# CHALLENGE!
WHAT IT LOOKS LIKE IN SCHOOL AND WHAT IT COULD LOOK LIKE AT HOME.

WHAT THE NATIONAL CURRICULUM SAYS

The national curriculum for mathematics aims to ensure that all pupils:

- become fluent in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.

- **reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language.

- can **solve problems** by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

CHILDREN OF ANY AGE CAN REASON
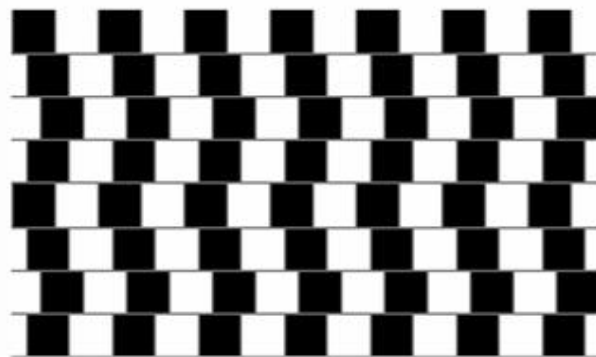
Odd one out???

KEY IDEAS

- Reasoning involves describing, explaining, evaluating, speculating, justifying, arguing.

- Exploring and not finding solutions. Not always the '*What*' but often the 'why'.

- Key questions can add reasoning to any task.

Describe Explain Speculate

Justify

Evaluate Compare Convince

QUESTIONS TO GENERATE REASONING IN ANY TASK

What can you see? What do you notice?

Is there another way?

How do you know? Why is that?

Is it always true?

What if?

Why is that ?

What else do you know?

Is it easy or hard? Is there a better way?
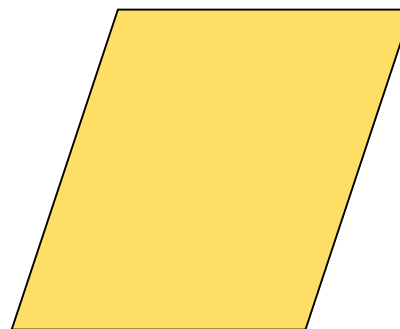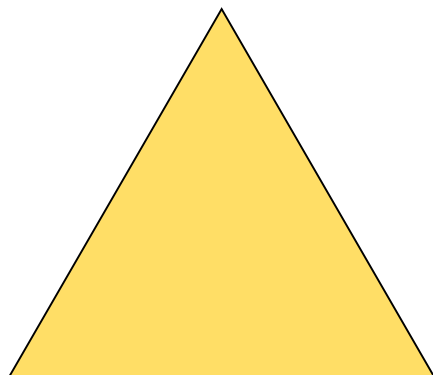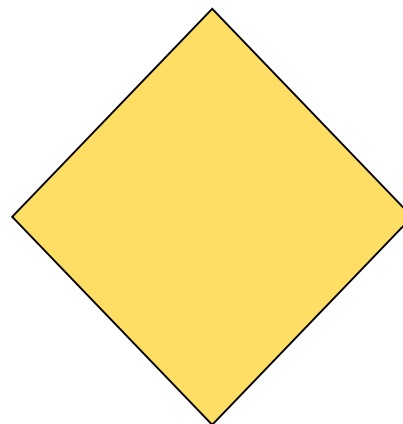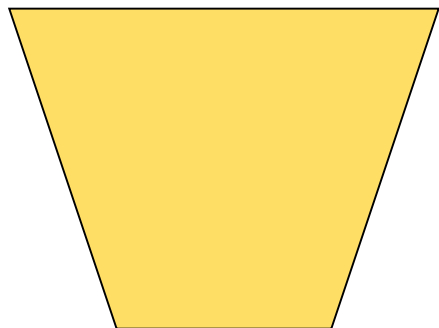
What is your favourite way?

ODD ONE OUT

32   36   45

ODD ONE OUT

TRUE OR FALSE?

