0	2956	2727
-18	0	1776	1598
18	2	-447	414
-18	2	2582	-2359
18	4	1467	-1555
-18	4	479	-507
18	6	815	-672
-18	6	1021	-1076
18	8	1306	-1459
-18	8	-390	256
-18	10	779	-775
19	1	766	763
-19	1	979	-770
19	3	507	-470
-19	3	939	1090
19	5	-406	395
-19	5	495	-386
19	7	-363	53
-19	7	-400	72
-19	9	-339	84
20	0	1070	1059
-20	0	743	-800
20	2	1688	1551
-20	2	-465	-166
20	4	-420	-30
-20	4	1465	1278
20	6	421	-545
-20	6	494	-361
-20	8	1531	1407
21	1	-453	203
-21	1	669	510
21	3	882	905
-21	3	-464	26
21	5	574	549
-21	5	427	-570
-21	7	1434	1442
-21	9	-296	356
22	0	-446	297
-22	0	1138	-984
22	2	1840	1823
-22	2	1643	-1547
-22	4	-415	225
-22	6	1169	1321
-23	1	1070	-1108
-23	3	885	-875
-23	5	474	-435
-23	7	823	-933
-24	0	2023	-2159
-24	2	857	-1116
-24	4	512	-634
-24	6	883	931
-25	1	452	547
-25	3	1073	-1263
-25	5	-320	556
-26	0	2079	-2439
-26	2	807	754
-26	4	469	554
-27	1	-314	303

L = 3

H	K	FO	FC
0	2	5591	5779
0	4	1773	-1930
0	6	888	-732
0	8	572	335
0	10	-339	-327
0	12	492	-605
0	14	-250	-121
1	1	2931	3011
-1	1	2087	1885
1	3	-225	11
-1	3	1369	-1320
1	5	428	-191
-1	5	3692	3701
1	7	1527	-1716
-1	7	-297	-860
1	9	2069	2055
-1	9	-323	-23
1	11	889	-1016
-1	11	-339	-303
1	13	-293	-280
-1	13	-301	245
2	2	2274	-2364
-2	2	1261	1248
2	4	5213	5498
-2	4	-244	-78
2	6	2590	-2499
-2	6	4742	4815
2	8	704	644
-2	8	1478	-1450
2	10	-333	123
-2	10	-331	330
2	12	-316	-85
-2	12	436	477
3	1	4741	4725
-3	1	3165	3376
3	3	4166	-4398
-3	3	747	833
3	5	2950	2939
-3	5	3089	3066
3	7	617	649
-3	7	1726	1892
3	9	1901	1970
-3	9	-340	-453
3	11	353	-440
-3	11	-346	-321
3	13	-289	-257
-3	13	-296	166
4	2	3287	3254
-4	2	1042	-1111
4	4	2688	2795
-4	4	3865	4224
4	6	511	352
-4	6	2994	3182
4	8	956	1022
-4	8	-338	-44
4	10	1093	-924
-4	10	604	578
4	12	-318	70
-4	12	841	-915
5	1	503	773
-5	1	3016	2864
5	3	3762	-3871
-5	3	4550	4630
5	5	4614	4734
-5	5	4504	4694
5	7	964	949
-5	7	1129	-995
-5	8	688	0
5	9	507	-503
5	11	-333	-85
-5	11	482	-339
5	13	-276	-267
-5	13	432	-390
6	2	3605	3620
-6	2	848	1048
6	4	956	2262
-6	4	453	-234
6	6	3398	3415
-6	6	-337	115
6	8	1931	-2010
-6	8	2112	2208
6	10	1019	-1111
-6	10	628	634
6	12	-309	-115
-6	12	1904	-1800
7	1	1222	1050
-7	1	2777	2774
7	3	395	472
-7	3	5576	5172
7	5	962	905
-7	5	592	538
7	7	892	874
-7	7	367	166
7	9	2034	2006
-7	9	410	554
7	11	1121	-960
-7	11	897	-757
-7	13	349	-317
8	2	3015	2983
-8	2	647	-476
8	4	2260	2171
-8	4	1788	-1570
8	6	2338	2418
-8	6	3451	3322
8	8	938	-857
-8	8	-402	377
8	10	-345	162
-8	10	1285	1386
8	12	466	-418
-8	12	-325	-153
9	1	2399	-2393
-9	1	1978	1628
9	3	2027	1868
-9	3	1786	1560
9	5	845	776
-9	5	1628	1582
9	7	375	486
-9	7	-388	-236
9	9	1599	1445
-9	9	415	341
9	11	373	4
-9	11	693	-570
-9	13	512	527
10	2	3552	3433
-10	2	1510	-1301
10	4	1037	943
-10	4	3495	-3164
10	6	-355	-167
-10	6	1255	1122
10	8	-365	112
-10	8	-390	704
10	10	-344	197
-10	10	-385	-160
10	12	477	-490
-10	12	-354	90
11	1	-350	110
-11	1	-356	-327
11	3	520	-442
-11	3	1286	-1103
11	5	560	-690
-11	5	3128	2998
11	7	902	1154
-11	7	2320	-2312
11	9	-364	-355
-11	9	850	-829
11	11	-313	7
-11	11	394	-145
12	2	1040	-998
-12	2	3367	-3029
12	4	912	979
-12	4	1298	1375
12	6	-377	85
-12	6	1200	-1144
12	8	1395	-1383
-12	8	959	1032
12	10	-334	-90
-12	10	-374	-131
-12	12	-322	20
13	1	535	245
-13	1	5095	4692
13	3	431	-335
-13	3	551	-618
13	5	571	-657
-13	5	717	844
13	7	942	829
-13	7	707	-839
13	9	516	-333
-13	9	734	651
13	11	-295	258
-13	11	452	-354
14	2	541	401
-14	2	780	-495
14	4	-398	20
-14	4	2569	2376
14	6	474	432
-14	6	548	-511
14	8	403	601
-14	8	1449	1389
14	10	-317	-66
-14	10	490	244
15	1	1305	-1393
-15	1	3616	3451
15	3	874	802
-15	3	-395	-119
15	5	1205	1113
-15	5	2322	2222
15	7	-377	-185
-15	7	-398	300
15	9	-339	127
-15	9	-386	-124
-15	11	439	350
16	2	-431	123
-16	2	3706	3575
16	4	615	666
-16	4	1405	-1286
16	6	-389	-220
-16	6	893	716
16	8	538	483
-16	8	632	662
-16	10	404	-445
17	1	949	1022
-17	1	-421	-294
17	3	956	863
-17	3	752	632
17	5	-399	16
-17	5	-417	52
17	7	-371	131
-17	7	689	613
17	9	-312	289
-17	9	-367	15
-17	11	436	-433
18	2	-445	-558
-18	2	766	-410
18	4	-418	341
-18	4	1465	1378
18	6	433	99
-18	6	1597	1574
18	8	-333	442
-18	8	1248	-1207
-18	10	-316	-45
19	1	1231	1234
-19	1	3028	-2721
19	3	-427	177
-19	3	1465	1197
19	5	1056	1111
-19	5	539	-470
19	7	-345	176
-19	7	527	526
-19	9	924	968
20	2	-436	24
-20	2	-469	310
20	4	-408	-480
-20	4	613	624
-20	6	-391	-148
-20	8	-346	277
-20	10	-286	237
21	1	735	707
-21	1	2415	-2466
21	3	-418	599
-21	3	633	-548
-21	5	841	-721
-21	7	473	491
-21	9	-297	-19
-22	2	451	210
-22	4	-395	150
-22	6	624	-553
-22	8	350	-458
-23	1	719	368
-23	3	965	-871
-23	5	1890	-2162
-23	7	824	922
-24	2	-383	232
-24	4	-353	109
-24	6	-319	-96
-25	1	1964	-1545
-25	3	-349	-228
-25	5	-320	-179
-26	2	746	1035
-26	4	-316	71
-27	1	432	-457
-27	3	-307	-134

L = 4

H	K	FO	FC
0	0	1132	1164
0	2	1379	1417
0	4	3304	3438
0	6	1644	1549
0	8	-315	130
0	10	947	886
0	12	-325	222
0	14	-245	268
1	1	1793	1804
-1	1	2031	-1983
1	3	2902	2861
-1	3	5587	5977
1	5	1203	1238
-1	5	6091	-6447
1	7	-294	273
-1	7	749	608
1	9	526	-515
-1	9	-327	-270
1	11	1065	1091
-1	11	906	976
1	13	306	26
-1	13	-288	50
2	0	1087	-1095
-2	0	1841	-1890
2	2	579	586
-2	2	6754	-7064
2	4	723	497
-2	4	-245	-356
2	6	510	-440
-2	6	950	-825
2	8	1177	-1069
-2	8	394	172
2	10	993	930
-2	10	-331	-30
2	12	-317	-166
-2	12	713	-720
3	1	282	-135
-3	1	1356	-1438
3	3	5261	-5431
-3	3	3386	-3444
3	5	1501	1372
-3	5	3028	-3083
3	7	945	-849
-3	7	2735	2660
3	9	591	-632
-3	9	824	-888
3	11	-332	-281
-3	11	-337	245
3	13	499	-486
-3	13	-300	311
4	0	1107	-1118
-4	0	2445	-2571
4	2	1671	1654
-4	2	3394	-3640
4	4	5813	-6225
-4	4	1464	-1604
4	6	1183	1234
-4	6	2351	2307
4	8	825	-931
-4	8	2155	2050
4	10	779	-880
4	12	-314	-9
-4	12	516	-676
5	1	2753	-2662
-5	1	386	-228
5	3	352	58
-5	3	2074	-2325
5	5	717	770
-5	5	2965	3205
5	7	1200	1068
-5	7	574	501
5	9	866	935
-5	9	2638	2692
5	11	-340	-591
-5	11	1384	1325
-5	13	305	150
6	0	4519	-4273
-6	0	4101	-4315
6	2	4217	4140
-6	2	1167	988
6	4	1240	-1206
-6	4	1134	1011
6	6	1374	1383
-6	6	4786	5058
6	8	541	665
-6	8	2333	2331
6	10	1000	963
-6	10	-366	130
6	12	383	469
-6	12	589	518
7	1	1031	-965
-7	1	1347	-1180
7	3	359	486
-7	3	2188	-1753
7	5	1925	1805
-7	5	499	-346
7	7	2792	2945
-7	7	2034	-1579
7	9	529	471
-7	9	1766	1627
7	11	-325	-125
-7	11	811	764
-7	13	-285	-3
8	0	3265	-3110
-8	0	11973	-14370
8	2	1766	1849
-8	2	1391	-1088
8	4	1594	-1676
-8	4	928	803
8	6	497	427
-8	6	415	-304
8	8	1366	-1329
-8	8	579	-625
8	10	1675	1655
-8	10	-349	161
8	12	-289	115
-8	12	469	-471
9	1	3800	-3647
-9	1	864	-1034
9	3	-335	-20
-9	3	1268	-1311
9	5	612	566
-9	5	1514	-1797
9	7	1421	-1524
-9	7	1059	-1048
9	9	-353	57
-9	9	-339	-83
9	11	327	-251
-9	11	-326	-224
-9	13	356	471
10	0	1178	1076
-10	0	362	-77
10	2	840	1013
-10	2	1272	-1240
10	4	3464	-3459
-10	4	649	-730
10	6	-365	-355
-10	6	1960	2149
10	8	1218	-941
-10	8	-341	75
10	10	-336	290
-10	10	-341	-262
-10	12	-301	-283
11	1	459	349
-11	1	3235	3070
11	3	571	-580
-11	3	1286	1088
11	5	1247	1221
-11	5	1065	1064
11	7	377	364
-11	7	625	-560
11	9	610	-668
-11	9	1578	1623
11	11	385	-427
-11	11	393	460
12	0	579	638
-12	0	2438	2331
12	2	4034	3730
-12	2	-377	-222
12	4	-386	-135
-12	4	873	582
12	6	948	-1043
-12	6	1990	1911
12	8	-364	-240
-12	8	899	1098
12	10	345	380
-12	10	-339	76
-12	12	-300	514
13	1	1273	1202
-13	1	1259	1041
13	3	1311	1330
-13	3	6084	-5369
13	5	-393	61
-13	5	1146	848
13	7	1263	1365
-13	7	937	824
13	9	607	-496
-13	9	-364	460
-13	11	-318	163
14	0	3195	3281
-14	0	5108	-4656
14	2	-419	-53
-14	2	2075	-1660
14	4	775	-721
-14	4	-409	-247
14	6	-390	-408
-14	6	2315	-2237
14	8	877	-717
-14	8	647	495
14	10	-298	-176
-14	10	464	-401
15	1	1530	-1383
-15	1	4973	-5162
15	3	1581	1378
-15	3	765	869
15	5	1144	-1235
-15	5	1770	-1544
15	7	544	-279
-15	7	474	200
15	9	907	-975
-15	9	714	653
-15	11	-311	227
16	0	1131	1041
-16	0	1381	1280
16	2	1365	-1163
-16	2	3517	-3151
16	4	513	333
-16	4	1039	1008
16	6	682	-530
-16	6	-404	-482
16	8	788	-760
-16	8	1743	1746
-16	10	-327	299
17	1	624	593
-17	1	2513	-2304
17	3	-429	-464
-17	3	-433	1710
17	5	-398	19
-17	5	685	653
17	7	382	420
-17	7	2325	2287
-17	9	724	805
-17	11	503	440
18	0	-444	-508
-18	0	3675	3327
18	2	689	516
-18	2	3429	-3259
18	4	516	600
-18	4	2556	2523
18	6	513	510
-18	6	976	-915
-18	8	827	836
-18	10	1570	1722
19	1	675	640
-19	1	1277	-1249
19	3	548	650
-19	3	1839	-1787
19	5	-367	52
-19	5	739	1001
-19	7	1316	1447
-19	9	-324	-113
20	0	1414	-1302
-20	0	2611	2514
20	2	684	791
-20	2	3040	-3140
-20	4	679	-820
-20	6	1266	-1346
-20	8	-332	-53
-20	10	-286	-302
-21	1	1999	-2083
-21	3	-395	-116
-21	5	522	611
-21	7	695	-685
-21	9	312	177
-22	0	412	300
-22	2	1320	1488
-22	4	-377	-288
-22	6	936	-931
-22	8	543	652
-23	1	-383	76
-23	3	-380	-462
-23	5	1474	1632
-23	7	463	566
-24	0	-372	-64
-24	2	1079	1171
-24	4	-347	151
-24	6	696	-914
-25	1	572	-748
-25	3	-352	-169
-25	5	514	497
-26	0	722	458
-26	2	1258	-1366
-26	4	990	-1183
-27	1	602	-834
-27	3	333	-465

