Strachey Method

by Ivan Ormsbee

The Strachey Method, by Ralph Strachey (1868-1923), is a simple method of preparing a singly even magic square. I tried to present it with a view on matrix operations.

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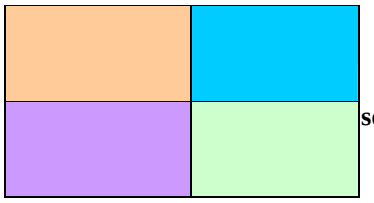
Strachey Method by Ralph Strachey (1868-1923)

1. Split the (4n + 2 = x) magic square into four identical (2n+1 = ½ x) magic squares and fill using the Siamese (also called de la Loubères) method – see worksheet – Examples.



This step generates the basic underlying pattern for the square.

2. Add the following amount to each cell within each (2n+1) magic square.

add 0	add ½ x^2
add ¾ x^2	add ¼ x^2

This step generates all the values needed for the magic square and keeps all the columns equal.

3. For the **top left (2n + 1) square**, add ¾ x^2 to the first n columns. Except the middle row, which has the first cell remaining unchanged and for the next n cells add ¾ x^2.
   For the **bottom left (2n + 1) square**, subtract ¾ x^2 from the first n columns. Except the middle row, which has the first cell remaining unchanged and for the next n cells subtract ¾ x^2.
   For the **top right (2n + 1) square**, minus ¼ x^2 from the first (n - 1) columns.
   For the **bottom right (2n + 1) square**, add ¼ x^2 to the first (n - 1) columns.

add	minus
minus	add

This step equalizes the rows by adding $(x/2)^3$ to each row in the top half of the (4n + 2) square and subtracting $(x/2)^3$ from each row of the bottom half of the (4n + 2) square.

The reason for the middle row exception above is to equalize the diagonals.

Worked examples:

BASIC PATTERN when x = 6, n = 1

.5x = 2n+1			**.5x = 2(1)+1 = 3**			
7	0	5	7	0	5	24
2	4	6	2	4	6	24
3	8	1	3	8	1	24
7	0	5	7	0	5	24
2	4	6	2	4	6	24
3	8	1	3	8	1	24
24	24	24	24	24	24	

BASIC PATTERN when x = 10, n = 2

	.5x = 2n+1				**.5x = 2(2)+1 = 5**					
16	23	0	7	14	16	23	0	7	14	120
22	4	6	13	15	22	4	6	13	15	120
3	5	12	19	21	3	5	12	19	21	120
9	11	18	20	2	9	11	18	20	2	120
10	17	24	1	8	10	17	24	1	8	120
16	23	0	7	14	16	23	0	7	14	120
22	4	6	13	15	22	4	6	13	15	120
3	5	12	19	21	3	5	12	19	21	120
9	11	18	20	2	9	11	18	20	2	120
10	17	24	1	8	10	17	24	1	8	120
120	120	120	120	120	120	120	120	120	120	

VALUES TO ADD TO GENERATE CONTINUOUS SEQUENCE.

$9 = .25x^2$, $18 = .5x^2$, $27 = .75x^2$

0	0	0	18	18	18	54
0	0	0	18	18	18	54
0	0	0	18	18	18	54
27	27	27	9	9	9	108
27	27	27	9	9	9	108
27	27	27	9	9	9	108
81	81	81	81	81	81	

VALUES TO ADD TO GENERATE CONTINUOUS SEQUENCE

$25 = .25x^2$, $50 = .5x^2$, $75 = .75x^2$

0	0	0	0	0	50	50	50	50	50	250
0	0	0	0	0	50	50	50	50	50	250
0	0	0	0	0	50	50	50	50	50	250
0	0	0	0	0	50	50	50	50	50	250
0	0	0	0	0	50	50	50	50	50	250
75	75	75	75	75	25	25	25	25	25	500
75	75	75	75	75	25	25	25	25	25	500
75	75	75	75	75	25	25	25	25	25	500
75	75	75	75	75	25	25	25	25	25	500
75	75	75	75	75	25	25	25	25	25	500
375	375	375	375	375	375	375	375	375	375	

CONTINUOUS SEQUENCE

$9 = .25x^2$, $18 = .5x^2$, $27 = .75x^2$

7	0	5	25	18	23	78
2	4	6	20	22	24	78
3	8	1	21	26	19	78
34	27	32	16	9	14	132
29	31	33	11	13	15	132
30	35	28	12	17	10	132

CONTINUOUS SEQUENCE

$25 = .25x^2$, $50 = .5x^2$, $75 = .75x^2$

16	23	0	7	14	66	73	50	57	64	370
22	4	6	13	15	72	54	56	63	65	370
3	5	12	19	21	53	55	62	69	71	370
9	11	18	20	2	59	61	68	70	52	370
10	17	24	1	8	60	67	74	51	58	370
91	98	75	82	89	41	48	25	32	39	620
97	79	81	88	90	47	29	31	38	40	620
78	80	87	94	96	28	30	37	44	46	620
84	86	93	95	77	34	36	43	45	27	620
85	92	99	76	83	35	42	49	26	33	620
495	495	495	495	495	495	495	495	495	495	

