Mrs Clay's Y5 Thursday Maths Task: 11th June

<u>Problem Solving: Magic Squares</u>

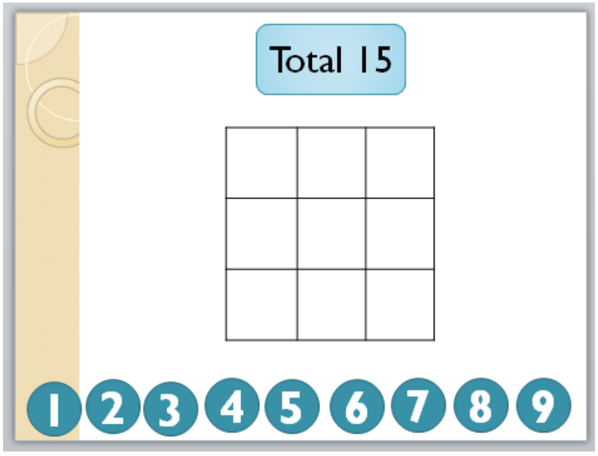
I know that you have been doing a lot of work on decimals this week and earlier on in lockdown (as well as before we broke up from school!), so I am going to set something different today. I have broken down the activity into two tasks

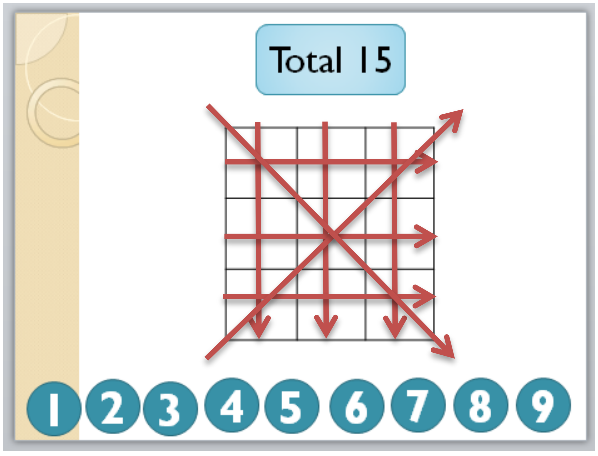
Task 1:

Look at the slides below. Your first task is to place each of the digits 1-9 into the grid (using them once only) so that each row, each column and the diagonal adds up to 15. I suggest writing the digits on small pieces of paper and placing them onto a grid template. This way you can move them around easily as you attempt to find the solution and you can be sure that you have used each digit once only. Remember that **every** row and column **and** the two diagonals need total 15.

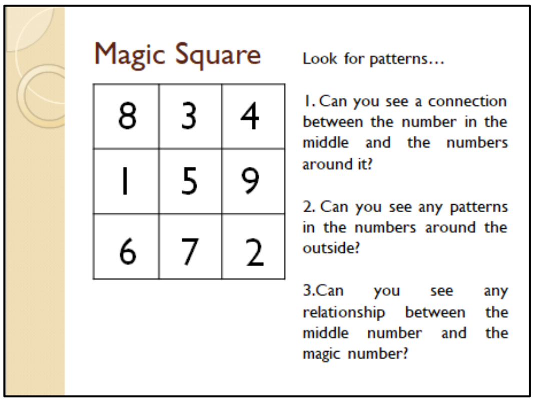
Tips to get you started: think about where the largest digits need to go and where the smallest ones should go. Does it matter which digit you place in the middle?

Now, it's over to you! When you have completed the challenge you can move onto step 2 (on the next page: don't look at it until you have completed step 1!)





Task 2:
Don't look here until you have completed task 1 *(unless an adult needs a clue to help you on your way)!*
I mean it! ☺



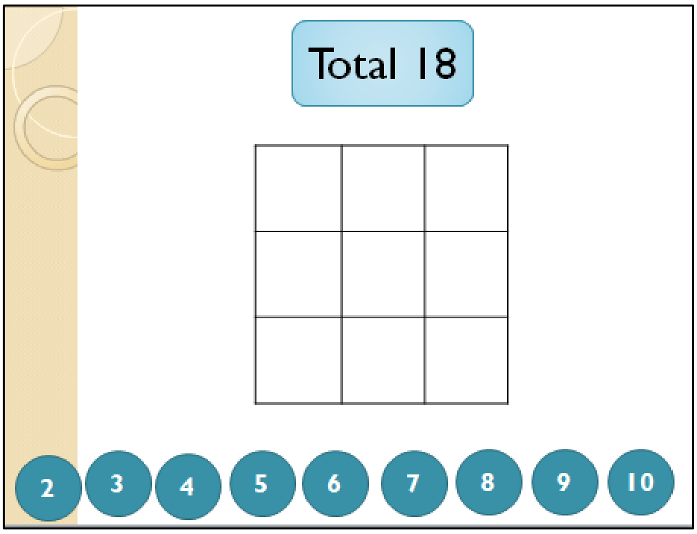
The slide on the left shows **one** possible solution to the 'total 15' magic square. There are other solutions, so don't panic if yours isn't the same!