L = 5

H	K	FO	FC
0	2	1360	-1374
0	4	5896	6516
0	6	808	728
0	8	-322	-186
0	10	390	-431
0	12	332	218
0	14	-231	145
1	1	-246	-224
-1	1	245	351
1	3	389	-117
-1	3	2415	-2366
1	5	3795	3934
-1	5	870	943
1	7	-304	323
-1	7	1300	1253
1	9	800	666
-1	9	782	737
1	11	-330	146
-1	11	364	-256
1	13	-283	-250
-1	13	-282	-139
2	2	4917	5271
-2	2	-237	183
2	4	847	-823
-2	4	2810	2849
2	6	913	992
-2	6	1111	-1104
2	8	894	745
-2	8	-316	-1104
2	10	425	-437
-2	10	639	-654
2	12	-313	-197
-2	12	-316	-73
3	1	3676	3683
-3	1	2667	-2568
3	3	549	550
-3	3	5631	-6040
3	5	793	539
-3	5	590	-713
3	7	527	416
-3	7	625	535
3	9	391	377
-3	9	-336	187
3	11	681	-792
-3	11	511	422
-3	13	-289	-324
4	2	1627	1668
-4	2	5392	5828
4	4	308	292
-4	4	3225	-3132
4	6	913	959
-4	6	-286	-138
4	8	381	-430
-4	8	-329	-396
4	10	-346	-308
-4	10	-347	198
4	12	-307	138
-4	12	-325	-280
5	1	1693	1655
-5	1	1494	1548
5	3	1308	1332
-5	3	378	-385
5	5	-312	153
-5	5	3670	-3725
5	7	-334	-122
-5	7	416	380
5	9	-347	313
-5	9	2464	2310
5	11	355	-232
-5	11	-337	135
6	2	1461	-1502
-6	2	291	330
6	4	1796	1792
-6	4	1095	-1191
6	6	638	-582
-6	6	1204	1277
6	8	1331	1330
-6	8	2253	-2352
6	10	-342	17
-6	10	867	832
6	12	312	-109
-6	12	411	362
7	1	2524	-2514
-7	1	3053	-3055
7	3	650	716
-7	3	-333	-326
7	5	1698	1670
-7	5	362	-163
7	7	-350	-155
-7	7	413	-193
7	9	946	-780
-7	9	1222	1191
7	11	502	561
-7	11	635	-593
-7	13	354	191
8	2	2339	-2276
-8	2	1476	1276
8	4	-346	106
-8	4	947	892
8	6	389	-11
-8	6	483	-391
8	8	582	585
-8	8	828	-874
8	10	-338	68
-8	10	-392	-302
-8	12	476	-348
9	1	-353	218
-9	1	1446	-1397
9	3	3307	3271
-9	3	2854	-2801
9	5	1620	-1571
-9	5	3322	3467
9	7	526	509
-9	7	408	-251
9	9	1025	-1083
-9	9	776	-820
9	11	-309	-332
-9	11	-331	232
-9	13	-269	-169
10	2	393	-89
-10	2	1532	-1380
10	4	1489	-1412
-10	4	2928	3051
10	6	1890	1989
-10	6	866	1018
10	8	-364	-129
-10	8	-334	-658
10	10	406	363
-10	10	-330	-64
-10	12	-294	95
11	1	1288	-1075
-11	1	6237	7535
11	3	4500	4365
-11	3	1961	-1926
11	5	457	429
-11	5	920	776
11	7	573	555
-11	7	554	514
11	9	527	-435
-11	9	724	791
-11	11	-309	283
12	2	1639	1600
-12	2	1209	1469
12	4	788	-802
-12	4	472	-643
12	6	1036	957
-12	6	-317	209
12	8	1345	1441
-12	8	500	673
12	10	433	419
-12	10	-325	357
-12	12	-285	97
13	1	557	-485
-13	1	415	1263
13	3	2978	3041
-13	3	2235	-2239
13	5	731	727
-13	5	1193	1044
13	7	940	936
-13	7	2285	-2390
13	9	569	-633
-13	9	921	946
14	2	1631	-1426
-14	2	-314	-306
14	4	2022	1901
-14	4	2700	-2898
14	6	-389	403
-14	6	1539	-1705
14	8	496	494
-14	8	669	730
-14	10	399	318
15	1	1313	1386
-15	1	-329	-207
15	3	1284	1341
-15	3	1490	-1648
15	5	-392	199
-15	5	776	968
15	7	-361	450
-15	7	2099	-2266
15	9	977	1138
-15	11	992	-1031
16	2	-433	-46
-16	2	4356	-4639
16	3	508	0
16	4	645	595
-16	4	1260	-1422
16	6	-366	-124
-16	6	445	-424
16	8	774	795
-16	8	-340	-371
-16	10	815	925
17	1	-433	38
-17	1	2359	2413
-17	3	1941	-2090
17	5	896	964
-17	5	543	360
17	7	404	245
-17	7	420	-545
-17	9	506	-516
-17	11	520	398
18	2	481	342
-18	2	498	-632
18	4	-383	233
-18	4	2675	-2775
18	6	-339	111
-18	6	470	-289
-18	8	736	803
-18	10	367	319
19	1	-416	154
-19	1	1471	1578
19	3	751	632
-19	3	532	-680
19	5	524	-379
-19	5	524	419
-19	7	793	-1057
-19	9	1193	-1240
-20	2	943	-849
-20	4	1143	-1302
-20	6	-352	43
-20	8	-325	-110
-20	10	451	379
-21	1	-369	209
-21	3	1567	1787
-21	5	900	-1127
-21	7	489	-483
-21	9	579	478
-22	2	475	-484
-22	4	432	-328
-22	6	511	537
-22	8	-309	-2
-23	1	1328	-1435
-23	3	905	1055
-23	5	677	665
-23	7	655	-684
-24	2	-359	-162
-24	4	1227	-1333
-24	6	-320	-42
-25	1	736	737
-25	3	462	-483
-25	5	496	-586
-26	2	1501	-1920
-26	4	-322	-48
-27	1	469	601
-27	3	974	-1258

