

# Block-Wise Bordered Magic Squares Multiples of 11

Inder J. Taneja<sup>1</sup>

## Abstract

*During past years author worked with **block-wise bordered magic squares** of even number blocks. These are based on equal sums magic squares of orders 4, 6, 8, 10, etc. This type of work is an extension of classical bordered magic squares. In case of multiples of 4, the extension is made for **pandiagonal** magic squares [23]. For multiples of order 6 refer Taneja [24]. For the first time, we are presenting here bordered magic squares of odd number blocks. Recently, author worked on multiples of 3, 5, 7 and 9. These are based on different sums of magic squares of order 3, 5, 7 and 9 [29, 30, 31, 32]. This work is for multiples of 11. This we have done with three different types of magic squares of order 11. Higher order examples can be seen in **Excel files** attached with the work. The total work is up to order 154.*

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<sup>1</sup>Formerly, Professor of Mathematics, Federal University of Santa Catarina, Florianópolis, SC, Brazil (1978-2012).  
Also worked at Delhi University, India (1976-1978).

**E-mail:** [ijtaneja@gmail.com](mailto:ijtaneja@gmail.com);

**Web-sites:** <http://inderjtaneja.com>; <http://numbers-magic.com>;

**Twitter:** @IJTANEJA; **Instagram:** @crazynumbers.

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## 1 Introduction

During past years author [2, 3, 4, 5, 6, 7, 8] worked with **block-wise** magic squares from orders 12 to 47. Author [9, 10, 11, 12, 13, 14] also worked with **bordered** magic squares. The study on **bordered** magic squares is extended to **block-bordered** magic squares [15, 16, 17]. This is specially done for the magic squares of orders  $p$  and  $2p$ , where  $p$  is a prime number. This study is still extended to **block-wise bordered** magic squares [18, 19, 20, 21]. Some connection with Pythagorean triples and area-representations are also made [23, 24, 25, 26, 27]. The main property of **bordered** magic squares is that if we remove external borders, still we get **sub-bordered** magic squares, i.e., each layer in itself lead us to magic squares. In many cases, the properties of **bordered** magic square are separated by **even** and **odd** orders magic squares. In many cases, we get good properties for the **even** order **bordered** magic squares. In some cases, we have to use fractional numbers to reach minimum perfect square sum of entries. For more study on **bordered** magic squares refer H. White’s web-site [1].

The idea of bordered magic squares is already discussed by H. White’s web-site [1] where the borders are of **single digits**. Borders multiples of even numbers starting from order 4 are done extensively by author [23, 24, 25, 26, 27, 28].

Recently, for the first time, we presented bordered magic squares of odd number blocks. In case of multiples of 3, we worked with different sums magic squares of order 3. In case of multiples of 5, 7 and 9, we worked with **pandiagonal** and **bordered** magic squares of orders 5, 7 and 9. This work is for multiples of 11. Here also we work with three types of magic squares of order 11. One of them is **pandiagonal** and another two are **bordered** and **block-bordered** magic squares of order 11. The procedure, how to get these **block-wise bordered** magic squares is also explained. This work is up to order 55. Higher orders examples can be seen in **Excel files** attached with this work. Before proceeding further, let’s summarize, the idea of **block-wise bordered** magic squares:

## 1.1 Summary of Bordered Magic Squares

### 1.1.1 Odd Numbers Multiples

- **Single Digit:** Bordered magic squares based on single digit [9, 10, 1].
- **Three Digits:** Bordered magic squares based on magic squares of order 3 [29].
- **Five Digits:** Bordered magic squares based on magic squares of order 5 [30].
- **Seven Digits:** Bordered magic squares based on magic squares of order 7 [31].
- **Nine Digits:** Bordered magic squares based on magic squares of order 9 [32]
- **Eleven Digits:** Bordered magic squares based on magic squares of order 11 [33] (This work)

### 1.1.2 Even Numbers Multiples

- **Two Digits:** Bordered magic squares based on magic rectangles multiples of 2 [60, 61, 62, 63, 63, 64].
- **Four Digits:** Bordered magic squares based on magic squares of order 4 [23].
- **Six Digits:** Bordered magic squares based on magic squares of order 6 [24].
- **Eight Digits:** Bordered magic squares based on magic squares of order 8 [25].
- **Ten Digits:** Bordered magic squares based on magic squares of order 10 [26].
- **Twelve Digits:** Bordered magic squares based on magic squares of order 12 [27].
- **Fourteen Digits:** Bordered magic squares based on magic squares of order 14 [28].

The advantage in working with even number multiples is that we can work with equal sums blocks of magic squares.

Let's see below the some examples of **block-wise bordered** magic squares multiples 11, where magic squares of order 11 are considered in two different ways.

## 2 Block-Wise Bordered Magic Squares Multiples of 11

### 2.1 Bordered Magic Squares of Orders 13 and 14

Let's consider **bordered** magic square of orders 13 and 14 given by

														1105
158	146	148	150	152	154	11	10	8	6	4	2	156	1105	1105
23	136	126	128	130	132	33	32	30	28	26	134	147	1105	1105
21	43	118	110	112	114	51	50	48	46	116	127	149	1105	1105
19	41	59	104	98	100	65	64	62	102	111	129	151	1105	1105
17	39	57	71	94	90	75	74	92	99	113	131	153	1105	1105
15	37	55	69	79	88	81	86	91	101	115	133	155	1105	1105
13	35	53	67	77	83	85	87	93	103	117	135	157	1105	1105
161	139	121	107	97	84	89	82	73	63	49	31	9	1105	1105
163	141	123	109	78	80	95	96	76	61	47	29	7	1105	1105
165	143	125	68	72	70	105	106	108	66	45	27	5	1105	1105
167	145	54	60	58	56	119	120	122	124	52	25	3	1105	1105
169	36	44	42	40	38	137	138	140	142	144	34	1	1105	1105
14	24	22	20	18	16	159	160	162	164	166	168	12	1105	1105
1105	1105	1105	1105	1105	1105	1105	1105	1105	1105	1105	1105	1105	1105	1105

															1379
183	172	174	176	192	194	26	24	22	20	6	4	2	184	1379	1379
19	159	150	152	167	169	48	46	44	31	29	27	160	178	1379	1379
17	43	139	132	134	146	66	64	62	52	50	140	154	180	1379	1379
15	40	61	123	118	129	80	78	69	67	124	136	157	182	1379	1379
11	39	59	76	111	108	90	88	82	112	121	138	158	186	1379	1379
9	34	55	75	87	106	103	94	91	110	122	142	163	188	1379	1379
1	32	49	70	81	92	93	104	105	116	127	148	165	196	1379	1379
179	155	137	120	113	95	98	99	102	84	77	60	42	18	1379	1379
181	156	141	125	114	101	100	97	96	83	72	56	41	16	1379	1379
185	161	143	126	85	89	107	109	115	86	71	54	36	12	1379	1379
187	162	144	73	79	68	117	119	128	130	74	53	35	10	1379	1379
189	164	57	65	63	51	131	133	135	145	147	58	33	8	1379	1379
190	37	47	45	30	28	149	151	153	166	168	170	38	7	1379	1379
13	25	23	21	5	3	171	173	175	177	191	193	195	14	1379	1379
1379	1379	1379	1379	1379	1379	1379	1379	1379	1379	1379	1379	1379	1379	1379	1379

The entries of above two magic squares are sequential numbers starting from 1:

$$D_{13 \times 13} := \{1, 2, \dots, 168, 169\}$$

$$D_{14 \times 14} := \{1, 2, \dots, 195, 196\}$$

The property of **bordered** magic squares is that removing the upper borders still we are left with magic squares of sequential values.

