Take Control of Sudoku

<http://WWW.HyperInfo.CA/Sudoku/>



3x3 SEE Method

6

8

7

3 1

2 8

9 6

1

4

5 2

5

3

4

7

9

2 1- 2		1	9	3	7	4	2
3-ру-3	5		4	6	2	1	9
	3	2		8	9	5	1
Sub-grid	4	9	2		6	8	5
Exhaustive	6	5	3	4		9	7
Elimination	7	8	1	2	5	3	4
	9	3	8	5	4	2	6
Method	2	6	5	1	8	7	3
	1	4	7	9	3	6	8

Simon Sunatori, P.Eng./ing., M.Eng. (Engineering Physics), F.N.A., SM IEEE, LM WFS

• MagneScribe[™]: A 3-in-1 Auto-Retractable Pen <<u>http://MagneScribe.com/</u>>

[Mail any comments or suggestions to]

• HyperInfo Canada Inc. <<u>mailto:Comments@HyperInfo.CA</u>>

[Credit]

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Description [Version 0.9]

- Solve 5-Star Sudoku Puzzles with the 3x3 SEE (3-by-3 Sub-grid Exhaustive Elimination) Method!
- The origin of **Sudoku** can be traced back to Swiss mathematician **Leonhard Euler**, who devised "Latin Squares" in 1783, which he described as "a new kind of magic squares". **Euler** created a grid in which every number or symbol appears once in each row or column.
- Sudoku puzzles were first published in the late 1970's in Math Puzzles and Logic Problems magazine by **Dell Magazines. Dell** took **Euler**'s Latin Square concept and applied it to a 9x9 grid with the addition of nine 3x3 boxes, each containing all numbers from 1 to 9. **Dell** called the puzzle "Number Place" and still do today.
- There are many excellent on-line tutorials for solving **Sudoku** puzzles. Here are some examples from which you can learn the concept and basic skills to solve 1-star (very easy) to 3-star (medium) **Sudoku** puzzles.
 - Sudoku
 http://en.wikipedia.org/wiki/Sudoku>
 - Sudoku puzzles: how to solve <<u>http://www.sudoku.com/howtosolve.htm</u>>
 - sudoku tutorial <<u>http://www.kingfeatures.com/features/puzzles/sudoku/tutorial.htm</u>>
- This E-book is meant to give power to the people who want to solve difficult **Sudoku** puzzles but lack the time to read books with hundreds of pages.
- The concentrated knowledge presented in this E-book will allow you to quickly master the techniques in order to solve 4-star (difficult) to 5-star (very difficult) **Sudoku** puzzles without guessing whatsoever.
- Instead of having a unique solution, some **Sudoku** puzzles have no solution or have multiple solutions.
- Out of hundreds Sudoku puzzles published in several newspapers, there has been 0 (zero) Sudoku puzzle that could not be solved by the 3x3 SEE Method.
- The basic approach of the **3x3 SEE Method** is systematic logic and reasoning.
 - A **row** refers to a horizontal 9 x 1 matrix.
 - A column refers to a vertical 1 x 9 matrix.
 - A **box** refers to a 3 x 3 matrix.
 - A **cell** refers to a spot in which a number is placed.
 - A sub-grid refers to a 3 x 3 matrix inside each cell.

How to Play

			3					5
		4					8	
	2			9				4
4					8			
		3				7		
			2					6
9				4			1	
	6					3		
1					6			

- This one is a 5-star **Sudoku** puzzle (very difficult).
- To solve the puzzle, each **row**, each **column**, and each **box** must contain all the numbers 1 through 9.
- The same number must be used only once in each **row**, in each **column**, and in each **box**.

Scan within Three Rows



- 1. Focus on the first set of three rows, as shown above.
- 2. Search for two numbers or one number within the three rows.

• "4" in red circles

3. Find a unique cell in which the selected number can be placed.

• "4" in green

- 4. Repeat steps 2 through 3 within the three rows.
- 5. Focus on the second set of three rows and repeat steps 2 through 3.
 6. Focus on the third set of three rows and repeat steps 2 through 3.

Scan within Three Columns



1. Focus on the first set of three columns, as shown above.

2. Search for two numbers or one number within the three columns.

• "4" in red circles

3. Find a unique cell in which the selected number can be placed.

• "4" in green

4. Repeat steps 2 through 3 within the three columns.

5. Focus on the second set of three columns and repeat steps 2 through 3.
6. Focus on the third set of three columns and repeat steps 2 through 3.

