

Opening up the maths learning

Below are some ideas, strategies, games that can be used to open up the maths learning. Many of them can be adapted to use with various areas of maths from number to measure to shape and they can be adapted to use across key stage one and two.

The activities can be used and adapted for mental starters, main teaches, guided groups, group work, in a plenary or as a challenge.

Always, Sometimes, Never True

Always, sometimes and never true involves children discussing statements, trying out multiple ideas and drawing a conclusion. Children can be encouraged to agree, disagree, question and challenge one another.

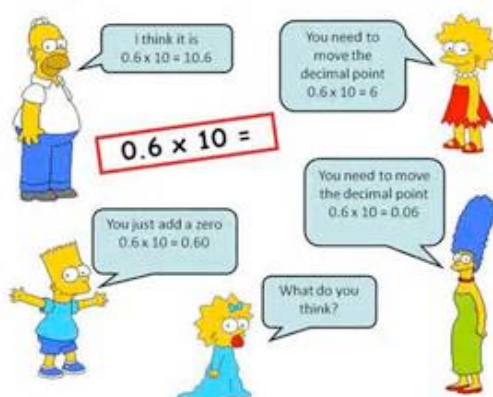
Ideas for possible statements:

- *whole numbers that end in 3 are divisible by 9*
- *the sum of any three consecutive numbers is a multiple of 3*
- *numbers that are multiples of both 8 and 5 are multiples of 20*
- *it is always possible to form a triangle from any three sticks chosen from three 4 cm sticks and three 9 cm sticks*
- *a quadrilateral with three equal sides must be a trapezium.*
- *All prime numbers are odd*
- *If the digits of any number add up to a multiple of 3, then the number is divisible by 3*
- *Multiplying by any number always makes the result larger*
- *Adding something to a number always makes it larger*
- *Subtracting something from a number always makes it smaller*
- *Dividing a number by something always makes it smaller*

The possibilities of statements are endless...

Concept Cartoons

Concept cartoons are a powerful tool for promoting children's thinking, provoking discussion and mathematical reasoning. They are a quick way to identify common mathematical misconceptions on a topic area. Concept cartoons can be designed for any mathematical topic and involve four or five possible answers which have scope for discussion.



There are some electronic samples of concept cartoons here:

<http://www.millgatehouse.co.uk/wp-content/web-examples/cc-maths/cc12.html>

<http://www.millgatehouse.co.uk/wp-content/web-examples/cc-maths/cc32.html>

<http://www.millgatehouse.co.uk/wp-content/web-examples/cc-maths/cc56.html>

<http://www.millgatehouse.co.uk/wp-content/web-examples/cc-maths/cc88.html>

Attached to this document are some examples of concept maps developed by a maths team which can be used and adapted.

Mistake Spotter

Mistake spotter can be applied to any areas of maths and involves the children identifying where mistakes have been made and thinking about why specific mistakes have been made. This activity is a powerful in allowing children to learn from mistakes, whether it be their own or someone else's.

Key questions to promote discussion:

Explain what the child has done/what strategy has been used

What is unclear about the learning/method/strategy?

What questions would you like to ask this child?

What advice would you give this child when tackling... again?

Ninety-six children are in each year group. How many children are there in three year groups.

$$95 \times 3 = 308$$

x	90	5
3	290	8

Number cards/Dice games

Number cards and dice games can be used in lots of areas of maths and with a little imagination can allow children to generate their own maths learning eg: by generating numbers to round/generating numbers to calculate/generate numbers to work out place value.

Number card and dice games can be found on nrich:

<http://nrich.maths.org>

Example games from Nrich

Nice and Nasty Numbers

Nice Numbers

2 players.

Each player draws 3 squares for a three-digit number:

A)

--	--	--

B)

--	--	--

Player A rolls a 10 sided die and puts the number in one of their squares.

Player B does the same.

Continue until all 6 boxes are filled.

Winner is the player who has made the largest three-digit number.

Variations:

Lowest number wins

Nearest to 500 wins

Largest even number wins

If the difference between the final numbers is less than 500, player A wins; if greater than 500, player B wins

Add a decimal point to the squares – closest to 1 wins

Digits can only be used once – e.g. if 7 is rolled a second time, roll again

Add scoring system – e.g. Largest number wins. The difference between the two numbers is the number of points scored by winner for that round.

Nasty Numbers

When you roll the die, you can choose to either put the digit in your grid or put it somewhere in your opponent's grid.

Variation:

Only have one 'nasty' number each game – choose when to use it; or have 2nd roll must be put in one of opponent's squares, etc...

Example number cards game

1, 2, 3, 4

Using the number cards 1, 2, 3 and 4 and +, -, x and ÷ symbols make the numbers from 1 to 30.

Each of the numbers has to be used every time, for example $1 + 2 + 3 + 4 = 10$.

Example dice game from Nrich

The Tug of War Game 1

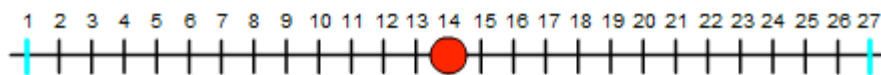
A game for two players

One of you is Plus and goes from left to right,

the other player is Minus and goes from right to left.

Take turns to throw two dice. Add the scores to see how far you go.

If the counter gets to 1, Minus wins. If the counter gets to 27, Plus wins.



Discs



Each disc has another number (not necessarily the same) written on the reverse side.

Tossing the discs in the air and then adding the numbers on the uppermost faces, the totals 9, 10, 11 and 12 can be produced.

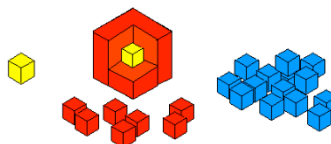
What numbers are written on the reverse sides of the discs?

With different numbers on the reverse, can you produce different sets of four consecutive numbers as totals?

How many different consecutive totals can you find?

Visualisations

Visualisations allow children to use visual images to support their maths thinking. We rely on visualising when solving problems, therefore it is a good idea to practise visualisations regularly some children can use this strategy when solving problem solving activities/tasks. Visualisations in problem solving tasks may need to be modelled by teachers asking key questions, for example the teacher below asks probing questions to encourage a number of visualisations by the children.



Supporting pupils in modelling situations
 Ask the children to imagine they have an unlimited supply of interlocking cubes (all the same size) in different colours.
 Invite them to imagine starting with one yellow cube.
 This is covered all over with a single layer of red cubes.

Describe what you see:

- How many red cubes touch the yellow cube face-to-face?
- How do the cubes along the edge of the red cube touch the yellow cube?
- How many red cubes touch the yellow cube in this way (careful)?
- How do the red cubes in the corners of the large red cube touch the yellow cube?
- How many touch in this way?
- How many red cubes are there altogether?
- How many red and yellow cubes?
- Can you explain why?

Some examples of visualisations which have been developed by Leicester schools have been attached to this document.

Odd one out

The odd one out activity allows children to use their reasoning skills to explain the odd one out. Children should be encouraged to explain how or why a number/shape/calculation etc. is the odd one out. Again the odd one out activity can be adapted to various areas of maths.

Odd one out?
 16, 64, 27, 8, 32

The odd one is 27 as the others are in the 8x table

This activity can be used to challenge pupils further by encouraging children to generate more than one reason why a number might be the odd one out.

You can always choose numbers where there is no set odd one out and this encourages children to think creatively in order to develop their mathematical thinking.

Odd one out?
7 11 14

Children may think creatively, for example 11 is the odd one as it is the only prime number or 7 is the odd one as it is the only single digit number. The more open ended they are the better; this avoids the child guessing the answer in the teacher's head!

Calculations

It is crucial that children are confident at using their written methods for addition, subtraction, multiplication and division. Therefore children do need time to practise them but working through a list of calculations is a mundane, closed activity. It is important children get to practise and apply their calculation methods to new situations.

Here are some examples:

Targets board

Children are given a target number to achieve using the numbers on the target board.

For example:

Can you make the number 78 in less than five attempts?

What is the greatest total you can make when adding three of the digits?

Can you create a number bigger than 500 using addition, subtraction and two numbers of the target board?

Target number: 456

Example Target board

45	321	758
678	12	18
241	32	9

Questions on target boards can be adapted to the operation or level of challenge but questions should be as open as possible allowing children to try out multiple calculations.

The answer is...what is the question?

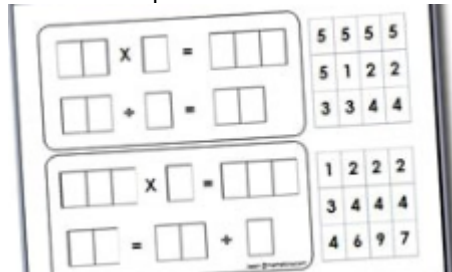
The children are provided with a possible answer and children have to generate their own question. This allows children to think creatively without the constraint of one set answers which they must get right.

The answer is £5.67, what is the question?

Missing Digits

Children are provided with calculations but they must work out the numbers in order to make the calculations correct. This encourages children to try out different ideas and refine ideas themselves. It also ensures that children recognise that maths is not always about the end product but the process in order to arrive at the end product.

For example:



$$\begin{array}{r} 30 \\ + 28 \\ \hline 526 \end{array}$$

$$\begin{array}{r} 43 \\ + 18 \\ \hline 605 \end{array}$$

Open ended calculation activities

Integers to 10

Pick 2 integers (whole numbers) which add to 10. (3 and 7)

What is their product? (21)

Is this the maximum product with a pair which add to 10?

What is the maximum product? Why do you think that is?

Which 2 integers which add to 20 will give the maximum product? How will you prove it?

What about other numbers?

What about 3 integers which add to 10? What is the maximum product?

3 integers that total 20...?

4 integers...

...etc...