Multiplying each entry of above two magic squares of orders 13 and 14 by 121, we get

													133705
19118	17666	17908	18150	18392	18634	1331	1210	968	726	484	242	18876	133705
2783	16456	15246	15488	15730	15972	3993	3872	3630	3388	3146	16214	17787	133705
2541	5203	14278	13310	13552	13794	6171	6050	5808	5566	14036	15367	18029	133705
2299	4961	7139	12584	11858	12100	7865	7744	7502	12342	13431	15609	18271	133705
2057	4719	6897	8591	11374	10890	9075	8954	11132	11979	13673	15851	18513	133705
1815	4477	6655	8349	9559	10648	9801	10406	11011	12221	13915	16093	18755	133705
1573	4235	6413	8107	9317	10043	10285	10527	11253	12463	14157	16335	18997	133705
19481	16819	14641	12947	11737	10164	10769	9922	8833	7623	5929	3751	1089	133705
19723	17061	14883	13189	9438	9680	11495	11616	9196	7381	5687	3509	847	133705
19965	17303	15125	8228	8712	8470	12705	12826	13068	7986	5445	3267	605	133705
20207	17545	6534	7260	7018	6776	14399	14520	14762	15004	6292	3025	363	133705
20449	4356	5324	5082	4840	4598	16577	16698	16940	17182	17424	4114	121	133705
1694	2904	2662	2420	2178	1936	19239	19360	19602	19844	20086	20328	1452	133705
133705	133705	133705	133705	133705	133705	133705	133705	133705	133705	133705	133705	133705	133705

														166859
22143	20812	21054	21296	23232	23474	3146	2904	2662	2420	726	484	242	22264	166859
2299	19239	18150	18392	20207	20449	5808	5566	5324	3751	3509	3267	19360	21538	166859
2057	5203	16819	15972	16214	17666	7986	7744	7502	6292	6050	16940	18634	21780	166859
1815	4840	7381	14883	14278	15609	9680	9438	8349	8107	15004	16456	18997	22022	166859
1331	4719	7139	9196	13431	13068	10890	10648	9922	13552	14641	16698	19118	22506	166859
1089	4114	6655	9075	10527	12826	12463	11374	11011	13310	14762	17182	19723	22748	166859
121	3872	5929	8470	9801	11132	11253	12584	12705	14036	15367	17908	19965	23716	166859
21659	18755	16577	14520	13673	11495	11858	11979	12342	10164	9317	7260	5082	2178	166859
21901	18876	17061	15125	13794	12221	12100	11737	11616	10043	8712	6776	4961	1936	166859
22385	19481	17303	15246	10285	10769	12947	13189	13915	10406	8591	6534	4356	1452	166859
22627	19602	17424	8833	9559	8228	14157	14399	15488	15730	8954	6413	4235	1210	166859
22869	19844	6897	7865	7623	6171	15851	16093	16335	17545	17787	7018	3993	968	166859
22990	4477	5687	5445	3630	3388	18029	18271	18513	20086	20328	20570	4598	847	166859
1573	3025	2783	2541	605	363	20691	20933	21175	21417	23111	23353	23595	1694	166859
166859	166859	166859	166859	166859	166859	166859	166859	166859	166859	166859	166859	166859	166859	166859

In this case, the entries distributions of these two magic squares are given by

$$D_{13 \times 13} := \{121, 242, \dots, 20328, 20449\}$$

$$D_{14 \times 14} := \{121, 242, \dots, 23595, 23716\}.$$

Let's consider following three magic squares of order 11.

	pan	671	671	671	671	671	671	671	671	671	671	
671	1	21	30	39	48	57	77	86	95	104	113	671
671	101	121	9	18	27	36	45	65	74	83	92	671
671	80	89	109	118	6	15	24	44	53	62	71	671
671	59	68	88	97	106	115	3	12	32	41	50	671
671	38	47	56	76	85	94	103	112	11	20	29	671
671	17	26	35	55	64	73	82	91	100	120	8	671
671	117	5	14	23	43	52	61	70	79	99	108	671
671	96	105	114	2	22	31	40	49	58	67	87	671
671	75	84	93	102	111	10	19	28	37	46	66	671
671	54	63	72	81	90	110	119	7	16	25	34	671
	33	42	51	60	69	78	98	107	116	4	13	671
	671	671	671	671	671	671	671	671	671	671	671	671

													671
12	20	18	16	14	113	114	116	118	120	10			671
121	28	100	98	96	95	32	34	36	30	1			671
119	21	78	74	76	41	40	38	80		101	3		671
117	23	37	70	73	53	55	54		85	99	5		671
115	25	39	50	60	65	58	72	83	97	7			671
11	93	79	51	59	61	63	71	43	29	111			671
13	91	77	66	64	57	62		56	45	31	109		671
15	89	75	68	49	69	67	52	47	33	107			671
17	87	42	48	46	81	82	84	44	35	105			671
19	92	22	24	26	27	90	88	86	94	103			671
112	102	104	106	108	9	8	6	4	2	110			671
671	671	671	671	671	671	671	671	671	671	671	671	671	671

														671
12	20	18	16	14	113	114	116	118	120	10				671
121	42	91	50	47	84	52	40	89	54	1				671
119	55	41	87	48	43	92	53	45	85	3				671
117	86	51	46	88	56	39	90	49	44	5				671
115	60	28	95	65	21	97	58	26	99	7				671
11	100	59	24	93	61	29	98	63	22	111				671
13	23	96	64	25	101	57	27	94	62	109				671
15	78	73	32	83	66	34	76	71	36	107				671
17	37	77	69	30	79	74	35	81	67	105				671
19	68	33	82	70	38	75	72	31	80	103				671
112	102	104	106	108	9	8	6	4	2	110				671
671	671	671	671	671	671	671	671	671	671	671	671	671	671	671

Let's replace each entry in above two magic squares of orders 13 and 14 by above two magic squares of order 11. The entries chosen in these magic squares are as given below:

$$\begin{aligned} 121 &\rightarrow 1, 2, \dots, 121 \\ 242 &\rightarrow 122, 123, \dots, 242 \\ 363 &\rightarrow 243, 244, \dots, 363 \\ &\dots \rightarrow \dots \dots \\ 23595 &\rightarrow 23475, 23476, \dots, 23595 \\ 23716 &\rightarrow 23596, 23597 \dots, 23716 \end{aligned}$$

This lead us to two big **block-bordered** magic squares of orders 143 and 154. Since these two magic squares are very big, these are given in two **excel files** attached with this work.

The multiples blocks are two different kinds of magic squares of order 11. Based on these two big magic squares we get the following magic squares.

## 2.2 Magic Squares of Order 55

Below are three magic squares of order 55 obtained from magic squares of order 143. It is obtained by the application of the formula  $\frac{a^2 - b^2}{2}$ ,  $a > b$ , i.e., subtract  $\frac{143^2 - 55^2}{2} := 8712$  from each entry of magic squares order 143, we get the following two magic squares of order 55:

