

# THE MAGIC OF MATH

## Wisconsin State Curriculum Alignment:

Math A.4.3 – Connect mathematical learning with other subjects, personal experiences, current events, and personal interests

- See relationships between various kinds of problems and actual events
- Use mathematics as a way to understand other areas of the curriculum

Math B.4.5 – In problem-solving situations involving whole numbers, select and efficiently use appropriate computational procedures such as

- Recalling the basic facts of addition, subtraction, multiplication, and division
- Using mental math

Just as scientific principles are instrumental in making magic tricks successful, so are the concepts of mathematics. Especially in the field of “mental magic,” math is an important factor in the success of many illusions. Mental magic is a type of magic performance that usually requires no props and uses the thought processes of the audience to be successful.

Magic squares are a type of mental magic. The Chinese invented magic squares many centuries ago. An example of a magic square appears below.

4	9	2
3	5	7
8	1	6

In a magic square, whether you add up, down, or across, you will always come up with the same sum. This number is called the magic total. In this case, you will always arrive at the number 15.

$$\begin{aligned}4+9+2&=15 \\3+5+7&=15 \\8+1+6&=15 \\4+3+8&=15 \\9+5+1&=15 \\2+7+6&=15 \\4+5+6&=15 \\2+5+8&=15\end{aligned}$$

This example is an order three square since it has three rows and three columns. You can make other order three squares by adding the same number to each number in the square or by multiplying each number in the square by the same number. Here is an example:

4	9	2
3	5	7
8	1	6

+2 to each number in the square =

6	11	4
5	7	9
10	3	8

To make an order four magic square, enter the numbers 1-16 (or any other 16 consecutive numbers) onto a 4x4 grid as shown. I'll start with the number 5 for the sake of this example.

5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20

Now: Switch the corners along the diagonals like this:

20			17
8			5

Also, switch the four center numbers along the diagonals:

20			17
	15	14	
	11	10	
8			5

Add the remaining numbers back into the square in their original positions.

20	6	7	17
9	15	14	12
13	11	10	16
8	18	19	5

Add all of the rows, columns, and diagonals and you will get the same number.

- $20+6+7+17=50$
- $9+15+14+12=50$
- $13+11+10+16=50$
- $8+18+19+5=50$
- $20+9+13+8=50$
- $6+15+11+18=50$
- $7+14+10+19=50$
- $20+15+10+5=50$
- $8+11+14+17=50$

Also, the numbers in the center add up to 50:  $15+14+11+10=50$

Use the directions above to create your own 3x3 or 4x4 magic square. Check the square by adding each row, column, and diagonal to make sure they add up to the same sum.

Here is another mathematical magic trick that will astonish and amaze your friends and family! This trick is found in a book called *Math-a-Magic: Number Tricks for Magicians* by Laurence B. White, Jr. and Ray Broekel. It is called "No Questions Asked."

Effect: You are able miraculously to guess the number of which a friend is thinking.

Routine: Tell your friend to think of any even number and to remember that number. Now ask her to double the number she chose (in her head, not aloud.) Now, have her add 12 to the total (again in her head.) Next, have her divide this total by 4 and remember the new total. Finally, have her divide the original number by half and subtract this number from the last total.

You will now read your volunteer's mind. Ask him or her to concentrate on her final number. Pretend to struggle figuring it out. Pretend as though you are really a mind reader. It will be easy to play the part, though, because your volunteer will always be thinking of the number 3.

Method: Do the trick as instructed and it will always work for you. But, be warned since the answer is always three, you probably will not want to repeat the trick using the same volunteer or he or she will catch on quickly.

How it works: Remember that you start by asking your volunteer for an even number. Since later in the trick, you ask him or her to subtract half of that number it is easiest to think of the number your friend chooses as two halves of a whole. For example, let us start with the number 4.

4 = the magic number; which is the same as  $2 \times \_ \text{ the magic number}$ , or  $2 \times 2$

When you double it, you get  $2 \times 2 \times \_ \text{ the magic number}$ , or  $2 \times 2 \times 2$

This is the same as  $4 \times \_ \text{ the magic number}$  or  $4 \times 2$ , which is 8.

Now, add 12 to this number.  $4 \times \_ \text{ the magic number} + 12 = 8 + 12$

Now, divide by four.  $\frac{4 \times \_ \text{ the magic number} + 12}{4} = \frac{8}{4} + \frac{12}{4}$

You get  $\_ \text{ the magic number} + 3$ .

Now, subtract the  $\_ \text{ of the magic number}$ .  $\_ \text{ the magic number} + 3 - \_ \text{ the magic number} = 2 + 3 - 2 = 3$ .

Wow! Isn't that cool? You can appear to have magical powers even though you are just using the power of math! Try these awesome math-a-magic puzzles on your friends and family.