Cross sums

Children arrange numbers 1 to 5 on a cross to show that the row and column have the same total.

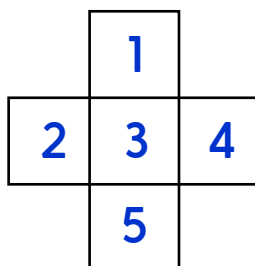## Skill practised:

- Adding three single-digit numbers

Conjecture: It is possible to arrange numbers 1 to 5 in a cross such that the row and column have the same total. We can say how many ways there are to do this.

What to do:

Children work individually or in pairs.
Children will need a set of 1 to 5 digit cards.

1. Ask children to arrange their five cards in a cross like this:

2. They find the total of the three numbers going down, i.e. 1 + 3 + 5, and then a total of the three numbers going across, i.e. 2 + 3 + 4. What do they notice?
3. Ask them to keep 3 in the middle but rearrange the other cards so that both lines on the cross still have the same total.
4. Ask children to put 1 in the middle and see if they can place the other cards so that each line has the same total. But this total will be different from before!

Children repeat this with 2, 4 and 5 in the middle. Which middle numbers are possible and which aren't? What do children notice about the central numbers which are possible?

CHALLENGE: Can children say how many ways are possible in all?

Can children apply what they have learnt to arrange numbers 2, 3, 4, 5 and 6 in a cross, with each line having the same total?
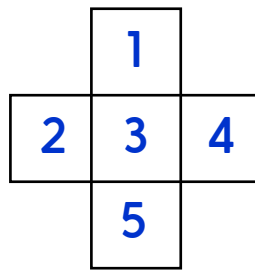
Aims:

- To use trial and improvement
- To understand that some central numbers give possible solutions and others don't
- To find a total number of ways and demonstrate that this is all the possible solutions

Minimum number of calculations expected

10

Cross sums

1. Arrange your five cards in a cross like this:

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      1
  2   3   4
      5
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2. Find the total of the three numbers going down and then a total of the three numbers going across. What do you notice?

$1 + 3 + 5 = 9$
$2 + 3 + 4 =$

3. Now keep 3 in the middle but rearrange the other cards so that both lines on the cross still have the same total.

4. Put 1 in the middle and see if you can place the other cards so that each line has the same total. This total will be different from before!

Repeat with 2, 4 and 5 in the middle.
Which middle numbers work? Which don't?

What do you notice about the central numbers which are possible?

Challenge

Can you say how many ways are possible in all?
Can you arrange the numbers 2, 3, 4, 5 and 6 in a cross, with each line having the same total?