2542 2562 2571 2580 2589 2598 2618 2627 2636 2645 2654	2058 2078 2087 2096 2105 2114 2134 2143 2152 2161 2170	243 263 272 281 290 299 319 328 337 346 355	122 142 151 160 169 178 198 207 216 225 234	2300 2320 2329 2338 2347 2356 2376 2385 2394 2403 2412	83215
2642 2662 2550 2559 2568 2577 2586 2606 2615 2624 2633	2158 2178 2066 2075 2084 2093 2102 2122 2131 2140 2149	343 363 251 260 269 278 287 307 316 325 334	222 242 130 139 148 157 166 186 195 204 213	2400 2420 2308 2317 2326 2335 2344 2364 2373 2382 2391	83215
2621 2630 2650 2659 2547 2556 2565 2585 2594 2603 2612	2137 2146 2166 2175 2063 2072 2081 2101 2110 2119 2128	322 331 351 360 248 257 266 286 295 304 313	201 210 230 239 127 136 145 165 174 183 192	2379 2388 2408 2417 2305 2314 2323 2343 2352 2361 2370	83215
2600 2609 2629 2638 2647 2656 2544 2553 2573 2582 2591	2116 2125 2145 2154 2163 2172 2060 2069 2089 2098 2107	301 310 330 339 348 357 245 254 274 283 292	180 189 209 218 227 236 124 133 153 162 171	2358 2367 2387 2396 2405 2414 2302 2311 2331 2340 2349	83215
2579 2588 2597 2617 2626 2635 2644 2653 2552 2561 2570	2095 2104 2113 2133 2142 2151 2160 2169 2068 2077 2086	280 289 298 318 327 336 345 354 253 262 271	159 168 177 197 206 215 224 233 132 141 150	2337 2346 2355 2375 2384 2393 2402 2411 2310 2319 2328	83215
2558 2567 2576 2596 2605 2614 2623 2632 2641 2661 2549	2074 2083 2092 2112 2121 2130 2139 2148 2157 2177 2065	259 268 277 297 306 315 324 333 342 362 250	138 147 156 176 185 194 203 212 221 241 129	2316 2325 2334 2354 2363 2372 2381 2390 2399 2419 2307	83215
2658 2546 2555 2564 2584 2593 2602 2611 2620 2640 2649	2174 2062 2071 2080 2100 2109 2118 2127 2136 2156 2165	359 247 256 265 285 294 303 312 321 341 350	238 126 135 144 164 173 182 191 200 220 229	2416 2304 2313 2322 2342 2351 2360 2369 2378 2398 2407	83215
2637 2646 2655 2543 2563 2572 2581 2590 2599 2608 2628	2153 2162 2171 2059 2079 2088 2097 2106 2115 2124 2144	338 347 356 244 264 273 282 291 300 309 329	217 226 235 123 143 152 161 170 179 188 208	2395 2404 2413 2301 2321 2330 2339 2348 2357 2366 2386	83215
2616 2625 2634 2643 2652 2551 2560 2569 2578 2587 2607	2132 2141 2150 2159 2168 2067 2076 2085 2094 2103 2123	317 326 335 344 353 252 261 270 279 288 308	196 205 214 223 232 131 140 149 158 167 187	2374 2383 2392 2401 2410 2309 2318 2327 2336 2345 2365	83215
2595 2604 2613 2622 2631 2651 2660 2548 2557 2566 2575	2111 2120 2129 2138 2147 2167 2176 2064 2073 2082 2091	296 305 314 323 332 352 361 249 258 267 276	175 184 193 202 211 231 240 128 137 146 155	2353 2362 2371 2380 2389 2409 2418 2306 2315 2324 2333	83215
2574 2583 2592 2601 2610 2619 2639 2648 2657 2545 2554	2090 2099 2108 2117 2126 2135 2155 2164 2173 2061 2070	275 284 293 302 311 320 340 349 358 246 255	154 163 172 181 190 199 219 228 237 125 134	2332 2341 2350 2359 2368 2377 2397 2406 2415 2303 2312	83215
727 747 756 765 774 783 803 812 821 830 839	1816 1836 1845 1854 1863 1872 1892 1901 1910 1919 1928	969 989 998 1007 1016 1025 1045 1054 1063 1072 1081	1574 1594 1603 1612 1621 1630 1650 1659 1668 1677 1686	2179 2199 2208 2217 2226 2235 2255 2264 2273 2282 2291	83215
827 847 735 744 753 762 771 791 800 809 818	1916 1936 1824 1833 1842 1851 1860 1880 1889 1898 1907	1069 1089 977 986 995 1004 1013 1033 1042 1051 1060	1674 1694 1582 1591 1600 1609 1618 1638 1647 1656 1665	2279 2299 2187 2196 2205 2214 2223 2243 2252 2261 2270	83215
806 815 835 844 732 741 750 770 779 788 797	1895 1904 1924 1933 1821 1830 1839 1859 1868 1877 1886	1048 1057 1077 1086 974 983 992 1012 1021 1030 1039	1653 1662 1682 1691 1579 1588 1597 1617 1626 1635 1644	2258 2267 2287 2296 2184 2193 2202 2222 2231 2240 2249	83215
785 794 814 823 832 841 729 738 758 767 776	1874 1883 1903 1912 1921 1930 1818 1827 1847 1856 1865	1027 1036 1056 1065 1074 1083 971 980 1000 1009 1018	1632 1641 1661 1670 1679 1688 1576 1585 1605 1614 1623	2237 2246 2266 2275 2284 2293 2181 2190 2210 2219 2228	83215
764 773 782 802 811 820 829 838 737 746 755	1853 1862 1871 1891 1900 1909 1918 1927 1826 1835 1844	1006 1015 1024 1044 1053 1062 1071 1080 979 988 997	1611 1620 1629 1649 1658 1667 1676 1685 1584 1593 1602	2216 2225 2234 2254 2263 2272 2281 2290 2189 2198 2207	83215
743 752 761 781 790 799 808 817 826 846 734	1832 1841 1850 1870 1879 1888 1897 1906 1915 1935 1823	985 994 1003 1023 1032 1041 1050 1059 1068 1088 976	1590 1599 1608 1628 1637 1646 1655 1664 1673 1693 1581	2195 2204 2213 2233 2242 2251 2260 2269 2278 2298 2186	83215
843 731 740 749 769 778 787 796 805 825 834	1932 1820 1829 1838 1858 1867 1876 1885 1894 1914 1923	1085 973 982 991 1011 1020 1029 1038 1047 1067 1076	1690 1578 1587 1596 1616 1625 1634 1643 1652 1672 1681	2295 2183 2192 2201 2221 2230 2239 2248 2257 2277 2286	83215
822 831 840 728 748 757 766 775 784 793 813	1911 1920 1929 1817 1837 1846 1855 1864 1873 1882 1902	1064 1073 1082 970 990 999 1008 1017 1026 1035 1055	1669 1678 1687 1575 1595 1604 1613 1622 1631 1640 1660	2274 2283 2292 2180 2200 2209 2218 2227 2236 2245 2265	83215
801 810 819 828 837 736 745 754 763 772 792	1890 1899 1908 1917 1926 1825 1834 1843 1852 1861 1881	1043 1052 1061 1070 1079 978 987 996 1005 1014 1034	1648 1657 1666 1675 1684 1583 1592 1601 1610 1619 1639	2253 2262 2271 2280 2289 2188 2197 2206 2215 2224 2244	83215
780 789 798 807 816 836 845 733 742 751 760	1869 1878 1887 1896 1905 1925 1934 1822 1831 1840 1849	1022 1031 1040 1049 1058 1078 1087 975 984 993 1002	1627 1636 1645 1654 1663 1683 1692 1580 1589 1598 1607	2232 2241 2250 2259 2268 2288 2297 2185 2194 2203 2212	83215
759 768 777 786 795 804 824 833 842 730 739	1848 1857 1866 1875 1884 1893 1913 1922 1931 1819 1828	1001 1010 1019 1028 1037 1046 1066 1075 1084 972 981	1606 1615 1624 1633 1642 1651 1671 1680 1689 1577 1586	2211 2220 2229 2238 2247 2256 2276 2285 2294 2182 2191	83215
485 505 514 523 532 541 561 570 579 588 597	1211 1231 1240 1249 1258 1267 1287 1296 1305 1314 1323	1453 1473 1482 1491 1500 1509 1529 1538 1547 1556 1565	1695 1715 1724 1733 1742 1751 1771 1780 1789 1798 1807	2421 2441 2450 2459 2468 2477 2497 2506 2515 2524 2533	83215
585 605 493 502 511 520 529 549 558 567 576	1311 1331 1219 1228 1237 1246 1255 1275 1284 1293 1302	1553 1573 1461 1470 1479 1488 1497 1517 1526 1535 1544	1795 1815 1703 1712 1721 1730 1739 1759 1768 1777 1786	2521 2541 2429 2438 2447 2456 2465 2485 2494 2503 2512	83215
564 573 593 602 490 499 508 528 537 546 555	1290 1299 1319 1328 1216 1225 1234 1254 1263 1272 1281	1532 1541 1561 1570 1458 1467 1476 1496 1505 1514 1523	1774 1783 1803 1812 1700 1709 1718 1738 1747 1756 1765	2500 2509 2529 2538 2426 2435 2444 2464 2473 2482 2491	83215
543 552 572 581 590 599 487 496 516 525 534	1269 1278 1298 1307 1316 1325 1213 1222 1242 1251 1260	1511 1520 1540 1549 1558 1567 1455 1464 1484 1493 1502	1753 1762 1782 1791 1800 1809 1697 1706 1726 1735 1744	2479 2488 2508 2517 2526 2535 2423 2432 2452 2461 2470	83215
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739	749	822	790	751	827	783	753	820	788	835	1828	1838	1911	1879	1840	1916	1872	1842	1909	1877	1924	981	991	1064	1032	993	1069	1025	995	1062	1030	1077	1586	1596	1669	1637	1598	1674	1630	1600	1667	1635	1682	2191	2201	2274	2242	2203	2279	2235	2205	2272	2240	2287	83215
741	804	799	758	809	792	760	802	797	762	833	1830	1893	1888	1847	1898	1881	1849	1891	1886	1851	1922	983	1046	1041	1000	1051	1034	1002	1044	1039	1004	1075	1588	1651	1646	1605	1656	1639	1607	1649	1644	1609	1680	2193	2256	2251	2210	2261	2244	2212	2254	2249	2214	2285	83215
743	763	803	795	756	805	800	761	807	793	831	1832	1852	1892	1884	1845	1894	1889	1850	1896	1882	1920	985	1005	1045	1037	998	1047	1042	1003	1049	1035	1073	1590	1610	1650	1642	1603	1652	1647	1608	1654	1640	1678	2195	2215	2255	2247	2208	2257	2252	2213	2259	2245	2283	83215
745	794	759	808	796	764	801	798	757	806	829	1834	1883	1848	1897	1885	1853	1890	1887	1846	1895	1918	987	1036	1001	1050	1038	1006	1043	1040	999	1048	1071	1592	1641	1606	1655	1643	1611	1648	1645	1604	1653	1676	2197	2246	2211	2260	2248	2216	2253	2250	2209	2258	2281	83215
838	828	830	832	834	735	734	732	730	728	836	1927	1917	1919	1921	1923	1824	1823	1821	1819	1817	1925	1080	1070	1072	1074	1076	977	976	974	972	970	1078	1685	1675	1677	1679	1681	1582	1581	1579	1577	1575	1683	2290	2280	2282	2284	2286	2187	2186	2184	2182	2180	2288	83215
496	504	502	500	498	597	598	600	602	604	494	1222	1230	1228	1226	1224	1323	1324	1326	1328	1330	1220	1464	1472	1470	1468	1466	1565	1566	1568	1570	1572	1462	1706	1714	1712	1710	1708	1807	1808	1810	1812	1814	1704	2432	2440	2438	2436	2434	2533	2534	2536	2538	2540	2430	83215
605	526	575	534	531	568	536	524	573	538	485	1331	1252	1301	1260	1257	1294	1262	1250	1299	1264	1211	1573	1494	1543	1502	1499	1536	1504	1492	1541	1506	1453	1815	1736	1785	1744	1741	1778	1746	1734	1783	1748	1695	2541	2462	2511	2470	2467	2504	2472	2460	2509	2474	2421	83215
603	539	525	571	532	527	576	537	529	569	487	1329	1265	1251	1297	1258	1253	1302	1263	1255	1295	1213	1571	1507	1493	1539	1500	1495	1544	1505	1497	1537	1455	1813	17																					

