

These crosses can be drawn on number grids of various sizes.

Add opposite pairs of shaded numbers (i.e. north + south, east + west).

Notice anything? Try a few more.

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

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

Now try adding opposite pairs on crosses with just two lines of symmetry, like the ones on the right.

Experiment with grids of various sizes. What do you notice? Can you explain your findings?

1	2	3	4	5	6	7	8
9	10		12	13	14	15	16
17	18		20	21	22	23	24
25	26		28	29	30	31	32
33	34		36	37	38	39	40
41	42		44	45	46	47	48
49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64
65	66	67	68	69	70	71	72
73	74	75	76		78	79	80
81	82						88
89	90	91	92		94	95	96
97	98	99	100	101	102	103	104

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

What happens if you add the shaded squares in adjacent pairs?  
(try  $N + W$ ,  $S + E$ )

Can you predict in advance how the totals will relate to each other? What does it depend on?

Is it the same if you added them the other way round? (i.e.  $N + E$ ,  $S + W$ )

Can you explain your findings?