			3		4			5
		4					8	
	2			9				4
4					8			
		3	4			7		
			2					6
9				4		6	1	
	6					3		
1	4				6			

- Repeat scanning sets of **three rows** and sets of **three columns** because the situation changes when a number is placed in a cell.
- In this example, only two more numbers can be entered by repeating the scanning process.
- The Scanning Method may be enough to solve 1-star (very easy) to 3-star (medium) **Sudoku** puzzles.
- More difficult ones, such as the 5-star (very difficult) **Sudoku** puzzle of this example, cannot be solved by the Scanning Method alone.



 Starting with number 1, examine each cell to see if the number can be placed there, excluding prohibitive zones of the row in which the number belongs, of the column in which the number belongs, and of the box in which the number belongs, as shown above.

• Large "1" in red circles

2. Mark the sub-grid with the number.

```
• Small "1" everywhere
```

3. Repeat marking sub-grids with numbers 2, 3, 4, 5, 6, 7, 8, and 9.

Check the Exhaustive Sub-grids

		1	1		1	1						1	2			100		1	2			2				
		6						6		3				6		4							6		5	
7	8		7	8	9	7	8	9		5		7	8			-				9	7		9		-	
		3	1		3				1			1	2		1	2		1	2					1	2	3
	5	6		5			4			5	6		5	6		5						8				
7		1	7		9		_	_	7			7		~	7					9		-	_	7		9
		3		-		1			1				-		1			1					3			
	5	6		2			5	6		5	6		9		_	5							6		4	
7	8					-	8	-	H	8	-	-		0	-		_	Ļ	0		-	0	0	-		
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	5	6	Ľ	5			2			л		Ľ	5	6	Ľ	5			7			5		Ľ	-	
	8	Ŭ		8	9		Э			4			Ŭ	Ŭ		Ū	9		1			Ŭ	9		8	9
			1			1	-					1		3	1		3	1	_	-		_	3			
	5			5			5			2			5			5		4	5		4	5			6	123
7	8		7	8	9	7	8	9		-		7			7		9		8	9			9		<u> </u>	
					3		2									2	3								2	
	9			5			5			5			4			5			6			1				
	-		7	8	1	7	8		7	8			_		7				_	_		_	_	7	8	_
	2			-			2		1			1	2		1	2			-			2			2	
	5			6			5			5			5			5			3		4	5				
7	8	1		_	_	7	8	-	7	8	9	7	8	2	7		9		_		7		9	7	8	9
	-						2			_			2	3		-			2			2			2	
	1			4			5			5			5			6			5			5				
	_			_		7	8		7	8	9	17	8			-			8	9	7		9	7	8	9

- Sub-grid marking is time-consuming and requires self-discipline. High quality sub-grids are essential for solving the puzzle. Therefore, it is highly recommended that you double-check the numbers in the sub-grids.
- There is a website that automatically generates **Exhaustive Matrix** online. The printable **Exhaustive Matrix** is correct by construction.
 - o Sudoku <<u>http://WWW.HyperInfo.CA/Sudoku/</u>>
- The puzzle is now ready for the 3x3 SEE Method.

Identify Single Numbers -> Eliminate!

		1	1		1	1						1	2					X	2		2			Т	
		6						6		2				6		Λ			-		4	6		¢,	
7	8	1	7	8	9	7	8	9		5		7	8	1		Ŧ			9	7		9		9	
		3	1		3				1			1	2		1	2		X	2	t	1		X	2	3
	5	6		5			4			5	6		5	6		5		-	-	⊢	8		F	+	- 1
7			7		9	L	_	_	7	_	~	7			7	_			9		Ţ		7		9
		3		~		X			X				~		X	<u> </u>		Ľ				3		L	
	5	6		2			5	6		5	6		9			5			-		t	6		4	
-	8		-			Ľ	8	-	4	8		-		0	4		_	-	<u> </u>	Ľ		0	-		0
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	8	Ů		8	9		3			4			3	Ö		3	9		1	L	3	9		8	9
\vdash	-		1	-	-	1	-	-	-			1	_	3	1	_	3	X	-	⊢	_	3		-	-
	5			5			5			2			5			5		4	5	4	5			6	
7	8		7	8	9	7	8	9		4		7			7		9		89			9		0	
					3		2				1					2	3							2	
	9			5			5			5			4			5		1	5		1				
	-		7	8	1	7	8		7	8	1		-		7				ſ		-		7	8	
	2						2		1		1	1	2		1	2					2			2	
	5			6			5			5			5			5			3	4	5				
7	8	1		_		7	8		7	8	9	7	8		7		9	_`	Ĺ	7		9	7	8	9
	-						2						2	3		-			2		2			2	
	1			4			5			5			5			6			5		5				
	_			_		7	8		7	8	9	7	8			-			89	17		9	7	8	9

- 1. If there is a single number in any cell anywhere, then select the number, as shown above.
 - Small "1" in green circle
- 2. Eliminate the number within the **row** to which the number belongs, within the **column** to which the number belongs, and within the **box** to which the number belongs.