Palindromes

Think of a three-digit number. Reverse the digits to generate a second number. Subtract the smaller from the larger. Reverse the digits again. Add the two new numbers.

e.g. 341
 143

 198
 891

 1089

Do you always get 1089? If so, why?

Try with 2, 4, 5 digit palindromes.

Useful Questions to promote mathematical thinking/reasoning

Several different questions can be useful in probing pupils' thinking.

- Why do you think that ...?
- Can you explain why that is right?
- How do you know?
- How did you reach that conclusion?
- What might explain that ...?
- How is that possible?
- Can you show me ...?
- Is there another way ...?
- What explanation do you think is best ...?
- Have you tried all the possible cases?
- Does it always work? Why?
- What do you notice when ...?

Once pupils' thinking is secure, then 'What if ...?' questions can be used to promote new ideas and to extend the scope or context of the problem.

Useful ways to record mathematical thinking/reasoning

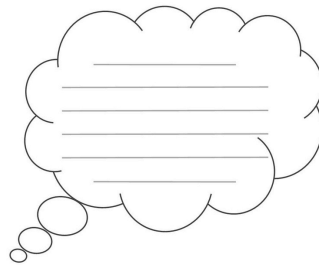
- Photographs
- Post it notes with what children have said
- Thought/speech bubbles where children record their thinking

Useful questions:

What did you find out?

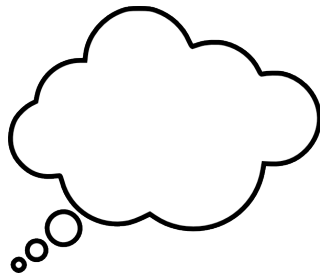
What worked well? What might you change if you were to repeat the activity?

What school values did you show in your maths learning today?

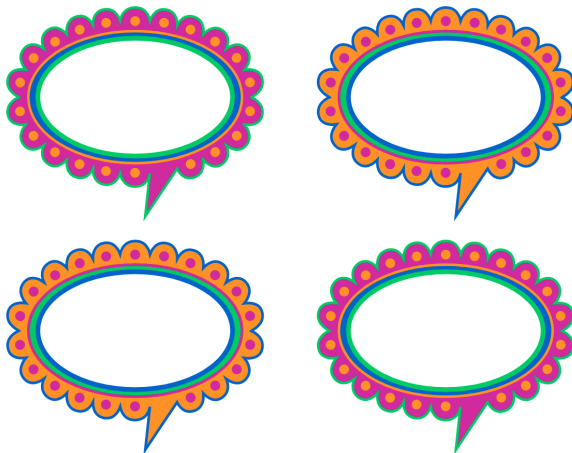


What I knew at the beginning of the lesson:

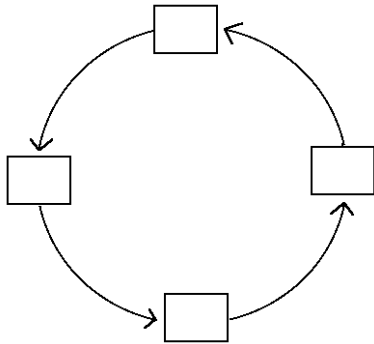
What I now know:



Record three things you have learnt or found out from the problem solving activity and one thing you want to investigate further



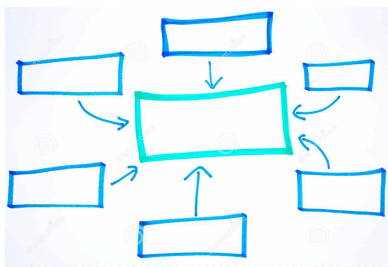
Record your thought process in the investigation/activity



Describe the steps you took in the investigation/activity

↓
↓
↓
↓

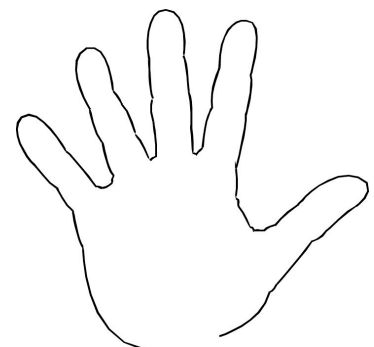
Record the six most important things to remember about.....
Eg: 3d shapes/solving word problems



What five things will you take from today's maths learning? Record on the hand.

Sources

Nrich
Nfer
Mill Gate House Publications
TES



Visualization Activities

Here is a collection of visualization activities, including ideas from some of our Leading Maths Teachers. Although they are grouped into key stages, the activities could all be adapted to make them easier / harder. The teacher's knowledge of the children should be used to decide to what extent visible images should be available to support thinking.

The teacher should seek to create opportunities for children to talk to each other and explain their thinking. The teacher should ask probing questions to encourage precise use of mathematical vocabulary.

KS1 Visualisations

Shapes

- Imagine a big blue triangle on the floor. How many points can you see? How many sides?
- Imagine holding a tin of beans and turning it round and round in your hands. How many circles can you see?
- Shut your eyes while I describe a shape to you. Now open your eyes. Can you pick up the shape I was describing?
- How many of these bricks / cubes do you think I could pack into this box? Try to picture it in your head.
- I've hidden a shape in this bag. Feel it and tell me what you think it is.
- Find a shape in the bag that is round. Find one with sharp points.

Number visualisations

- Imagine the number eight.
- Lay it on its side.
- Draw what this number looks like.
- Imagine a number 8.
- In your head, draw one line of symmetry.....draw 2 lines.
- Now draw on paper what you have seen and show a partner.

Number Visualisations – links with arrays/ dominoes/number beads

- Visualise 5 red dots. Talk to your partner about how they are arranged.
- Colour 3 of them green. How many red dots are left?
- Now imagine 5 blue dots, also. Talk to your partner about how they are arranged now.
- How many dots do you have altogether?
- Now arrange them differently.....talk.
- Teacher could make links to arrays, dominoes etc. E.g. arrange your dots in 2 rows. How many are in each row?
- Imagine a domino with a total of 5 red dots. How many dots are on each half of your domino? Could you arrange the dots another way?
- Look at this grid. Imagine the numbers 1, 2, 3, and 4 on your grid. What numbers have you placed on the top row? What is their total? What is the total of the bottom two numbers? What is the sum of all the numbers?

- Repeat with, for example, 3, 4, 5 and 6, or 2, 4, 6, 8, or 1, 3, 5, 7
- Look at this ladybird (with 3 spots on one wing). Imagine there are 4 spots on the other wing. How many spots altogether?
- Visualise a number track / number line. What number comes after 10 / before 10 / between 7 and 9?
- Visualise a number line that goes up in twos. A flea starts at 2 and makes 3 hops along the line. What number is it on now?
- Visualise an empty number line with 0 at one end and 10 at the other. Where would the number 5 go? The number 2? The number 9?

Ladder Visualisation

Explain that each step is 1 and that the ladder has 20 steps (these numbers can be altered). Consider using talk partners and encourage plenty of discussion. This can be linked to stairs and lifts.

Questions

- Start on step 1, take 3 steps up, what number will you be on?
- Start on step 1, take 5 steps up, what number will you be on?
- You are on step 5. How many more steps would you need to take to get to step 10?
- You are on step 7, how many more steps would you need to take to get to step 12?
- You are on step 10. You go down 3 steps, what number would you be on?
- You are on step 16, you go down 4 steps, what number would you be on?
- You are on step 19, how many steps would you have to go down to get to step 12?
- You are on step 3. Your friend is on step 9. How many steps would you need to take to be on the same step as your friend?
- How many steps would you need to take to be one ahead of your friend? What number would you be on?
- Is your number odd or even?
- Choose an even step. Go up 2 steps and back 3. Are you on an odd or an even number?
- Which step is halfway between 8 and 12?
- Now imagine each step goes up in 2s/5s/10s.
- Your friend is on the same ladder next to you. You both take 3 steps. What's the sum of the numbers you on?
- You are on step 4. Your friend is on step 12. How many steps ahead is your friend?

Clock Visualisation

Questions

- Start on number 1. Add 2. What number would you land on?
- What numbers would come after 10?
- What number is at the top of the clock?
- What number is at the bottom of the clock?
- What number is opposite 3?
- What number is between 9 and 11?
- What number comes after 12?
- What is the sum of numbers between 12 and 4?

KS2 Visualisations

Nets for 3D Shapes

- Give the children a cube net, (or various different cube nets). Ask them to imagine there is a semi-circle on the edge of one of the faces. Imagine making the cube. Where would the semi-circle touch?
- This could be repeated for other 3D shapes.

Coach Trip

- A coach has 56 seats for children.
- There is a central aisle, and each row has two seats each side of the aisle.
- The seats are numbered from left to right, starting at the front of the bus (don't include the driver).
- Which side of the bus will seat 5 be on? Seat 7? Seat 14? Seat 56?
- On the first row, which numbers are next to the windows?
- On the second row, which numbers are next to the windows?
- Will seat number 40 be next to a window? How do you know?
- What about seat 42? Seat 39?
- If you coloured all the seats that are a multiple of 4, can you visualize the pattern? Multiples of 3? Multiples of 5?
- Fred is sitting in seat number 13. Bob is sitting in front. What seat is Bob sitting in? What seat is behind Fred?

Position and Direction

- Imagine you are a weather vane. You are pointing North. The wind blows you ____ degrees clockwise. What direction are you now facing? Etc

Shape

- Describe a shape (using vocabulary appropriate to the year group. For example, in Year 4: curved, straight, faces, centre, radius, diameter, angle, right-angle, regular, irregular, concave, convex, 2D, line of symmetry, reflect, equilateral, isosceles etc)
- Ask children to draw a picture in their minds as you describe.
- Then ask them to sketch what they see, and compare their drawing with a partner's.
- Alternatively, ask each child to visualize a shape such as a triangle, or a quadrilateral. Then ask pairs to describe their shapes to each other, and discuss similarities and differences.