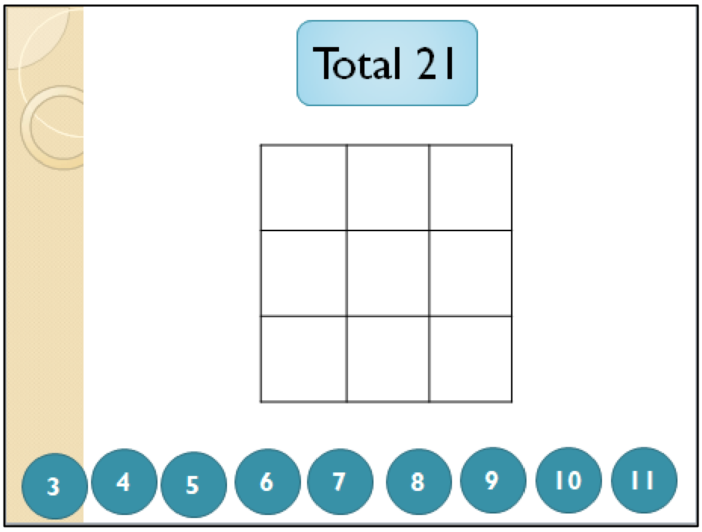
Look at the magic square solution. What do you notice? Look at my questions on the slide and see if you can answer them. *(Answers when you scroll down).*

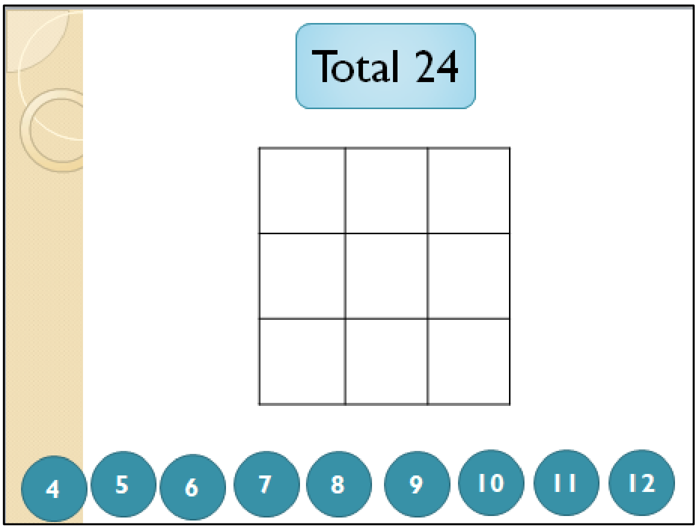
Keep scrolling for the answers…

You should have noticed that the four corners of the magic square contain **even** numbers. This is an important pattern to note when solving other magic squares for other numbers, although remember that you can have odd numbers too… You may also have noticed that 5 is in the middle (again, important). The numbers on either side of the 5 are paired number bonds to 10. This is how you can make sure that each row/column/diagonal adds to 15: you make sure 5 is in the middle and that the pairs of numbers either side of the central number add up to 10. Finally, you may have noticed a relationship between 5 (the central number) and 15 (the magic number): if you multiply 5 by 3 you get 15 (i.e. if you multiply the central number by 3 you get the magic number). Try this to help you work out which number to place in the other magic squares I am about to set!

Over to you:
Now, using what you have learnt, have a go at solving the following magic squares. Please note that you are using different numbers for each magic square: it is not 1-9 as it was for magic square 15. The idea is exactly the same: use each of the listed numbers once only and make sure that each row, column and diagonal add up to the magic number listed on the slide. I have included an extension slide too, if you would like it. Don't worry if you can't do them all, or if an adult needs to look at the answers to give you some clues to help solve them.







What if…

… the total number was a negative number?

… numbers were in steps of more than one?