• Small "1" in red Xs

Identify Unique Numbers within a Row -> Eliminate!

7	8	6	17	8	9	17	8	69		3	1.23	1	2 6 8		4	ŀ	2	9	7	2	6 9		5	1. 2.6	
7	5	3 6	1	5	3 9		4	1 . C. M.	1 7	5	6	1	2 56	1	2 5	ŀ	2	9		8	1.23	•	2	3 9	
7	5 8	3 6		2		•7	5 8	6	•7	5 8	6		9	• 7	5		1		7		3 6		4		
	4	1.23	1 7	5	9	1 7	2 5	6 9	1 7	5	6 9	1 7	56		8	ŀ	2 5	9		2 5	3 9	1	2	3 9	
	2 5 8	6	1	5 8	9		3			4		1	56	1	5 9		7	1.1.1		2 5	9	1	2 8	9	
7	5 8		1 7	5 8	9	1 7	5 8	9		2		1 7		1 7	3 5 9	• 4	5 8	9	4	5	3 9		6		
	9	1.28	7	5 8	3	7	2 5 8		7	5			4	7	2 >		6			1	1. 28	7	2 8		
7	2 5 8			6	1. 2. M	7	2 5 8		1 7	5	9	1 7	2 5 8	1 7	2 5 9		3	1. 2. M	4 7	2 5	9	7	2 8	9	
	1			4		,	2 5 8		7	5	9	7	23 5 8		6		2 5 8	9	7	2 5	9	7	2 8	9	

- 1. Focus on one **row**, as shown above.
- 2. If there is a unique number in any cell within the **row**, then select the number.

• Small "3" in green circle in row 9

3. Eliminate the number within the **column** to which the number belongs, and within the **box** to which the number belongs.

• Small "3" in red Xs

4. Repeat steps 2 through 3 in all nine rows.

Identify Unique Numbers within a Column -> Eliminate!



- 1. Focus on one **column**, as shown above.
- 2. If there is a unique number in any cell within the **column**, then select the number.

• Small "3" in green circle in column 6

3. Eliminate the number within the **row** to which the number belongs, and within the **box** to which the number belongs.

• Small "3" in red Xs

4. Repeat steps 2 through 3 in all nine columns.

Identify Unique Numbers within a Box -> Eliminate!

			1			1					-	1	2				Ŀ	2		1	2		1000	
		6						6		3				6		4	L				6		5	
7	8		7	8	9	7	8	9		-		7	8			-			9	7	9		-	
		3	1		3				1			1	2		1	2	ŀ	2				•	2	3
	5	6		5			4			5	6		5	6		5	L			8	3			
7			7		9		_		7		_	7			7		⊢		9			7		9
	_	3		~		•	_		ŀ	_			~		•	_		-			3			
	5	6		2			5	6		5	6		9			5	L	Т			6		4	
7	8		-	_		-	8	_	7	8	_	-	_		7		ł.	0		7	2	-	0	2
			1	5		1	2 5	2	Ľ	5	2	1	5	į		•	Ľ.	2			. 3	1	z.	3
	4		 _	3	q	١,	J	9	2	3	9	,	3	•		8	L		q		4			
-	2	_	1	_	-	ŕ		-	ŕ		-	1		_	1		t		-		-		2	4
	5	6	 -	5			2			Λ		1	5	6	 	5	E	7			ļ	⁻	-	
	8	-		8	9		J			4			-			- 9		1			9		8	9
	_		1	_		1	_	-				1		•			Ŀ				٠			
	5			5			5			2			5			3	4	5		$\mathbf{\times}$	5		6	
7	8		7	8	9	7	8	9		~		7				5		8	9		9		U	
					3		2									2 •	Г						2	٦
	9			5			5			5			4			5	E	6		1				
	_		7	8		7	8		7	8			_		7		L	-				7	8	
	2			_			2		1			1	2		1	2		_			2		2	
	5			6			5	-		5	-		5			5	t	3	-	9				-
7	8			_		7	8	_	7	8	9	7	8		7	9	L	_		7	9	7	8	9
	-						2						-			-	L .	2		1			2	
	T			4			5			5			3			6	L .	5						
						7	8		7	8	9							8	9	7	.9	7	8	Ľ

- 1. Focus on one **box**, as shown above.
- 2. If there is a unique number in any cell within the **box**, then select the number.

