LIONHEART ACADEMIES TRUST – MATHS: 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 is 151.

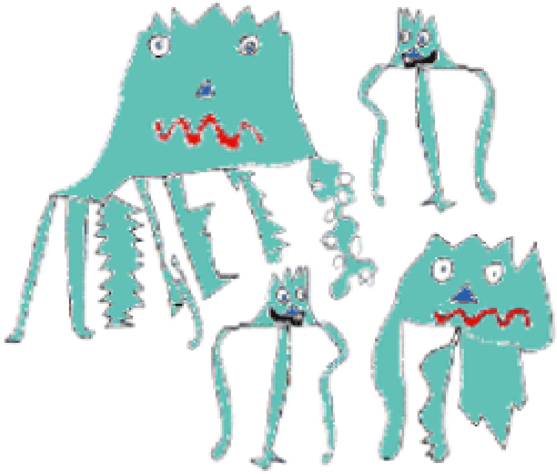
Try a few examples of your own.

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?

On the planet Vuv there are two sorts of creatures. The Zios have 3 legs and the Zepts have 7 legs.



The great planetary explorer Nico, who first discovered the planet, saw a crowd of Zios and Zepts. He managed to see that there was more than one of each kind of creature before they saw him. Suddenly they all rolled over onto their backs and put their legs in the air.

He counted 52 legs. How many Zios and how many Zepts were there?
Do you think there are any different answers?

Flora had a challenge for her friends.
She asked, "Can you make square numbers by adding two prime numbers together?"

Ollie had a think.
"Well, let me see... I know that 4 = 2 + 2. That's a good start!"

Have a go yourself before reading any further. Try with the squares of the numbers from 4 to 20.

Once you have had some initial ideas, look at how three more of Flora's friends started the problem:

Bailey said: *"I made the square numbers out of cubes and tried taking a prime number of cubes away and seeing if it left a prime number of cubes."*

Dina said: *"I wondered whether noticing that 2 is the only even prime number was important."*

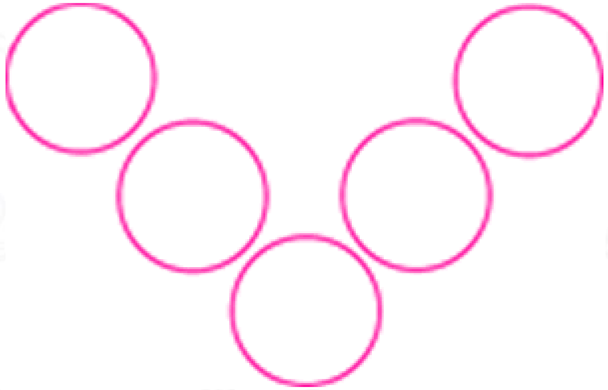
Shameem said: *"I listed the prime numbers up to 100 and then I listed the squares of the numbers from 4 to 20."*

Did you go about the task in the same way as any of these children?
What do you like about each method?

Continue working on the problem. You might like to adopt Bailey's or Dina's or Shameem's approach.

Did you find any square numbers which cannot be made by adding two prime numbers together? Why or why not?

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?

What can you discover about a V that has arms of length 4 using the numbers $1–7$?

As I walked down the street this morning, I noticed that all of my neighbours' house numbers were odd!

I added three house numbers together as I walked past: 7 + 9 + 11 = 27
Further down the road, I passed some bigger numbers. I added another set of three neighbouring house numbers: 15+17+19 = 51

Can you find some other totals I could make, by adding together the house numbers of three (odd) next-door-neighbours?

Once you've found a few totals, here are some questions you might like to explore:

Is there anything special about all the totals?
Is there a quick way to work out the total?
Can you predict what would happen if I walked down the other side of the street instead (where all the houses have even numbers)?

Are there any patterns if I add together four house numbers instead of just three?
Or five house numbers?
Or...

Can you explain and justify the patterns you have noticed?

nrich.maths.org/housenumbers

LIONHEART ACADEMIES TRUST – MATHS: Shape Times Shape

The coloured shapes stand for eleven of the numbers from 0 to 12. Each shape is a different number.

Can you work out what they are from the multiplications below?