

N-wing Problems and Solutions

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N-wings.

The analysis of patterns, whether or not n-wings are found which eliminate candidates, is always a useful procedure, because the process often uncovers unnoticed unique digits, overlooked row-box & column-box (box-line) eliminations, as well as eliminations by polarity, and, finally, subpattern analysis and the related occasional discovery of killer candidates.

The discovery of n-wings and their companions does not always guarantee the elimination of candidates. N-wings are often found which eliminate no candidates. Secondly, the elimination of candidates, although it simplifies the sudoku, does not always result in an immediate solution

When an n-wing includes *all* the candidates in a digit pattern, it *never* results in candidate elimination, because there are no candidates left to eliminate. Much of the time, the only n-wing to be found in a sudoku for any particular digit is the overall pattern for that digit.

An n-wing which does not include all the candidates in the sudoku *always* has a *companion* n-wing, one which coexists with it, and always occupies a *non-overlapping* set of rows and columns. The companion of a row n-wing is always a column n-wing, and vice versa. The two companion n-wings are seldom of the same order. One might be a 2-wing, and the other a 3-wing.

Companion n-wings generally eliminate candidates from the same sets of squares. There are, however, occasional circumstances, such as the solutions to problems #42 and #46, in which overlapping, but slightly different sets of squares, are eliminated by the two companions. It's probably worth while to keep an eye out for such circumstances.

N-wing terminology:

Before we go any further, I'd like to explain my use of "n-wing" as opposed to "x-wing". It's because there's a need for a general term to express a general phenomenon. Terms like x-wings, swordfish, jellyfish and squirmbags suggest a variety of life forms, whereas 2-wings, 3-wings, 4-wings, and 5-wings suggest a group of related phenomena, and n-wings is a good general term for all of them. It's important to be able to talk about them as related mathematical objects, and worth the sacrifice of a bit of levity in nomenclature. The only practical value of "x" in x-wings is to conjure up the image of two crossed lines connecting the two pairs of diagonally opposite corners in the rectangle created by the four identical candidates. With multidimensional structures, the "n" can denote the dimension of the structure, and unite the similar properties of all n-wings.

An n-wing is composed of a certain number of rows crossed by the same number of columns. The number of rows and columns is the same, so a 2-wing has 2 rows and 2 columns, a 3-wing has 3 rows and 3 columns, and so on. An 8-wing would have 8 rows and 8 columns, and that is as large as n-wings get. A 9-wing might exist, but it would have no practical use, because there are no candidates outside it, and it is the candidates outside the n-wing which are of importance, because we want to eliminate them..

The n-wing theorem.

The property that makes an n-wing useful is that if there are no candidates in the parts of the rows which are outside the n-wing, then there can be no candidates in the parts of the columns which are outside the n-wing. So if an n-wing is discovered which has no candidates in its rows except for the ones inside, one can get rid of all the candidates in the columns outside the n-wing. N-wings are particularly useful because they can sometimes be used to get rid of large numbers of candidates.

Since n-wings deal only with candidates for one particular digit, we shall use ***digit patterns only*** in sudoku diagrams, which have all squares blank except those containing the digit as a candidate, and is shown as if it were the ***real digit*** for that square, writ in large in the middle of the square. The main difference between the digits in a digit pattern and those in an ordinary suboku is that there are more than one of the same digit in every row and column, because they really show the positions of the candidates written at the tops of the blanks squares, and not the real, established digits. Digit patterns are used exclusively in pattern analysis, and are explained in detail in the ***Subpattern Analysis Textbook***.

Proof of the n-wing theorem:

1. Every established value lies at the intersection of a unique row and column.

2. In an equal number of rows and columns, there must be the same number of row-column pairs.

3. If there exists a candidate in one of the columns of the n-wing which is not in any of the rows of the n-wing, then when that candidate is promoted to an established value, it causes the column it is in to be devoid of candidates, so none of the squares of that column in the rows of the n-wing can have an established value, which decreases the number of row-column pairs in the n-wing, which causes a row of the n-wing to not have an established value.

4. Therefore there can be no viable candidate (one which can be promoted to an established value) in any of the columns of the n-wing which is not in one of the rows of the n-wing, else it could be promoted as in the argument in 3 above, and thereby create a contradiction.

5. Repeat this proof, interchanging rows and columns, and you have the same result. When the columns of an n-wing have no viable candidates in rows other than those of the n-wing, the rows of the n-wing can have no viable candidates in columns other than those of the n-wing. Candidates which are not viable (cannot be promoted) are false, and may be removed.

Properties of N-wings

For any digit n ($n = 1, 2, 3, \dots, 9$),

- a. Every n -wing always has an equal number of rows & columns.
- b. For two companion n -wings,
the minor i -wing, having i rows & i columns, and
the major j -wing, having j rows & j columns,
being non-overlapping,
together occupy n rows & n columns, where
 $n = 9 - \text{number of squares containing that digit as an}$
 $\text{established value.}$
- c. Therefore the two companion n -wings are always
 i rows by i columns & j rows by j columns, where $i + j = n$.
- d. This rule may be verified in the 64 examples.
(see N-wing Solutions, starting on page 19,
in n -wing solution no. 1, $i = 2$, $j = 3$, & $n = 5$.
in n -wing solution no. 4, $i = 2$, $j = 2$, & $n = 4$.
in n -wing solution no. 7, $i = 2$, $j = 5$, & $n = 7$,
in n -wing solution no. 35, $i = 3$, $j = 4$, & $n = 7$,
etc.)