• Small "4" in green circle in box 9

3. Eliminate the number within the **row** to which the number belongs, and within the **column** to which the number belongs.

• Small "4" in red Xs

4. Repeat steps 2 through 3 in all nine boxes.

Use the Double Technique -> Eliminate!

7	8	6	1 7	8	9	1 7	8	6 9		3		1 7	2 8	6		4	1. 1. 1. 1. 1.	•2	7	6 X		5	
7	5	3 6	1 7	5	3 9		4	1. 24	1 7	5	6	1 7	2 5	6	1 7	2 5		•2	8		• 7	×	3
7	5 8	3 6		2		• 7	5 8	6	•7	5 8	6		9		•7	5		1	7	3 6		4	
	4	1.22	1 7	5	9	1 7	2 5	6 9	1 7	5	6 9	1 7	5	•		8	1	•2 5 9	2 5	3 9	1	2	3 9
	2 5 8	6	1	5 8	9		3			4		1	5	6	1	5	9	7	2 5	9	1	2 8	9
7	5 8		1 7	5 8	9	1 7	5 8	9		2		1 7	5	•		3	10 - 10 B	• 45 89	• 5	•		6	
	9	1 . 2 2	7	5 8	3	7	2 5 8		7	5 8			4		7	2 · 5	•	6	1		7	2 8	
7	2 5 8			6		7	2 5 8		1 7	5 8	9	1 7	2 5 8		1 7	2 5	9	3	4		7	2 8	9
	1	1. 2. 2.		4	1	7	2 5 8		7	5 8	9		3	1. 2.		6	1	2 5 8 9	2 5 7	9	7	2 8	9

- 1. Focus on one row, on one column, or on one box, as shown above.
- 2. Within the row, within the column, or within the box, identify two cells, each containing two identical numbers only.

• Small "2" and "9" in blue circles

3. Eliminate any of the two numbers in other cells within the **row**, within the **column**, or within the **box**.

• Small "2" and "9" in red Xs

4. Select a single number each in the cells, if possible.

• None

• The Double Technique may not be required for less difficult puzzles.

Use the Triple Technique -> Eliminate!

,	9	6	1	9	9	1	0	6		3	1.24	1	2	6		4	ŀ	2	9	2	6		5	1.20
7	5	3 6	, 1 7	5	3 9	-	4	-	1	5	6	, 1 7	2 5	6	1	2 5	ŀ	2	9	8		•	2	3 9
7	5 8	3 6		2		• 7	5 8	6	•7	5 8	6		9		• 7	5		1		7	3 6		4	21.20
	4	1.22	1 7	5	9	1 7	2 5	6 9	1 7	5	6 9	1 7	5	•		8	ŀ	2 5	9	2 5	3 9	1	2	3 9
	2 5 8	6	1	5 8	9		3	1. 28		4	1. 2.8	1	5	6	1	5 9		7		2 5	9	1	2 8	9
7	5 8		1 7	5 8	9	1 7	5 8	9		2	1. 28	1 7	5	•		3	• 4	5 •	9	• 5	•		6	21.23
	9		7	5 8	3	7	2 5 8		7	5 8			4		7	2• 5		6		1		7	2	
7	2 5 8			6		7	2 5 8		1 7	5 8	9	1 7	2 5 8		1 7	2 5 9		3		4		7	2	9
	1			4		7	2 5		7	5	9		3			6		8		5	ý	7	2	9

1. Focus on one row, on one column, or on one box, as shown above.

2. Within the **row**, within the **column**, or within the **box**, identify three cells, each containing two or three identical numbers only.

• Small "2", "7" and "9" in blue circles

3. Eliminate any of the three numbers in other cells within the **row**, within the **column**, or within the **box**.

• Small "2", "7" and "9" in red Xs

4. Select a single number each in the cells, if possible.

• Small "5" in green circles

• The Triple Technique may not be required for less difficult puzzles.

Use the Extend Technique -> Eliminate!