### 2.3 Magic Squares of Order 44

Below are three magic squares of order 44 obtained from magic squares of order 154. It is obtained by the application of the formula  $\frac{a^2 - b^2}{2}$ ,  $a > b$ , i.e., subtract  $\frac{154^2 - 44^2}{2} := 10890$  from each entry of magic square order 154, we get the following three magic squares of order 44:

																																												42614
1816	1836	1845	1854	1863	1872	1892	1901	1910	1919	1928	1453	1473	1482	1491	1500	1509	1529	1538	1547	1556	1565	364	384	393	402	411	420	440	449	458	467	476	1	21	30	39	48	57	77	86	95	104	113	42614
1916	1936	1824	1833	1842	1851	1860	1880	1889	1898	1907	1553	1573	1461	1470	1479	1488	1497	1517	1526	1535	1544	464	484	372	381	390	399	408	428	437	446	455	101	121	9	18	27	36	45	65	74	83	92	42614
1895	1904	1924	1933	1821	1830	1839	1859	1868	1877	1886	1532	1541	1561	1570	1458	1467	1476	1496	1505	1514	1523	443	452	472	481	369	378	387	407	416	425	434	80	89	109	118	6	15	24	44	53	62	71	42614
1874	1883	1903	1912	1921	1930	1818	1827	1847	1856	1865	1511	1520	1540	1549	1558	1567	1455	1464	1484	1493	1502	422	431	451	460	469	478	366	375	395	404	413	59	68	88	97	106	115	3	12	32	41	50	42614
1853	1862	1871	1891	1900	1909	1918	1927	1826	1835	1844	1490	1499	1508	1528	1537	1546	1555	1564	1463	1472	1481	401	410	419	439	448	457	466	475	374	383	392	38	47	56	76	85	94	103	112	11	20	29	42614
1832	1841	1850	1870	1879	1888	1897	1906	1915	1935	1823	1469	1478	1487	1507	1516	1525	1534	1543	1552	1572	1460	380	389	398	418	427	436	445	454	463	483	371	17	26	35	55	64	73	82	91	100	120	8	42614
1932	1820	1829	1838	1858	1867	1876	1885	1894	1914	1923	1569	1457	1466	1475	1495	1504	1513	1522	1531	1551	1560	480	368	377	386	406	415	424	433	442	462	471	117	5	14	23	43	52	61	70	79	99	108	42614
1911	1920	1929	1817	1837	1846	1855	1864	1873	1882	1902	1548	1557	1566	1454	1474	1483	1492	1501	1510	1519	1539	459	468	477	365	385	394	403	412	421	430	450	96	105	114	2	22	31	40	49	58	67	87	42614
1890	1899	1908	1917	1926	1825	1834	1843	1852	1861	1881	1527	1536	1545	1554	1563	1462	1471	1480	1489	1498	1518	438	447	456	465	474	373	382	391	400	409	429	75	84	93	102	111	10	19	28	37	46	66	42614
1869	1878	1887	1896	1905	1925	1934	1822	1831	1840	1849	1506	1515	1524	1533	1542	1562	1571	1459	1468	1477	1486	417	426	435	444	453	473	482	370	379	388	397	54	63	72	81	90	110	119	7	16	25	34	42614
1848	1857	1866	1875	1884	1893	1913	1922	1931	1819	1828	1485	1494	1503	1512	1521	1530	1550	1559	1568	1456	1465	396	405	414	423	432	441	461	470	479	367	376	33	42	51	60	69	78	98	107	116	4	13	42614
122	142	151	160	169	178	198	207	216	225	234	243	263	272	281	290	299	319	328	337	346	355	1574	1594	1603	1612	1621	1630	1650	1659	1668	1677	1686	1695	1715	1724	1733	1742	1751	1771	1780	1789	1798	1807	42614
222	242	130	139	148	157	166	186	195	204	213	343	363	251	260	269	278	287	307	316	325	334	1674	1694	1582	1591	1600	1609	1618	1638	1647	1656	1665	1795	1815	1703	1712	1721	1730	1739	1759	1768	1777	1786	42614
201	210	230	239	127	136	145	165	174	183	192	322	331	351	360	248	257	266	286	295	304	313	1653	1662	1682	1691	1579	1588	1597	1617	1626	1635	1644	1774	1783	1803	1812	1700	1709	1718	1738	1747	1756	1765	42614
180	189	209	218	227	236	124	133	153	162	171	301	310	330	339	348	357	245	254	274	283	292	1632	1641	1661	1670	1679	1688	1576	1585	1605	1614	1623	1753	1762	1782	1791	1800	1809	1697	1706	1726	1735	1744	42614
159	168	177	197	206	215	224	233	132	141	150	280	289	298	318	327	336	345	354	253	262	271	1611	1620	1629	1649	1658	1667	1676	1685	1584	1593	1602	1732	1741	1750	1770	1779	1788	1797	1806	1705	1714	1723	42614
138	147	156	176	185	194	203	212	221	241	129	259	268	277	297	306	315	324	333	342	362	250	1590	1599	1608	1628	1637	1646	1655	1664	1673	1693	1581	1711	1720	1729	1749	1758	1767	1776	1785	1794	1814	1702	42614
238	126	135	144	164	173	182	191	200	220	229	359	247	256	265	285	294	303	312	321	341	350	1690	1578	1587	1596	1616	1625	1634	1643	1652	1672	1681	1811	1699	1708	1717	1737	1746	1755	1764	1773	1793	1802	42614
217	226	235	123	143	152	161	170	179	188	208	338	347	356	244	264	273	282	291	300	309	329	1669	1678	1687	1575	1595	1604	1613	1622	1631	1640	1660	1790	1799	1808	1696	1716	1725	1734	1743	1752	1761	1781	42614
196	205	214	223	232	131	140	149	158	167	187	317	326	335	344	353	252	261	270	279	288	308	1648	1657	1666	1675	1684	1583	1592	1601	1610	1619	1639	1769	1778	1787	1796	1805	1704	1713	1722	1731	1740	1760	42614
175	184	193	202	211	231	240	128	137	146	155	296	305	314	323	332	352	361	249	258	267	276	1627	1636	1645	1654	1663	1683	1692	1580	1589	1598	1607	1748	1757	1766	1775	1784	1804	1813	1701	1710	1719	1728	42614
154	163	172	181	190	199	219	228	237	125	134	275	284	293	302	311	320	340	349	358	246	255	1606	1615	1624	1633	1642	1651	1671	1680	1689	1577	1586	1727	1736	1745	1754	1763	1772	1792	1801	1810	1698	1707	42614
485	505	514	523	532	541	561	570	579	588	597	848	868	877	886	895	904	924	933	942	951	960	969	989	998	1007	1016	1025	1045	1054	1063	1072	1081	1332	1352	1361	1370	1379	1388	1408	1417	1426	1435	1444	42614
585	605	493	502	511	520	529	549	558	567	576	948	968	856	865	874	883	892	912	921	930	939	1069	1089	977	986	995	1004	1013	1033	1042	1051	1060	1432	1452	1340	1349	1358	1367	1376	1396	1405	1414	1423	42614
564	573	593	602	490	499	508	528	537	546	555	927	936	956	965	853	862	871	891	900	909	918	1048	1057	1077	1086	974	983	992	1012	1021	1030	1039	1411	1420	1440	1449	1337	1346	1355	1375	1384	1393	1402	42614
543	552	572	581	590	599	487	496	516	525	534	906	915	935	944	953	962	850	859	879	888	897	1027	1036	1056	1065	1074	1083	971	980	1000	1009	1018	1390	1399	1419	1428	1437	1446	1334	1343	1363	1372	1381	42614
522	531	540	560	569	578	587	596	495	504	513	885	894	903	923	932	941	950	959	858	867	876	1006	1015	1024	1044	1053	1062	1071	1080	979	988	997	1369	1378	1387	1407	1416	1425	1434	1443	1342	1351	1360	42614
501	510	519	539	548	557	566	575	584	604	492	864	873	882	902	911	920	929	938	947	967	855	985	994	1003	1023	1032	1041	1050	1059	1068	1088	976	1348	1357	1366	1386	1395	1404	1413	1422	1431	1451	1339	42614
601	489	498	507	527	536	545	554	563	583	592	964	852	861	870	890	899	908	917	926	946	955	1085	973	982	991	1011	1020	1029	1038	1047	1067	1076	1448	1336	1345	1354	1374	1383	1392	1401	1410	1430	1439	42614
580	589	598	486	506	515	524	533	542	551	571	943	952	961	849	869	878	887	896	905	914	934	1064	1073	1082	970	990	999	1008	1017	1026	1035	1055	1427	1436	1445	1333	1353	1362	1371	1380	1389	1398	1418	42614
559	568	577	586	595	494	503	512	521	530	550	922	931	940	949	958	857	866	875	884	893	913	1043	1052	1061	1070	1079	978	987	996	1005	1014	1034	1406	1415	1424	1433	1442	1341	1350	1359	1368	1377	1397	42614
538	547	556	565	574	594	603	491	500	509	518	901	910	919	928	937	957	966	854	863	872	881																							

