

LOGIC and REASONING

Goal: - Use reasoning to solve logic puzzles.

Solving Logic Puzzles

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

Mental Math

Fill in the Blanks

- If a triangle is not scalene, it must be ____?
- If an integer is neither negative nor positive, it must be ____?
- If a positive integer is prime and not odd, then the integer is ____.

Ruling Out Possibilities

This can be extended to “If you know that one of a set of possibilities must be true, and you can eliminate all but one, that one must be true.”

In mathematics, ruling out possibilities is often easy. For example, you know every angle in a triangle is either acute, right, or obtuse. If $\angle A$ in $\triangle ABC$ is not acute or right, then, using the Law of Ruling Out Possibilities, $\angle A$ is obtuse. There is no other possibility.

In real life, if words are not carefully defined, you may not be able to rule out possibilities so easily. For example, if a person is not young, that does not necessarily mean the person is old.

Sudoku puzzles can be solved by repeated application of the Law of Ruling Out Possibilities.

Map of the United States

I am a state that does not lie west of the Mississippi River. My name consists of more than one word. I have no seashore. I do not border another country. What state am I?

Solving Logic Puzzles

In the questions for this lesson, you are asked to solve some logic puzzles. These puzzles use the idea of ruling out possibilities again and again. Notice how little information is given and how much you can deduce. The same happens in geometry and other branches of mathematics.

Here are some hints for doing these puzzles:

1. Logic puzzles take a lot of time and analysis, so do not hurry.
2. Construct a grid and place Xs in squares whenever something *cannot* occur. Place an O in the square when the situation *must* occur.

Example

Aaliyah, Marissa, Jordan, Hassan, and Ian each have a different hobby. Their hobbies are chess, fencing, sailing, hockey, and knitting. From the clues below, determine which hobby each student has.

- (1) Aaliyah likes either sailing, hockey, or fencing.
- (2) Jordan likes either hockey or knitting.
- (3) Marissa does not like fencing, hockey, or sailing.
- (4) Ian does not like sailing, knitting, fencing, or hockey.
- (5) Hassan does not like fencing.

Aaliyah Marissa Jordan Hassan Ian

C	X	X	X	X	O
C	X	X	X	X	X
S	X	X	X	O	X
F	X	X	O	X	X
K	X	O	X	X	X

su·do·ku *noun* \sü-'dō-kü\

Definition of SUDOKU

: a puzzle in which several numbers are to be filled into a 9x9 grid of squares so that every row, every column, and every 3x3 box contains the numbers 1 through 9

Origin of SUDOKU

Japanese *sūdoku*, short for *sūji wa dokushin ni kagiru* "the numerals must remain single" (i.e., the digits can occur only once)

First Known Use: 2004

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

sudoku *noun* (*Concise Encyclopedia*)

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

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Puzzle in which numbers are filled into a grid subject to certain constraints. In its simplest form, sudoku consists of a 9 x 9 grid with numbers appearing in some of the squares. The object of the puzzle is to fill the remaining squares, using all the numbers 1-9 exactly once in each row, column, and the nine 3 x 3 subgrids. Sudoku

is based entirely on logic, and the level of difficulty is determined by the quantity and positions of the original numbers.

The first known appearance of sudoku was in 1979 in a New York-based puzzle magazine, which called them Number Place puzzles. They next appeared in 1984 in a magazine in Japan, where they acquired the name sudoku (abbreviated from *suuji wa dokushin ni kagiru*, meaning "the numbers must remain single"). In spite of the puzzle's popularity in Japan, the worldwide sudoku explosion had to wait another 20 years.

	Ms. Landis	Mr. Farmer	Mr. Guinness	Ms. Voila	Ms. Edwards	Teller	Secretary	Bookkeeper	Guard	Manager
Catherine				○			○			
Edgar			○							○
Wilbur		○				○				
Marjorie	○								○	
Shirley					○			○		
Teller		○								
Secretary				○						
Bookkeeper					○					
Guard	○									
Manager			○							