II. Problems in analyzing n-wings.

n-wing problem no.1:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
				1	1				row 1					2			2		row 1
		1		1			1		row 2				2				2	2	row 2
		1					1		row 3										row 3
									row 4	2			2	2				2	row 4
									row 5					2			2		row 5
									row 6	2				2			2	2	row 6
				1	1			1	row 7										row 7
				1	1			1	row 8										row 8
									row 9										row 9

n-wing problem no.2:

n-wing problem no.3:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
9		9		9				9	row 1		8					8	8		row 1
9			9					9	row 2										row 2
9								9	row 3	8							8		row 3
									row 4	8							8		row 4
									row 5		8					8	8		row 5
									row 6										row 6
9			9						row 7										row 7
									row 8										row 8
9		9		9					row 9										row 9

n-wing problem no.4:

n-wing problem no.5:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
			6		6				row 1		5			5	5		5	5	row 1
									row 2	5	5								row 2
									row 3	5				5			5	5	row 3
6				6			6		row 4										row 4
6			6	6	6		6		row 5							5		5	row 5
6				6					row 6										row 6
			6		6				row 7	5	5								row 7
									row 8						5	5			row 8
									row 9					5		5	5		row 9

n-wing problem no.6:

n-wing problem no.7:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
					5		5		row 1	6	6								row 1
									row 2								6	6	row 2
				5		5	5	5	row 3										row 3
									row 4	6				6				6	row 4
									row 5	6		6	6	6		6	6	6	row 5
						5	5	5	row 6	6			6	6				6	row 6
		5		5	5	5			row 7			6				6	6		row 7
					5		5		row 8	6	6		6				6		row 8
		5			5		5	5	row 9		6			6			6		row 9

n-wing problem no.8:

n-wing problem no.9:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
									row 1		9					9	9		row 1
9	9						9		row 2	9						9		9	row 2
9								9	row 3										row 3
									row 4										row 4
9		9						9	row 5							9		9	row 5
	9	9					9		row 6										row 6
									row 7	9				9		9		9	row 7
9		9							row 8	9				9		9		9	row 8
									row 9		9			9		9	9		row 9

n-wing problem no.10:

n-wing problem no.11:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
	2			2					row 1										row 1
									row 2										row 2
2		2			2				row 3										row 3
									row 4				4				4		row 4
									row 5										row 5
2	2	2							row 6						4			4	row 6
									row 7				4				4		row 7
	2			2					row 8			4	4				4	4	row 8
2				2	2				row 9			4			4				row 9

n-wing problem no.12:

n-wing problem no.13:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
									row 1			2					2		row 1
5		5						5	row 2		2	2			2		2	2	row 2
		5						5	row 3		2				2			2	row 3
5		5						5	row 4										row 4
		5			5	5			row 5										row 5
5					5	5		5	row 6										row 6
									row 7										row 7
									row 8			2					2		row 8
									row 9		2	2					2	2	row 9

n-wing problem no.14:

n-wing problem no.15:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
									row 1		4		4	4	4		4		row 1
									row 2		4						4		row 2
									row 3				4	4	4				row 3
			3	3					row 4										row 4
									row 5				4		4				row 5
									row 6										row 6
		3						3	row 7				4	4					row 7
			3	3					row 8										row 8
		3	3	3				3	row 9										row 9

n-wing problem no.16:

n-wing problem no.17:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
9			9	9	9				row 1								5	5	row 1
		9		9					row 2										row 2
									row 3										row 3
9		9	9		9				row 4					5	5			5	row 4
		9		9					row 5										row 5
9		9	9		9				row 6						5	5			row 6
									row 7					5		5	5	5	row 7
									row 8										row 8
									row 9						5	5			row 9

n-wing problem no.18:

n-wing problem no.19:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
									row 1	1				1	1			1	row 1
			4	4					row 2	1				1	1	1	1		row 2
			4	4					row 3						1			1	row 3
									row 4						1			1	row 4
4		4	4	4	4	4			row 5					1	1	1			row 5
		4			4	4			row 6										row 6
		4			4			4	row 7										row 7
4				4				4	row 8				1			1	1		row 8
4		4			4				row 9				1			1		1	row 9

n-wing problem no.20:

n-wing problem no.21:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
				6	6		6	6	row 1					2			2		row 1
6			6	6			6	6	row 2				2				2	2	row 2
6			6		6		6	6	row 3										row 3
				6	6				row 4	2			2	2				2	row 4
							6	6	row 5					2			2		row 5
									row 6	2				2			2	2	row 6
									row 7										row 7
				6	6				row 8										row 8
									row 9										row 9

n-wing problem no.22:

n-wing problem no.23:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
		5		5					row 1	1	1		1				1		row 1
									row 2		1	1	1					1	row 2
	5		5						row 3		1						1		row 3
									row 4		1	1					1	1	row 4
									row 5										row 5
									row 6	1	1					1	1		row 6
	5	5	5	5			5		row 7		1						1		row 7
	5			5			5		row 8	1	1					1			row 8
		5		5					row 9										row 9

n-wing problem no.24:

n-wing problem no.25:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
									row 1	9		9		9					row 1
					8	8			row 2	9	9	9	9		9				row 2
				8	8		8		row 3										row 3
									row 4	9		9						9	row 4
									row 5	9		9		9				9	row 5
			8		8				row 6	9	9				9			9	row 6
	8		8	8		8	8		row 7	9	9		9				9		row 7
			8			8			row 8		9		9				9		row 8
	8		8	8		8	8		row 9			9		9					row 9

n-wing problem no.26:

n-wing problem no.27:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
									row 1	8		8				8			row 1
	7						7		row 2	8	8	8			8		8		row 2
	7						7	7	row 3			8			8		8	8	row 3
									row 4	8		8						8	row 4
7						7		7	row 5	8		8				8		8	row 5
7						7		7	row 6										row 6
									row 7		8						8		row 7
									row 8		8						8		row 8
						7		7	row 9										row 9

n-wing problem no.28:

n-wing problem no.29:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
2		2		2		2			row 1	7								7	row 1
2		2	2						row 2	7			7	7				7	row 2
		2						2	row 3				7			7			row 3
									row 4		7		7	7				7	row 4
									row 5		7					7		7	row 5
									row 6				7			7			row 6
2			2					2	row 7										row 7
			2					2	row 8										row 8
		2		2		2		2	row 9										row 9

n-wing problem no.30:

n-wing problem no.31:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
				2		2		2	row 1										row 1
	2			2		2		2	row 2										row 2
	2			2	2		2	2	row 3							5	5		row 3
									row 4		5		5	5				5	row 4
						2		2	row 5		5			5		5	5	5	row 5
									row 6					5		5	5		row 6
									row 7				5	5		5	5		row 7
				2	2	2	2		row 8					5			5		row 8
				2		2		2	row 9										row 9

n-wing problem no.32:

n-wing problem no.33:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
		6				6		6	row 1										row 1
									row 2			3				3			row 2
	6	6				6	6		row 3		3	3				3	3		row 3
									row 4										row 4
		6				6		6	row 5										row 5
	6	6				6	6	6	row 6										row 6
									row 7										row 7
									row 8			3				3			row 8
						6		6	row 9		3	3					3		row 9