100 square

- Picture a 100 square
- Find your birthday / house number and describe to your partner where it is. Can they guess what it is from your description?
- What's the difference between the smallest and largest numbers on the square?
- What is their sum?
- What about the smallest and largest odd/even number?
- Where on the grid is 10? Where is 91?
- Start at 10. If you go on a diagonal path to 91 what numbers do you walk over?
- If you start at your birthday and go to your partner's birthday, describe your journey.
- Start on 18. You have to get to 22. Traveling only in horizontal or vertical lines, what numbers will you travel over? Which is the shortest journey? Longest journey?
- Choose a square on the 100 square. What number is one more, one less, above, below
- What number is in the square below? What about 2 squares below?
- Diagonally above / below? (relate to compass directions? NW, NE, SW, SE)
- Put a rectangle over 3 multiples of 10. What is the total? Difference between first and last?
- Cover 4 of the numbers with an L shape. What numbers are they?
- Picture the bottom row of your 100 square. Picture the number at the end of that row (bottom right corner).
- Now add a row. What would the last number be now?
- Now add two rows. What number is at the start of the final row (bottom left)? How many multiples of 2 are in that row? How many multiples of 5?
- **Challenge** How many rows would you need before you get a 2 in the 100's?
- Picture 11? What would the next palindrome (*a number which looks the same either way round, e.g. 22, 33, or with larger numbers e.g. 212, 9229*) be? Can you give your partner directions to it? What about the next one? And the next?
- What would the next odd palindrome be?
- Visualise 3 single-digit consecutive numbers. What is the sum of the 3 numbers? Try it with another 3 numbers. Try it with 3 two-digit numbers.
- What's the difference between the largest consecutive trio and the smallest?

Clock

A **geared** clock may be useful when discussing the answers to these questions, if children have found the visualisations difficult.

- Visualise an analogue clock.
- If the big hand moves 15 minutes around the clock, how many degrees is this?
- How many degrees if the hand moves 5 minutes? 30 minutes? 45 minutes? 1 hour? 2 hours?
- Put the hands on so that the time reads 3 o'clock.
- How many degrees clockwise will the big hand have turned for the time to now read twenty past three?
- What about the small hand?
- In Australia, the time is ten hours ahead. How many degrees does the small hand turn through to move the clock to Australian time? What about the big hand?
- The time is 3 o'clock. The big hand moves 270 degrees clockwise. What time is it now?
- The time now is 3 o'clock **after** the big hand has moved 270 degrees? What time was it?
- The big hand and small hand are in a straight line. What time could it be? What other possibilities are there?
- The big hand and small hand are perpendicular. What could the possible times be?
- The time now is three o'clock. What is the earliest time it could be for the angle between the big hand and little hand to be obtuse?

Co-ordinates

- Visualise a co-ordinate grid.
- Imagine you are a bug, standing at (1,2).
- You move 3 places to the left, where are you now? 2 places up – where are you now?
- Visualise a square with one of its vertices in the origin.
- Each side is 4 units long.
- What are the co-ordinates of each vertex?
- Now, translate this square +2 x. What are the co-ordinates now?
- Translate original square +3 y. What are its co-ordinates now?
- Now visualise all four quadrants.
- Translate original shape -3 x. What are the co-ordinates now?
- Go back to the original square. Take any vertex and move it two spaces away from square, what shape do you have now?

- Visualise a co-ordinate grid with all four quadrants.
- Visualise a right angled triangle in the first quadrant with its right angle at the origin, two units tall and two units wide.
- Reflect it across all four quadrants. What shape do you have now? How do you know?

Calendar

- Visualise a calendar for the month of April.
- The month of April has 30 days. The first day of the month is a Tuesday.
- What would be the date on the second Tuesday?
- The 3rd Tuesday?
- What day of the week would the 12th be?
- How many Tuesdays would there be in April?
- On what day of the week would the last day of the month fall?
- Explain to a partner how you worked it out, using jottings if needed.

The Sound of Coins

- Close your eyes and listen to the coins dropping into the tin. Count the sounds as the coins drop.
- I am dropping 2ps/5ps/10ps/20ps/50ps – how much money is in the tin?
- I have £____ in my hand. Count the coins dropping into the tin. How much do I have left?
- Count the 2ps dropping into the tin. How much is in the tin now? What if I had used 5ps instead?
- What if I doubled the amount of coins?
- I need to save £10 for a theatre ticket. Count the 50ps as I drop them in the tin. How much more do I need.
- Listen to me drop 5ps and 2ps into the tin. How much money might be in the tin now? Work with a partner to discuss what other possibilities you can find?

Talking REAL Maths

A resource to engage children in discussion based on common errors and misconceptions in mathematics.

ALGEBRA

Discussion mat	Suggested year group/KS	APP link
Simple Sequence	Lower KS2	L3 Alg 1 – Recognise a wider range of sequences
Balance Scale 1	Y2/Lower KS2	L3 Alg 2 –Begin to understand the role of ‘=’ (the ‘equals’ sign)
Balance Scale 2	Y2/Lower KS2	L3 Alg 2 –Begin to understand the role of ‘=’ (the ‘equals’ sign) L3 Calc 5 – Use mental recall of addition and subtraction facts to 20 in solving problems involving larger numbers
Coordinates	Upper KS2	L4 Alg 2 – Use and interpret coordinates in the first quadrant L4 SSM 3 – Reflect simple shapes in a mirror line, translate shapes horizontally or vertically and begin to rotate a simple shape or object about its centre or vertex

Two people are correct:

I think one of the missing numbers is 23.

I don't have enough information to work out the missing numbers.

...38, 33, —, —, 18...

18 and 33 are both in the 3 times table, so it must be jumping in 3's,

I think the last number will be zero.

I think the sequence is about subtraction.

I think we could have 8 on the left so $8 = 2+6$.

I think we could put two weights on the number 3 to still make 8.
 $3+3 = 8$.

I think this balance shows that $5+3 = 2+6$

I think I could take off the 2 and the 6 and just put a weight on the 8 so $5+3=8$

Sarah says that the equals (=) sign always has to come at the end of the number sentence so $2 + 6 = 8$. Is she right?

Who's is wrong?

Balance Scale 1

Balancing Scales

100

=

23 + 87

Which answer would you choose to evenly balance these scales?

The answer is 100 because I know that $20 + 80 = 100$.

The answer is 111 because I know that $20 + 80 = 100$
And $3 + 8 = 11$

111

110

90

Which two are correct?

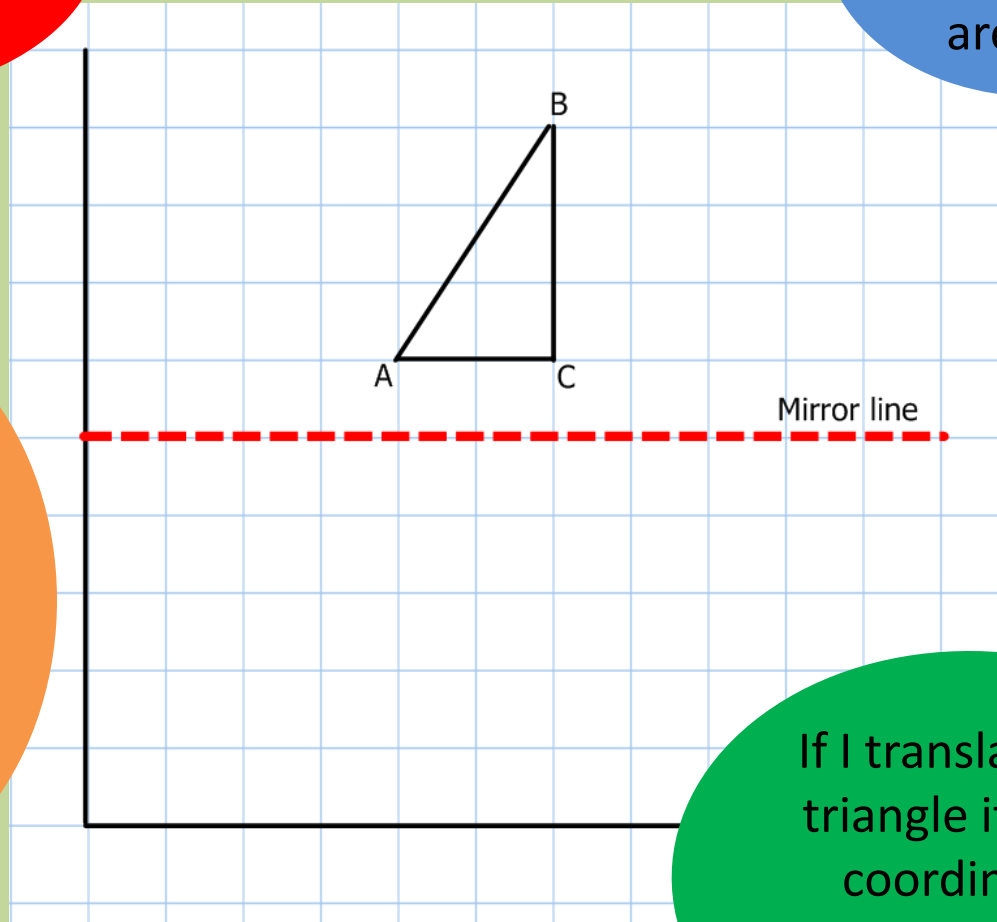
The coordinates of point A are (6,4)

The coordinates of point B are (6,6)

If I reflect the triangle in the mirror line the new coordinates will be (4,1), (6,1) and (6,4)

The mirror line is $y=5$

If I translate the triangle its new coordinates could be (4,1), (6,1) and (6,4)