VALUES TO ADD TO EQUALIZE ROWS

27	0	0	0	0	0	27
0	27	0	0	0	0	27
27	0	0	0	0	0	27
-27	0	0	0	0	0	-27
0	-27	0	0	0	0	-27
-27	0	0	0	0	0	-27
0	0	0	0	0	0	

VALUES TO ADD TO EQUALIZE ROWS

x=4n+2, when x = 10, then n = 2 & n - 1 = 1

75	75	0	0	0	0	0	0	0	-25	125
75	75	0	0	0	0	0	0	0	-25	125
0	75	75	0	0	0	0	0	0	-25	125
75	75	0	0	0	0	0	0	0	-25	125
75	75	0	0	0	0	0	0	0	-25	125
-75	-75	0	0	0	0	0	0	0	25	-125
-75	-75	0	0	0	0	0	0	0	25	-125
0	-75	-75	0	0	0	0	0	0	25	-125
-75	-75	0	0	0	0	0	0	0	25	-125
-75	-75	0	0	0	0	0	0	0	25	-125
0	0	0	0	0	0	0	0	0	0	

Magic Square Starting with 0

34	0	5	25	18	23	105
2	31	6	20	22	24	105
30	8	1	21	26	19	105
7	27	32	16	9	14	105
29	4	33	11	13	15	105
3	35	28	12	17	10	105
105	105	105	105	105	105	

Magic Square Starting with 0

91	98	0	7	14	66	73	50	57	39	495
97	79	6	13	15	72	54	56	63	40	495
3	80	87	19	21	53	55	62	69	46	495
84	86	18	20	2	59	61	68	70	27	495
85	92	24	1	8	60	67	74	51	33	495
16	23	75	82	89	41	48	25	32	64	495
22	4	81	88	90	47	29	31	38	65	495
78	5	12	94	96	28	30	37	44	71	495
9	11	93	95	77	34	36	43	45	52	495
10	17	99	76	83	35	42	49	26	58	495
495	495	495	495	495	495	495	495	495	495	

Magic Square Starting with 1

35	1	6	26	19	24	111
3	32	7	21	23	25	111
31	9	2	22	27	20	111
8	28	33	17	10	15	111
30	5	34	12	14	16	111
4	36	29	13	18	11	111
111	111	111	111	111	111	

Magic Square Starting with 1

92	99	1	8	15	67	74	51	58	40	505
98	80	7	14	16	73	55	57	64	41	505
4	81	88	20	22	54	56	63	70	47	505
85	87	19	21	3	60	62	69	71	28	505
86	93	25	2	9	61	68	75	52	34	505
17	24	76	83	90	42	49	26	33	65	505
23	5	82	89	91	48	30	32	39	66	505
79	6	13	95	97	29	31	38	45	72	505
10	12	94	96	78	35	37	44	46	53	505
11	18	100	77	84	36	43	50	27	59	505
505	505	505	505	505	505	505	505	505	505	

BASIC PATTERN when n = 3, x = 14

BASIC PATTERN

x = 4n+2 **.5x = 2n+1** **.5x = 2(3)+1 = 7**

29	38	47	0	9	18	27	29	38	47	0	9	18	27	336
37	46	6	8	17	26	28	37	46	6	8	17	26	28	336
45	5	7	16	25	34	36	45	5	7	16	25	34	36	336
4	13	15	24	33	35	44	4	13	15	24	33	35	44	336
12	14	23	32	41	43	3	12	14	23	32	41	43	3	336
20	22	31	40	42	2	11	20	22	31	40	42	2	11	336
21	30	39	48	1	10	19	21	30	39	48	1	10	19	336
29	38	47	0	9	18	27	29	38	47	0	9	18	27	336
37	46	6	8	17	26	28	37	46	6	8	17	26	28	336
45	5	7	16	25	34	36	45	5	7	16	25	34	36	336
4	13	15	24	33	35	44	4	13	15	24	33	35	44	336
12	14	23	32	41	43	3	12	14	23	32	41	43	3	336
20	22	31	40	42	2	11	20	22	31	40	42	2	11	336
21	30	39	48	1	10	19	21	30	39	48	1	10	19	336
336	336	336	336	336	336	336	336	336	336	336	336	336	336	