n-wing problem no.34:

n-wing problem no.35:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
7		7		7					row 1				2	2	2	2			row 1
7		7		7					row 2				2	2		2			row 2
									row 3										row 3
			7		7				row 4	2				2					row 4
						7	7		row 5										row 5
									row 6	2		2		2	2				row 6
		7	7		7	7	7		row 7										row 7
7		7		7		7	7		row 8			2		2	2				row 8
		7		7					row 9	2					2				row 9

n-wing problem no.36:

n-wing problem no.37:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
	3		3			3	3	3	row 1										row 1
						3	3		row 2										row 2
	3			3		3		3	row 3										row 3
									row 4						7		7		row 4
			3	3		3		3	row 5	7	7			7	7				row 5
			3				3		row 6		7			7	7				row 6
									row 7	7	7			7				7	row 7
									row 8						7		7		row 8
						3	3		row 9	7	7			7				7	row 9

n-wing problem no.38:

n-wing problem no.39:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
									row 1				1	1				1	row 1
									row 2						1		1	1	row 2
									row 3										row 3
									row 4										row 4
			9		9	9	9		row 5										row 5
					9		9		row 6				1	1					row 6
	9						9		row 7						1		1	1	row 7
					9		9		row 8	1			1						row 8
	9		9		9	9			row 9	1				1				1	row 9

n-wing problem no.40:

n-wing problem no.41:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
	9		9		9	9			row 1						6		6		row 1
	9						9		row 2	6					6				row 2
	9	9	9		9				row 3	6	6			6			6		row 3
									row 4		6			6	6				row 4
9	9								row 5	6					6				row 5
									row 6										row 6
9			9		9	9			row 7										row 7
9							9		row 8										row 8
9		9	9		9		9		row 9										row 9

n-wing problem no.42:

n-wing problem no.43:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
			9		9				row 1		8	8							row 1
									row 2										row 2
				9		9	9		row 3								8	8	row 3
									row 4		8	8							row 4
			9		9				row 5										row 5
									row 6										row 6
		9		9	9		9		row 7	8			8				8	8	row 7
		9	9		9	9	9		row 8	8			8					8	row 8
			9		9	9	9		row 9		8	8					8		row 9

n-wing problem no.44:

n-wing problem no.45:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
					1	1			row 1	6	6		6						row 1
			1					1	row 2			6				6			row 2
									row 3		6				6	6		6	row 3
					1	1			row 4		6				6	6			row 4
		1	1		1	1		1	row 5	6			6					6	row 5
		1	1			1			row 6		6				6				row 6
									row 7										row 7
									row 8										row 8
									row 9		6	6							row 9

n-wing problem no.46:

n-wing problem no.47:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
			1		1	1			row 1	4		4				4			row 1
					1			1	row 2					4			4		row 2
									row 3	4				4					row 3
									row 4										row 4
									row 5			4				4		4	row 5
									row 6	4								4	row 6
					1			1	row 7										row 7
									row 8										row 8
			1		1	1		1	row 9								4	4	row 9

n-wing problem no.48:

n-wing problem no.49:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
		1			1			1	row 1		8						8		row 1
1			1		1				row 2	8						8	8		row 2
				1		1			row 3										row 3
			1	1	1				row 4										row 4
									row 5										row 5
									row 6										row 6
1				1					row 7										row 7
		1	1		1			1	row 8		8						8		row 8
1			1		1	1			row 9	8	8					8	8		row 9

n-wing problem no.50:

n-wing problem no.51:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
									row 1			8			8	8			row 1
									row 2	8		8	8		8	8			row 2
									row 3			8		8		8		8	row 3
	8				8				row 4	8			8						row 4
8			8		8	8			row 5			8				8			row 5
8						8			row 6					8	8			8	row 6
8	8		8						row 7										row 7
									row 8										row 8
	8				8				row 9				8		8				row 9

n-wing problem no.52:

n-wing problem no.53:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
			1		1	1			row 1	4		4				4			row 1
					1			1	row 2					4			4		row 2
									row 3	4				4					row 3
									row 4										row 4
									row 5			4				4		4	row 5
									row 6	4								4	row 6
					1			1	row 7										row 7
									row 8										row 8
			1		1	1		1	row 9								4	4	row 9

n-wing problem no.54:

n-wing problem no.55:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
		9			9	9	9		row 1	3		3		3					row 1
9					9	9			row 2	3			3						row 2
			9			9			row 3										row 3
									row 4	3			3						row 4
									row 5			3		3					row 5
									row 6										row 6
9		9			9	9	9		row 7										row 7
9		9	9			9	9		row 8										row 8
			9			9			row 9										row 9

n-wing problem no.56:

n-wing problem no.57:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
									row 1	2		2		2		2			row 1
			2		2				row 2	2		2	2						row 2
									row 3			2						2	row 3
									row 4										row 4
						2	2		row 5										row 5
									row 6										row 6
		2	2		2	2			row 7	2			2					2	row 7
		2	2		2		2		row 8				2					2	row 8
						2	2		row 9					2		2		2	row 9

n-wing problem no.58:

n-wing problem no.59:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
							4	4	row 1				4				4		row 1
				4	4				row 2	4			4					4	row 2
									row 3	4					4			4	row 3
									row 4		4		4		4			4	row 4
									row 5		4		4		4		4		row 5
				4	4				row 6				4				4		row 6
			4		4		4		row 7										row 7
									row 8										row 8
			4	4	4			4	row 9										row 9

n-wing problem no.60:

n-wing problem no.61:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
									row 1										row 1
			4		4		4	4	row 2										row 2
					4			4	row 3		2	2							row 3
									row 4		2				2	2			row 4
					4			4	row 5			2			2	2			row 5
				4		4			row 6		2	2							row 6
									row 7										row 7
			4	4	4	4	4		row 8										row 8
			4		4		4		row 9										row 9

n-wing problem no.62:

n-wing problem no.63:

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
									row 1					1		1			row 1
			6	6				6	row 2	1					1	1			row 2
				6			6		row 3			1			1		1		row 3
		6	6	6				6	row 4										row 4
		6					6	6	row 5										row 5
				6			6		row 6										row 6
									row 7					1		1			row 7
									row 8	1		1			1		1		row 8
									row 9	1				1	1				row 9

n-wing problem no.64:

