Playing Cards Revisited – Additive and Multiplicative Reasoning Y5/6

Day 1

- This week you need to cut a piece of paper into ten pieces and number them zero to nine or you can use ten playing cards, ace to nine plus a joker to act as a zero.
- You may also need a calculator. There are calculators on phones, laptops and other devices. Here's a link to one: https://www.online-calculator.com/
- Lay out the cards from 1 to 9 in order in front of you.
- Choose any three consecutive digits to make a three-digit number. For example, 123 or 567.
- Consider if it is a multiple of 3. You can check this by entering your number in a calculator and pressing '÷' '3' '='. If you get a whole number answer, your number **is** a multiple of 3. For example,
    - 123 ÷ 3 = 41 so 123 is a multiple of 3
- Choose another three consecutive digits and see if the three-digit number is a multiple of 3.
- Keep repeating; what do you notice? Why do you think this is?

Notes for adults working with groups of children

- Help the children to work systematically and encourage the children to describe any patterns they see. For example they could start with the first three digits, 123, then move along 1 and try the next three digits, 234 etc. There will be other ways to be systematic.

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Day 2

- Lay out the cards from 1 to 9 in order in front of you.
- Choose any three consecutive digits to make a three-digit number. For example, 123 or 567.
- You already know from Day 1 that your number is divisible by 3.
- What happens if you jumble the digits up? For example:
    - Rearranging 123 could give you 132, 213, 231, 312 and 321
- Find all the possible arrangements of your three digits and check each one to see if it is a multiple of 3.
- What do you notice?
- Pick another three consecutive digits and repeat.
- What do you notice now? Is this always true?

Notes for adults working with groups of children

- Help the children to work systematically and encourage the children to describe and explain any patterns they see.

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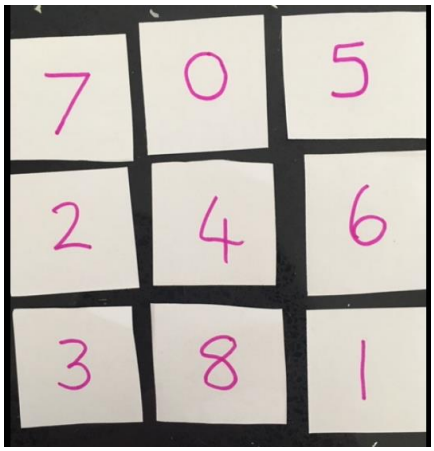
Day 3

- You will need cards 0 to 8 to make a magic square.
- In a magic square every column, row and diagonal adds up to the same number.

  In this example of a magic square each row, column and diagonal adds up to 12. For example:

  - the top row 7 + 0 + 5 = 12
  - the left hand column 7 + 2 + 3 = 12
  - the diagonal top left to bottom right 7 + 4 + 1 = 12

  Check the other rows, columns and diagonal for yourself.



- Using your numbers from 0 to 8 see if you can complete this magic square where each row, column and diagonal also add up to 12.

	8	
2		6
7	0	

- Find other ways to make a magic square for 12 using the same cards.
- What do you notice about the centre number each time?

Notes for adults working with groups of children

- Explore the relationship between the centre number and the 'magic number' (total of each row, column and diagonal).
- Encourage the children to consider the pairs of numbers on either side of the centre number and to explain what they notice and why this has to be.

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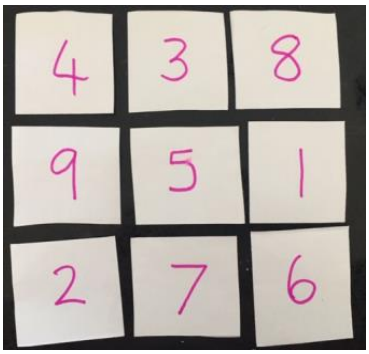
Day 4

- Below is another magic square. Check that the sum of each row, column and diagonal is the same. This is the ‘magic number’ for this square.



- What do you notice about the centre number and the magic number?
- Using the cards from 1 to 9 see if you can make another magic square with the same ‘magic number’ as the square above.
- See if you can find more than one new magic square with the same magic number.
- Can you create a magic square with the magic number 18? Where did you start to make this easy?

Notes for adults working with groups of children

- Explore the relationship between the centre number and the ‘magic number’ and encourage the children to use this to create more magic squares.

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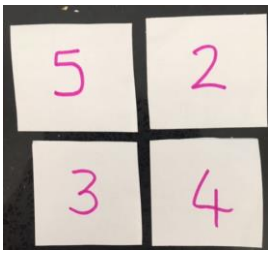
Day 5

- Using the cards 1 to 9, choose four cards and arrange them in a two by two grid. For example:



- There are two ways to read the numbers. Reading from left to right you can see 52 and 34. Add these numbers together, 52 + 34 = **86**
- Reading from top to bottom you can see 53 and 24. Add these numbers together, 53 + 24 = **77**
- The total of these four numbers is 163 (**86** + **77** = 163)
- Now rearrange the same digit cards and add up the four new two-digit numbers. Write down the total.
- How many different totals can you make using the same four cards? What's the smallest total you can make with your cards? What's the largest total?
- Can you find four cards that you can arrange to give you a total of 100 exactly? It is possible! Can you find more than one way?
- What if the total is 200?

Notes for adults working with groups of children

- Help the children to work and record systematically to ensure they have considered all possibilities. For example, first put the largest number in the top left hand corner and arrange the other three numbers and then move these around, keeping the top left number the same. There will be other ways to be systematic.

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