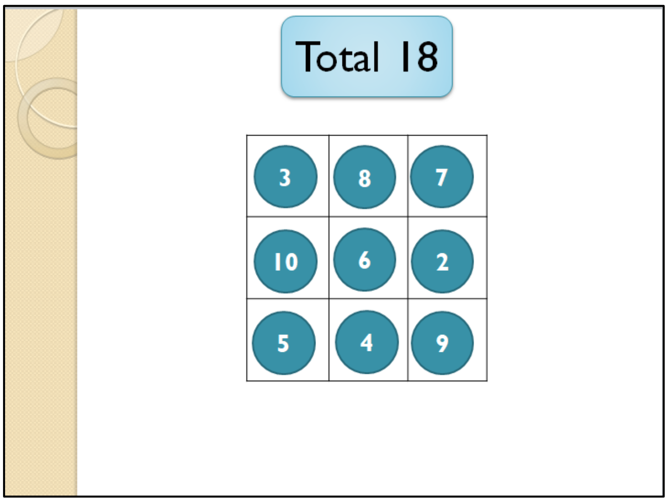
… corners were odd numbers?

… we had a 4 by 4 magic square?

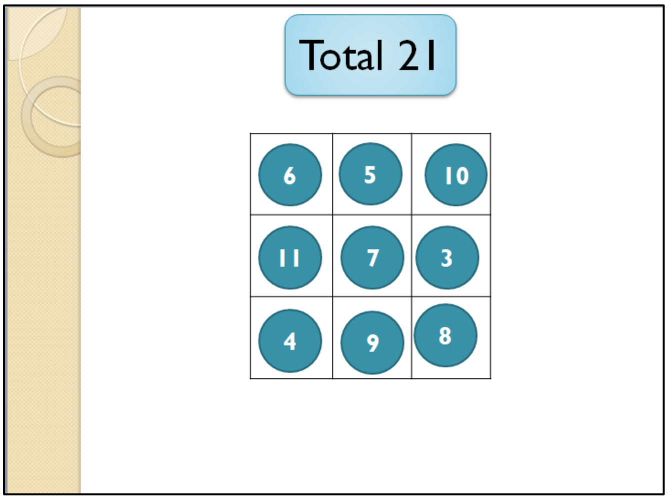
Choose one and have a go! Write about any patterns you find.

SPOILER ALERT: ANSWERS ON THE NEXT PAGE!

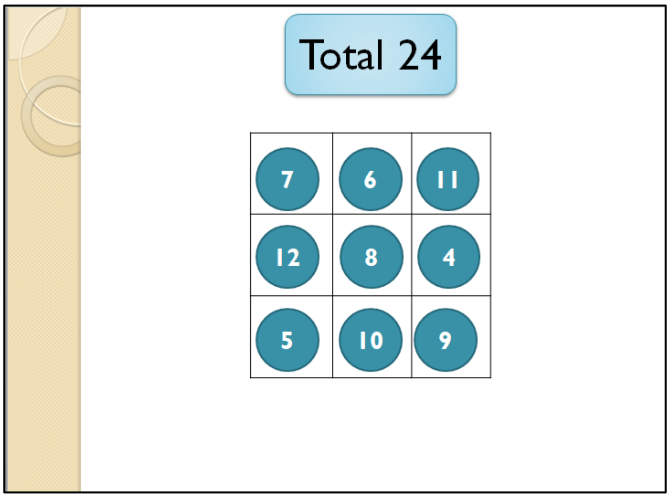
ANSWERS



To solve the 18 magic square:
We know that 3x the middle number gives the magic number, so place 6 in the middle. This time, the corner numbers need to be **odd**. With 6 in the middle, we are looking at making pairs of numbers that total 12 (18-6= 12), so when we place our corner numbers and then the other numbers, we need to place them in pairs that total 12 around the central 6, e.g:
2 and 10
3 and 9
4 and 8
5 and 7



To solve the 21 magic square:
7 needs to go in the middle (7x3 = 21, the magic number)
Even numbers need to go in the corners.
All numbers need to be placed in pairs that total 14 (21-7), so:
3 and 11
4 and 10
5 and 9
6 and 8



To solve the 24 magic square:
8 needs to go in the middle (8x3 = 24, the magic number)
Odd numbers need to go in the corners.
All numbers need to be placed in pairs that total 16 (24-8), so:
4 and 12
5 and 11
6 and 10
7 and 9