N-wing Solutions.

solution no.1 (a 2-wing):

alternate solution no.1 (a 3-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
				1	1				row 1					1	1				row 1
		1		1			1		row 2			1		1			1		row 2
		1					1		row 3			1					1		row 3
									row 4										row 4
									row 5										row 5
									row 6										row 6
				1	1			1	row 7					1	1			1	row 7
				1	1			1	row 8					1	1			1	row 8
									row 9										row 9

solution no.2 (a 2-wing):

alternate solution no.2 (a 3-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
				2			2		row 1					2			2		row 1
			2				2	2	row 2				2				2	2	row 2
									row 3										row 3
2			2	2				2	row 4	2			2	2				2	row 4
				2			2		row 5					2			2		row 5
2				2			2	2	row 6	2				2			2	2	row 6
									row 7										row 7
									row 8										row 8
									row 9										row 9

solution no.3 (a 2-wing):

alternate solution no.3 (a 3-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
9		9		9				9	row 1	9		9		9				9	row 1
9			9					9	row 2	9			9					9	row 2
9								9	row 3	9								9	row 3
									row 4										row 4
									row 5										row 5
									row 6										row 6
9			9						row 7	9			9						row 7
									row 8										row 8
9		9		9					row 9	9		9		9					row 9

solution no.4 (a 2-wing):

alternate solution no.4 (a 2-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
	8					8	8		row 1		8					8	8		row 1
									row 2										row 2
8							8		row 3	8							8		row 3
8							8		row 4	8							8		row 4
	8					8	8		row 5		8					8	8		row 5
									row 6										row 6
									row 7										row 7
									row 8										row 8
									row 9										row 9

solution no.5 (a 2-wing):

alternate solution no.5 (a 3-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
			6		6				row 1				6		6				row 1
									row 2										row 2
									row 3										row 3
6				6			6		row 4	6				6			6		row 4
6			6	6	6		6		row 5	6			6	6	6		6		row 5
6				6					row 6	6				6					row 6
			6		6				row 7				6		6				row 7
									row 8										row 8
									row 9										row 9

solution no.6 (a 2-wing):

alternate solution no.6 (a 5-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
	5			5	5		5	5	row 1		5			5	5		5	5	row 1
5	5								row 2	5	5								row 2
5				5			5	5	row 3	5				5			5	5	row 3
									row 4										row 4
						5		5	row 5							5		5	row 5
									row 6										row 6
5	5								row 7	5	5								row 7
					5	5			row 8						5	5			row 8
				5		5	5		row 9					5		5	5		row 9

solution no.7 (a 2-wing):

alternate solution no.7 (a 4-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
					5		5		row 1						5		5		row 1
									row 2										row 2
				5		5	5	5	row 3					5		5	5	5	row 3
									row 4										row 4
									row 5										row 5
						5	5	5	row 6							5	5	5	row 6
		5		5	5	5			row 7			5		5	5	5			row 7
					5		5		row 8						5		5		row 8
		5			5		5	5	row 9			5			5		5	5	row 9

solution no.8 (a 2-wing):

alternate solution no.8 (a 6-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
6	6								row 1	6	6								row 1
							6	6	row 2								6	6	row 2
									row 3										row 3
6				6				6	row 4	6				6				6	row 4
6		6	6	6		6	6	6	row 5	6		6	6	6		6	6	6	row 5
6			6	6				6	row 6	6			6	6				6	row 6
		6				6	6		row 7			6				6	6		row 7
6	6		6				6		row 8	6	6		6				6		row 8
	6			6			6		row 9		6			6			6		row 9

solution no.9 (a 2-wing):

alternate solution no.9 (a 3-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
									row 1										row 1
$\Rightarrow$	9						9		row 2	$\Rightarrow$	9						9		row 2
9								9	row 3	9								9	row 3
									row 4										row 4
9		9						9	row 5	9		9						9	row 5
	9	$\Rightarrow$					9		row 6		9	$\Rightarrow$					9		row 6
									row 7										row 7
9		9							row 8	9		9							row 8
									row 9										row 9

solution no.10 (a 2-wing):

alternate solution no.10 (a 4-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
	9					$\Rightarrow$	9		row 1		9					$\Rightarrow$	9		row 1
9						9		9	row 2	9						9		9	row 2
									row 3										row 3
									row 4										row 4
						9		9	row 5							9		9	row 5
									row 6										row 6
9				9		9		9	row 7	9				9		9		9	row 7
9				9		9		9	row 8	9				9		9		9	row 8
	9			$\Rightarrow$		$\Rightarrow$	9		row 9		9			$\Rightarrow$		$\Rightarrow$	9		row 9

solution no.11 (a 2-wing):

alternate solution no.11 (a 3-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
	2			2					row 1		2			2					row 1
									row 2										row 2
2		2			2				row 3	2		2			2				row 3
									row 4										row 4
									row 5										row 5
2	<u>2</u>	2							row 6	2	<u>2</u>	2							row 6
									row 7										row 7
	2			2					row 8		2			2					row 8
2				<u>2</u>	2				row 9	2				<u>2</u>	2				row 9

solution no.12 (a 2-wing):

alternate solution no.12 (a 3-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
									row 1										row 1
									row 2										row 2
									row 3										row 3
			4				4		row 4				4				4		row 4
									row 5										row 5
					4			4	row 6						4			4	row 6
			4				4		row 7				4				4		row 7
		4	4				4	4	row 8			4	4				4	4	row 8
		4			4				row 9			4			4				row 9

solution no.13 (a 2-wing):

alternate solution no.13 (a 3-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
									row 1										row 1
5		5						5	row 2	5		5						5	row 2
		5						5	row 3			5						5	row 3
5		5						5	row 4	5		5						5	row 4
		5			5	5			row 5			5			5	5			row 5
5					5	5		5	row 6	5					5	5		5	row 6
									row 7										row 7
									row 8										row 8
									row 9										row 9

solution no.14 (a 2-wing):

alternate solution no.14 (a 3-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
		2					2		row 1			2					2		row 1
	2	2			2		2	2	row 2		2	2			2		2	2	row 2
	2				2			2	row 3		2				2			2	row 3
									row 4										row 4
									row 5										row 5
									row 6										row 6
									row 7										row 7
		2					2		row 8			2					2		row 8
	2	2					2	2	row 9		2	2					2	2	row 9