1827	1835	1833	1831	1829	1928	1929	1931	1933	1935	1825	1464	1472	1470	1468	1466	1565	1566	1568	1570	1572	1462	375	383	381	379	377	476	477	479	481	483	373	12	20	18	16	14	113	114	116	118	120	10	42614
1936	1843	1915	1913	1911	1910	1847	1849	1851	1845	1816	1573	1480	1552	1550	1548	1547	1484	1486	1488	1482	1453	484	391	463	461	459	458	395	397	399	393	364	121	28	100	98	96	95	32	34	36	30	1	42614
1934	1836	1893	1889	1891	1856	1855	1853	1895	1916	1818	1571	1473	1530	1526	1528	1493	1492	1490	1532	1553	1455	482	384	441	437	439	404	403	401	443	464	366	119	21	78	74	76	41	40	38	80	101	3	42614
1932	1838	1852	1885	1888	1868	1870	1869	1900	1914	1820	1569	1475	1489	1522	1525	1505	1507	1506	1537	1551	1457	480	386	400	433	436	416	418	417	448	462	368	117	23	37	70	73	53	55	54	85	99	5	42614
1930	1840	1854	1865	1875	1880	1873	1887	1898	1912	1822	1567	1477	1491	1502	1512	1517	1510	1524	1535	1549	1459	478	388	402	413	423	428	421	435	446	460	370	115	25	39	50	60	65	58	72	83	97	7	42614
1826	1908	1894	1866	1874	1876	1878	1886	1858	1844	1926	1463	1545	1531	1503	1511	1513	1515	1523	1495	1481	1563	374	456	442	414	422	424	426	434	406	392	474	11	93	79	51	59	61	63	71	43	29	111	42614
1828	1906	1892	1881	1879	1872	1877	1871	1860	1846	1924	1465	1543	1529	1518	1516	1509	1514	1508	1497	1483	1561	376	454	440	429	427	420	425	419	408	394	472	13	91	77	66	64	57	62	56	45	31	109	42614
1830	1904	1890	1883	1864	1884	1882	1867	1862	1848	1922	1467	1541	1527	1520	1501	1521	1519	1504	1499	1485	1559	378	452	438	431	412	432	430	415	410	396	470	15	89	75	68	49	69	67	52	47	33	107	42614
1832	1902	1857	1863	1861	1896	1897	1899	1859	1850	1920	1469	1539	1494	1500	1498	1533	1534	1536	1496	1487	1557	380	450	405	411	409	444	445	447	407	398	468	17	87	42	48	46	81	82	84	44	35	105	42614
1834	1907	1837	1839	1841	1842	1905	1903	1901	1909	1918	1471	1544	1474	1476	1478	1479	1542	1540	1538	1546	1555	382	455	385	387	389	390	453	451	449	457	466	19	92	22	24	26	27	90	88	86	94	103	42614
1927	1917	1919	1921	1923	1824	1823	1821	1819	1817	1925	1564	1554	1556	1558	1560	1461	1460	1458	1456	1454	1562	475	465	467	469	471	372	371	369	367	365	473	112	102	104	106	108	9	8	6	4	2	110	42614
133	141	139	137	135	234	235	237	239	241	131	254	262	260	258	256	355	356	358	360	362	252	1585	1593	1591	1589	1587	1686	1687	1689	1691	1693	1583	1706	1714	1712	1710	1708	1807	1808	1810	1812	1814	1704	42614
242	149	221	219	217	216	153	155	157	151	122	363	270	342	340	338	337	274	276	278	272	243	1694	1601	1673	1671	1669	1668	1605	1607	1609	1603	1574	1815	1722	1794	1792	1790	1789	1726	1728	1730	1724	1695	42614
240	142	199	195	197	162	161	159	201	222	124	361	263	320	316	318	283	282	280	322	343	245	1692	1594	1651	1647	1649	1614	1613	1611	1653	1674	1576	1813	1715	1772	1768	1770	1735	1734	1732	1774	1795	1697	42614
238	144	158	191	194	174	176	175	206	220	126	359	265	279	312	315	295	297	296	327	341	247	1690	1596	1610	1643	1646	1626	1628	1627	1658	1672	1578	1811	1717	1731	1764	1767	1747	1749	1748	1779	1793	1699	42614
236	146	160	171	181	186	179	193	204	218	128	357	267	281	292	302	307	300	314	325	339	249	1688	1598	1612	1623	1633	1638	1631	1645	1656	1670	1580	1809	1719	1733	1744	1754	1759	1752	1766	1777	1791	1701	42614
132	214	200	172	180	182	184	192	164	150	232	253	335	321	293	301	303	305	313	285	271	353	1584	1666	1652	1624	1632	1634	1636	1644	1616	1602	1684	1705	1787	1773	1745	1753	1755	1757	1765	1737	1723	1805	42614
134	212	198	187	185	178	183	177	166	152	230	255	333	319	308	306	299	304	298	287	273	351	1586	1664	1650	1639	1637	1630	1635	1629	1618	1604	1682	1707	1785	1771	1760	1758	1751	1756	1750	1739	1725	1803	42614
136	210	196	189	170	190	188	173	168	154	228	257	331	317	310	291	311	309	294	289	275	349	1588	1662	1648	1641	1622	1642	1640	1625	1620	1606	1680	1709	1783	1769	1762	1743	1763	1761	1746	1741	1727	1801	42614
138	208	163	169	167	202	203	205	165	156	226	259	329	284	290	288	323	324	326	286	277	347	1590	1660	1615	1621	1619	1654	1655	1657	1617	1608	1678	1711	1781	1736	1742	1740	1775	1776	1778	1738	1729	1799	42614
140	213	143	145	147	148	211	209	207	215	224	261	334	264	266	268	269	332	330	328	336	345	1592	1665	1595	1597	1599	1600	1663	1661	1659	1667	1676	1713	1786	1716	1718	1720	1721	1784	1782	1780	1788	1797	42614
233	223	225	227	229	130	129	127	125	123	231	354	344	346	348	350	251	250	248	246	244	352	1685	1675	1677	1679	1681	1582	1581	1579	1577	1575	1683	1806	1796	1798	1800	1802	1703	1702	1700	1698	1696	1804	42614
496	504	502	500	498	597	598	600	602	604	494	859	867	865	863	861	960	961	963	965	967	857	980	988	986	984	982	1081	1082	1084	1086	1088	978	1343	1351	1349	1347	1345	1444	1445	1447	1449	1451	1341	42614
605	512	584	582	580	579	516	518	520	514	485	968	875	947	945	943	942	879	881	883	877	848	1089	996	1068	1066	1064	1063	1000	1002	1004	998	969	1452	1359	1431	1429	1427	1426	1363	1365	1367	1361	1332	42614
603	505	562	558	560	525	524	522	564	585	487	966	868	925	921	923	888	887	885	927	948	850	1087	989	1046	1042	1044	1009	1008	1006	1048	1069	971	1450	1352	1409	1405	1407	1372	1371	1369	1411	1432	1334	42614
601	507	521	554	557	537	539	538	569	583	489	964	870	884	917	920	900	902	901	932	946	852	1085	991	1005	1038	1041	1021	1023	1022	1053	1067	973	1448	1354	1368	1401	1404	1384	1386	1385	1416	1430	1336	42614
599	509	523	534	544	549	542	556	567	581	491	962	872	886	897	907	912	905	919	930	944	854	1083	993	1007	1018	1028	1033	1026	1040	1051	1065	975	1446	1356	1370	1381	1391	1396	1389	1403	1414	1428	1338	42614
495	577	563	535	543	545	547	555	527	513	595	858	940	926	898	906	908	910	918	890	876	958	979	1061	1047	1019	1027	1029	1031	1039	1011	997	1079	1342	1424	1410	1382	1390	1392	1394	1402	1374	1360	1442	42614
497	575	561	550	548	541	546	540	529	515	593	860	938	924	913	911	904	909	903	892	878	956	981	1059	1045	1034	1032	1025	1030	1024	1013	999	1077	1344	1422	1408	1397	1395	1388	1393	1387	1376	1362	1440	42614
499	573	559	552	533	553	551	536	531	517	591	862	936	922	915	896	916	914	899	894	880	954	983	1057	1043	1036	1017	1037	1035	1020	1015	1001	1075	1346	1420	1406	1399	1380	1400	1398	1383	1378	1364	1438	42614
501	571	526	532	530	565	566	568	528	519	589	864	934	889	895	893	928	929	931	891	882	952	985	1055	1010	1016	1014	1049	1050	1052	1012	1003	1073	1348	1418	1373	1379	1377	1412	1413	1415	1375	1366	1436	42614
503	576	506	508	510	511	574	572	570	578	587	866	939	869	871	873	874	937	935	933	941	950	987	1060																					

