

Magic Squares

A GUIDE

Crack the secret of a number grid where every row, column, and diagonal adds up to the very same total.

A Square With a Secret

Look at the grid below. It seems like nine ordinary numbers dropped into nine boxes. But this square is hiding something.

Add the top row: $2 + 7 + 6 = 15$. Now add the left column: $2 + 9 + 4 = 15$. Try a diagonal, corner to corner: $2 + 5 + 8 = 15$ again.

Every row, every column, and both diagonals add to 15. That is eight different lines, all landing on the same total. A square that pulls off this trick is called a magic square, and the shared total is its magic sum.

2	7	6
9	5	1
4	3	8

Magic sum = 15

Find the Magic Sum

Here is the key move, and it works on any magic square puzzle: find one complete line and add it up. A complete line is any row, column, or diagonal with no blanks in it.

That one total is the magic sum for the whole square. You never need to add every line — one is enough, because all eight lines must match it. Try it on the square below before reading the worked example.

5	10	9
12	8	4
7	6	11

Magic sum = 24

Worked example The top row of a magic square reads 5, 10, 9. What is the magic sum?

1. Pick a line with no blanks — the top row works.
2. Add its three numbers: $5 + 10 + 9 = 24$.
3. That total is the magic sum, so every row, column, and diagonal in this square must also add to 24.

Answer: 24

Fill the Blank

Once you know the magic sum, blanks stop being scary. Any line with exactly one blank is really a subtraction problem in disguise.

The whole line must reach the magic sum. So add the two numbers you can see, then subtract that from the magic sum. Whatever is left over is the missing number.

One more habit worth building: after you fill a blank, add the whole line again to check it hits the magic sum. Magic squares let you catch your own mistakes.

Worked example A magic square has magic sum 15. One column shows 9 at the top, a blank in the middle, and 1

at the bottom. What is the missing number?

1. The whole column must add to the magic sum, 15.
2. Add the numbers you can see: $9 + 1 = 10$.
3. Subtract from the magic sum: $15 - 10 = 5$.
4. Check the line: $9 + 5 + 1 = 15$. It works.

Answer: 5

Secrets of the Center

The middle cell of a 3×3 magic square is special. Four different lines pass through it: the middle row, the middle column, and both diagonals. All that traffic forces a rule: the center is always the magic sum $\div 3$.

So if someone tells you only the magic sum, you already know one cell. And it works backwards too: see the center, multiply by 3, and you have the magic sum without adding a single line.

Here is one more piece of magic. If you double every number in a magic square, it stays magic — and the magic sum doubles too. Scaling the numbers scales the sum right along with them.

4	14	12
18	10	2
8	6	16

Magic sum = 30

Worked example Every line of a 3×3 magic square adds to 30. What number sits in the center?

1. In a 3×3 magic square, the center is always the magic sum $\div 3$.
2. Divide: $30 \div 3 = 10$.
3. Check with the square above: its middle row is $18 + 10 + 2 = 30$, and 10 is right in the center.

Answer: 10

Remember

- ★ One complete line tells you everything — its total is the magic sum for all eight lines.
- ★ Missing number = magic sum – the two numbers you can already see.
- ★ In a 3×3 magic square, the center cell is always the magic sum $\div 3$.
- ★ After filling a blank, re-add that line — a magic square checks your work for free.

Now you try

- 1) One row of a magic square reads 4, 9, 2. What is the magic sum?

Answer: _____

- 2) A magic square has magic sum 15. One column shows 3 and 5 with one blank. What is the missing number?

Answer: _____

- 3) One diagonal of a magic square reads 12, 8, 4. What is the magic sum?

Answer: _____

- 4) A magic square has magic sum 24. One row shows 9 and 11 with one blank. What number goes in the blank?

Answer: _____

- 5) One row of a magic square reads 5, 10, 9. Another row in the same square shows 12 and 4 with one blank. What number goes in the blank?

Answer: _____

- 6) A 3×3 magic square has magic sum 27. What number sits in the center cell?

Answer: _____

- 7) The center cell of a 3×3 magic square is 6. What is the magic sum?

Answer: _____

- 8) Every number in a magic square with magic sum 15 is doubled. What is the new magic sum?

Answer: _____

Answers — check yourself

1. 15
2. 7
3. 24
4. 4
5. 8
6. 9
7. 18
8. 30