solution no.15 (a 2-wing):

alternate solution no.15 (a 2-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
									row 1										row 1
									row 2										row 2
									row 3										row 3
			3	3					row 4				3	3					row 4
									row 5										row 5
									row 6										row 6
		3						3	row 7			3						3	row 7
			3	3					row 8				3	3					row 8
		3	2	2				3	row 9			3	2	2				3	row 9

solution no.16 (a 2-wing):

alternate solution no.16 (a 3-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
	4		4	4	4		4		row 1		4		4	4	4		4		row 1
	4						4		row 2		4						4		row 2
			4	4	4				row 3				4	4	4				row 3
									row 4										row 4
			4		4				row 5				4		4				row 5
									row 6										row 6
			4	4					row 7				4	4					row 7
									row 8										row 8
									row 9										row 9

solution no.17 (a 2-wing):

alternate solution no.17 (a 3-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
9			9	9	9				row 1	9			9	9	9				row 1
		9		9					row 2			9		9					row 2
									row 3										row 3
9		9	9		9				row 4	9		9	9		9				row 4
		9		9					row 5			9		9					row 5
9		9	9		9				row 6	9		9	9		9				row 6
									row 7										row 7
									row 8										row 8
									row 9										row 9

solution no.18 (a 2-wing):

alternate solution no.18 (a 3-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
							5	5	row 1								5	5	row 1
									row 2										row 2
									row 3										row 3
				5	5			5	row 4					5	5			5	row 4
									row 5										row 5
					5	5			row 6						5	5			row 6
				5		5	5	5	row 7					5		5	5	5	row 7
									row 8										row 8
					5	5			row 9						5	5			row 9

solution no.19 (a 2-wing):

alternate solution no.19 (a 5-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
									row 1										row 1
			4	4					row 2				4	4					row 2
			4	4					row 3				4	4					row 3
									row 4										row 4
4		4	4	4	4	4			row 5	4		4	4	4	4	4			row 5
		4			4	4			row 6			4			4	4			row 6
		4			4			4	row 7			4			4			4	row 7
4				4				4	row 8	4				4				4	row 8
4		4			4				row 9	4		4			4				row 9

solution no.20 (a 2-wing):

alternate solution no.20 (a 5-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
1				1	±			±	row 1	1				1	±			±	row 1
1				1	±	1	1		row 2	1				1	±	1	1		row 2
					1			1	row 3						1			1	row 3
					1			1	row 4						1			1	row 4
				1	±	1			row 5					1	±	1			row 5
									row 6										row 6
									row 7										row 7
			1			1	1		row 8				1			1	1		row 8
			1			1		±	row 9				1			1		±	row 9

solution no.21 (a 2-wing):

alternate solution no.21 (a 4-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
				6	6		6	6	row 1					6	6		6	6	row 1
6			6	6			6	6	row 2	6			6	6			6	6	row 2
6			6		6		6	6	row 3	6			6		6		6	6	row 3
				6	6				row 4					6	6				row 4
							6	6	row 5								6	6	row 5
									row 6										row 6
									row 7										row 7
				6	6				row 8					6	6				row 8
									row 9										row 9

solution no.22 (a 2-wing):

alternate solution no.22 (a 3-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
				2			2		row 1					2			2		row 1
			2				2	2	row 2				2				2	2	row 2
									row 3										row 3
2			2	2				2	row 4	2			2	2				2	row 4
				2			2		row 5					2			2		row 5
2				2			2	2	row 6	2				2			2	2	row 6
									row 7										row 7
									row 8										row 8
									row 9										row 9

solution no.23 (a 2-wing):

alternate solution no.23 (a 3-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
		5		5					row 1			5		5					row 1
									row 2										row 2
	5		5						row 3		5		5						row 3
									row 4										row 4
									row 5										row 5
									row 6										row 6
	5	5	5	5			5		row 7		5	5	5	5			5		row 7
	5			5			5		row 8		5			5			5		row 8
		5		5					row 9			5		5					row 9

solution no.24 (a 2-wing):

alternate solution no.24 (a 5-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
1	1		1				1		row 1	1	1		1				1		row 1
	1	1	1					1	row 2		1	1	1					1	row 2
	1						1		row 3		1						1		row 3
	1	1					1	1	row 4		1	1					1	1	row 4
									row 5										row 5
1	1					1	1		row 6	1	1					1	1		row 6
	1						1		row 7		1						1		row 7
1	1					1			row 8	1	1					1			row 8
									row 9										row 9

solution no.25 (a 3-wing):

alternate solution no.25 (a 3-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
									row 1										row 1
					8	8			row 2						8	8			row 2
				8	8		8		row 3					8	8		8		row 3
									row 4										row 4
									row 5										row 5
			8		8				row 6				8		8				row 6
	8		8	8		8	8		row 7		8		8	8		8	8		row 7
			8			8			row 8				8			8			row 8
	8		8	8		8	8		row 9		8		8	8		8	8		row 9

solution no.26 (a 4-wing):

alternate solution no.26 (a 4-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
9		9		9					row 1	9		9		9					row 1
9	9	9	9		9				row 2	9	9	9	9		9				row 2
									row 3										row 3
9		9						9	row 4	9		9						9	row 4
9		9		9				9	row 5	9		9		9				9	row 5
9	9				9			9	row 6	9	9				9			9	row 6
9	9		9				9		row 7	9	9		9				9		row 7
	9		9				9		row 8		9		9				9		row 8
		9		9					row 9			9		9					row 9

solution no.27 (a 2-wing):

alternate solution no.27 (a 3-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
									row 1										row 1
	7						7		row 2		7						7		row 2
	7						7	7	row 3		7						7	7	row 3
									row 4										row 4
7						7		7	row 5	7						7		7	row 5
7						7		7	row 6	7						7		7	row 6
									row 7										row 7
									row 8										row 8
						7		7	row 9							7		7	row 9

solution no.28 (a 2-wing):

alternate solution no.28 (a 5-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
8		8				8			row 1	8		8				8			row 1
8		8			8		8		row 2	8		8			8		8		row 2
		8			8		8	8	row 3			8			8		8	8	row 3
8		8						8	row 4	8		8						8	row 4
8		8				8		8	row 5	8		8				8		8	row 5
									row 6										row 6
	8						8		row 7		8						8		row 7
	8						8		row 8		8						8		row 8
									row 9										row 9

