

# INVESTIGATIONS

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## MAGIC SQUARE MARVELS

A classic puzzle with a twist! *Magic Square Marvels* invites students to explore, question and think strategically. What's more, it's a powerful problem for purposeful addition practice, with surprising symmetry connections.

### HOW IT WORKS

Magic Squares are a puzzle with a long history. The earliest known references date back to ancient China, some 3000 years ago. Present students with the original version:

*Place the numbers 1 to 9, so that every row, column and diagonal adds to the same amount. Is a solution possible? If so, how many can you find?*


Sharing a non-example can help students to make sense of how a Magic Square works. For example, the numbers in each row, diagonal and column here do *not* add to the same amount:

5	3	6
8	7	4
2	9	1

Give students time to play, explore, ask, guess, look for patterns and explain.

As students start to find solutions, they may notice:

- Different solutions are a rotation or reflection of one another
- The only possible number to go in the middle is 5
- The sum of each row, column and diagonal is 15
- There are 8 possible solutions.

### TIPS FOR GETTING STARTED

- Use physical number cards: This makes it easier for students to discuss what they're doing. It also helps students to try something and quickly make changes.
- Fix some numbers: Instead of having 9 numbers to move

around the grid, fix 2-3 numbers (anywhere). This will help students to focus and reduces the cognitive load.

- Make solutions visible for all: Have a shared space where solutions are added as they're found. If students are stuck, they can then use one solution to try and find another, or they can check that the solutions actually do work.

### A TWIST!

The beauty of this puzzle is that it can quickly be adapted. This opens new avenues to explore – and it helps students to see if their existing strategies still work. Each variation also brings a new challenge: *Is it still possible to make a Magic Square?*

Some possible variations:

- Use a different set of consecutive numbers, e.g. 2 to 10, or 5 to 13
- Use consecutive multiples of a number, e.g. 3, 6, 9, 12, ... 27
- Use a random selection of 9 numbers
- Use 9 fractions or decimals
- Use a 4 x 4 (i.e. numbers 1 to 16) or a 5 x 5 (i.e. numbers 1 to 25) Magic Square.

### WHY USE IT?

*Magic Square Marvels* give learners valuable practice in addition strategies, comparing quantities, testing strategies and looking for patterns, justifying and explaining their thinking.

### VC:M 2.0 LINKS

Level 1: VC2M1N04, Level 2: VC2M2N04, Level 3: VC2M3A02, Level 4: VC2M4N06, VC2M4SP04, Level 5: VC2M5N05, VC2M5SP03, Level 6: VC2M6N04, VC2M6N05.

Scan this QR code to get 10 more problems for building strategy and reasoning in maths.



What kinds of investigations have you used in your classroom as a launch for mathematical exploration? Our readers would love to hear your experiences. You can share your ideas with us at [primenumber@mav.vic.edu.au](mailto:primenumber@mav.vic.edu.au).