NUMBERS AND THE NUMBER SYSTEM

Discussion mat	Suggested year group/KS	APP link
Cake Fractions 1	KS1	L1 NNS 4 – begin to use the fraction one-half L2 NNS 3 – Begin to use halves and quarters and relate the concept of half of a small quantity to the concept of half of a shape
Playground Balls 1	KS1	L1 NNS 4 – begin to use the fraction one-half L2 NNS 3 – Begin to use halves and quarters and relate the concept of half of a small quantity to the concept of half of a shape
Playground Balls 2	Y2/Lower KS2	L2 NNS 3 – Begin to use halves and quarters and relate the concept of half of a small quantity to the concept of half of a shape
Place Value	Y2/Lower KS2	L3 NNS 1 – understand place value in numbers to 1000
Pizza Fractions 1	Lower KS2	L3 NNS 4 – Use simple fractions that are several parts of a whole and recognise when two simple fractions are equivalent.
Chocolate Fractions	Lower KS2	L3 NNS 4 – Use simple fractions that are several parts of a whole and recognise when two simple fractions are equivalent.
Cake Fractions 2	Lower KS2	L3 NNS 4 – Use simple fractions that are several parts of a whole and recognise when two simple fractions are equivalent.
Smarties Fractions	Lower KS2	L3 NNS 4 – Use simple fractions that are several parts of a whole and recognise when two simple fractions are equivalent.
Tricky Sequence	Upper KS2	L4 NNS 1 – recognise and describe number patterns
Pizza Fractions 2	Upper KS2	L4 NNS 4 – Recognise approximate proportions of a whole and use simple fractions and percentages to describe these



When you've made the cake you can share it between you!

Which of the thought bubbles show the cake being shared in half?

Mr Newman has asked us to put $\frac{1}{2}$ of the balls into the skipping circle.



I'm going to put one ball in the circle because 1 is the top number



I don't think I can do this because if I cut a ball in half then the next group can't use it



I think he wants 6 balls because if you put the balls into two groups there will be 6 in each group.



I will put 3 balls in because $\frac{1}{2}$ means $1 + 2$



Mr Newman has asked us to put $\frac{1}{4}$ of the balls into the skipping circle for the next group.



I'm going to put one ball in the circle because 1 is the top number



I think he means 5 because $\frac{1}{4}$ is $1 + 4$



I think he wants 6 balls because if you put the balls into two groups there will be 6 in each group.

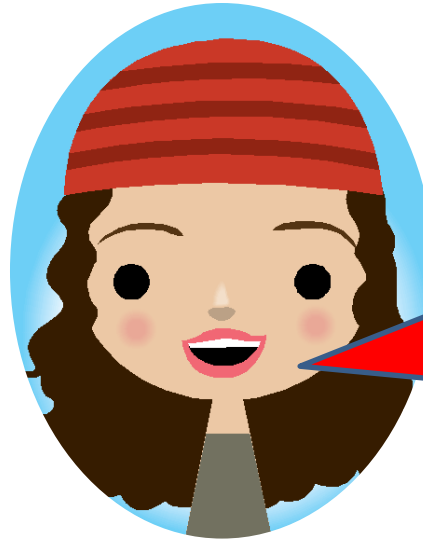


I will put 3 balls in because if I put the balls into 4 equal groups there will be 3 balls in each group and 3 lots of 4 is 12



Daisy, Kyle and Luke have been learning about adding tens to three-digit numbers

When you add 10 to a three-digit number the hundreds digit always stays the same!

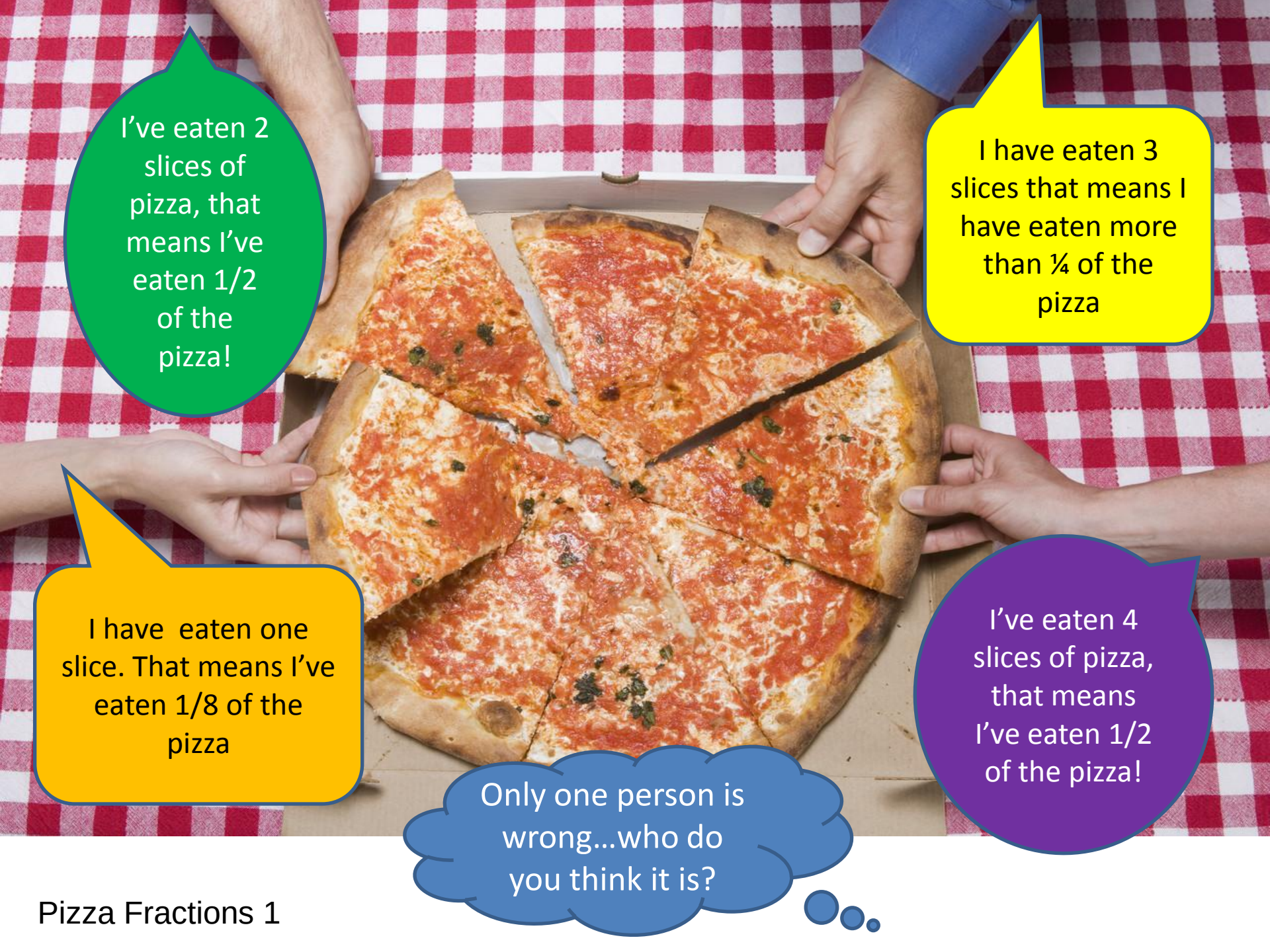


I think when you add 10 the units digit always stays the same.

I'm not too sure...what do you think?



354
364
374
384



I've eaten 2
slices of
pizza, that
means I've
eaten $\frac{1}{2}$
of the
pizza!

I have eaten 3
slices that means I
have eaten more
than $\frac{1}{4}$ of the
pizza

I have eaten one
slice. That means I've
eaten $\frac{1}{8}$ of the
pizza

I've eaten 4
slices of pizza,
that means
I've eaten $\frac{1}{2}$
of the pizza!

Only one person is
wrong...who do
you think it is?