solution no.29 (a 2-wing):

alternate solution no.29 (a 4-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
<u>2</u>		<u>2</u>		2		2			row 1	<u>2</u>		<u>2</u>		2		2			row 1
2		2	2						row 2	2		2	2						row 2
		2						2	row 3			2						2	row 3
									row 4										row 4
									row 5										row 5
									row 6										row 6
2			2					2	row 7	2			2					2	row 7
			2					2	row 8				2					2	row 8
		<u>2</u>		2		2		<u>2</u>	row 9			<u>2</u>		2		2		<u>2</u>	row 9

solution no.30 (a 2-wing):

alternate solution no.30 (a 4-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
7								7	row 1	7								7	row 1
7			7	7				7	row 2	7			7	7				7	row 2
			7			7			row 3				7			7			row 3
	7		7	7				7	row 4		7		7	7				7	row 4
	7					7		7	row 5		7					7		7	row 5
			7			7			row 6				7			7			row 6
									row 7										row 7
									row 8										row 8
									row 9										row 9

solution no.31 (a 3-wing):

alternate solution no.31 (a 3-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
				2		2		2	row 1					2		2		2	row 1
	2			≠		≠		≠	row 2		2			≠	2	≠		≠	row 2
	2			≠	2		2	≠	row 3		2			≠	2		2	≠	row 3
									row 4										row 4
						2		2	row 5							2		2	row 5
									row 6										row 6
									row 7										row 7
				≠	2	≠	2		row 8					≠	2	≠	2		row 8
				2		2		2	row 9					2		2		2	row 9

solution no.32 (a 2-wing):

alternate solution no.32 (a 4-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
									row 1										row 1
									row 2										row 2
						5	5		row 3							5	5		row 3
	5		≠	≠				5	row 4		5		≠	≠				5	row 4
	5			≠		≠	≠	5	row 5		5			≠		≠	≠	5	row 5
				5		5	5		row 6					5		5	5		row 6
			5	5		5	5		row 7				5	5		5	5		row 7
				5			5		row 8					5			5		row 8
									row 9										row 9

solution no.33 (a 2-wing):

alternate solution no.33 (a 3-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
		6				6		6	row 1			6				6		6	row 1
									row 2										row 2
	6	6				6	6		row 3		6	6				6	6		row 3
									row 4										row 4
		6				6		6	row 5			6				6		6	row 5
	6	6				6	6	6	row 6		6	6				6	6	6	row 6
									row 7										row 7
									row 8										row 8
						6		6	row 9							6		6	row 9

solution no.34 (a 2-wing):

alternate solution no.34 (a 2-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
									row 1										row 1
		3				3			row 2			3				3			row 2
	3	3				3	3		row 3		3	3				3	3		row 3
									row 4										row 4
									row 5										row 5
									row 6										row 6
									row 7										row 7
		3				3			row 8			3				3			row 8
	3	3					3		row 9		3	3					3		row 9

solution no.35 (a 3-wing):

alternate solution no.35 (a 4-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
7		7		7					row 1	7		7		7					row 1
7		7		7					row 2	7		7		7					row 2
									row 3										row 3
			7		7				row 4				7		7				row 4
						7	7		row 5							7	7		row 5
									row 6										row 6
		7	7		7	7	7		row 7			7	7		7	7	7		row 7
		7		7		7	7		row 8			7		7		7	7		row 8
		7		7					row 9			7		7					row 9

solution no.36 (a 2-wing):

alternate solution no.36 (a 4-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
			2	2	2	2			row 1				2	2	2	2			row 1
			2	2		2			row 2				2	2		2			row 2
									row 3										row 3
2				2					row 4	2				2					row 4
									row 5										row 5
2		2		2	2				row 6	2		2		2	2				row 6
									row 7										row 7
		2		2	2				row 8			2		2	2				row 8
2					2				row 9	2					2				row 9

solution no.37 (a 2-wing):

alternate solution no.37 (a 4-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
	3		3			3	3	3	row 1		3		3			3	3	3	row 1
						3	3		row 2							3	3		row 2
	3			3		3		3	row 3		3			3		3		3	row 3
									row 4										row 4
			3	3		3		3	row 5				3	3		3		3	row 5
			3				3		row 6				3				3		row 6
									row 7										row 7
									row 8										row 8
						3	3		row 9							3	3		row 9

solution no.38 (a 2-wing):

alternate solution no.38 (a 4-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
									row 1										row 1
									row 2										row 2
									row 3										row 3
					7		7		row 4						7		7		row 4
7	7			7	7			7	row 5	7	7			7	7			7	row 5
	7			7	7			7	row 6		7			7	7				row 6
7	7			7				7	row 7	7	7			7				7	row 7
					7		7		row 8						7		7		row 8
7	7			7				7	row 9	7	7			7				7	row 9

solution no.39 (a 2-wing):

alternate solution no.39 (a 3-wing)::

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
									row 1										row 1
									row 2										row 2
									row 3										row 3
									row 4										row 4
			9		9	9	9		row 5				9		9	9	9		row 5
					9		9		row 6						9		9		row 6
	9						9		row 7		9						9		row 7
					9		9		row 8						9		9		row 8
	9		9		9	9			row 9		9		9		9	9			row 9

solution no.40 (a 2-wing):

alternate solution no.40 (a 4-wing)::

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
			1	1				1	row 1				1	1				1	row 1
					1		1	1	row 2						1		1	1	row 2
									row 3										row 3
									row 4										row 4
									row 5										row 5
			1	1					row 6				1	1					row 6
					1		1	1	row 7						1		1	1	row 7
1			1						row 8	1			1						row 8
1				1				1	row 9	1				1				1	row 9

solution no.41 (a 3-wing):

alternate solution no.41 (a 4-wing)::