L = 6

H	K	FO	FC
0	0	546	-896
0	2	3749	-3760
0	4	1335	-1413
0	6	-296	-16
0	8	501	-492
0	10	1430	1352
0	12	-307	-12
1	1	6876	-7520
-1	1	-249	-316
1	3	840	-854
-1	3	4539	-4617
1	5	-284	252
-1	5	2754	2541
1	7	550	517
-1	7	3448	3492
1	9	354	149
-1	9	-335	-322
1	11	-332	168
-1	11	-335	98
1	13	609	-755
2	0	2657	-2684
-2	0	4049	3902
2	2	1745	-1734
-2	2	2432	2578
2	4	2246	-2341
-2	4	1715	-1709
2	6	1214	1227
-2	6	361	443
2	8	455	-567
-2	8	1786	1847
2	10	1626	1519
-2	10	679	743
2	12	343	257
-2	12	529	497
3	1	3463	-3457
-3	1	1153	-1183
3	3	2300	2404
-3	3	3203	3349
3	5	581	-521
-3	5	1292	1261
3	7	2618	2486
-3	7	2339	2448
3	9	1164	1243
-3	9	-335	28
3	11	419	449
-3	11	-340	223
-3	13	319	-202
4	0	5247	-5457
-4	0	1989	1822
4	2	4353	4510
-4	2	735	-526
4	4	-313	301
-4	4	2470	-2603
4	6	-331	154
-4	6	1276	-1220
4	8	1094	1077
-4	8	888	-832
4	10	1603	1575
-4	10	-345	-19
4	12	406	462
-4	12	-321	293
5	1	326	-220
-5	1	5620	-6081
5	3	1485	-1459
-5	3	1057	886
5	5	972	1073
-5	5	1999	-2126
5	7	829	791
-5	7	341	486
5	9	992	960
-5	9	1805	-1752
5	11	-318	-222
-5	11	-334	-29
6	0	2621	-2510
-6	0	3844	-4052
6	2	702	656
-6	2	1246	1045
6	4	4471	-4478
-6	4	-281	328
6	6	1549	1457
-6	6	1498	-1658
6	8	468	-246
-6	8	2627	-2584
6	10	503	-582
-6	10	2415	2181
6	12	-276	94
-6	12	-326	-334
7	1	-334	-149
-7	1	1696	-1664
7	3	2470	-2511
-7	3	-302	47
7	5	956	905
-7	5	908	1080
7	7	2253	-2219
-7	7	537	379
7	9	443	386
-7	9	-355	219
7	11	-309	-32
-7	11	645	597
-7	13	-289	17
8	0	1934	-1802
-8	0	763	-790
8	2	-358	408
-8	2	2833	2746
8	4	634	-767
-8	4	3135	-3060
8	6	634	749
-8	6	3627	3660
8	8	479	-512
-8	8	1164	1239
8	10	-328	12
-8	10	1561	1506
-8	12	472	554
9	1	1546	1584
-9	1	395	-336
9	3	541	-577
-9	3	552	-709
9	5	-368	-117
-9	5	1970	1898
9	7	505	452
-9	7	1127	1029
9	9	-343	106
-9	9	2200	2072
-9	11	495	347
-9	13	-284	237
10	0	1884	-1638
-10	0	9557	-9346
10	2	-387	48
-10	2	2049	1869
10	4	1819	1877
-10	4	5484	-5321
10	6	1138	1268
-10	6	1748	1728
10	8	434	585
-10	8	1490	1423
10	10	756	815
-10	10	364	-403
-10	12	303	35
11	1	1507	-1344
-11	1	1089	-1343
11	3	1823	1784
-11	3	5164	-5164
11	5	1391	-1384
-11	5	1153	-1013
11	7	505	395
-11	7	-329	-118
11	9	-330	239
-11	9	-336	300
-11	11	429	-562
12	0	702	-660
-12	0	7362	-8242
12	2	3051	-3118
-12	2	702	320
12	4	469	-249
-12	4	962	-1021
12	6	822	789
-12	6	731	809
12	8	549	510
-12	8	-323	-120
-12	10	-320	222
-12	12	-283	-237
13	1	762	-654
-13	1	-280	-407
13	3	1296	-1149
-13	3	1309	1337
13	5	1096	-1067
-13	5	-304	319
13	7	377	66
-13	7	1313	-1380
13	9	-306	6
-13	9	1066	1096
-13	11	860	849
14	0	1635	-1687
-14	0	3713	3922
14	2	1820	-1842
-14	2	955	-1086
14	4	1168	1196
-14	4	2010	2239
14	6	-372	11
-14	6	2837	3250
14	8	724	736
-14	8	850	-1000
-14	10	1022	946
15	1	1081	1023
-15	1	2443	2641
-15	2	1082	0
15	3	911	-868
-15	3	885	1010
15	5	-381	-139
-15	5	828	-792
15	7	406	346
-15	7	-324	-94
-15	9	-323	-158
-15	11	771	868
16	0	-431	89
-16	0	1656	-1712
16	2	824	-684
-16	2	1002	-1220
16	4	937	893
-16	4	1254	1371
16	6	589	817
-16	6	862	-833
-16	8	486	-531
-16	10	-308	-92
17	1	-416	-112
-17	1	591	660
17	3	709	714
-17	3	672	-852
17	5	590	-658
-17	5	3213	-3472
-17	7	-329	-239
-17	9	1282	-1347
-17	11	288	-209
18	0	595	-495
-18	0	-327	-511
18	2	573	-560
18	4	-360	197
-18	4	684	-820
-18	6	-329	23
-18	8	997	1082
-18	10	1565	-1579
19	1	1912	407
-19	1	897	904
19	3	598	-553
-19	3	1082	1208
-19	5	761	-838
-19	7	432	-423
-19	9	514	543
-20	0	-340	233
-20	2	506	-644
-20	4	1825	1990
-20	6	720	701
-20	8	619	682
-20	10	-287	250
-21	1	1132	1185
-21	3	1199	-1223
-21	5	391	289
-21	7	-327	349
-21	9	-295	225
-22	0	-345	-348
-22	2	1847	-1901
-22	4	889	945
-22	6	-332	-406
-22	8	424	-354
-23	1	1653	-2008
-23	3	-344	-7
-23	5	829	-837
-23	7	632	-876
-24	0	390	466
-24	2	-345	-179
-24	4	1093	-1153
-24	6	-315	139
-25	1	883	1077
-25	3	-338	19
-25	5	437	570
-26	0	496	-680
-26	2	1791	1879
-26	4	592	552
-27	1	1026	1030
-27	3	650	-760

L = 7

H	K	FO	FC
0	2	2301	-2498
0	4	2162	-2332
0	6	772	-912
0	8	601	574
0	10	394	-322
0	12	503	449
1	1	2586	2656
-1	1	1647	-1727
1	3	2773	-2849
-1	3	1854	1894
1	5	903	-948
-1	5	-285	283
1	7	409	26
-1	7	1033	-1020
1	9	2114	-2021
-1	9	1196	-1078
1	11	-326	304
-1	11	567	428
1	13	-256	310
2	2	5165	-5422
-2	2	882	977
2	4	771	-736
-2	4	2040	-1992
2	6	1172	-1167
-2	6	765	-796
2	8	504	681
-2	8	1621	1535
2	10	-337	-215
-2	10	722	790
2	12	839	930
-2	12	-298	-47
3	1	716	-519
-3	1	349	-467
3	3	368	191
-3	3	5035	5206
3	5	-321	-14
-3	5	2098	-2197
3	7	821	-1018
-3	7	350	-395
3	9	658	-517
-3	9	1128	1065
3	11	758	731
-3	11	643	-483
-3	13	-268	110
4	2	964	-1040
-4	2	2224	-2113
4	4	732	-726
-4	4	480	524
4	6	1854	-1948
-4	6	-301	102
4	8	1882	2095
-4	8	-331	-15
4	10	-343	302
-4	10	648	655
4	12	-281	-32
-4	12	415	-341
5	1	1124	-1342
-5	1	1507	-1433
5	3	2439	2522
-5	3	1050	1030
5	5	922	-782
-5	5	1153	-1126
5	7	1152	-1157
-5	7	566	644
5	9	408	318
-5	9	1714	-1747
5	11	-302	-244
-5	11	-339	255
6	2	463	-388
-6	2	461	-571
6	4	1289	-1245
-6	4	1417	-1328
6	6	608	533
-6	6	546	-492
6	8	-352	-296
-6	8	497	-484
6	10	-325	154
-6	10	-348	-145
-6	12	-323	-228
7	1	640	-607
-7	1	2626	-2428
7	3	2476	2584
-7	3	2422	-2411
7	5	1715	-1889
-7	5	-302	-216
7	7	1279	1271
-7	7	633	973
7	9	-348	-267
-7	9	1641	-1700
7	11	405	-456
-7	11	1419	1419
-7	13	-286	244
8	2	1485	1532
-8	2	2823	-2972
8	4	830	-885
-8	4	894	-1016
8	6	1558	1546
-8	6	567	532
8	8	-354	-222
-8	8	1282	-1051
8	10	-315	-106
-8	10	554	511
-8	12	763	692
9	1	2306	-2212
-9	1	1071	-1252
9	3	1274	1308
-9	3	380	-438
9	5	498	520
-9	5	4960	-5081
9	7	1024	951
-9	7	653	-728
9	9	990	-992
-9	9	1534	1625
-9	11	-354	87
-9	13	531	467
10	2	428	23
-10	2	498	397
10	4	1271	1307
-10	4	3304	-3202
10	6	-376	81
-10	6	1843	-1752
10	8	-346	14
-10	8	770	-696
-10	10	-380	311
-10	12	-321	-222
11	1	922	-966
-11	1	4062	-3526
11	3	1044	870
-11	3	2988	-2594
11	5	1784	-1716
-11	5	1698	-1570
11	7	982	973
-11	7	2379	-2218
11	9	-312	-194
-11	9	1345	1303
-11	11	-325	-31
12	2	627	-597
-12	2	2396	2350
12	4	1092	1142
-12	4	1969	-1933
12	6	737	-599

Table II. (Continued)