1827	1835	1833	1831	1829	1928	1929	1931	1933	1935	1825	1464	1472	1470	1468	1466	1565	1566	1568	1570	1572	1462	375	383	381	379	377	476	477	479	481	483	373	12	20	18	16	14	113	114	116	118	120	10	42614
1936	1857	1906	1865	1862	1899	1867	1855	1904	1869	1816	1573	1494	1543	1502	1499	1536	1504	1492	1541	1506	1453	484	405	454	413	410	447	415	403	452	417	364	121	42	91	50	47	84	52	40	89	54	1	42614
1934	1870	1856	1902	1863	1858	1907	1868	1860	1900	1818	1571	1507	1493	1539	1500	1495	1544	1505	1497	1537	1455	482	418	404	450	411	406	455	416	408	448	366	119	55	41	87	48	43	92	53	45	85	3	42614
1932	1901	1866	1861	1903	1871	1854	1905	1864	1859	1820	1569	1538	1503	1498	1540	1508	1491	1542	1501	1496	1457	480	449	414	409	451	419	402	453	412	407	368	117	86	51	46	88	56	39	90	49	44	5	42614
1930	1875	1843	1910	1880	1836	1912	1873	1841	1914	1822	1567	1512	1480	1547	1517	1473	1549	1510	1478	1551	1459	478	423	391	458	428	384	460	421	389	462	370	115	60	28	95	65	21	97	58	26	99	7	42614
1826	1915	1874	1839	1908	1876	1844	1913	1878	1837	1926	1463	1552	1511	1476	1545	1513	1481	1550	1515	1474	1563	374	463	422	387	456	424	392	461	426	385	474	11	100	59	24	93	61	29	98	63	22	111	42614
1828	1838	1911	1879	1840	1916	1872	1842	1909	1877	1924	1465	1475	1548	1516	1477	1553	1509	1479	1546	1514	1561	376	386	459	427	388	464	420	390	457	425	472	13	23	96	64	25	101	57	27	94	62	109	42614
1830	1893	1888	1847	1898	1881	1849	1891	1886	1851	1922	1467	1530	1525	1484	1535	1518	1486	1528	1523	1488	1559	378	441	436	395	446	429	397	439	434	399	470	15	78	73	32	83	66	34	76	71	36	107	42614
1832	1852	1892	1884	1845	1894	1889	1850	1896	1882	1920	1469	1489	1529	1521	1482	1531	1526	1487	1533	1519	1557	380	400	440	432	393	442	437	398	444	430	468	17	37	77	69	30	79	74	35	81	67	105	42614
1834	1883	1848	1897	1885	1853	1890	1887	1846	1895	1918	1471	1520	1485	1534	1522	1490	1527	1524	1483	1532	1555	382	431	396	445	433	401	438	435	394	443	466	19	68	33	82	70	38	75	72	31	80	103	42614
1927	1917	1919	1921	1923	1824	1823	1821	1819	1817	1925	1564	1554	1556	1558	1560	1461	1460	1458	1456	1454	1562	475	465	467	469	471	372	371	369	367	365	473	112	102	104	106	108	9	8	6	4	2	110	42614
133	141	139	137	135	234	235	237	239	241	131	254	262	260	258	256	355	356	358	360	362	252	1585	1593	1591	1589	1587	1686	1687	1689	1691	1693	1583	1706	1714	1712	1710	1708	1807	1808	1810	1812	1814	1704	42614
242	163	212	171	168	205	173	161	210	175	122	363	284	333	292	289	326	294	282	331	296	243	1694	1615	1664	1623	1620	1657	1625	1613	1662	1627	1574	1815	1736	1785	1744	1741	1778	1746	1734	1783	1748	1695	42614
240	176	162	208	169	164	213	174	166	206	124	361	297	283	329	290	285	334	295	287	327	245	1692	1628	1614	1660	1621	1616	1665	1626	1618	1658	1576	1813	1749	1735	1781	1742	1737	1786	1747	1739	1779	1697	42614
238	207	172	167	209	177	160	211	170	165	126	359	328	293	288	330	298	281	332	291	286	247	1690	1659	1624	1619	1661	1629	1612	1663	1622	1617	1578	1811	1780	1745	1740	1782	1750	1733	1784	1743	1738	1699	42614
236	181	149	216	186	142	218	179	147	220	128	357	302	270	337	307	263	339	300	268	341	249	1688	1633	1601	1668	1638	1594	1670	1631	1599	1672	1580	1809	1754	1722	1789	1759	1715	1791	1752	1720	1793	1701	42614
132	221	180	145	214	182	150	219	184	143	232	253	342	301	266	335	303	271	340	305	264	353	1584	1673	1632	1597	1666	1634	1602	1671	1636	1595	1684	1705	1794	1753	1718	1787	1755	1723	1792	1757	1716	1805	42614
134	144	217	185	146	222	178	148	215	183	230	255	265	338	306	267	343	299	269	336	304	351	1586	1596	1669	1637	1598	1674	1630	1600	1667	1635	1682	1707	1717	1790	1758	1719	1795	1751	1721	1788	1756	1803	42614
136	199	194	153	204	187	155	197	192	157	228	257	320	315	274	325	308	276	318	313	278	349	1588	1651	1646	1605	1656	1639	1607	1649	1644	1609	1680	1709	1772	1767	1726	1777	1760	1728	1770	1765	1730	1801	42614
138	158	198	190	151	200	195	156	202	188	226	259	279	319	311	272	321	316	277	323	309	347	1590	1610	1650	1642	1603	1652	1647	1608	1654	1640	1678	1711	1731	1771	1763	1724	1773	1768	1729	1775	1761	1799	42614
140	189	154	203	191	159	196	193	152	201	224	261	310	275	324	312	280	317	314	273	322	345	1592	1641	1606	1655	1643	1611	1648	1645	1604	1653	1676	1713	1762	1727	1776	1764	1732	1769	1766	1725	1774	1797	42614
233	223	225	227	229	130	129	127	125	123	231	354	344	346	348	350	251	250	248	246	244	352	1685	1675	1677	1679	1681	1582	1581	1579	1577	1575	1683	1806	1796	1798	1800	1802	1703	1702	1700	1698	1696	1804	42614
496	504	502	500	498	597	598	600	602	604	494	859	867	865	863	861	960	961	963	965	967	857	980	988	986	984	982	1081	1082	1084	1086	1088	978	1343	1351	1349	1347	1345	1444	1445	1447	1449	1451	1341	42614
605	526	575	534	531	568	536	524	573	538	485	968	889	938	897	894	931	899	887	936	901	848	1089	1010	1059	1018	1015	1052	1020	1008	1057	1022	969	1452	1373	1422	1381	1378	1415	1383	1371	1420	1385	1332	42614
603	539	525	571	532	527	576	537	529	569	487	966	902	888	934	895	890	939	900	892	932	850	1087	1023	1009	1055	1016	1011	1060	1021	1013	1053	971	1450	1386	1372	1418	1379	1374	1423	1384	1376	1416	1334	42614
601	570	535	530	572	540	523	574	533	528	489	964	933	898	893	935	903	886	937	896	891	852	1085	1054	1019	1014	1056	1024	1007	1058	1017	1012	973	1448	1417	1382	1377	1419	1387	1370	1421	1380	1375	1336	42614
599	544	512	579	549	505	581	542	510	583	491	962	907	875	942	912	868	944	905	873	946	854	1083	1028	996	1063	1033	989	1065	1026	994	1067	975	1446	1391	1359	1426	1396	1352	1428	1389	1357	1430	1338	42614
495	584	543	508	577	545	513	582	547	506	595	858	947	906	871	940	908	876	945	910	869	958	979	1068	1027	992	1061	1029	997	1066	1031	990	1079	1342	1431	1390	1355	1424	1392	1360	1429	1394	1353	1442	42614
497	507	580	548	509	585	541	511	578	546	593	860	870	943	911	872	948	904	874	941	909	956	981	991	1064	1032	993	1069	1025	995	1062	1030	1077	1344	1354	1427	1395	1356	1432	1388	1358	1425	1393	1440	42614
499	562	557	516	567	550	518	560	555	520	591	862	925	920	879	930	913	881	923	918	883	954	983	1046	1041	1000	1051	1034	1002	1044	1039	1004	1075	1346	1409	1404	1363	1414	1397	1365	1407	1402	1367	1438	42614
501	521	561	553	514	563	558	519	565	551	589	864	884	924	916	877	926	921	882	928	914	952	985	1005	1045	1037	998	1047	1042	1003	1049	1035	1073	1348	1368	1408	1400	1361	1410	1405	1366	1412	1398	1436	42614
503	552	517	566	554	522	559	556	515	564	587	866	915	880	929	917	885	922	919	878	927	950	987	1036	1																				