VALUES TO ADD TO GENERATE CONTINUOUS SEQUENCE

49 = .25x^2, 98 = .5x^2, 147 = .75x^2

0	0	0	0	0	0	0	98	98	98	98	98	98	98	686
0	0	0	0	0	0	0	98	98	98	98	98	98	98	686
0	0	0	0	0	0	0	98	98	98	98	98	98	98	686
0	0	0	0	0	0	0	98	98	98	98	98	98	98	686
0	0	0	0	0	0	0	98	98	98	98	98	98	98	686
0	0	0	0	0	0	0	98	98	98	98	98	98	98	686
0	0	0	0	0	0	0	98	98	98	98	98	98	98	686
147	147	147	147	147	147	147	49	49	49	49	49	49	49	1372
147	147	147	147	147	147	147	49	49	49	49	49	49	49	1372
147	147	147	147	147	147	147	49	49	49	49	49	49	49	1372
147	147	147	147	147	147	147	49	49	49	49	49	49	49	1372
147	147	147	147	147	147	147	49	49	49	49	49	49	49	1372
147	147	147	147	147	147	147	49	49	49	49	49	49	49	1372
147	147	147	147	147	147	147	49	49	49	49	49	49	49	1372
1029	1029	1029	1029	1029	1029	1029	1029	1029	1029	1029	1029	1029	1029	

CONTINUOUS SEQUENCE

$49 = .25x^2$, $98 = .5x^2$, $147 = .75x^2$

29	38	47	0	9	18	27	127	136	145	98	107	116	125	1022
37	46	6	8	17	26	28	135	144	104	106	115	124	126	1022
45	5	7	16	25	34	36	143	103	105	114	123	132	134	1022
4	13	15	24	33	35	44	102	111	113	122	131	133	142	1022
12	14	23	32	41	43	3	110	112	121	130	139	141	101	1022
20	22	31	40	42	2	11	118	120	129	138	140	100	109	1022
21	30	39	48	1	10	19	119	128	137	146	99	108	117	1022
176	185	194	147	156	165	174	78	87	96	49	58	67	76	1708
184	193	153	155	164	173	175	86	95	55	57	66	75	77	1708
192	152	154	163	172	181	183	94	54	56	65	74	83	85	1708
151	160	162	171	180	182	191	53	62	64	73	82	84	93	1708
159	161	170	179	188	190	150	61	63	72	81	90	92	52	1708
167	169	178	187	189	149	158	69	71	80	89	91	51	60	1708
168	177	186	195	148	157	166	70	79	88	97	50	59	68	1708
1365	1365	1365	1365	1365	1365	1365	1365	1365	1365	1365	1365	1365	1365	

VALUES TO ADD TO EQUALIZE ROWS

x = 4n+2, when x = 14, then n = 3 & n -1 = 2

147	147	147	0	0	0	0	0	0	0	0	0	-49	-49	343
147	147	147	0	0	0	0	0	0	0	0	0	-49	-49	343
147	147	147	0	0	0	0	0	0	0	0	0	-49	-49	343
0	147	147	147	0	0	0	0	0	0	0	0	-49	-49	343
147	147	147	0	0	0	0	0	0	0	0	0	-49	-49	343
147	147	147	0	0	0	0	0	0	0	0	0	-49	-49	343
147	147	147	0	0	0	0	0	0	0	0	0	-49	-49	343
-147	-147	-147	0	0	0	0	0	0	0	0	0	49	49	-343
-147	-147	-147	0	0	0	0	0	0	0	0	0	49	49	-343
-147	-147	-147	0	0	0	0	0	0	0	0	0	49	49	-343
0	-147	-147	-147	0	0	0	0	0	0	0	0	49	49	-343
-147	-147	-147	0	0	0	0	0	0	0	0	0	49	49	-343
-147	-147	-147	0	0	0	0	0	0	0	0	0	49	49	-343
-147	-147	-147	0	0	0	0	0	0	0	0	0	49	49	-343

Magic Square Starting with 0

176	185	194	0	9	18	27	127	136	145	98	107	67	76	1365
184	193	153	8	17	26	28	135	144	104	106	115	75	77	1365
192	152	154	16	25	34	36	143	103	105	114	123	83	85	1365
4	160	162	171	33	35	44	102	111	113	122	131	84	93	1365
159	161	170	32	41	43	3	110	112	121	130	139	92	52	1365
167	169	178	40	42	2	11	118	120	129	138	140	51	60	1365
168	177	186	48	1	10	19	119	128	137	146	99	59	68	1365
29	38	47	147	156	165	174	78	87	96	49	58	116	125	1365
37	46	6	155	164	173	175	86	95	55	57	66	124	126	1365
45	5	7	163	172	181	183	94	54	56	65	74	132	134	1365
151	13	15	24	180	182	191	53	62	64	73	82	133	142	1365
12	14	23	179	188	190	150	61	63	72	81	90	141	101	1365
20	22	31	187	189	149	158	69	71	80	89	91	100	109	1365
21	30	39	195	148	157	166	70	79	88	97	50	108	117	1365
1365	1365	1365	1365	1365	1365	1365	1365	1365	1365	1365	1365	1365	1365	

Magic Square Starting with 1

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