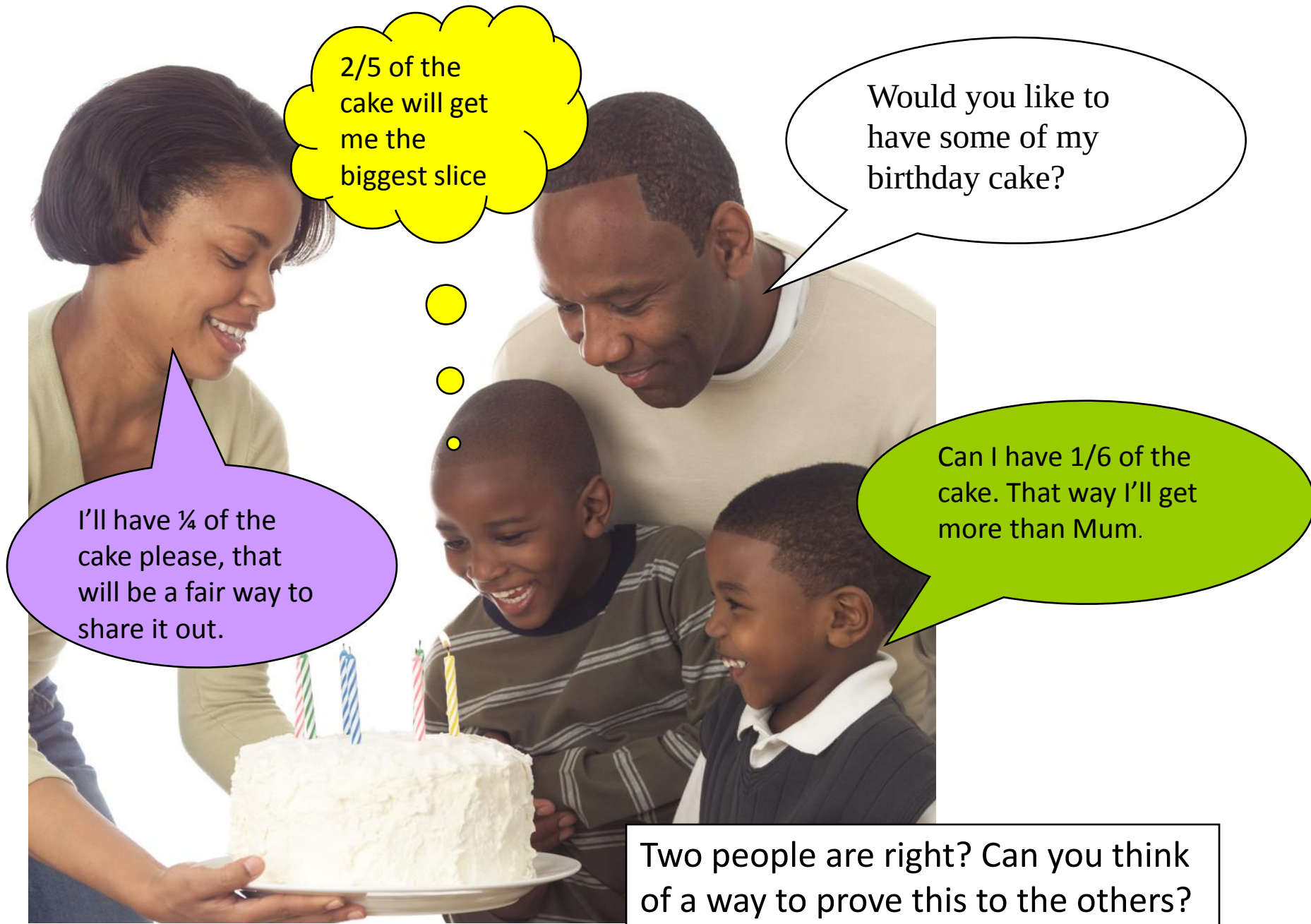
CHOCOLATE CHALLENGE

- How many pieces would half be?
- Write a fraction for this chocolate bar that is an equivalent to $\frac{1}{4}$
- What fraction of the bar would 2 squares be?
- Describe a quarter of this bar?
- Describe a third of this bar?



Even harder!!

What is the maximum number of people I could share this bar with?



Convince me that
this child is wrong:

6 Smarties are blue
so that means: $\frac{6}{15}$

is the fraction of
blue Smarties here.

There are 21 Smarties



What
fraction of
the Smarties
are green?

Draw a diagram to
convince me that
the fraction of green
Smarties is bigger
than the fraction of
red Smarties.

What is this child doing
wrong?

Fraction of red Smarties $\frac{21}{4}$

Explain what you would
do to help.

Only one person is correct.

I think 88
will be in the
sequence

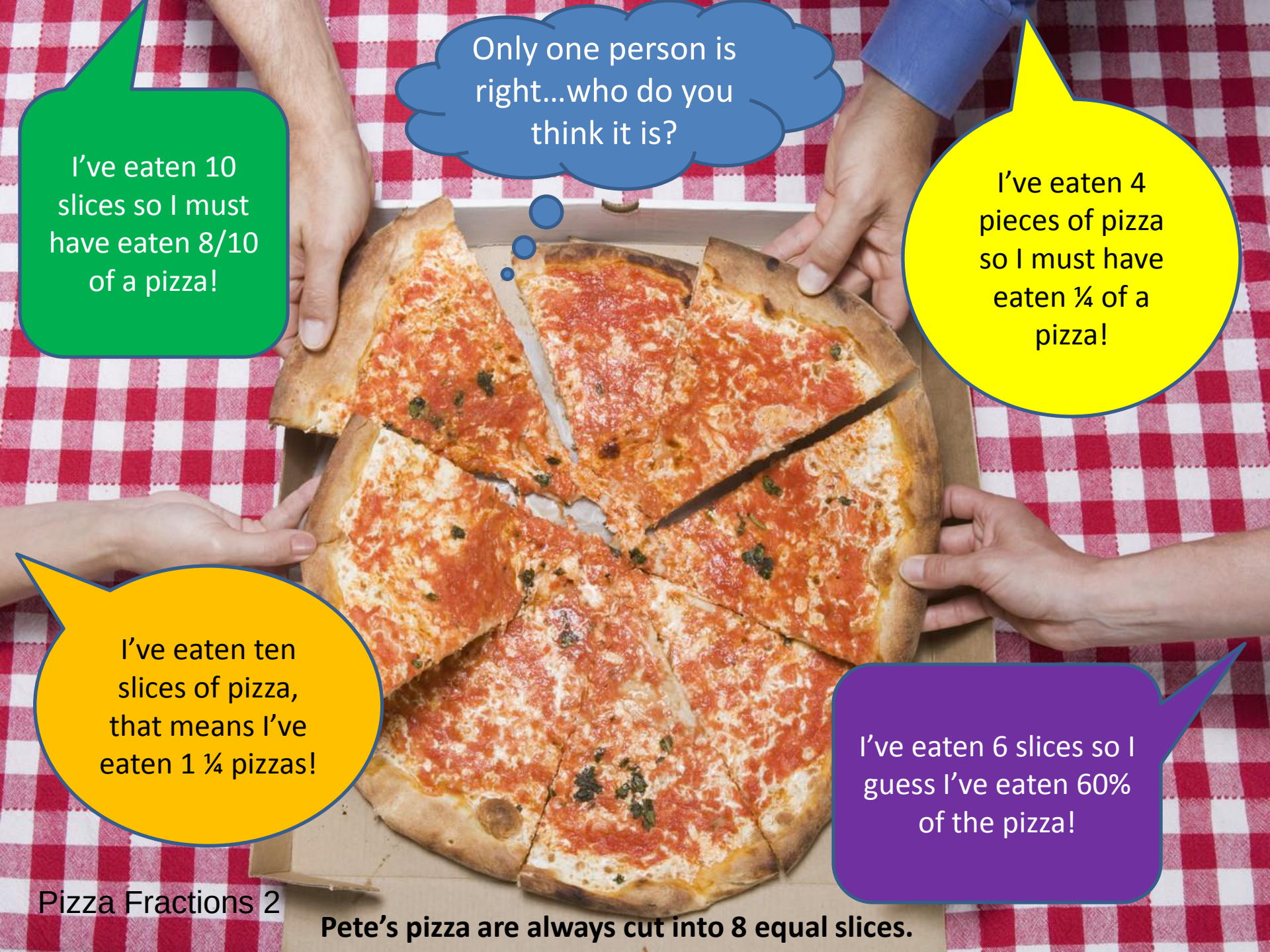
I think the
missing
number after
33 is $25\frac{1}{2}$

... 33, —, —, 18 ...

The difference
between 33 and
18 is 15 so it must
be counting in
steps of $7\frac{1}{2}$

The first negative
number in the
sequence will be
-3

What do you think the two
missing numbers are?



Only one person is
right...who do you
think it is?

I've eaten 10
slices so I must
have eaten $\frac{8}{10}$
of a pizza!

I've eaten 4
pieces of pizza
so I must have
eaten $\frac{1}{4}$ of a
pizza!

I've eaten ten
slices of pizza,
that means I've
eaten $1\frac{1}{4}$ pizzas!

I've eaten 6 slices so I
guess I've eaten 60%
of the pizza!

CALCULATING

Discussion mat	Suggested year group/KS	APP link
Purses	Y2/Lower KS2	L2 calc 3 – use mental calculation strategies to solve number problems including those involving money and measures
Starburst	Y2/Lower KS2	L2 calc 3 – use mental calculation strategies to solve number problems including those involving money and measures
Make 50	Y2/Lower KS2	L3 Calc 2 – add and subtract two digit numbers mentally
Toy Shop	Lower KS2	L3 Calc 5 - Use mental recall of addition and subtraction facts to 20 in solving problems involving larger numbers L3 NNS 5 – Begin to use decimal notation in contexts such as money
World Cup stickers	Lower KS2	L3 Calc 5 - Use mental recall of addition and subtraction facts to 20 in solving problems involving larger numbers L3 Calc 6 – Solve whole number problems including those involving multiplication or division that may give rise to remainders
Chocolate box	Upper KS2	L4 Calc 3 – use efficient written methods of addition and subtraction and of short multiplication and division
Cricket Scores	Upper KS2	L4 Calc 3 – use efficient written methods of addition and subtraction and of short multiplication and division
Calculator	Upper KS2	L4 Calc 5 – solve problems with or without a calculator (interpret a calculator display) L5 SSM 6 – Solve problems involving conversion of units and make sensible estimates of a range of measures in relation to everyday situations
DVDs	KS2	No specific APP link as a range of mathematical topics are covered.



Peter's purse

Which purse
shows the
correct amount.