## 2.4 Magic Squares of Order 33

Below are three magic squares of order 33 obtained from magic squares of order 143. It is obtained by the application of the formula  $\frac{a^2 - b^2}{2}$ ,  $a > b$ , i.e., subtract  $\frac{143^2 - 33^2}{2} := 9680$  from each entry of magic square order 143, we get the following three magic squares of order 33:

																																	17985
848	868	877	886	895	904	924	933	942	951	960	1	21	30	39	48	57	77	86	95	104	113	606	626	635	644	653	662	682	691	700	709	718	17985
948	968	856	865	874	883	892	912	921	930	939	101	121	9	18	27	36	45	65	74	83	92	706	726	614	623	632	641	650	670	679	688	697	17985
927	936	956	965	853	862	871	891	900	909	918	80	89	109	118	6	15	24	44	53	62	71	685	694	714	723	611	620	629	649	658	667	676	17985
906	915	935	944	953	962	850	859	879	888	897	59	68	88	97	106	115	3	12	32	41	50	664	673	693	702	711	720	608	617	637	646	655	17985
885	894	903	923	932	941	950	959	858	867	876	38	47	56	76	85	94	103	112	11	20	29	643	652	661	681	690	699	708	717	616	625	634	17985
864	873	882	902	911	920	929	938	947	967	855	17	26	35	55	64	73	82	91	100	120	8	622	631	640	660	669	678	687	696	705	725	613	17985
964	852	861	870	890	899	908	917	926	946	955	117	5	14	23	43	52	61	70	79	99	108	722	610	619	628	648	657	666	675	684	704	713	17985
943	952	961	849	869	878	887	896	905	914	934	96	105	114	2	22	31	40	49	58	67	87	701	710	719	607	627	636	645	654	663	672	692	17985
922	931	940	949	958	857	866	875	884	893	913	75	84	93	102	111	10	19	28	37	46	66	680	689	698	707	716	615	624	633	642	651	671	17985
901	910	919	928	937	957	966	854	863	872	881	54	63	72	81	90	110	119	7	16	25	34	659	668	677	686	695	715	724	612	621	630	639	17985
880	889	898	907	916	925	945	954	963	851	860	33	42	51	60	69	78	98	107	116	4	13	638	647	656	665	674	683	703	712	721	609	618	17985
243	263	272	281	290	299	319	328	337	346	355	485	505	514	523	532	541	561	570	579	588	597	727	747	756	765	774	783	803	812	821	830	839	17985
343	363	251	260	269	278	287	307	316	325	334	585	605	493	502	511	520	529	549	558	567	576	827	847	735	744	753	762	771	791	800	809	818	17985
322	331	351	360	248	257	266	286	295	304	313	564	573	593	602	490	499	508	528	537	546	555	806	815	835	844	732	741	750	770	779	788	797	17985
301	310	330	339	348	357	245	254	274	283	292	543	552	572	581	590	599	487	496	516	525	534	785	794	814	823	832	841	729	738	758	767	776	17985
280	289	298	318	327	336	345	354	253	262	271	522	531	540	560	569	578	587	596	495	504	513	764	773	782	802	811	820	829	838	737	746	755	17985
259	268	277	297	306	315	324	333	342	362	250	501	510	519	539	548	557	566	575	584	604	492	743	752	761	781	790	799	808	817	826	846	734	17985
359	247	256	265	285	294	303	312	321	341	350	601	489	498	507	527	536	545	554	563	583	592	843	731	740	749	769	778	787	796	805	825	834	17985
338	347	356	244	264	273	282	291	300	309	329	580	589	598	486	506	515	524	533	542	551	571	822	831	840	728	748	757	766	775	784	793	813	17985
317	326	335	344	353	252	261	270	279	288	308	559	568	577	586	595	494	503	512	521	530	550	801	810	819	828	837	736	745	754	763	772	792	17985
296	305	314	323	332	352	361	249	258	267	276	538	547	556	565	574	594	603	491	500	509	518	780	789	798	807	816	836	845	733	742	751	760	17985
275	284	293	302	311	320	340	349	358	246	255	517	526	535	544	553	562	582	591	600	488	497	759	768	777	786	795	804	824	833	842	730	739	17985
364	384	393	402	411	420	440	449	458	467	476	969	989	998	1007	1016	1025	1045	1054	1063	1072	1081	122	142	151	160	169	178	198	207	216	225	234	17985
464	484	372	381	390	399	408	428	437	446	455	1069	1089	977	986	995	1004	1013	1033	1042	1051	1060	222	242	130	139	148	157	166	186	195	204	213	17985
443	452	472	481	369	378	387	407	416	425	434	1048	1057	1077	1086	974	983	992	1012	1021	1030	1039	201	210	230	239	127	136	145	165	174	183	192	17985
422	431	451	460	469	478	366	375	395	404	413	1027	1036	1056	1065	1074	1083	971	980	1000	1009	1018	180	189	209	218	227	236	124	133	153	162	171	17985
401	410	419	439	448	457	466	475	374	383	392	1006	1015	1024	1044	1053	1062	1071	1080	979	988	997	159	168	177	197	206	215	224	233	132	141	150	17985
380	389	398	418	427	436	445	454	463	483	371	985	994	1003	1023	1032	1041	1050	1059	1068	1088	976	138	147	156	176	185	194	203	212	221	241	129	17985
480	368	377	386	406	415	424	433	442	462	471	1085	973	982	991	1011	1020	1029	1038	1047	1067	1076	238	126	135	144	164	173	182	191	200	220	229	17985
459	468	477	365	385	394	403	412	421	430	450	1064	1073	1082	970	990	999	1008	1017	1026	1035	1055	217	226	235	123	143	152	161	170	179	188	208	17985
438	447	456	465	474	373	382	391	400	409	429	1043	1052	1061	1070	1079	978	987	996	1005	1014	1034	196	205	214	223	232	131	140	149	158	167	187	17985
417	426	435	444	453	473	482	370	379	388	397	1022	1031	1040	1049	1058	1078	1087	975	984	993	1002	175	184	193	202	211	231	240	128	137	146	155	17985
396	405	414	423	432	441	461	470	479	367	376	1001	1010	1019	1028	1037	1046	1066	1075	1084	972	981	154	163	172	181	190	199	219	228	237	125	134	17985
17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985