	_	6	1	_		1	_	6		3	1.23	1	2	6		4	1.23	•	2		2	6		5	
7	8	3	7	8	9 3	7	8	9	1			7	8 2	_	1	2	-	ŀ	2	9	7	9	ŀ	2	3
7	5	6	7	5	9		4		7	5	6	7	5	6	7	5			,	9	8	3	7		9
7	5 8	3 6		2		•	5 8	6	• 7	5 8	6		9		•	5			1		7	3 6		4	1.00
	4	1.23	1 7	5	9	1 7	2 5	6 9	1 7	5	6 9	1	5	•		8	1.00	•	2 5	9	2 5	3 9	1	2	3 9
	2 5 8	6	1	5 8	9		3	1.24		4		1	5	6	1	5	9		7		2 5	9	1	2 8	9
7	5 8		1 7	5 8	9	1 7	5 8	9		2		1 7	5	•		3	2000	• 4	5 8 9	9	• 5	•		6	1. 2. 2
	9	1.23	7	5 8	3	7	2 5 8		7	5 8			4		7	2 5	•		6		1		7	2 8	
	2 5			6			2 5		1	5		1	25		1	25			2		_			2	2
7	8			0		7	8		7	8	9	7	8		7		9		2		4	:	7	8	9
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						7	8		7	8	9		-						8	9	7	9	7	8	9

- 1. Focus on one **box**, as shown above.
- Within the box, identify one number in only one row or in only one column.

• Small "5" in blue circles

3. Eliminate the number outside the **box** in other cells within the **row** or within the **column**.

• Small "5" in red Xs

• The Extend Technique may not be required for less difficult puzzles.

Use the Corner Technique -> Eliminate!

7	8	6	1	8	9	1	8	6		3	1.24	1	2	6		4	1.00	•	9	7	2 6 9		5
, 7	5	3 6	, 1 7	5	3		4	,	1	5	6	, 1 7	2 5	6	1	2 5		• :	9	(D	• :	23
7	5 8	3 6		2		•	5 8	6	• 7	5 8	6		9		• 7	5		0	D	7	3 6	4	ł
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	1			4		7	2 5		7	5 •	9		3			6	1	(7	9	7	2 9

- Focus on one set of three rows or on one set of three columns, as shown above.
- 2. Within the set of **three rows** or within the set of **three columns**, identify two numbers each in two **boxes**.
 - Large "1" and "8" in blue circles
- 3. Inside a corner with two cells within the other **box**, eliminate the numbers other than the two numbers.

• Small "2", "3" and "9" in red Xs

- 4. Select a single number each in the two cells, if possible.
 - Small "1" and "8" in green circles
 - The Corner Technique may not be required for less difficult puzzles.

Use the Block Technique -> Eliminate!

7	8	6	1 7	8	9	1 7	8	6 9		3		1 7	2 8	6		4	·	2	,	2	: 6 9	(5)
7	5	3 6	1 7	5	3 9		4	1. 2. 1	1 7	5	6	1 7	2 5	6	1 7	2 5	·	2	,	8	3	• 7	2	3 9
7	5 8	3 6		2		• 7	5 8	6	• 7	5 8	6		9		•7	5		1	2	,	3 6		4	
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7	5 8		1 7	5 8	9	1 7	5 8	9		2	1. 2. 10	1 7	5	•		3	• 4	5 • 9		>	< ,		6	
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	1			4		7	2 5		7	5	9		3			6	(8),	7	2	9

- Focus on one set of three rows or on one set of three columns, as shown above.
- 2. Within the set of **three rows** or within the set of **three columns**, identify three numbers placed consecutively.
 - Large "6", "3" and "8" in blue circles
- 3. Identify a number outside the **box** which contains the three numbers.

• Large "5" in green circles

- 4. Recognise a **row** or a **column** in which the number is prohibited, and eliminate the number.
 - Small "5" in red Xs
- 5. Select the number in non-prohibited zones.

• Small "5" in green circles

• The Block Technique may not be required for less difficult puzzles.

Complete the Puzzle

8	1	9	3	7	4	2	6	5
5	7	4	6	2	1	9	8	3
3	2	6	8	9	5	1	7	4
4	9	2	7	6	8	5	3	1
6	5	3	4	1	9	7	2	8
7	8	1	2	5	3	4	9	6
9	3	8	5	4	2	6	1	7
2	6	5	1	8	7	3	4	9
1	4	7	9	3	6	8	5	2

- Repeating these processes leads to the solution of the 5-star (very difficult) **Sudoku** puzzle.
- Once you start identifying single and unique numbers, you will see a domino effect to give you an orgasmic experience!



- This pen with a very fine tip is ideal for playing **Sudoku** puzzles!
 - MagneScribe[™] Pen
 <<u>http://MagneScribe/</u>>