H	K	FO	FC
L = 7			
-12	6	1579	-1483
12	8	691	-715
-12	8	389	-538
-12	10	607	-439
-12	12	386	291
13	1	1381	-1385
-13	1	3832	4035
13	3	570	-448
-13	3	4875	-5221
13	5	751	-823
-13	5	405	-369
13	7	380	375
-13	7	745	544
-13	9	464	503
-13	11	-303	258
14	2	1981	1899
-14	2	748	-921
14	4	-394	-225
-14	4	2376	2474
14	6	375	-390
-14	6	606	754
-14	8	1140	-1181
-14	10	633	-737
15	1	715	-677
-15	1	1638	1654
15	3	610	-558
-15	3	3504	-3862
15	5	-363	-19
-15	5	1803	2155
-15	7	-316	161
-15	9	-316	-21
-15	11	-291	282
16	2	-404	102
-16	2	714	825
16	4	767	982
-16	4	1552	1709
-16	6	1771	-2016
-16	8	-317	-146
-16	10	696	-724
17	1	-401	452
-17	1	1682	-1790
-17	3	1870	-1585
-17	5	761	875
-17	7	1559	-1674
-17	9	990	1129
-17	11	363	-437
18	2	-367	386
-18	2	-311	462
-18	4	323	329
-18	6	751	-652
-18	8	1079	-1103
-18	10	334	456
-19	1	388	332
-19	3	-324	-554
-19	5	1698	-1998
-19	7	-322	15
-19	9	1145	1199
-20	2	886	923
-20	4	2080	-2353
-20	6	402	420
-20	8	861	-972
-20	10	554	582
-21	1	726	-696
-21	3	2065	-2456
-21	5	-329	-91
-21	7	416	-202
-21	9	404	-384
-22	2	-332	-262
-22	4	1595	-1969
-22	6	440	-547
-22	8	477	-557
-23	1	457	496
-23	3	572	-800
-23	5	676	-723
-23	7	399	-307
-24	2	1512	-1836
-24	4	530	331
-24	6	-313	-133
-25	1	933	980
-25	3	391	463
-25	5	526	507
-26	2	675	699
-26	4	784	-891
-27	1	-326	301
-27	3	-316	163
L = 8			
0	0	480	358
0	2	-285	9
0	4	347	506
0	6	762	900
0	8	1267	1225
0	10	781	-771
0	12	-293	-118
1	1	4492	4641
-1	1	1926	-1815
1	3	765	-678
-1	3	757	577
1	5	583	-605
-1	5	2475	-2606
1	7	1405	1424
-1	7	349	-322
1	9	-342	282
-1	9	-338	-119
1	11	-315	174
-1	11	490	488
2	0	3416	-3515
-2	0	950	1040
2	2	2616	2687
-2	2	5530	-5904
2	4	914	923
-2	4	-286	-72
2	6	-340	433
-2	6	-310	-32
2	8	913	1022
-2	8	1119	-1075
2	10	747	-724
-2	10	467	243
2	12	281	279
-2	12	443	-511
3	1	987	1041
-3	1	2180	-2172
3	3	810	-795
-3	3	636	434
3	5	797	-760
-3	5	1890	-1808
3	7	2624	-2801
-3	7	777	717
3	9	646	631
-3	9	-341	-370
3	11	-308	243
-3	11	970	892
4	0	2154	-2069
-4	0	3541	-3582
4	2	2125	-2258
-4	2	1309	-1345
4	4	-347	-236
-4	4	4653	4001
4	10	499	-605
-4	10	2021	1875
-4	12	-303	-36
5	1	-349	-37
-5	1	-273	-109
5	3	1321	-1360
-5	3	2239	2356
5	5	384	402
-5	5	502	432
5	7	1834	-1770
-5	7	1697	1736
5	9	394	245
-5	9	544	537
5	11	368	332
-5	11	869	919
6	0	1957	-2125
-6	0	1260	1050
6	2	1250	-1254
-6	2	2366	2491
6	4	1152	1200
-6	4	2436	-2388
6	6	1075	1098
-6	6	1829	1814
6	8	-355	266
-6	8	1189	1238
6	10	899	908
-6	10	676	-693
-6	12	501	446
7	1	622	630
-7	1	1517	-1504
7	3	-371	-244
-7	3	1695	-1518
7	5	394	181
-7	5	-311	3
7	7	1451	1299
-7	7	733	-640
7	9	1074	1119
-7	9	567	-644
-7	11	964	-1012
-7	13	-280	-296
8	0	1034	-1114
-8	0	-299	-295
8	2	654	-643
-8	2	2434	2586
8	4	-386	-276
-8	4	5357	-5385
8	6	1071	1124
-8	6	1250	-1333
8	8	1490	1410
-8	8	1642	-1578
8	10	-294	-189
-8	10	489	-364
-8	12	482	-456
9	1	-399	-1824
-9	1	1857	1884
9	3	590	-461
-9	3	3224	-3233
9	5	613	-652
-9	5	2187	2116
9	7	-361	-133
-9	7	-354	260
9	9	781	796
-9	9	1179	-1102
-9	11	992	-785
-9	13	-277	-83
10	0	1805	-1582
-10	0	3251	3350
10	2	1453	-1403
-10	2	3699	4325
10	4	500	-409
-10	4	812	-732
10	6	-373	-292
-10	6	471	473
10	8	721	736
-10	8	2744	-2695
10	10	1069	909
-10	12	-324	121
11	1	634	-489
-11	1	498	334
11	3	1325	-1403
-11	3	4819	4703
11	5	670	500
-11	5	1629	1599
11	7	-350	143
-11	7	493	-411
-11	9	548	463
-11	11	-355	328
12	0	1219	1187
-12	0	524	-842
12	2	1065	-1139
-12	2	5369	4859
12	4	1432	1471
-12	4	1658	-1465
12	6	877	-1011
-12	6	-384	134
-12	8	1428	-1329
-12	10	736	728
-12	12	471	592
13	1	-416	-314
-13	1	3163	-3123
13	3	1152	1225
-13	3	-328	188
13	5	-366	87
-13	5	667	-853
13	7	594	548
-13	7	-342	-18
-13	9	840	-864
-13	11	767	-837
14	0	2649	2641
-14	0	4935	-5221
14	2	1486	-1444
-14	2	2458	2527
14	4	530	456
-14	4	3090	-3155
14	6	-332	-360
-14	6	2236	-2464
-14	8	-329	-119
15	1	1001	-1125
-15	1	326	-81
15	3	462	208
-15	3	2321	-2677
-15	5	1174	1240
-15	7	572	561
-15	9	-317	-178
-15	11	-290	-294
16	0	-388	213
-16	0	3409	3445
16	2	-400	-776
-16	2	547	503
-16	4	1512	-1828
-16	6	1805	1939
-16	8	-313	-128
-16	10	461	422
17	1	658	-673
-17	1	590	739
-17	3	1678	1770
-17	5	1232	1216
-17	7	897	979
-17	9	-305	92
-17	10	300	0
-17	11	488	419
-18	0	2061	2190
-18	2	-298	-38
-18	4	1173	1274
-18	6	-312	-193
-18	8	1605	-1076
-18	10	627	714
-19	1	824	-775
-19	3	857	969
-19	5	1975	-2279
-19	7	801	863
-19	9	1796	-1758
-20	0	454	-393
-20	2	-311	211
-20	4	-319	-242
-20	6	1485	-1603
-20	8	1043	-1241
-20	10	288	-240
-21	1	448	506
-21	3	2114	2455
-21	5	1339	-1472
-21	7	1121	-1064
-21	9	761	-858
-22	0	1882	2173
-22	2	1280	1610
-22	4	-328	-305
-22	6	1036	1126
-22	8	-299	174
-23	1	2496	2795
-24	2	1283	1456
-24	4	-324	202
-24	6	376	436
-25	1	728	947
-25	3	1017	-1199
-25	5	-313	-295
-26	0	1345	-1442
-26	2	-323	-299
-26	4	1271	-1410
-27	1	382	-163
-27	3	839	833
L = 9			
0	2	1290	1251
0	4	408	-354
0	6	1457	-1483
0	8	835	876
0	10	-333	-298
0	12	-282	306
1	1	3259	-3295
-1	1	2472	2578
1	3	416	-422
-1	3	1288	-1246
1	5	-336	138
-1	5	3329	-3390
1	7	-347	-349
-1	7	376	571
1	9	921	1061
-1	9	-338	181
1	11	-303	183
-1	11	-311	167
2	2	629	664
-2	2	2058	-2236
2	4	1291	1341
-2	4	965	-891
2	6	678	-778
-2	6	2716	-2746
2	8	-351	-51
-2	8	397	-263
2	10	598	-576
-2	10	-324	-147
2	12	-259	189
-2	12	487	504
3	1	1519	-1447
-3	1	741	-763
3	3	1029	-992
-3	3	1771	-1958
3	5	482	-533
-3	5	1614	-1701
3	7	-354	-45
-3	7	-332	208
3	9	-342	453
-3	9	1961	-1933
3	11	-301	-402
-3	11	1088	1012
4	2	838	-868
-4	2	2541	-2605
4	4	1371	1431
-4	4	1899	-1892
4	6	382	330
-4	6	1489	-1491
4	8	1455	-1585
-4	8	-345	666
4	10	743	-726
-4	10	-334	98
-4	12	494	554
5	1	445	-74
-5	1	4987	-5319
5	3	1757	-1809
-5	3	896	989
5	5	838	-902
-5	5	682	-686
5	7	558	699
-5	7	-345	-66
5	9	417	-414
-5	9	1014	-891
-5	11	654	532
6	2	1565	1633
-6	2	2024	-2263
6	4	1244	-1252
-6	4	1045	-813
6	6	824	-675
-6	6	749	674
6	8	-346	-15
-6	8	1109	-1057
6	10	-294	-41
-6	10	715	585
7	1	1381	-1478
-7	1	2310	-2412
7	3	825	-957
-7	3	4392	4395
7	5	1461	-1494
-7	5	3050	-3072
7	7	-362	491
-7	7	-353	321
7	9	-320	262
-7	9	451	-464
-7	11	577	-410
8	2	-398	-121
-8	2	1791	1991
8	4	-384	-263
-8	4	3172	-3132
8	6	734	-644
-8	6	573	555
8	8	1175	-1259
-8	8	-358	90
-8	10	394	438
-8	12	650	-688
9	1	2374	-2220
-9	1	438	-247
9	3	398	-22
-9	3	4403	4310
9	5	2489	-2472
-9	5	1165	-1235
9	7	-347	-184
-9	7	-358	-83
-9	9	1644	-1614
-9	11	354	407
10	2	-406	125
-10	2	357	-278
10	4	835	-875
-10	4	1228	-1079
10	6	-357	-188
-10	6	-356	196
10	8	725	-762
-10	8	1558	1636
-10	10	-359	156
-10	12	-316	-299
11	1	1691	-1757
-11	1	668	467
11	3	632	-682
-11	3	3052	2953
11	5	-362	-132
-11	5	390	-278
11	7	-320	-4
-11	7	864	816
-11	9	1018	-879
-11	11	-345	14
12	2	-406	324
-12	2	6534	-6370
12	4	-382	-338
-12	4	2182	2039
12	6	-336	-26
-12	6	1326	-1104
-12	8	445	203
-12	10	-371	160
-12	12	-298	339
13	1	1240	1199
-13	1	2500	-2160
13	3	524	-551
-13	3	477	-362
13	5	-347	-136
-13	5	703	568
-13	7	1829	-1695
-13	9	1176	-999
-13	11	-318	-47
14	2	765	-866
-14	2	876	-966
14	4	582	636
-14	4	2739	-2730
-14	6	1314	-1232
-14	8	775	829
-14	10	329	-366
15	1	981	978
-15	1	1396	1389
-15	3	941	-874
-15	5	603	-885
-15	7	1463	-1271
-16	6	711	675
-16	8	-322	-87
-16	10	-301	-87
-17	1	2293	2673
-17	3	632	-639
-17	5	1767	-1866
-17	7	478	369
-17	9	601	707
-17	11	-269	12
-18	2	598	654
-18	4	761	748
-18	6	874	-871
-18	8	-317	395
-18	10	390	-166
-19	1	1320	-1597
-19	3	-313	-425
-19	5	1297	1495
-19	7	444	-310
-19	9	647	-853
-20	2	-307	183
-20	4	1938	2111
-20	6	388	-514
-20	8	-307	-278
-20	10	552	-543
-21	1	-308	-248
-21	3	865	937
-21	5	-316	35
-21	7	1012	937
-21	9	-291	20
-22	2	579	574
-22	4	886	992
-22	6	1630	1763
-22	8	1084	-1241
-23	1	856	-1126
-23	3	-319	303
-23	5	-315	-253
-23	7	409	416
-24	2	2278	2696
-24	4	930	-1039
-24	6	404	373
-25	1	1167	-1258
-25	3	593	-660
-25	5	477	-563
-26	2	450	-69
-26	4	869	802
-27	1	679	878
-27	3	1129	-1269
L = 10			
0	0	1644	1710
0	2	1432	-1595
0	4	1236	1190
0	6	759	-737
0	8	-349	-288
0	10	-331	-387
0	12	-260	-3
1	1	1548	-1604
-1	1	1459	1554
1	3	437	216
-1	3	2130	2205
1	5	819	-796
-1	5	354	-275
1	7	524	-640
-1	7	638	507
1	9	-335	29
-1	9	505	-294
1	11	-294	-499
-1	11	-300	200
2	0	2782	2799
-2	0	1258	1107
2	2	2399	-2484
-2	2	1404	1513
2	4	1063	-1063
-2	4	4555	4641
2	6	433	-373
-2	6	1932	-1927
2	8	-353	-147
-2	8	607	513
2	10	-311	-115
-2	10	570	-408
3	1	403	464
-3	1	2803	2836
3	3	2393	-2578
-3	3	1106	1196
3	5	1759	1859
-3	5	-326	-439
3	7	579	286
-3	7	1624	-1590
3	9	-332	116
-3	9	870	-926
-3	11	-311	278
4	0	-378	-117
-4	0	4036	4090
4	2	1697	1792
-4	2	2858	-2921
4	4	-383	465
-4	4	-320	-114
4	6	-367	11
-4	6	549	-668
4	8	572	563
-4	8	-344	-153
4	10	432	366
-4	10	1934	-1815
5	1	508	-154
-5	1	2129	2191
5	3	538	489
-5	3	1394	-1395
5	5	1599	1668
-5	5	2473	-2511
5	7	-354	-304
-5	7	1458	-1552
5	9	770	860
-5	9	1048	-969
-5	11	399	-252
6	0	-393	-135
-6	0	2953	2836
6	2	1284	1387
-6	2	2029	-2079
6	4	951	-1298
-6	4	1784	1623
6	6	1189	-1221
-6	6	-344	78
6	8	497	299
-6	8	-353	174
-6	10	443	-377
7	1	1416	-1335
-7	1	3296	3126
7	3	504	462
-7	3	763	807
7	5	689	464
-7	5	1389	-1641
7	7	691	-857
-7	7	-355	1545
7	9	519	-478
-7	11	460	311
8	0	1446	1344
-8	0	1480	-1385
8	2	515	329
-8	2	1292	1187
8	4	-390	-88
-8	4	2001	2008
8	6	1779	-1951
-8	6	1451	1264
8	8	503	-571
-8	8	766	809
-8	10	-352	199
-8	12	-302	-52
9	1	-408	196
-9	1	1042	-1154
9	3	-394	-289
-9	3	3532	3340
9	5	555	615
-9	5	594	-513
9	7	691	695
-9	7	2002	-2087
-9	9	1185	1232
-9	11	563	626
10	0	3817	3881
-10	0	6176	-6262
10	2	925	-846
-10	2	891	597
10	4	747	849
-10	4	1129	-1100
10	6	-340	-204
-10	6	461	292
-10	8	1193	-1129
-10	10	882	-895
-10	12	413	-286
11	5	-345	195
-11	5	1107	1155
-11	7	2756	-2750
-11	9	-368	-12
-11	11	-337	-197
12	0	944	1193
-12	0	1818	-1600
12	2	789	-895
-12	2	2443	2261
12	4	-355	141
-12	4	-371	-249
-12	6	935	866
-12	8	638	-603
-12	10	-366	-204
13	1	682	-619
-13	1	4629	4345
13	3	517	-647
-13	3	-387	-308
-13	5	1434	1155
-13	7	695	-464
-13	9	-388	-126
-13	11	486	-399
14	0	828	-751