- I start at 2 and count in twos. I will say 9

- ¾ of 12cm = 9cm

- 38 is a multiple of 8
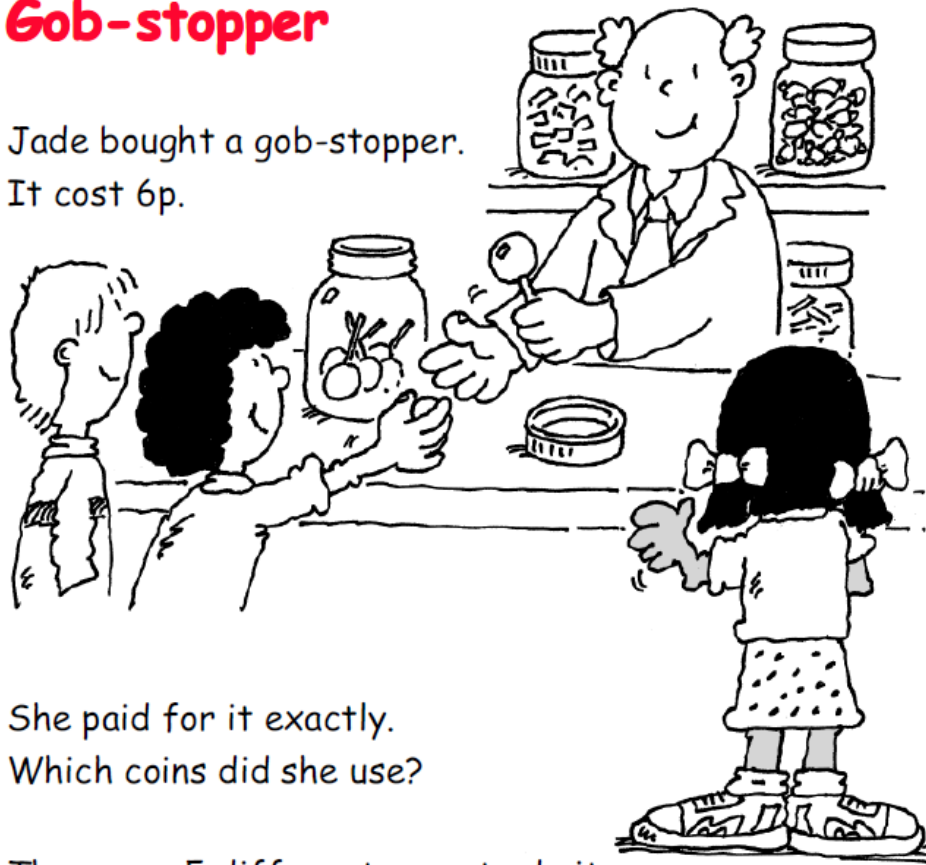
- 2/10 of 20cm = 2cm

- 0.1 of a kilometre is 1m

ALWAYS, SOMETIMES, NEVER

- When you add 10 to a number the answer is a multiple of 10?

- When you cut a square in half you get a triangle?

- Numbers that end in 3 are odd?

PROBLEM SOLVING

Gob-stopper

Jade bought a gob-stopper.
It cost 6p.

She paid for it exactly.
Which coins did she use?

There are 5 different ways to do it.
Find as many as you can.

What if the gob-stopper cost 7p?

TYPES OF PROBLEMS

- Word problems
- Finding all possibilities
- Visual problems
- Logic problems
- Rules and patterns

VARIATION

It is more challenging to solve one problem 5 ways, than 5 problems the same way.

IN THIS DIAGRAM SHAPES REPRESENT NUMBERS. THE SUM OF EACH ROW IS SHOWN AT THE SIDE. FIND THE VALUE OF EACH SHAPE.

GONE ARE THE DAYS OF JUST PAGES OF CALCULATIONS

Mastery with Greater Depth

There are six 3-digit addition calculations shown below.

a)   124
    + 233
    _____

b)   644
    + 172
    _____

c)   366
    + 277
    _____

d)   579
    + 221
    _____

e)   791
    + 163
    _____

f)   567
    + 233
    _____

Which calculations have no carry digits?

Which calculations have a carrying digit only once?

Which calculations have a carrying digit twice?

Which calculation has the largest answer?

Which calculation has the smallest answer?

Check that children are looking at the numbers involved, rather than doing the calculations.

PROBLEM-SOLVING SKILLS

1. Getting started
   try a simpler case   draw a diagram
   represent with model   act it out
2. Working on the problem
   visualise   work backwards
   reason logically   conjecture
   work systematically   look for a pattern
              trial and improvement
3. Going further
   generalise   prove
4. Concluding
       communicate findings
   reflect on efficiency of method & elegance of solution

HOW CAN YOU HELP AT HOME?

Fluency is key:

- Number facts
- Including subtraction facts as well
- Doubles and halves
- Skip counting
- Times tables and related division facts
- Practise, practise, practise!

Other activities can include:

- Practise writing number formation
- Match words to numbers
- Think and talk like a mathematician
- Dice games
- Try to make it fun so they don't actually realise they are doing the maths.

DICE GAMES

Tug of war – Nrich website

One player is called "PLUS"
The other is called "MINUS" so decide who is who.
Plus moves from left to right and Minus moves from right to left. (The children may be encouraged to think about why that might be.)
Take it in turns to throw the two dice and add up the numbers on the two dice.
Move that number of places in your direction.
If the counter reaches 1, Minus has won and so, of course if the counter reaches 27, Plus has won.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27

Strike it Out

Try this game: draw a number line from 1 to 20. The first player picks two numbers, crosses them out and circles either their sum or their difference. The second player crosses out the circled number and another number that's still left, and again circle the sum or the difference.

The winner is the person who stops their opponent from being able to move!

Thousands more problems can be found on the NRICH maths website:

http://nrich.maths.org

HELP WITH TIMES TABLES

ANOTHER USEFUL RESOURCE

- https://nrich.maths.org/

You can then pick maths games or investigations that link to the maths that has been taught that week/ block.

USEFUL WEBSITES AND RESOURCES TO PROMOTE MATHS LEARNING

Useful websites and resources to promote challenge

- Nrich - https://nrich.maths.org/

- NCETM – National Centre for Excellence in Teaching Mathematics - https://www.ncetm.org.uk/

- White Rose Maths Hub planning with reasoning and problem solving

- http://www.sowevalleyprimary.co.uk/documents/DiceGames-plus.pdf

- https://www.oxfordowl.co.uk/for-home/maths-owl/help-with-times-tables

- Question prompts (see handout)

QUESTIONS