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
	9		9		9	9			row 1		9		9		9	9			row 1
	9						9		row 2		9						9		row 2
	9	9	9		9				row 3		9	9	9		9				row 3
									row 4										row 4
9	9								row 5	9	9								row 5
									row 6										row 6
9			9		9	9			row 7	9			9		9	9			row 7
9							9		row 8	9							9		row 8
9		9	9		9		9		row 9	9		9	9		9		9		row 9

solution no.42 (a 2-wing):

alternate solution no.42 (a 2-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
					6		6		row 1						6		6		row 1
6					6				row 2	6					6				row 2
6	6			6			6		row 3	6	6			6			6		row 3
	6			6	6				row 4		6			6	6				row 4
6					6				row 5	6					6				row 5
									row 6										row 6
									row 7										row 7
									row 8										row 8
									row 9										row 9

solution no.43 (a 2-wing):

alternate solution no.43 (a 4-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
			9		9				row 1				9		9				row 1
									row 2										row 2
				9		9	9		row 3					9		9	9		row 3
									row 4										row 4
			9		9				row 5				9		9				row 5
									row 6										row 6
		9		9			9		row 7			9		9			9		row 7
		9	9		9	9			row 8			9	9		9	9			row 8
			9		9	9	9		row 9				9		9	9	9		row 9

solution no.44 (a 2-wing):

alternate solution no.44 (a 4-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
	8	8							row 1		8	8							row 1
									row 2										row 2
							8	8	row 3								8	8	row 3
	8	8							row 4		8	8							row 4
									row 5										row 5
									row 6										row 6
8		8	8				8	8	row 7	8		8	8				8	8	row 7
8		8	8					8	row 8	8		8	8					8	row 8
	8	8					8		row 9		8	8					8		row 9

solution no.45 (a 2-wing):

alternate solution no.45 (a 3-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
					1	1			row 1						1	1			row 1
			1					1	row 2				1					1	row 2
									row 3										row 3
					1	1			row 4						1	1			row 4
		1	1		±	±		1	row 5			1	1		±	±		1	row 5
		1	1			±			row 6			1	1			±			row 6
									row 7										row 7
									row 8										row 8
									row 9										row 9

solution no.46 (a 2-wing):

alternate solution no.46 (a 4-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
6	6		6						row 1	6	6		6						row 1
		6				6			row 2			6				6			row 2
	6				6	6		6	row 3		6				6	6		6	row 3
	6				6	6			row 4		6				6	6			row 4
6			6					6	row 5	6			6					6	row 5
	6				6				row 6		6				6				row 6
									row 7										row 7
									row 8										row 8
	6	6							row 9		6	6							row 9

solution no.47 (a 2-wing):

alternate solution no.47 (a 2-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
			1		1	1			row 1				1		1	1			row 1
					1			1	row 2						1			1	row 2
									row 3										row 3
									row 4										row 4
									row 5										row 5
									row 6										row 6
					1			1	row 7						1			1	row 7
									row 8										row 8
			1		1	1		1	row 9				1		1	1		1	row 9

solution no.48 (a 2-wing):

alternate solution no.48 (a 4-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
4		4				4			row 1	4		4				4			row 1
				4			4		row 2					4			4		row 2
4				4					row 3	4				4					row 3
									row 4										row 4
		4				4		4	row 5			4				4		4	row 5
4								4	row 6	4								4	row 6
									row 7										row 7
									row 8										row 8
							4	4	row 9								4	4	row 9

solution no.49 (a 2-wing):

alternate solution no.49 (a 5-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
		1			1			1	row 1			1			1			1	row 1
1			1		1				row 2	1			1		1				row 2
				1		1			row 3					1		1			row 3
			1	1	1				row 4				1	1	1				row 4
									row 5										row 5
									row 6										row 6
1				1					row 7	1				1					row 7
		1	1		1			1	row 8			1	1		1			1	row 8
1			1		1	1			row 9	1			1		1	1			row 9

solution no.50 (a 2-wing):

alternate solution no.50 (a 2-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
	8						8		row 1		8						8		row 1
8						8	8		row 2	8						8	8		row 2
									row 3										row 3
									row 4										row 4
									row 5										row 5
									row 6										row 6
									row 7										row 7
	8						8		row 8		8						8		row 8
8	8					8	8		row 9	8	8					8	8		row 9

solution no.51 (a 2-wing):

alternate solution no.51 (a 3-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
									row 1										row 1
									row 2										row 2
									row 3										row 3
	8				8				row 4		8				8				row 4
8			8		8	8			row 5	8			8		8	8			row 5
8						8			row 6	8						8			row 6
8	8		8						row 7	8	8		8						row 7
									row 8										row 8
	8				8				row 9		8				8				row 9

solution no.52 (a 2-wing):

alternate solution no.52 (a 5-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
		8			8	8			row 1			8			8	8			row 1
8		8	8		8	8			row 2	8		8	8		8	8			row 2
		8		8		8		8	row 3			8		8		8		8	row 3
8			8						row 4	8			8						row 4
		8				8			row 5			8				8			row 5
				8	8			8	row 6					8	8			8	row 6
									row 7										row 7
									row 8										row 8
			8		8				row 9				8		8				row 9

solution no.53 (a 2-wing):

alternate solution no.53 (a 2-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
			1		1	1			row 1				1		1	1			row 1
					1			1	row 2						1			1	row 2
									row 3										row 3
									row 4										row 4
									row 5										row 5
									row 6										row 6
					1			1	row 7						1			1	row 7
									row 8										row 8
			1		1	1		1	row 9				1		1	1		1	row 9

solution no.54 (a 2-wing):

alternate solution no.54 (a 4-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
4		4				4			row 1	4		4				4			row 1
				4			4		row 2					4			4		row 2
4				4					row 3	4				4					row 3
									row 4										row 4
		4				4		4	row 5			4				4		4	row 5
4								4	row 6	4								4	row 6
									row 7										row 7
									row 8										row 8
							4	4	row 9								4	4	row 9

solution no.55 (a 2-wing):

alternate solution no.55 (a 4-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
		9			9	9	9		row 1			9			9	9	9		row 1
9					9	9			row 2	9					9	9			row 2
			9			9			row 3				9			9			row 3
									row 4										row 4
									row 5										row 5
									row 6										row 6
9		9			9	9	9		row 7	9		9			9	9	9		row 7
9		9	9			9	9		row 8	9		9	9			9	9		row 8
			9			9			row 9				9			9			row 9

solution no.56 (a 2-wing):

alternate solution no.56 (a 2-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
3		3		3					row 1	3		3		3					row 1
3			3						row 2	3			3						row 2
									row 3										row 3
3			3						row 4	3			3						row 4
		3		3					row 5			3		3					row 5
									row 6										row 6
									row 7										row 7
									row 8										row 8
									row 9										row 9

solution no.57 (a 2-wing):