-14	0	4419	4009
-14	2	3640	3067
-14	4	1038	-1018
-14	6	2695	2429
-14	8	-371	135
-14	10	1251	-1020
-15	1	1245	1179
-15	3	3182	3280
-15	5	2636	-2681
-15	7	524	545
-15	9	741	-616
-15	11	587	-447
-16	0	896	-950
-16	2	-324	282
-16	4	-335	266
-16	6	2119	-2244
-16	8	1723	-1806
-16	10	448	-464
-17	1	414	-383
-17	3	-318	7
-17	5	1313	-1435
-17	7	-321	181
-17	9	1524	-1531
-17	11	312	-88
-18	0	1640	1596
-18	2	376	331
-18	4	725	854
-18	6	536	-703
-18	8	1150	-1179
-18	10	605	509
-19	1	545	-634
-19	3	1365	1356
-19	5	1778	1761
-19	7	517	414
-19	9	391	449
-20	0	2957	3183
-20	2	615	648
-20	4	-311	-162
-20	6	416	489
-20	8	604	531
-20	10	342	363
-21	1	434	-367
-21	3	552	-638
-21	5	-316	265
-21	7	1268	1407
-21	9	-293	-469
-22	0	1557	-1588
-22	2	603	590
-22	4	1234	-1376
-22	6	1170	-1303
-22	8	-299	-377
-23	1	1399	-1487
-23	3	-317	144
-23	5	480	-636
-23	7	564	523
-24	0	1352	1296
-24	2	647	974
-24	4	729	-976
-24	6	580	626
-25	1	-317	189
-25	3	1609	1924
-25	5	1067	1210
-26	0	-315	40
-26	2	2193	2642
-26	4	448	-577
-27	1	615	683
-27	3	1028	-1065
L = 11			
0	2	1136	-1195
0	4	1902	2031
0	6	1339	-1311
0	8	-348	-8
0	10	-316	-418
1	1	3066	3149
-1	1	906	-794
1	3	1263	-1513
-1	3	1319	-1199
1	5	1364	-1278
-1	5	1586	1726
1	7	628	-731
-1	7	390	-234
1	9	-336	519
-1	9	-336	193
1	11	-268	-66
-1	11	-287	171
2	2	-372	49
-2	2	1713	1713
2	4	1085	-1010
-2	4	1503	1694
2	6	1085	-1080
-2	6	355	394
2	8	-348	178
-2	8	-336	50
2	10	-296	-143
-2	10	666	-674
3	1	836	820
-3	1	1889	-1768
3	3	1864	-1877
-3	3	491	-238
3	5	557	410
-3	5	1142	1195
3	7	773	-703
-3	7	906	970
3	9	-317	-59
-3	9	483	28
-3	11	-295	-74
4	2	-392	387
-4	2	729	966
4	4	1967	-2100
-4	4	1199	1227
4	6	-367	387
-4	6	1563	1564
4	8	-336	94
-4	8	1715	-1745
-4	10	551	-526
5	1	793	-717
-5	1	764	-367
5	3	-388	110
-5	3	-336	-40
5	5	462	-429
-5	5	2452	-2440
5	7	617	-581
-5	7	1380	1458
5	9	-297	290
-5	9	-342	137
-5	11	-305	-300
6	2	2156	-2121
-6	2	2786	2871
6	4	646	-731
-6	4	-340	169
6	6	600	620
-6	6	1606	-1679
6	8	637	-632
-6	8	364	197
-6	10	-332	-188
7	1	677	-464
-7	1	2516	-2499
7	3	1154	1144
-7	3	-340	166
7	5	-371	55
-7	5	1918	-1729
7	7	995	-1030
-7	7	966	864
-7	9	496	548
-8	4	1163	1323
8	6	-343	-149
-8	6	1660	-1613
-8	8	-366	86
-8	10	-348	311
-8	12	-289	-39
9	1	780	671
-9	1	2305	-2231
9	3	-385	434
-9	3	-348	-257
9	5	-354	422
-9	5	2427	-2465
-9	7	1224	1267
-9	9	-362	-104
10	2	-388	-461
-10	2	555	-663
10	4	-361	-590
-10	4	-359	0
-10	6	963	1096
-10	8	-377	-1963
-10	10	487	-394
-10	12	652	589
11	1	1354	1454
-11	1	2715	-2664
11	3	-361	124
-11	3	-358	-52
-11	5	374	358
-11	7	828	867
-11	9	1200	-1187
-11	11	-331	28
12	2	815	-763
-12	2	2703	2681
-12	4	1579	-1623
-12	6	1565	1446
-12	8	380	-87
-12	10	570	-629
-13	1	698	-595
-13	3	3239	3268
-13	5	691	454
-13	7	-391	172
-13	9	385	401
-13	11	348	-53
-14	2	-406	-236
-14	4	3658	3423
-14	6	587	-499
-14	8	1390	1199
-14	10	-342	53
-15	1	3013	2431
-15	3	2837	2563
-15	5	446	266
-15	7	-373	115
-15	9	-347	331
-15	11	693	-656
-16	2	-360	-199
-16	4	1966	1911
-16	6	1610	-1573
-16	8	1483	1321
-16	10	418	-645
-17	1	-328	-200
-17	3	-336	91
-17	5	1660	1754
-17	7	445	345
-17	9	1678	-1645
-17	11	-274	210
-18	2	859	-1027
-18	4	1164	-1068
-18	6	1000	1041
-18	8	660	688
-18	10	-291	-266
-19	1	-313	198
-19	3	1332	1362
-19	5	535	-503
-19	7	563	519
-19	9	491	-487
-20	2	1456	-1535
-20	4	961	-967
-20	6	772	823
-20	8	355	-235
-20	10	650	575
-21	1	1999	-2017
-21	3	2377	2526
-21	5	692	-798
-21	7	355	-97
-21	9	433	-534
-22	2	506	600
-22	4	1160	-1217
-22	6	692	-912
-22	8	952	1020
-23	1	431	-410
-23	3	1624	1863
-23	5	321	-523
-23	7	318	316
-24	2	762	-801
-24	4	745	953
-24	6	764	827
-25	1	1048	1011
-25	3	1449	1711
-25	5	-305	-71
-26	2	666	841
-26	4	-312	429
-27	1	808	-1035
-27	3	585	869
L = 12			
0	0	-383	-57
0	2	412	483
0	4	968	878
0	6	1679	-1933
0	8	377	-342
0	10	-298	79
1	1	1712	1671
-1	1	1411	-1474
1	3	-380	-299
-1	3	664	-698
1	5	2121	2198
-1	5	689	677
1	7	654	-614
-1	7	822	-854
1	9	-317	179
-1	9	-323	-93
2	0	1425	1396
-2	0	3648	3684
2	2	2366	2534
-2	2	2518	-2616
2	4	-381	226
-2	4	593	-613
2	6	486	-564
-2	6	992	-973
2	8	-335	-59
-2	8	-337	-21
2	10	-279	-127
-2	10	496	-484
3	1	-392	-44
-3	1	1034	-1062
3	3	1367	1385
-3	3	826	754
3	5	-373	-130
-3	5	624	-758
3	7	589	-759
-3	7	2063	2198
3	9	-296	85
-3	9	-336	-330
4	0	925	894
-4	0	5145	5120
4	2	764	877
-4	2	1120	-1020
4	4	897	-1067
-4	4	2005	2029
4	6	-364	-313
-4	6	1349	-1417
4	8	321	-341
-4	8	1066	1138
-4	10	373	381
5	1	835	802
-5	1	449	366
5	3	483	-551
-5	3	999	949
5	5	787	-703
-5	5	-354	817
5	7	-329	-120
-5	7	2071	2134
-5	9	683	-567
-5	11	432	-278
6	0	407	-67
-6	0	4113	4256
6	2	-398	186
-6	2	975	-1057
6	4	482	392
-6	10	379	-231
7	1	959	1118
-7	1	1834	-1771
7	3	-386	96
-7	3	775	620
7	5	721	649
-7	5	1072	1065
-7	7	2659	-2668
-7	9	644	-666
-7	11	304	-236
8	0	561	608
-8	0	761	892
8	2	-387	-152
-8	2	-363	-297
8	4	-365	242
-8	4	484	628
-8	6	1996	-1897
-8	8	1234	-1165
-8	10	783	-733
9	1	-380	181
-9	1	2384	2145
9	3	-363	240
-9	3	-363	152
-9	5	1057	960
-9	7	584	-399
-9	9	606	-442
-9	11	599	-511
10	0	1489	-1400
-10	0	636	962
10	2	-359	-256
-10	2	3241	3126
-10	4	714	574
-10	6	492	-548
-10	8	1192	1220
-10	10	-349	-189
-11	1	1670	1543
-11	3	1522	1408
-11	5	-379	-186
-11	7	739	821
-11	9	-368	399
-11	11	634	-604
-12	0	3005	2852
-12	2	1045	-1077
-12	4	2251	-2141
-12	6	1235	1047
-12	8	774	860
-12	10	680	-589
-13	1	1142	-1051
-13	3	2318	-2212
-13	5	720	-396
-13	7	1527	-1592
-13	9	-373	157
-13	11	-330	-395
-14	0	3399	-3315
-14	2	2510	-2248
-14	4	1738	1496
-14	6	474	-87
-14	8	740	-749
-14	10	435	383
-15	1	1481	1029
-15	3	1916	-1586
-15	5	1937	1709
-15	7	925	-827
-15	9	818	818
-15	11	718	717
-16	0	1966	-1732
-16	2	1082	755
-16	4	2240	2066
-16	6	902	701
-16	8	1318	1225
-16	10	-313	-187
-17	1	990	885
-17	3	2897	2609
-17	5	431	-248
-17	7	786	-735
-17	9	722	760
-18	0	435	104
-18	2	918	-823
-18	4	434	323
-18	6	-337	262
-18	8	665	757
-18	10	1088	-1064
-19	1	548	841
-19	3	1082	-1180
-19	5	2649	-2978
-19	9	1442	-1375
-20	0	890	1048
-20	2	2355	-2499
-20	4	1527	1675
-20	6	-320	-242
-20	8	729	-579
-20	10	393	-449
-21	1	1357	1385
-21	3	884	1085
-21	5	966	-1057
-21	7	-312	425
-21	9	382	-337
-22	0	2615	2782
-22	2	765	-856
-22	4	1189	1317
-22	6	1224	1238
-22	8	-292	119
-23	1	386	118
-23	3	894	1058
-23	5	-313	154
-23	7	-299	-15
-24	0	2995	-3231
-24	2	698	628
-24	4	-315	109
-24	6	447	-405
-25	1	842	-971
-25	3	1653	-1750
-25	5	-306	-82
-26	0	2028	-2105
-26	2	428	283
-26	4	1287	-1411
-27	1	451	-422
-27	3	347	217
L = 13			
0	2	-393	-381
0	4	1459	-1537
0	6	962	926
0	8	596	652
0	10	-275	-83
1	1	1500	1500
-1	1	1104	1357
1	3	-385	-111
-1	3	1012	-979
1	5	2264	2426
-1	5	1194	1297
1	7	840	-872
-1	7	948	-1093
1	9	324	-99
-1	9	-310	-175
2	2	-396	-275
-2	2	2569	-2702
2	4	-387	-143
-2	4	-376	248
2	6	720	626
-2	6	-361	-346
2	8	421	363
-2	8	-327	227
3	1	2128	2136
-3	1	2586	2616
3	3	840	980
-3	3	417	-508
3	5	561	462
-3	5	-362	122
3	7	425	-424
-3	7	729	-730
4	2	-398	-155
-4	2	-370	284
4	4	586	658
-4	4	448	289
4	6	-343	-71
-4	6	1528	-1522
-4	8	[illegible]	1732
-4	10	511	510
5	1	-403	4
-5	1	1609	1753
5	3	-385	388
-5	3	673	567
5	5	868	926
-5	5	1098	1090
-5	7	-353	-209
-5	9	-327	-251
6	2	640	815
-6	8	-349	-87
-6	9	-335	0
-6	10	-312	148
7	1	-386	-22
-7	1	790	734
7	3	-361	120
-7	3	2167	2182
7	5	-324	-26
-7	5	449	392
-7	7	556	714
-7	9	-339	-410
-7	11	654	-643
8	2	-361	107
-8	2	-382	102
-8	4	601	437
-8	6	2760	2696
-8	8	1433	-1490
-8	10	-318	-106
9	1	-355	-338
-9	1	3849	-3842
-9	3	1850	1835
-9	5	2107	2055
-9	7	-376	90
-9	9	-350	-244
-9	11	-303	-397
-10	2	1915	1854
-10	4	1467	1552
-10	6	818	589
-10	8	379	176
10	10	336	238
-11	1	549	-207
-11	3	853	819
-11	5	759	-662
-11	7	833	575
-11	9	975	934
-12	2	-399	546
-12	4	1044	880
-12	6	-393	-336
-12	8	-374	-142
-12	10	356	-169
-13	1	3162	2976
-13	3	2387	-2139
-13	5	2218	-2137
-13	7	1033	782
-13	9	-365	317
-14	2	1659	1534
-14	4	1084	-1026
-14	6	-400	-419
-14	8	389	358
-14	10	774	-671
-15	1	1682	-1559
-15	3	2269	-2158
-15	5	1169	1205
-15	7	-401	36
-15	9	405	294
-16	2	2117	-342
-16	6	-408	199
-16	8	-364	-335
-16	10	479	-496
-17	1	965	-881
-17	3	-399	37
-17	5	1020	901
-17	7	427	286
-17	9	1155	1087
-18	2	-368	-201
-18	4	2755	2729
-18	6	-350	-134
-18	8	-323	-100
-18	10	526	-476
-19	1	-344	31
-19	3	-354	382
-19	5	-342	296
-19	7	603	424
-19	9	-299	-97
-20	2	2658	2858
-20	4	933	961
-20	6	498	-586
-20	8	698	634
-21	1	657	757
-21	3	612	765
-21	5	-323	-197
-21	7	1283	1367
-21	9	293	-210
-22	2	-325	237
-22	4	-327	1260
-22	6	482	482
-22	8	298	-324
-23	1	1630	-1810
-23	3	-316	1216
-23	5	1031	-1083
-23	7	1133	1220
-24	2	349	-283
-24	4	986	-1008
-24	6	-304	97
-25	1	2783	-3213
-25	3	1019	1604
-25	5	-306	-61
-26	2	-316	-343
-26	4	1175	-1226
-27	1	613	595
-27	3	948	1066
L = 14			
0	0	-411	506
0	2	488	-392
0	4	-387	-135
0	6	1221	1454
0	8	-315	35
1	1	-407	166
-1	1	2173	2191
1	3	665	627
-1	3	589	578
1	5	1039	-1038
-1	5	725	-596
1	7	661	-733
-1	7	474	524
2	0	3293	-3396
-2	0	1313	1188
2	2	595	520
-2	2	435	-34
2	4	-379	-173
-2	4	1353	1470
2	6	-346	320
-2	6	-352	210
2	8	379	-328
-2	8	-316	126
3	1	-399	394
-3	1	1242	1102
3	3	915	-1178
-3	3	903	-964
3	5	368	264
-3	5	515	-499
-3	7	420	-384
-3	9	709	-636
4	0	1254	-1571
-4	0	-390	-335
4	2	929	954
-4	2	1189	-1293
4	4	-362	-198
-4	6	922	-825
-4	8	-333	-127
5	1	723	732
-5	1	1467	-1668
5	3	-366	-22
-5	3	1297	1431
5	5	677	639
-5	5	888	-947
-5	7	759	-727
6	0	-381	-230
-6	0	511	-662
6	2	429	416
-6	2	-378	-349
-6	4	1570	1795
-6	6	905	-841
-6	8	617	584
7	1	-360	399
-7	1	-381	-26
-7	3	551	450
-7	5	-370	175
-7	7	1861	1853
-7	9	496	460
-8	0	2072	1965
-8	2	1461	-1519
-8	4	546	628
-8	6	-370	221
-8	8	540	587
-8	10	819	831
-9	1	751	-862
-10	0	2484	2436
-10	2	2634	-2611
-10	4	2295	-2371
-10	6	-387	435
-10	8	393	-258
-10	10	-321	-340
-11	1	1416	-1104
-11	3	1406	-1326
-11	5	1440	1388
-11	7	434	-414
-11	9	414	276
-12	0	2097	-2257
-12	2	3989	3783
-12	4	-404	391
-12	6	1419	-1371
-12	8	-373	404
-13	1	-412	168
-13	3	1206	1155
-13	5	2380	2453
-13	7	-384	-280
-13	9	593	466
