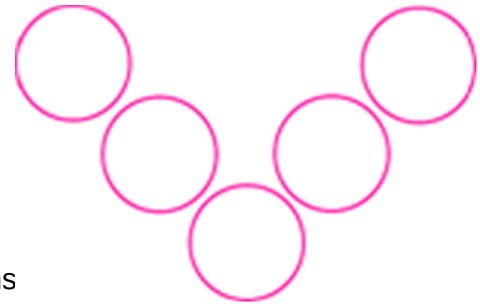
Mathematics Project

Magic Vs

Place each of the numbers 1 to 5 in the V shape below so that the two arms of the V have the same total.

How many different possibilities are there?



What do you notice about all the solutions you find?

Can you explain what you see?

Can you convince someone that you have all the solutions

What happens if we use the numbers from 2 to 6? From 12 to 16? From 37 to 41? From 103 to 107? Try it.

What can you discover about a V that has arms of length 4 using the numbers 1−7? Try it.

Reach 100

Here is a grid of four "boxes":

You must choose four **different** digits from 1−9 and put one in each box. For example:

5	2
1	9

This gives four two-digit numbers:

52 (reading along the 1st row)
19 (reading along the 2nd row)
51 (reading down the left hand column)
29 (reading down the right hand column)

In this case their sum (total when added together) is 151.

Try a few examples of your own.

Is there a quick way to tell if the total is going to be even or odd?

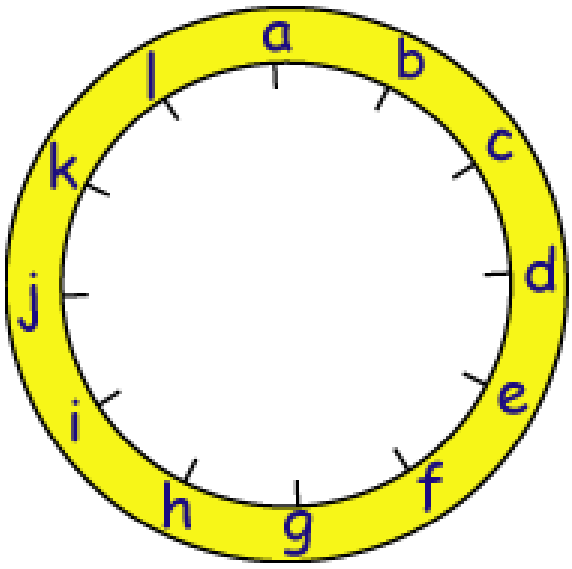
Your challenge is to find four **different** digits that give four two-digit numbers which add to a total of 100.

How many ways can you find of doing it?

A Mixed-up Clock

There is a clock-face where the numbers have become all mixed up. Can you find out where all the numbers have got to from the ten statements below?

Here is a clock-face with letters to mark the position of the numbers so that the statements are easier to read and to follow.



1 No even number is between two odd numbers.

2 No consecutive numbers are next to each other.

3 The numbers on the vertical axis (a) and (g) add to 13.

4 The numbers on the horizontal axis (d) and (j) also add to 13.

5 The first set of 6 numbers [(a) - (f)] add to the same total as the second set of 6 numbers [(g) - (l)] .

6 The number at position (f) is in the correct position on the clock-face.

7 The number at position (d) is double the number at position (h).

8 There is a difference of 6 between the number at position (g) and the number preceding it (f).

9 The number at position (l) is twice the top number (a), one third of the number at position (d) and half of the number at position (e).

10 The number at position (d) is 4 times one of the numbers adjacent (next) to it.

Four Go - for Two

Here's a game to play with an adult!

How do you play?
You will need an adult to play with.
You will also need a number line from 1-20, like the one above. You can print one off or draw your own.

To start, the adult chooses two numbers in this grid and either multiplies them together or divides them (bigger divide by smaller).

100	25	5
10	2	36
12	4	3

÷

×

They then mark the answer to the calculation on the number line. You then choose two numbers and either × or ÷ , and mark that number in a different colour on the number line.

If the answer is too big or too small to be marked on the number line, the player misses a go. The winner is the person to get four marks in a row with none of their opponent's marks in between (they do not have to be consecutive numbers, just four marks in a row)

Reflection:
What good ways do you have of winning the game?
Does it matter if you go first or second?
How are you deciding which number to aim for next?
Can you find a winning strategy?

Easier version: you could use a calculator, and/or adapt the grid and numberline.

Harder version: children can be encouraged to tweak the game and to try out their new version. For example, they might change the number line, the grid of numbers, the operations, the number of numbers needed to win...

Nice or Nasty - for Two

Here's a game to play with an adult!

How do you play?
You will need an adult to play with. There are 5 variations of this game, some more difficult than others. You will need a 1 to 6 dice, or even a 0 to 9 dice if you have one. You could use a spinner instead of a dice. If you have access to the internet you can use this virtual dice or spinner: https://nrich.maths.org/6717

Each of you draw a set of four boxes like this:

Game 1 - Take turns with the adult to roll the dice and decide which of your four boxes to fill. Do this four times each until all your boxes are full. Read the four digits as a whole number.

Whoever has the larger four-digit number wins.

There are two possible scoring systems:
- A point for a win. The first person to reach 10 wins the game.
- Work out the difference between the two four-digit numbers after each round. The winner keeps this score. First to 10000 wins.

Game 2 - Whoever makes the smaller four digit number wins. See if you can come up with a suitable scoring system.

Game 3 - Set a target to aim for. Then throw the dice four times each and work out how far each of you is from the target number. Whoever is the closer wins.

There are two possible scoring systems:
- A point for a win. The first person to reach 10 wins the game.
- Work out the difference between the two four-digit numbers and the target number after each round. Keep a running total. First to 10000 **loses**.

Game 4 - This game introduces a decimal point. The decimal point will take up one of the cells so this time the dice only needs to be thrown three times by each player. The winner is the one closer to the target. Choose a target.

Two possible versions:
- Each player decides in advance where they want to put the decimal point before taking turns to throw the dice.
- Each player throws the dice three times and **then** decides where to place the digits and the decimal point.

Again, two different scoring systems are possible.

Game 5 - This is the nasty version!

Play any of the games above. Only this time you can choose to keep your number rolled and put it in one of your cells, **OR** give it to the adult and tell them which cell to put it in! It's really important to take turns to start each round if this game is going to be fair.

Reflection:
What winning strategies can you come up with?
Why are some cells more significant than others?

Easier version: start with two or three boxes. Choose the easiest scoring system, or use a calculator to keep score.

Harder version: try using more than four boxes, or use more complicated scoring systems.