alternate solution no.57 (a 3-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
									row 1										row 1
			2		2				row 2				2		2				row 2
									row 3										row 3
									row 4										row 4
						2	2		row 5							2	2		row 5
									row 6										row 6
		2	2		2	2			row 7			2	2		2	2			row 7
		2	2		2		2		row 8			2	2		2		2		row 8
						2	2		row 9							2	2		row 9

solution no.58 (a 2-wing):

alternate solution no.58 (a 4-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
2		2		2		2			row 1	2		2		2		2			row 1
2		2	2						row 2	2		2	2						row 2
		2						2	row 3			2						2	row 3
									row 4										row 4
									row 5										row 5
									row 6										row 6
2			2					2	row 7	2			2					2	row 7
			2					2	row 8				2					2	row 8
		2		2		2		2	row 9			2		2		2		2	row 9

solution no.59 (a 2-wing):

alternate solution no.59 (a 3-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
							4	4	row 1								4	4	row 1
				4	4				row 2					4	4				row 2
									row 3										row 3
									row 4										row 4
									row 5										row 5
				4	4				row 6					4	4				row 6
			4		4		4		row 7				4		4		4		row 7
									row 8										row 8
			4	4	4			4	row 9				4	4	4			4	row 9

solution no.60 (a 2-wing):

alternate solution no.60 (a 4-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
			4				4		row 1				4				4		row 1
4			4					4	row 2	4			4					4	row 2
4					4			4	row 3	4					4			4	row 3
	4		4		4			4	row 4		4		4		4			4	row 4
	4		4		4		4		row 5		4		4		4		4		row 5
			4				4		row 6				4				4		row 6
									row 7										row 7
									row 8										row 8
									row 9										row 9

solution no.61 (a 2-wing):

alternate solution no.61 (a 4-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
									row 1										row 1
			4		4		4	4	row 2				4		4		4	4	row 2
					4			4	row 3						4			4	row 3
									row 4										row 4
					4			4	row 5						4			4	row 5
				4		4			row 6					4		4			row 6
									row 7										row 7
			4	4	4	4	4		row 8				4	4	4	4	4		row 8
			4		4		4		row 9				4		4		4		row 9

solution no.62 (a 2-wing):

alternate solution no.62 (a 2-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
									row 1										row 1
									row 2										row 2
	2	2							row 3		2	2							row 3
	<u>2</u>				2	2			row 4		<u>2</u>				2	2			row 4
		<u>2</u>			2	2			row 5			<u>2</u>			2	2			row 5
	2	2							row 6		2	2							row 6
									row 7										row 7
									row 8										row 8
									row 9										row 9

solution no.63 (a 2-wing):

alternate solution no.63 (a 3-wing)

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
									row 1										row 1
			6	6				6	row 2				6	6				6	row 2
				6			6		row 3					6			6		row 3
		6	6	6				6	row 4			6	6	6				6	row 4
		6					6	6	row 5			6					6	6	row 5
				6			6		row 6					6			6		row 6
									row 7										row 7
									row 8										row 8
									row 9										row 9

solution no.64 (a 2-wing):

alternate solution no.64 (a 4-wing):

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	L	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	R
				1		1			row 1					1		1			row 1
1					1	1			row 2	1					1	1			row 2
		1					1		row 3			1					1		row 3
									row 4										row 4
									row 5										row 5
									row 6										row 6
				1		1			row 7					1		1			row 7
1		1			1		1		row 8	1		1			1		1		row 8
1				1	1				row 9	1				1	1				row 9

N-wing Statistics.

<u>N-wing#</u>	<u>Min N-wing</u>	<u>Maj N-wing</u>	<u>N-wing#</u>	<u>Min N-wing</u>	<u>Maj N-wingt</u>
01	2x2 col	3x3 row	33	2x2 col	3x3 row
02	2x2 row	3x3 col	34	2x2 row	2x2 col
03	2x2 col	3x3 row	35	3x3 row	4x4 col
04	2x2 col	2x2 row	36	2x2 col	4x4 row
05	2x2 row	3x3 col	37	2x2 row	4x4 col
06	2x2 row	5x5 col	38	2x2 row	4x4 col
07	2x2 row	5x5 col	39	2x2 col	3x3 row
08	2x2 col	6x6 row	40	2x2 col	4x4 row
09	2x2 col	3x3 row	41	3x3 row	4x4 col
10	2x2 col	4x4 row	42	2x2 row	2x2 col
11	2x2 row	3x3 col	43	2x2 row	4x4 col
12	2x2 row	3x3 col	44	2x2 row	4x4 col
13	2x2 col	3x3 row	45	2x2 row	3x3 col
14	2x2 row	3x3 col	46	3x3 col	4x4 row
15	2x2 row	2x2 col	47	2x2 col	2x2 row
16	2x2 col	3x3 row	48	2x2 col	4x4 row
17	2x2 row	3x3 col	49	2x2 col	5x5 row
18	2x2 row	3x3 col	50	2x2 col	2x2 row
19	2x2 row	5x5 col	51	2x2 col	3x3 row
20	2x2 row	5x5 col	52	2x2 col	5x5 row
21	2x2 col	4x4 row	53	2x2 row	2x2 col
22	2x2 row	3x3 col	54	2x2 col	4x4 row
23	2x2 row	3x3 col	55	2x2 row	4x4 col
24	2x2 row	5x5 col	56	2x2 row	2x2 col
25	3x3 col	3x3 row	57	2x2 row	3x3 col
26	4x4 row	4x4 col	58	2x2 col	4x4 row
27	2x2 col	3x3 row	59	2x2 row	3x3 col
28	2x2 row	5x5 col	60	2x2 row	4x4 col
29	2x2 col	4x4 row	61	2x2 col	2x2 row
30	2x2 row	4x4 col	62	2x2 col	2x2 row
31	3x3 row	3x3 col	63	2x2 row	3x3 col
32	2x2 col	4x4 row	64	2x2 row	4x4 col

<u>Min N-wing</u>	<u>+</u>	<u>Maj N-wing</u>	<u>=</u>	<u>Count</u>
2x2	+	2x2	=	10
2x2	+	3x3	=	22
2x2	+	4x4	=	17
2x2	+	5x5	=	8
2x2	+	6x6	=	1
3x3	+	3x3	=	2
3x3	+	4x4	=	3
4x4	+	4x4	=	1
Total			=	64