Lucy's purse

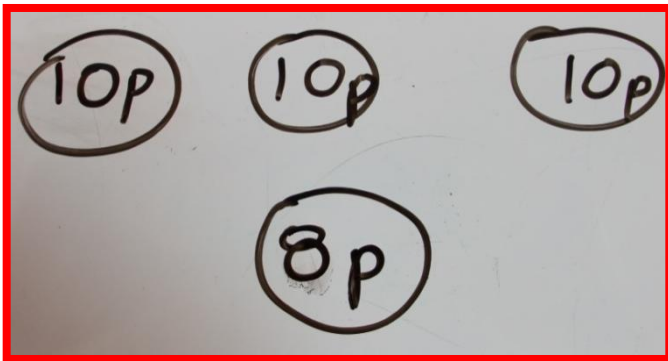


Susie's purse

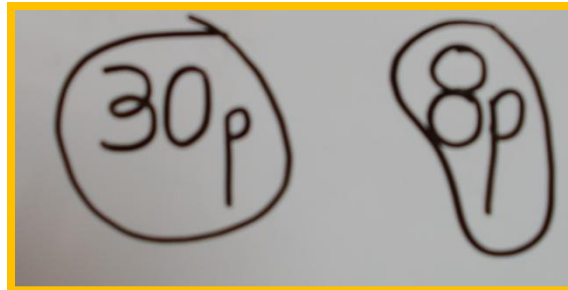
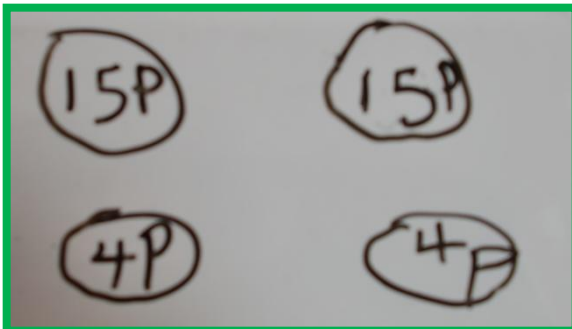
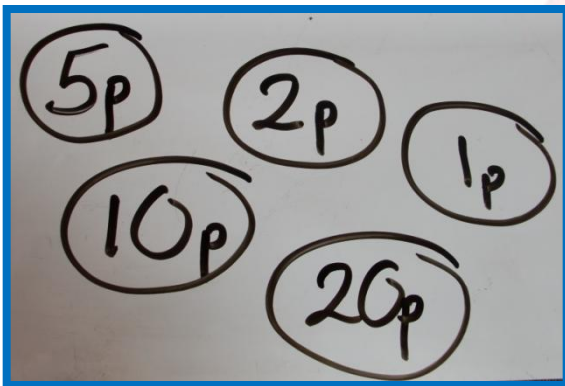


Shaman's purse

Purses

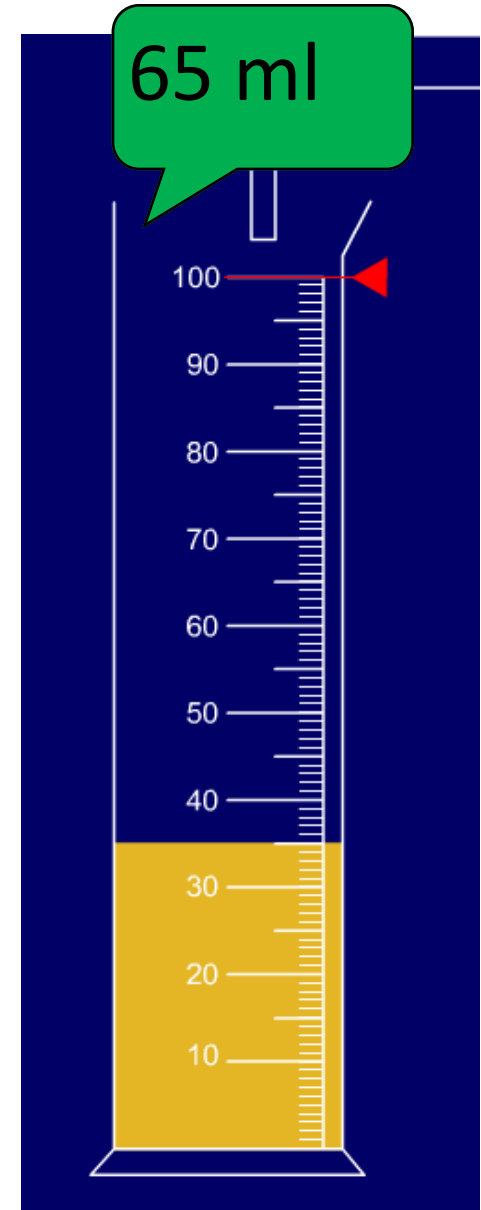
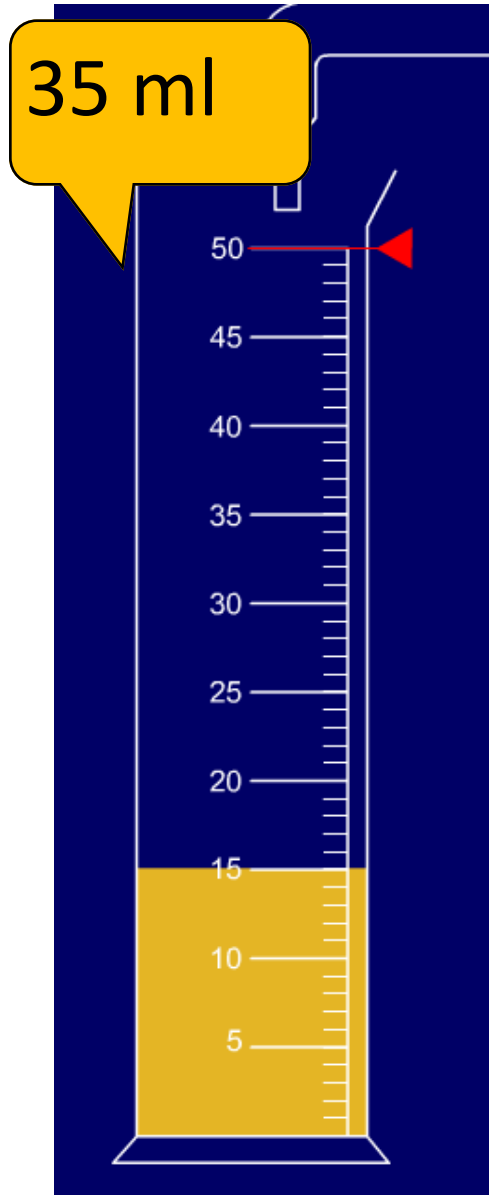
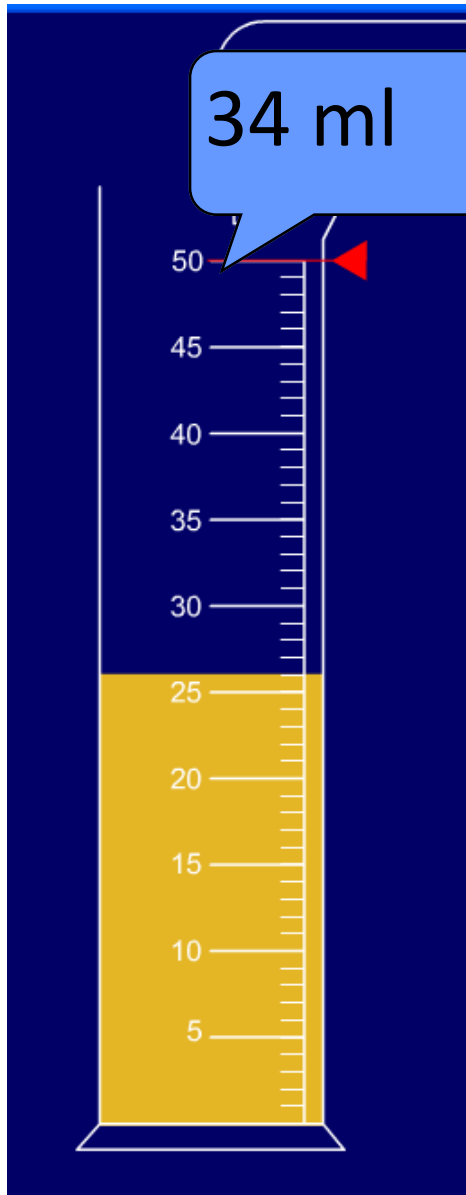


Which coins would you use to buy a packet of Starburst costing 38p?



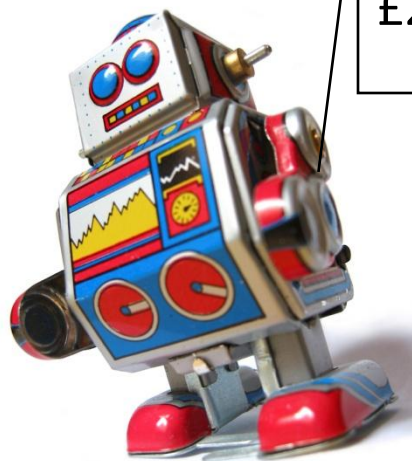
Only two are correct.
Which ones are they?

What needs to be added to each cylinder to make 50 ml?

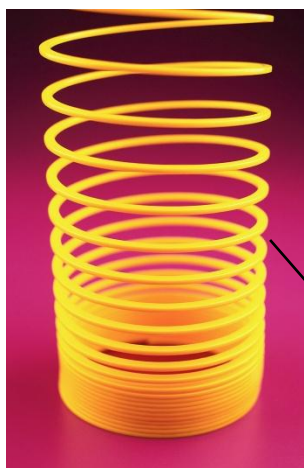


Make 50

Who is correct?



£2.64



£1.90



£ 2.36

**Can you work out if any of these children worked out their answers correctly?
If they have made mistakes how could you help them?**

If I buy one of everything it will cost £7.90.

$$\begin{array}{r} \text{£}1.90 \\ \text{£}3.36 \\ + \text{£}2.64 \\ \hline 0.10 \\ 1.80 \\ \hline 6.00 \\ \hline \text{£}7.90 \end{array}$$

If I buy two slinky toys it will cost me £2.18.

$$\begin{array}{l} \text{£}1.90 + \text{£}1.90 = \\ \text{£}1.00 + \text{£}1.00 = \text{£}2.00 \\ 9 + 9 + 18 \\ \text{£}2.00 + 18 = \text{£}2.18 \end{array}$$

If I buy a robot and pay with £10.00 I will get £8.46 change.
I know this is right because a robot costs £2.64 and I used my number bonds.