-14	0	-422	362
-14	2	2420	2204
-14	4	510	476
-14	6	1135	-1002
-14	8	-380	219
-14	10	401	-282
-15	1	2276	-1582
-15	3	597	492
-15	5	922	857
-15	7	672	-719
-15	9	-368	329
-16	0	3058	2845
-16	2	3528	-3032
-16	4	1469	-1205
-16	6	931	-935
-16	8	767	-655
-16	10	-303	43
-17	1	-453	-212
-17	3	2501	-2106
-17	5	515	-77
-17	7	1583	1497
-17	9	398	-387
-18	0	2613	2509
-18	2	2045	-1997
-18	4	1396	1304
-18	6	732	-571
-18	10	693	761
-19	1	702	-748
-19	3	1377	1003
-19	5	-353	310
-19	7	1181	1139
-19	9	565	517
-20	0	557	395
-20	2	1224	-1235
-20	4	809	935
-20	6	-327	137
-20	8	1421	1376
-21	1	1624	-1752
-21	3	-339	190
-21	5	-338	-291
-21	7	-312	-262
-21	9	-280	190
-22	0	1425	-1644
-22	2	1863	-1936
-22	4	-326	1084
-22	6	2041	-2013
-22	8	-291	53
-23	1	341	314
-23	3	911	-989
-23	5	-315	-126
-23	7	-301	-63
-24	0	2249	2606
-24	2	849	-807
-24	4	592	570
-24	6	730	698
-25	1	747	826
-25	3	1285	1257
-25	5	-303	63
-26	0	-318	12
-26	2	-311	-43
-26	4	-307	181
-27	1	449	479
-27	3	797	-784
L = 15			
0	2	-394	-52
0	4	1809	1913
0	6	-341	-99
0	8	-286	-224
1	1	514	483
-1	1	2293	2382
1	3	694	-876
-1	3	928	-1031
1	5	766	621
-1	5	1179	1092
1	7	-301	-124
-1	7	387	374
2	2	-383	375
-2	2	2039	2104
2	4	464	430
-2	4	698	588
2	6	-320	99
-2	6	-345	-94
-2	8	806	804
3	1	1218	-1310
-3	1	1468	1436
3	3	496	-587
-3	3	-385	1
-3	5	1129	1149
-3	7	374	-352
4	2	939	913
-4	2	-389	62
-4	4	-381	229
-4	6	567	345
-4	8	-319	-126
5	1	-361	-103
-5	1	-393	24
-5	3	-382	-1
-5	5	453	278
-5	7	523	-483
-5	9	-304	324
-6	2	1447	-1603
-6	4	-380	93
-6	6	503	336
-6	8	400	-471
-7	1	600	-659
-7	3	798	-832
-7	5	1476	1415
-7	7	-354	134
-7	9	624	-659
-8	2	-398	-89
-8	4	1720	-1886
-8	6	-371	277
-8	8	656	583
-9	1	2507	2435
-9	3	-392	-138
-9	5	749	-762
-9	7	422	172
-9	9	373	-277
-10	2	447	-391
-10	4	836	-952
-10	6	423	221
-10	8	-347	0
-10	10	656	715
-11	1	1039	834
-11	3	2152	1970
-11	5	-397	-219
-11	9	-337	357
-12	2	611	586
-12	4	-416	-142
-12	6	-396	302
-12	8	768	632
-12	10	405	489
-13	1	1649	-1509
-13	3	1920	1565
-13	5	3044	2925
-13	7	1194	-1054
-13	9	-349	272
-14	2	1102	-1076
-14	4	502	417
-14	6	1931	1951
-14	8	-377	-198
-15	1	2898	2479
-15	3	838	-351
-15	5	1158	977
-15	7	409	-247
-15	9	-428	-317
-17	1	3405	2916
-17	3	1724	-1543
-17	5	1052	850
-17	7	955	-972
-17	9	-319	-264
-18	2	456	319
-18	4	488	-675
-18	6	1375	-1444
-18	8	1464	1523
-19	1	892	922
-19	3	1180	-1147
-19	5	773	-851
-19	7	-340	-443
-19	9	971	1072
-20	2	1927	-1301
-20	4	-360	252
-20	6	-330	-166
-20	8	-305	-93
-21	1	1134	-1186
-21	3	685	-823
-21	5	573	-398
-21	7	-310	-58
-21	9	342	316
-22	2	850	652
-22	4	645	-594
-22	6	600	554
-22	8	661	-579
-23	1	1406	-1442
-23	5	-319	349
-23	7	370	393
-24	2	587	623
-24	4	754	838
-24	6	576	378
-25	1	-319	214
-25	3	502	712
-25	5	803	-884
-26	2	-317	318
-26	4	1393	1483
-27	1	1276	-1335
-27	3	-309	196
L = 16			
0	0	2144	-2302
0	2	827	848
0	4	1230	-1220
0	6	-312	-123
1	1	-381	174
-1	1	859	-868
1	3	627	-689
-1	3	1199	-1044
1	5	518	669
-1	5	-345	151
2	0	479	598
-2	0	1308	-1369
2	2	747	830
-2	2	-394	77
2	4	819	-918
-2	4	873	-757
-2	6	-329	304
3	1	638	-488
-3	1	813	-865
-3	3	1114	1147
-3	5	-360	-166
-4	0	-402	239
-4	2	974	-830
-4	4	1659	1635
-4	6	787	819
-5	1	876	1041
-5	3	-388	-148
-5	5	633	-735
-5	9	-273	-576
-6	0	452	306
-6	2	1677	-1623
-6	4	-386	341
-6	6	-353	132
-6	8	-317	-227
-7	1	-402	147
7	3	-212	459
-7	5	1772	-1922
-7	7	349	34
-8	0	575	-482
-8	2	433	61
-8	4	912	-957
-8	6	722	711
-8	8	627	689
-9	1	1097	1153
-9	3	-399	423
-9	5	-385	-382
-9	7	-355	42
-9	9	-306	260
-10	0	3160	-3040
-10	2	1479	1300
-10	4	1358	1591
-10	6	722	698
-10	8	-338	176
-11	1	-421	-96
-11	3	613	-550
-11	5	782	892
-11	7	788	-896
-11	9	713	605
-12	0	2175	-2099
-12	2	1603	-1597
-12	4	650	-497
-12	6	1193	1236
-12	8	611	-761
-13	1	1561	-1498
-13	3	958	-763
-13	5	1127	-944
-13	7	1011	-1044
-13	9	786	749
-14	0	2041	-1694
-14	2	460	-202
-14	4	1361	-1320
-14	6	883	927
-14	8	558	495
-15	1	1328	1182
-15	3	966	-1067
-15	5	-418	251
-15	7	1543	1437
-15	9	505	501
-16	0	517	-450
-16	2	1565	1561
-16	4	-442	-293
-16	6	-410	340
-16	8	1248	1156
-17	1	-468	312
-17	3	466	7
-17	5	958	738
-17	7	569	-532
-17	9	-306	378
-18	0	700	574
-18	2	936	-795
-18	4	-414	-3
-18	6	531	-605
-18	8	689	-779
-19	1	1227	-938
-19	3	572	-479
-19	5	-369	-153
-19	7	1153	-1171
-19	9	297	-306
-20	0	1243	1205
-20	2	1068	-963
-20	4	1998	2018
-20	6	1672	-1577
-20	8	397	-543
-21	1	-361	-147
-21	3	1043	988
-21	5	-337	196
-21	7	1531	1578
-22	0	3022	3293
-22	2	971	-1082
-22	4	471	474
-22	6	-314	-224
-22	8	762	787
-23	1	1189	-1176
-23	3	945	857
-23	5	419	-537
-23	7	973	991
-24	0	594	667
-24	2	1574	-1625
-24	4	-322	-306
-24	6	983	-949
-25	1	-321	-913
-25	3	2171	-2220
-25	5	629	630
-26	0	386	-504
-26	2	-316	-43
-26	4	-306	146
0	2	721	638
0	4	373	-462
1	1	-354	74
-1	1	-384	-386
1	3	-328	-99
-1	3	377	-584
2	2	-330	-297
-2	2	463	-649
-2	4	357	130
-3	1	755	762
-3	3	1005	-1175
-3	5	-338	-86
-4	2	-389	-262
-4	4	916	798
-4	6	-323	65
-5	1	-398	-72
-5	3	1369	-1369
-5	5	952	877
-6	2	990	834
-6	4	1361	1230
-6	6	-345	-395
-7	1	541	-138
-7	5	551	-727
-7	7	-324	183
-8	2	1105	1094
-8	4	949	996
-8	6	-347	-215
-8	8	660	-731
-9	1	1132	-1060
L = 17			
-9	3	524	614
-9	5	819	-943
-9	7	-340	323
-10	2	2049	2092
-10	4	1070	-1400
-10	6	801	840
-10	8	568	-538
-11	1	998	-1052
-11	3	1147	-1157
-11	5	-384	215
-11	7	-348	254
-12	2	1009	-1035
-12	4	731	-867
-12	6	588	615
-12	8	1318	-1285
-13	1	524	217
-13	3	1679	-1684
-13	5	475	-389
-13	7	-357	60
-14	2	1334	-1199
-14	4	476	198
-14	6	1162	-1122
-14	8	-342	17
-15	1	550	329
-15	3	1414	-1226
-15	5	875	691
-15	7	1061	-936
-16	2	1080	957
-16	4	693	-651
-16	6	667	-617
-16	8	1169	1105
-17	1	2576	2289
-17	3	-463	187
-17	5	-425	404
-17	7	779	-794
-17	9	676	767
-18	2	-476	-528
-18	4	-417	-98
-18	6	844	853
-18	8	1374	-361
-19	1	1755	1565
-19	3	979	-892
-19	5	1565	1539
-19	7	535	-508
-20	2	702	-583
-20	4	-367	-99
-20	6	-336	-72
-20	8	484	423
-21	1	-373	325
-21	3	-360	-107
-21	5	1404	1532
-21	7	663	-584
-22	2	1677	-1590
-22	4	-339	226
-22	6	502	-432
-22	8	-273	218
-23	1	1284	1419
-23	3	-338	415
-23	5	916	-1055
-23	7	558	-575
-24	2	-332	-65
-24	4	1477	-1629
-24	6	-295	-234
-25	1	507	-539
-25	3	348	-303
-25	5	523	-589
-26	2	646	608
-26	4	1853	-1884
-27	1	366	-560
-27	3	335	265
L = 18			
0	0	680	640
0	2	506	536
-2	0	-368	66
-2	2	404	535
-3	1	536	-704
-3	3	534	-385
-4	0	502	-214
-4	2	-372	-18
-4	4	744	-734
-5	1	853	-777
-5	3	-367	-102
-5	5	-334	285
-6	0	1291	1483
-6	2	424	-449
-6	4	672	-654
-7	1	434	-251
-7	3	-383	-259
-7	5	853	754
-8	0	510	-409
-8	2	-401	-223
-8	4	482	554
-8	6	511	-563
-9	1	1580	-1548
-9	3	534	588
-9	5	717	-717
-9	7	-315	115
-10	0	842	-842
-10	2	481	485
-10	4	1064	-1013
-10	6	-349	-174
-11	1	665	-504
-11	3	1183	1275
-11	5	473	-578
-11	7	-330	109
-12	0	-419	-83
-12	2	1949	1994
-12	4	834	-831
-12	6	802	793
-13	1	2569	2484
-13	3	1614	-1560
-13	5	1155	985
-13	7	-340	134
-14	0	1219	-908
-14	2	1173	1285
-14	4	1406	-1513
-14	6	943	909
-15	1	-453	-277
-15	3	868	-668
-15	5	409	353
-15	7	1758	-1655
-16	0	2697	-2390
-16	2	521	-302
-16	4	600	-671
-16	6	550	581
-16	8	513	-531
-17	1	819	-685
-17	3	1054	902
-17	5	609	-510
-17	7	-331	-112
-18	0	2318	-2005
-18	2	-469	469
-18	4	1587	1456
-18	6	484	376
-18	8	-291	216
-19	1	501	394
-19	3	721	502
-20	4	-365	-350
-20	6	703	700
-20	8	353	362
-21	1	-372	271
-21	3	887	-928
-21	5	793	-853
-21	7	375	-366
-22	0	-354	-92
-22	2	1121	-1069
-22	4	-338	-184
-22	6	-300	-63
-23	1	1683	1612
-23	3	357	-293
-23	5	453	-443
-23	7	-276	48
-24	0	456	-38
-24	2	795	967
-24	4	1324	1423
-24	6	-286	-188
-25	1	-322	136
-25	3	1656	1802
-25	5	503	-610
-26	0	661	651
-26	2	332	-300
-26	4	-302	173
-27	1	504	-396
-27	3	571	-732
L = 19			
-5	1	412	554
-6	2	-364	-276
-7	1	392	42
-7	3	553	323
-8	2	-388	-117
-8	4	589	-615
-9	1	1536	-1595
-9	3	-379	230
-9	5	-342	-168
-10	2	1556	-1584
-10	4	1019	1051
-10	6	-324	109
-11	1	983	-996
-11	3	566	499
-11	5	-358	-362
-12	2	944	990
-12	4	-379	-33
-12	6	566	477
-13	1	425	-328
-13	3	692	740
-13	5	-364	-121
-14	2	2335	2315
-14	4	1013	-941
-14	6	486	384
-15	1	-434	379
-15	3	422	-276
-15	5	1175	-1123
-15	7	-321	-146
-16	2	517	-417
-16	4	505	502
-16	6	408	-329
-17	1	-461	-429
-17	3	451	-1867
-17	5	-376	338
-17	7	-305	-308
-18	2	510	-574
-18	4	801	761
-18	6	1077	-847
-19	1	-413	157
-19	3	2353	-2114
-19	5	780	767
-19	7	-291	-263
-20	2	519	-378
-20	4	-358	121
-20	6	-308	-186
-21	1	1528	1590
-21	3	777	-660
-21	5	583	-684
-22	2	923	1033
-22	4	591	-367
-22	6	-293	-213
-23	1	854	-730
-23	3	386	398
-23	5	404	511
-24	2	751	675
-24	4	410	446
-24	6	300	240
-25	3	-311	268
-25	5	-288	303
-26	2	798	-797
-26	4	408	353
-27	1	528	523
-27	3	417	-349
L = 20			
-8	0	803	1072
-8	2	476	-489
-9	1	431	306
-9	3	-356	58
-10	0	615	598
-10	2	435	219
-10	4	-342	-74
-11	1	-396	53
-11	3	1305	-1398
-12	0	1237	-1096
-12	2	541	490
-12	4	1605	-1595
-13	1	1546	-1386
-13	3	622	586
-14	0	-411	-456
-14	2	1056	1141
-14	4	659	-628
-14	6	358	236
-15	1	-420	-11
-15	3	782	827
-15	5	684	720
-16	0	-430	-410
-16	2	2051	1769
-16	4	-389	110
-16	6	-311	-274
-17	1	-438	253
-17	3	475	-539
-17	5	792	786
-18	0	889	978
-18	2	602	547
-18	4	1859	-1952
-18	6	-295	-69
-19	1	-390	1
-19	3	-369	-287
-19	5	-318	-243
-20	0	-376	380
-20	2	1119	921
-20	4	386	-308
-20	6	-283	-158
-21	1	413	327
-21	3	579	619
-21	5	-304	10
-22	0	-345	10
-22	2	644	-650
-22	4	913	1044
-23	1	953	-1102
-23	5	494	-314
-24	0	-325	-22
-24	2	1279	-1370
-24	4	-297	-116
-25	1	-314	-197
-25	3	435	-464
-26	0	826	-855
-26	2	911	979
-27	1	1156	1172
L = 21			
-12	2	-370	-14
-13	1	463	-318
-13	3	1215	1167
-14	2	1077	-959
-14	4	-349	77
-15	1	-402	-308
-15	3	-372	119
-16	2	486	-324
-16	4	-335	-83
-17	1	-386	116
-17	3	-349	189
-18	2	-357	-149
-18	4	-315	343
-19	1	700	712
-19	3	671	804
-22	2	318	-50
-22	4	-291	-67
-23	1	327	369
-24	2	603	-770
-25	1	1000	-1142
L = 22			
-16	0	608	-582
-17	1	-329	243
-18	0	-326	119
-18	2	-315	70
-19	1	-321	146
-20	0	410	83
-20	2	-305	-332
-21	1	814	-995
-22	0	-299	239
-23	1	461	498
-24	0	1019	1227