																																	17985
859	867	865	863	861	960	961	963	965	967	857	12	20	18	16	14	113	114	116	118	120	10	617	625	623	621	619	718	719	721	723	725	615	17985
968	889	938	897	894	931	899	887	936	901	848	121	42	91	50	47	84	52	40	89	54	1	726	647	696	655	652	689	657	645	694	659	606	17985
966	902	888	934	895	890	939	900	892	932	850	119	55	41	87	48	43	92	53	45	85	3	724	660	646	692	653	648	697	658	650	690	608	17985
964	933	898	893	935	903	886	937	896	891	852	117	86	51	46	88	56	39	90	49	44	5	722	691	656	651	693	661	644	695	654	649	610	17985
962	907	875	942	912	868	944	905	873	946	854	115	60	28	95	65	21	97	58	26	99	7	720	665	633	700	670	626	702	663	631	704	612	17985
858	947	906	871	940	908	876	945	910	869	958	11	100	59	24	93	61	29	98	63	22	111	616	705	664	629	698	666	634	703	668	627	716	17985
860	870	943	911	872	948	904	874	941	909	956	13	23	96	64	25	101	57	27	94	62	109	618	628	701	669	630	706	662	632	699	667	714	17985
862	925	920	879	930	913	881	923	918	883	954	15	78	73	32	83	66	34	76	71	36	107	620	683	678	637	688	671	639	681	676	641	712	17985
864	884	924	916	877	926	921	882	928	914	952	17	37	77	69	30	79	74	35	81	67	105	622	642	682	674	635	684	679	640	686	672	710	17985
866	915	880	929	917	885	922	919	878	927	950	19	68	33	82	70	38	75	72	31	80	103	624	673	638	687	675	643	680	677	636	685	708	17985
959	949	951	953	955	856	855	853	851	849	957	112	102	104	106	108	9	8	6	4	2	110	717	707	709	711	713	614	613	611	609	607	715	17985
254	262	260	258	256	355	356	358	360	362	252	496	504	502	500	498	597	598	600	602	604	494	738	746	744	742	740	839	840	842	844	846	736	17985
363	284	333	292	289	326	294	282	331	296	243	605	526	575	534	531	568	536	524	573	538	485	847	768	817	776	773	810	778	766	815	780	727	17985
361	297	283	329	290	285	334	295	287	327	245	603	539	525	571	532	527	576	537	529	569	487	845	781	767	813	774	769	818	779	771	811	729	17985
359	328	293	288	330	298	281	332	291	286	247	601	570	535	530	572	540	523	574	533	528	489	843	812	777	772	814	782	765	816	775	770	731	17985
357	302	270	337	307	263	339	300	268	341	249	599	544	512	579	549	505	581	542	510	583	491	841	786	754	821	791	747	823	784	752	825	733	17985
253	342	301	266	335	303	271	340	305	264	353	495	584	543	508	577	545	513	582	547	506	595	737	826	785	750	819	787	755	824	789	748	837	17985
255	265	338	306	267	343	299	269	336	304	351	497	507	580	548	509	585	541	511	578	546	593	739	749	822	790	751	827	783	753	820	788	835	17985
257	320	315	274	325	308	276	318	313	278	349	499	562	557	516	567	550	518	560	555	520	591	741	804	799	758	809	792	760	802	797	762	833	17985
259	279	319	311	272	321	316	277	323	309	347	501	521	561	553	514	563	558	519	565	551	589	743	763	803	795	756	805	800	761	807	793	831	17985
261	310	275	324	312	280	317	314	273	322	345	503	552	517	566	554	522	559	556	515	564	587	745	794	759	808	796	764	801	798	757	806	829	17985
354	344	346	348	350	251	250	248	246	244	352	596	586	588	590	592	493	492	490	488	486	594	838	828	830	832	834	735	734	732	730	728	836	17985
375	383	381	379	377	476	477	479	481	483	373	980	988	986	984	982	1081	1082	1084	1086	1088	978	133	141	139	137	135	234	235	237	239	241	131	17985
484	405	454	413	410	447	415	403	452	417	364	1089	1010	1059	1018	1015	1052	1020	1008	1057	1022	969	242	163	212	171	168	205	173	161	210	175	122	17985
482	418	404	450	411	406	455	416	408	448	366	1087	1023	1009	1055	1016	1011	1060	1021	1013	1053	971	240	176	162	208	169	164	213	174	166	206	124	17985
480	449	414	409	451	419	402	453	412	407	368	1085	1054	1019	1014	1056	1024	1007	1058	1017	1012	973	238	207	172	167	209	177	160	211	170	165	126	17985
478	423	391	458	428	384	460	421	389	462	370	1083	1028	996	1063	1033	989	1065	1026	994	1067	975	236	181	149	216	186	142	218	179	147	220	128	17985
374	463	422	387	456	424	392	461	426	385	474	979	1068	1027	992	1061	1029	997	1066	1031	990	1079	132	221	180	145	214	182	150	219	184	143	232	17985
376	386	459	427	388	464	420	390	457	425	472	981	991	1064	1032	993	1069	1025	995	1062	1030	1077	134	144	217	185	146	222	178	148	215	183	230	17985
378	441	436	395	446	429	397	439	434	399	470	983	1046	1041	1000	1051	1034	1002	1044	1039	1004	1075	136	199	194	153	204	187	155	197	192	157	228	17985
380	400	440	432	393	442	437	398	444	430	468	985	1005	1045	1037	998	1047	1042	1003	1049	1035	1073	138	158	198	190	151	200	195	156	202	188	226	17985
382	431	396	445	433	401	438	435	394	443	466	987	1036	1001	1050	1038	1006	1043	1040	999	1048	1071	140	189	154	203	191	159	196	193	152	201	224	17985
475	465	467	469	471	372	371	369	367	365	473	1080	1070	1072	1074	1076	977	976	974	972	970	1078	233	223	225	227	229	130	129	127	125	123	231	17985
17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985	17985

More examples of higher order can also be obtained in a similar way. See the attached **Excel files** giving **block-wise** bordered magic squares from orders 11 to 154.



### 3 Author's Contribution to Recreation of Numbers and Magic Squares

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