There is a half price offer on for this week only. I think that for £5.00 I can buy one of each toy.

Two friends are collecting World Cup stickers



I can fill 6 pages with 8 stickers on each page so I have 48 stickers

I have 37 stickers and if I put 12 on each page I will have 3 full pages with one left over.

Stickers cost 50p for 6 stickers so it has cost me £4.00 to buy my stickers.

If we add our collections together we will have 75 stickers.

One of the statements is wrong!

World cup stickers

$$\begin{array}{r} 36 \\ \times 4 \\ \hline 1224 \end{array}$$

**There are 36 chocolates in a layer.
How many are in the whole box?**



X	30	6	
4	12	24	
12	+	24	= 36

$$\begin{array}{r} 36 \\ \times 4 \\ \hline 144 \end{array}$$

$$(30 \times 4) + (6 \times 4) \\ = 120 + 24 \\ = 144$$

**One person is correct.
Who do you agree
with?**

x	3	0	4
y	6	1	8
z	0	2	4
w	2	0	4

Chocolate Box

How many runs did England win by?

Which answer is correct?

$$\begin{array}{r} 400 + 20 + 7 \\ - 200 + 80 + 5 \\ \hline 200 + 60 + 2 \\ \hline = 262 \end{array}$$

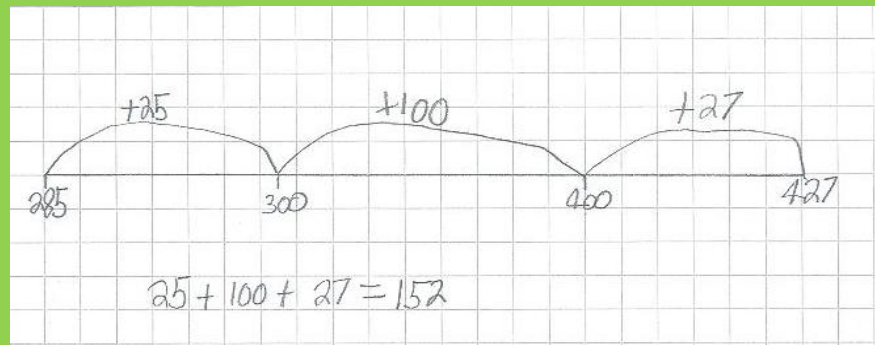
$$\begin{array}{r} 285 \\ + 427 \\ \hline 712 \\ \hline 11 \end{array}$$

$$\begin{array}{r} 3487 \\ - 258 \\ \hline 169 \end{array}$$

Australia	3rd ODI Last Innings	England
CONGRATULATIONS ENGLAND		
39	Overs	40
5	Wickets	8
46	Extras	57
285	Total	427

$$\begin{array}{r} 400 + 20 + 7 \\ - 200 + 80 + 5 \\ \hline = 300 + 20 + 7 \\ - 200 + 80 + 5 \\ \hline 100 + 40 + 2 \\ \hline = 142 \end{array}$$

$$\begin{array}{r} 285 \\ - 427 \\ \hline 262 \end{array}$$



The calculator shows the answer to a question. What could this mean?

3kg and 8g

£3.08

38mm

£3.80

3 litres 80ml

Two are correct.

Calculator



I have 24 DVDs. Which two of these statements are correct?

I have a rack that holds 100 so I need to get 86 more to fill it.

$\frac{1}{4}$ of these are too young. $\frac{1}{3}$ of them are too old. So I can only watch 10 of them.

Mum said that $\frac{3}{4}$ of these are made by Disney so that is 3.



Shrek the Third takes 90 minutes so if I start watching at 6.35pm I will finish before my bedtime at 8.15pm.

SHAPE SPACE AND MEASURES

Discussion mat	Suggested year group/KS	APP link
Sorting Shapes	KS1/Lower KS2	L2 SSM 1 – use mathematical names for common 3-D and 2-D shapes L2 SSM 2 – Describe their properties, including number of sides and corners L2 HD 1 – Sort objects and classify them using more than one criterion
Ruler 1	KS1/Lower KS2	L2 SSM 5 – begin to use a wider range of measures including everyday non-standard and stand units to measure length and mass
Measuring Cylinders	Lower KS2	L3 SSM 5 – Use a wider range of measures including non-standard units and standard metric units of length, capacity and mass in a range of contexts L3 Calc 2 – add and subtract two digit numbers mentally
Flapjacks	Lower KS2	L3 SSM 5 – Use a wider range of measures including non-standard units and standard metric units of length, capacity and mass in a range of contexts
Cake Time	KS2	L3 SSM 6 – Use standard units of time
Ruler 2	Upper KS2	L4 SSM 5 – Interpret, with appropriate accuracy, numbers on a range of measuring instruments
Temperature	Upper KS2	L4 SSM 5 – Interpret, with appropriate accuracy, numbers on a range of measuring instruments
Playground Measures	Upper KS2	L4 SSM 5 – Interpret, with appropriate accuracy, numbers on a range of measuring instruments
Timetable	Upper KS2	No specific link to APP assessment criteria

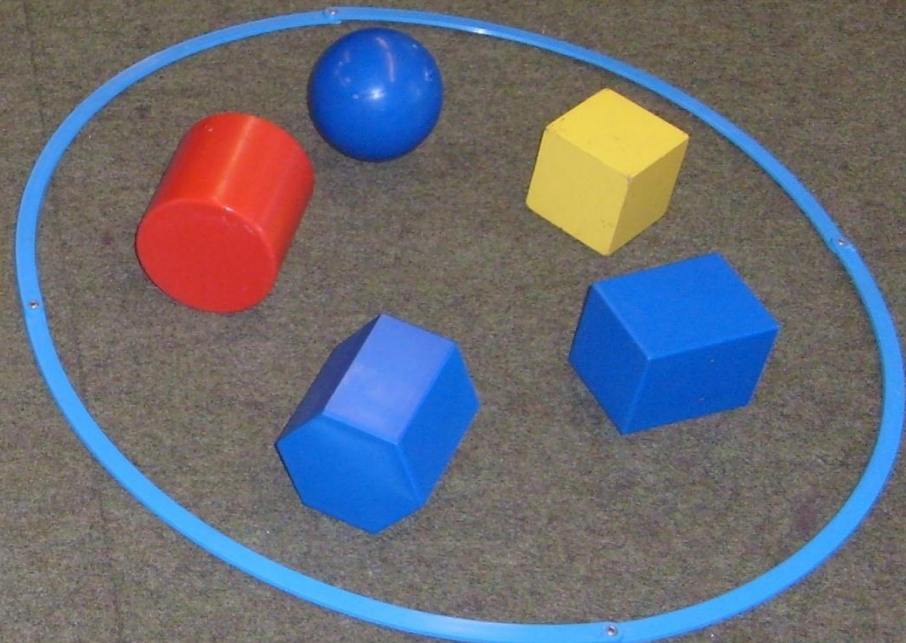
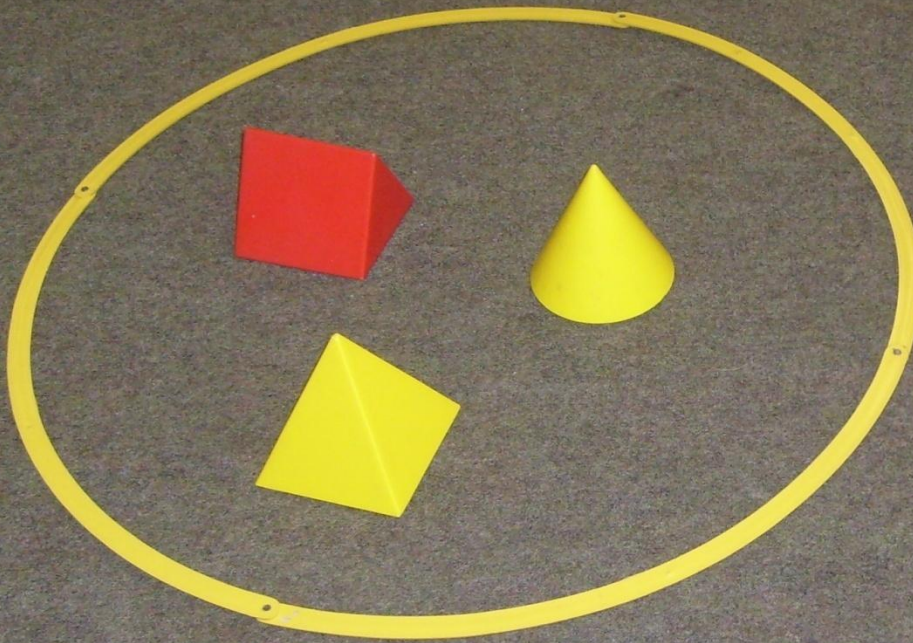
Sorting Shapes

Can you find these shapes and name them?

I think shapes with more faces have more corners?