Table IIIa. Interatomic Distances.

O-Cu1	1.93(1)Å	N1-C11	1.36(3)
O-Cu2	1.93(1)Å	C11-C12	1.41(3)
O-Cu3	1.92(1)Å	C12-C13	1.41(2)
O-Cu4	1.91(1)Å	C13-C14	1.33(3)
Cu1-N1	2.01(2)	C14-C15	1.38(3)
Cu-N2*	2.01(2)	C15-N1	1.33(2)
Cu3-N3	2.07(2)	N2-C21	1.35(3)
Cu4-N4**	1.98(2)	C21-C22	1.41(3)
Cu1-Br2	2.563(3)	C22-C23	1.25(3)
Cu1-Br3	2.531(4)	C23-C24	1.34(3)
Cu1-Br5	2.486(4)	C24-C25	1.40(3)
Cu2-Br2	2.544(4)	C25-N2	1.34(2)
Cu2-Br4	2.609(4)	N3-C31	1.32(2)
Cu2-Br6***	2.470(4)	C31-C32	1.49(3)
Cu3-Br1	2.527(4)	C32-C33	1.30(3)
Cu3-Br3	2.610(4)	C33-C34	1.40(3)
Cu3-Br4	2.490(4)	C34-C35	1.31(3)
Cu4-Br1	2.582(4)	C35-N3	1.31(3)
Cu4-Br5	2.518(4)	N4-C41	1.27(3)
Cu4-Br6***	2.477(4)	C41-C42	1.36(3)
		C42-C43	1.46(4)
		C43-C44	1.47(3)
		C44-C45	1.40(3)
		C45-N4	1.36(3)

