



TRICKS IN MAGIC SQUARE

Chew Yee Ming, Ch'ng Pei Eng & Ng Kok Shien

Have you tried to solve a magic square in less than five minutes? It's fun and good for brain teaser activity. To engage students in learning mathematics and develop mathematical skills, the magic square can become one of the useful tools in recreational mathematics. This kind of logic puzzle provides an alternative to solve traditional arithmetic calculations in a playful and meaningful way.

A magic square is a square of array positive integers where the sum of each row, column and diagonal is the same. One of the example 3 x 3 magic squares is shown in Figure 1. We can observe that the sum of each row, column and diagonals is 18. 18 is called a magic constant.

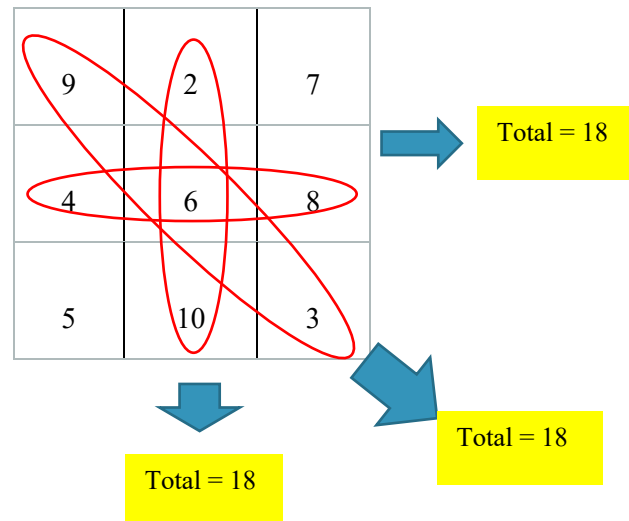


Figure 1: A sample 3 x 3 magic square

There is a trick to tackle the above magic square. Make sure that all nine numbers given are in consecutive order. Those nine numbers can be arranged in ascending or descending order. To calculate a magic constant, you need to add up all the nine consecutive numbers and divide by three. This example uses the numbers 2, 3, 4, 5, 6, 7, 8, 9, 10 and the magic constant is calculated as $\frac{2+3+4+5+6+7+8+9+10}{3} = 18$.

Four simple steps to solve the 3 x 3 magic square is explained in the following.

Step 1: Identify the median in the given consecutive numbers.

Step 2: Place the median in the middle square of the 3 x 3 magic square.

	6	

Step 3: Assume that the median is y . Use formula $y + 3$ and $y + 1$ to calculate the diagonal values in the first row.

9		7
	6	

Step 4: Use formula $y - 1$ and $y - 3$ to calculate the diagonal values in the third row.

	6	
5		3

Step 5: Calculate the remaining numbers in the 3x3 magic square.

By following the aforementioned steps, you can easily construct a 3 x 3 magic square using any nine consecutive numbers within five minutes.

Moreover, another example of a 4x4 magic square is explored in Figure 2. Surprisingly, this kind of 4 x 4 magic square follows a pattern to form it. All 16 consecutive numbers are used and arranged in a pattern. The magic constant of Figure 2 is 38. Therefore, five steps to validate the magic square 4 x 4 are described.

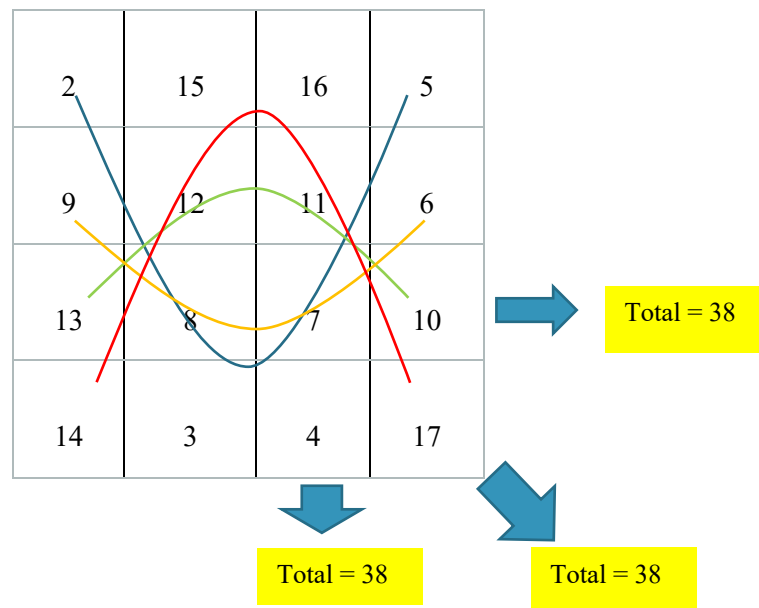


Figure 2: A sample 4 x 4 magic square

Step 1: Arrange the 16 numbers in ascending order in four rows.

The numbers 2–5 are in the first row, the numbers 6–9 is in the second row, the numbers 10–13 is in the third row, and the numbers 14–17 is in the fourth row.

Step 2: Place the first row numbers (2–5) in a U shape as shown in Figure 2.

Step 3: Place the fourth row numbers (14–17) in an N shape as shown in Figure 2.

Step 4: Place the second row numbers (9–6) in a U shape as shown in Figure 2.

Step 5: Place the third row numbers (13–10) in a N shape as shown in Figure 2.

Let's try to solve a 4x4 magic square using the numbers 1–16. Don't forget to check that the sum of each row, column and diagonal must be the same. You will obtain the magic constant in this question is 34.