* 1/2+x, 1/2—y, 1/2+z.
** 1/2—x, 1/2+y, 1/2—z
*** 1—x, y, 1/2—z

Table IIIb. Interatomic Angles.

Cu1-O-Cu2	109.7(6)	Cu3-Br1-Cu4	76.0(2)
Cu1-O-Cu3	109.9(6)	Cu1-Br2-Cu2	76.5(2)
Cu1-O-Cu4	109.1(6)	Cu1-Br3-Cu3	75.7(2)
Cu2-O-Cu3	109.4(6)	Cu2-Br4-Cu3	76.2(2)
Cu2-O-Cu4	108.4(6)	Cu1-Br5-Cu4	77.4(2)
Cu3-O-Cu4	110.3(6)	Cu2-Br6***-Cu4	78.2(2)
O-Cu1-N1	174.2(6)	O-Cu3-N3	174.7(7)
O-Cu1-Br2	86.2(4)	O-Cu3-Br1	86.9(4)
O-Cu1-Br3	88.1(4)	O-Cu3-Br3	86.1(4)
O-Cu1-Br5	87.4(4)	O-Cu3-Br4	88.9(4)
N1-Cu1-Br2	95.3(5)	N3-Cu3-Br1	90.1(5)
N1-Cu1-Br3	96.6(5)	N3-Cu3-Br3	99.1(5)
N1-Cu1-Br5	87.7(5)	N3-Cu3-Br4	90.2(5)
Br2-Cu1-Br3	108.3(1)	Br1-Cu3-Br3	113.4(1)
Br2-Cu1-Br5	127.7(2)	Br1-Cu3-Br4	134.5(2
Br3-Cu1-Br5	123.2(2)	Br3-Cu3-Br4	111.4(1)
O-Cu2-N2	176.4(7)	O-Cu4-N4**	178.4(7)
O-Cu2-Br2	86.7(4)	O-Cu4-Br1	85.5(3)
O-Cu2-Br4	85.2(3)	O-Cu4-Br5	86.5(4)
O-Cu2-Br6***	85.8(4)	O-Cu4-Br6***	86.2(3)
N2*-Cu2-Br2	90.2(5)	N4-Cu4-Br1	94.2(5)
N2*-Cu2-Br4	94.2(5)	N4-Cu4-Br5	95.1(5)
N2*-Cu2-Br6***	97.6(5)	N4**-Cu4-Br6***	92.6(5)
Br2-Cu2-Br4	107.0(1)	Br1-Cu4-Br5	109.0(1)
Br2-Cu2-Br6***	137.1(2)	Br1-Cu4-Br6***	118.8(1)
Br4-Cu2-Br6***	114.4(2)	Br5-Cu4-Br6***	130.8(1)

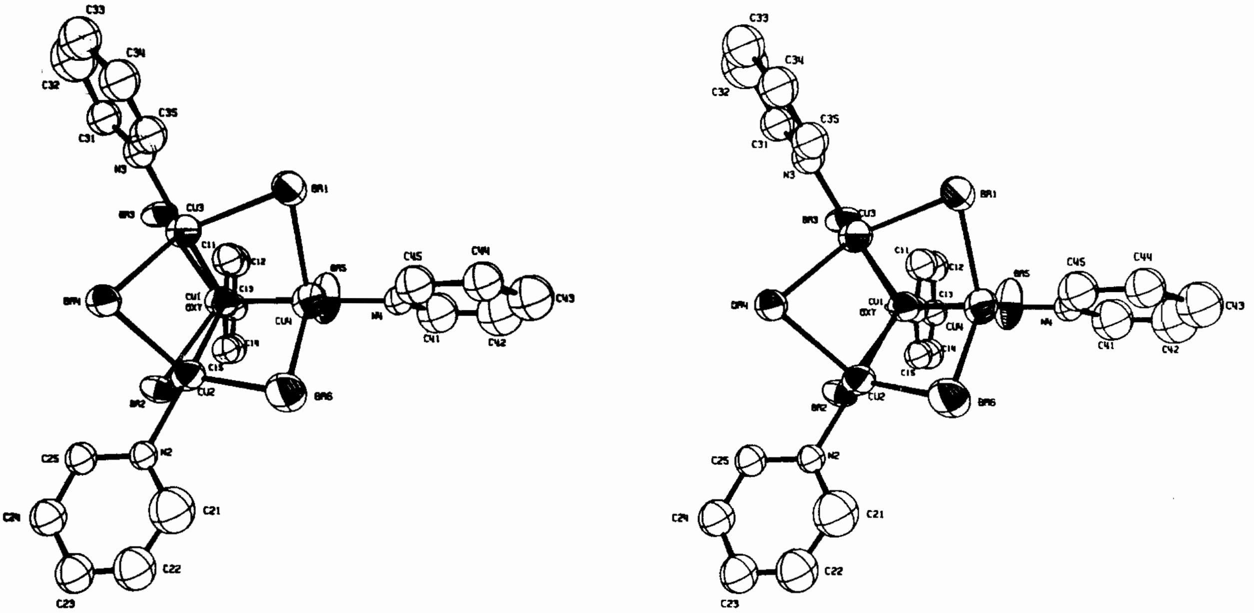

Figure 1. A stereoscopic illustration of the $Cu_4Br_6O(C_5H_5N)_4$ molecule.

Table IV.

Bond	Ave. Distance	Range
Cu-O	1.92	1.91-1.93(1)
Cu-N	2.02	1.98-2.07(2)
Cu-Br	2.534	2.470-2.610(4)
N-C	1.33	1.27-1.36(3)
C-C	1.38	1.25-1.49(3)
Angle	**Ave.**	**Range**
Cu-O-Cu	109.5	108.4-110.3(6)
Br-Cu-Br	120.4	107.0-137.1(2)
N-Cu-Br	93.6	87.7-99.1(5)
O-Cu-Br	175.9	85.2-88.9(4)
O-Cu-N	86.6	174.2-178.4(7)

bond angles and distances are given in Table III. An illustration of the molecule is given in Figure 1 and the packing diagram is shown in Figure 2.[8]

Discussion

The geometry of the molecule is shown in Figure 1. The average distances and bond angles are given in Table IV. It is the same basic structural unit that is found in $Cu_4Cl_6O[C_6H_5)_3PO]_4$,[2] $Cu_4Cl_6O(C_5H_5N)_4$,[9]

---

[8] Carrol K. Johnson, "ORTEP, A FORTRAN Thermal-Ellipsoid Plot Program for Crystal Structure Illustrations," Oak Ridge National Laboratory, Report ORNL-3794 (1965).

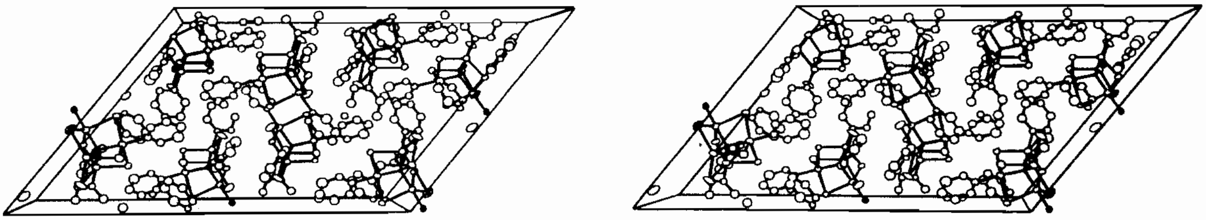

Figure 2. A stereoscopic illustration of the packing of the tetramers in $Cu_4Br_6O(C_5H_5N)_4$ as viewed from the (010) diretion.

and in $Cu_4Br_6O(NH_3)_4$.[10] The general comments about these structures apply equally well to the structure reported here and need not be further elaborated upon. This structure adds an additional line of the table given by Bertrand and Kelley[10] which summarizes the results on all of this type of cluster compound. One structural feature which is noticeable is the Cu–N bond length, 1.96 (1)A in the chloride and 2.02(3)A in the bromide. This is presumably due to the larger bulk of the bromide ion preventing the pyridine ring from making a closer approach to the copper ion.

The fact that this compound is not isomorphous with the corresponding chloride[9] is surprising at first. As pointed out by Kilbourn and Dunitz, the only intermolecular contacts between adjacent tetramers in the chloride complex are either pyridine ring-pyridine ring contacts or pyridine ring-chloride ion contacts. In the bromide, this is not the situation. Rather, two tetramers pack around the two-fold axis such that the bromide ions on one tetrahedral face of one cluster are in contact with the bromide ions on the corresponding face of the other cluster. This is due, presumably, to the increase in the size of the tetramer upon replacement of chloride ion by bromide ion, pushing the pyridine rings further out and allowing the bromide ions in adjacent clusters to interact with each other. In addition, there are close bromide ion-bromide ion contacts between adjacent pairs in the (100) plane. Thus, the structure consists of layers of inorganic material concentrated in planes at $x = 0$ and $1/2$ and layers of organic material concentrated in planes at $x = 1/4$ and $x = 3/4$. These features may be recognized by examination of the stereographic packing diagram reproduced in Figure 2.

Finally, it should be noted that this structure is consistent with the physical properties reported by Harris and Sinn.[1] In particular, the electronic absorption spectrum, with two peaks in the region of 10-13,000 cm^{-1}, is characteristic of trigonal bipyramidal copper(II) complexes.[10]

Acknowledgment. This research was supported by NSF Grants GP-8563 and GU-2631.

---

(9) B. T. Kilbourn and J. D. Dunitz, *Inorg. Chim. Acta*, *1*, 209 (1967).

(10) J. A. Bertrand and J. A. Kelley, *Inorg. Chim. Acta*, *4*, 526 (1970).

(11) G. C. Allen and N. S. Hush, *Inorg. Chem.*, 6, 4 (1967).