Some faces are triangles

Shapes with an even number of faces

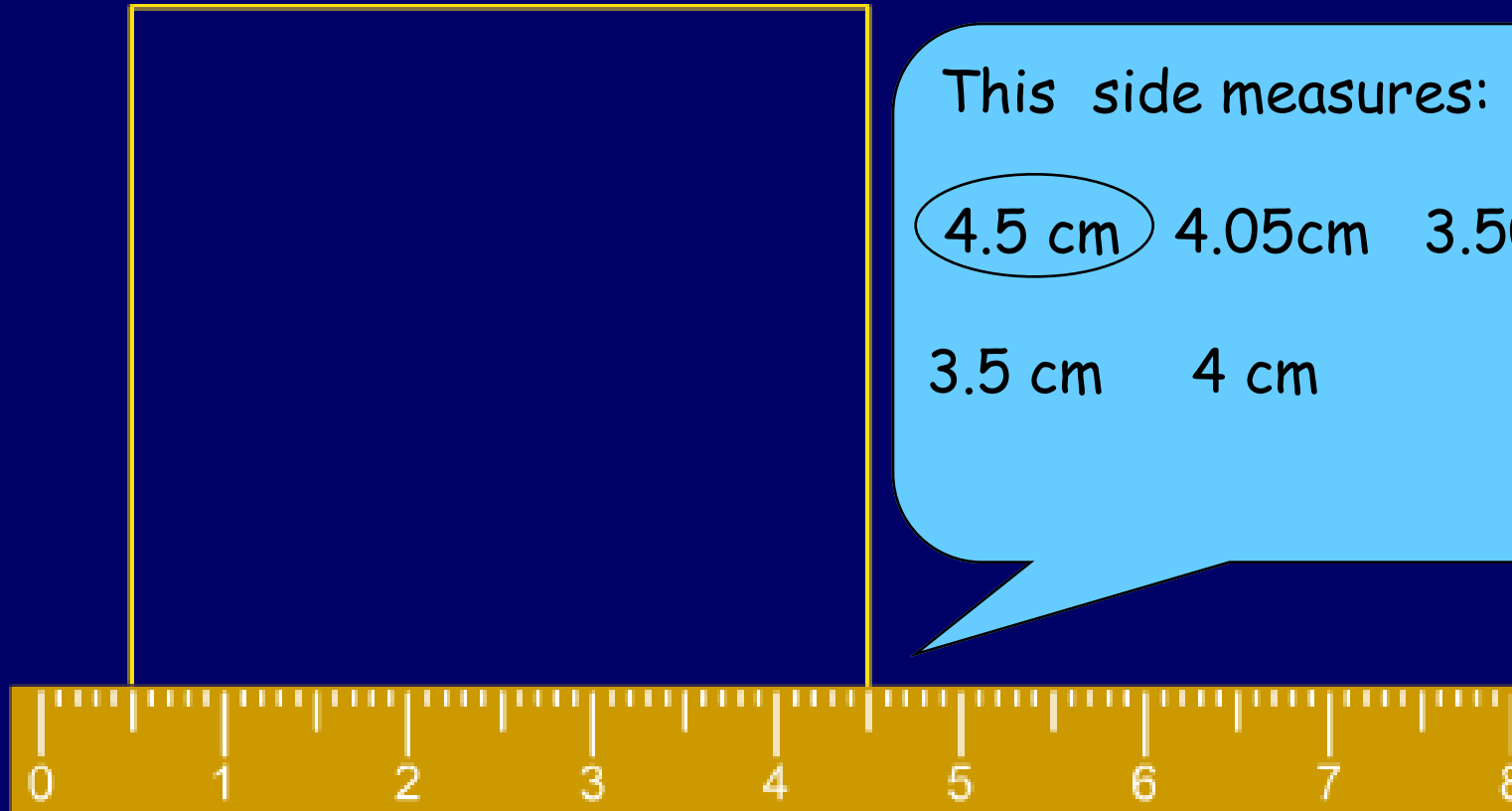


3 shapes have been sorted incorrectly. Can you find them?

Now that you've found the incorrect shapes, can you tell me something that is the same and something that is different about them?

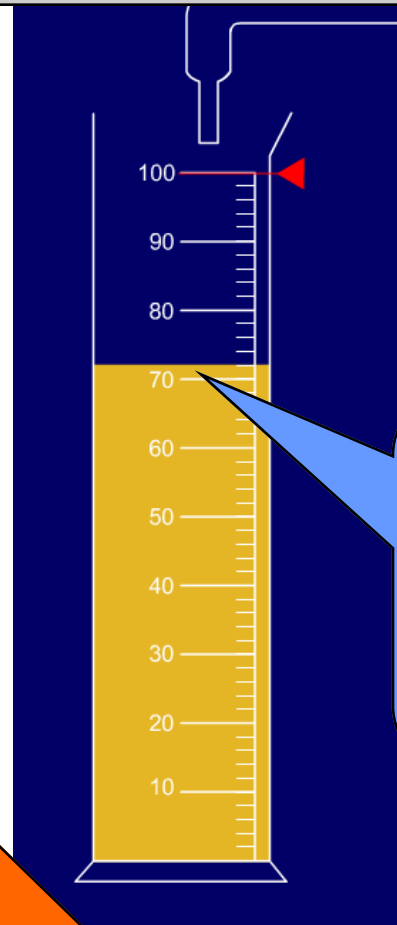
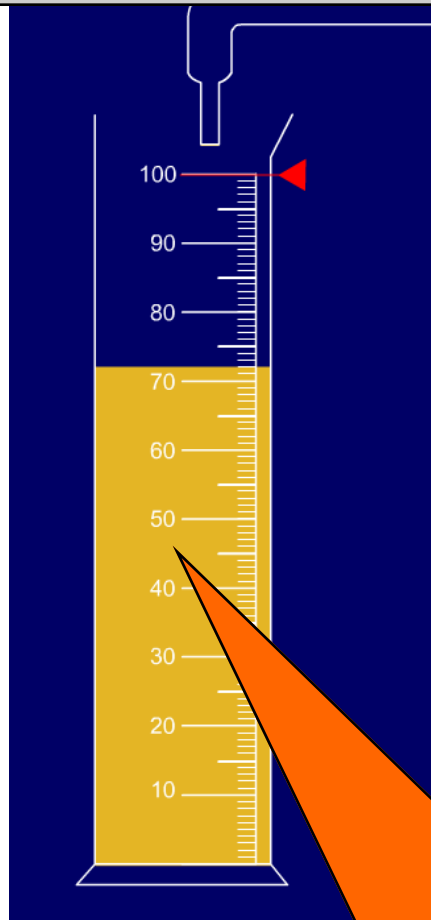
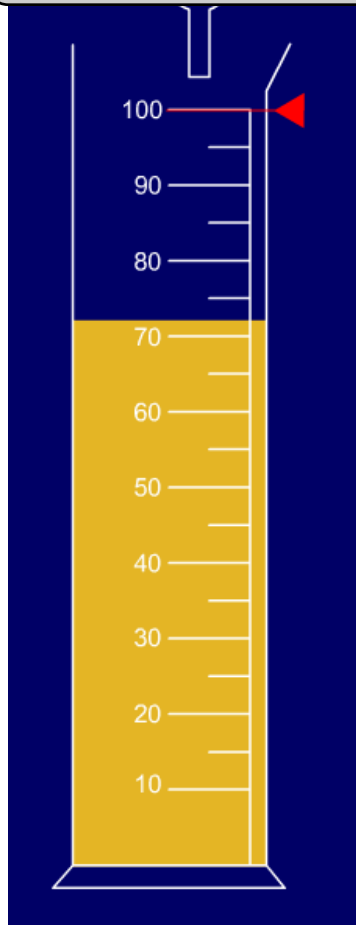
What do you think?

Has the correct answer been circled?
Explain your answer.



How is this child using the ruler incorrectly?
What would you do differently?

Measuring Cylinders



Convince me that this does not measure 71 ml

True/ False?

All of these measuring cylinders measure the same amount.

True/false?

I need to add 38ml more to make 100 ml.

Making Flapjacks

Here is a recipe for 18 Flapjacks

I only want
to make 6
flapjacks – I
can't do it!

Ingredients

75 g butter

30ml golden syrup

75g light brown sugar

150g porridge oats

50g raisins

If I add the
amount of
butter to the
porridge oats I
will have $\frac{1}{4}$ kg



If I have 1 kg of
raisins I can make
two batches of
flapjacks because
there are 100g in 1kg

There is half as
much sugar as
porridge oats in
this recipe.

Flapjacks

A woman and two children are in a kitchen, all wearing white chef hats and aprons. They are gathered around a table covered with flour, rolling out dough. The woman is smiling and looking down at the dough. The children are also looking down, focused on their task. There are several thought bubbles overlaid on the image, each containing a different interpretation of the time 'twenty to four'.

I think twenty
to four is
03:40

I wish I'd paid
attention at
school...is
twenty to 4
04:20

The cake takes an hour
to cook so we'll need to
put it in at **twenty to
four** so it is ready for tea
time.

Twenty to four...
that's when the
cooker clock says
20:4

What do you think?

Cake Time



Two answers are correct. Which two would you choose? Explain your choices.

Only one answer is correct. Which would you choose? Explain your choice.

This line measures:
6.5 cm 6.05 cm 65 mm

To make it 10cm, I need to add:

4.05cm 4 cm 4.5 cm 3.5 cm

The first thermometer's temperature is 2.5°C because if you count up from 0 it is 2.5 more.

Which statements do you agree with?

I think all of these thermometers have the same temperature reading.

The middle thermometer's temperature is only 1°C because it is 1 more above 0°C

Temperature



This is
26,400
cm

The perimeter of
our playground is
264.59m

I think this
is $> 2\text{km}$

I need
another
51cm to
make 265m

I think
this is
 $< 1\text{km}$

This number
means 264m,
5cm and
9mm

1 person is correct. Who do you agree with?

Playground measures

Bristol to Gloucester, Cheltenham Spa, Worcester and Great Malvern

Mondays to Fridays

Operator		XC	GW	XC	XC	XC	LM	GW	XC
Notes		H		V		H			V
Facilities		I◇I	◇	I◇I	I◇	I◇I		◇	I◇I
Weston-super-Mare	d	1240		1310		1340			1410
Bath Spa	⑦ d	1300	1319	1335		1400		1415	1435
Bristol Temple Meads	⑩ d	1330	1341	1400		1430		1441	1500
Filton Abbey Wood	d		1348	1357				1448	1457
Bristol Parkway	⑦ d	1340	1352	1410		1440		1452	1510
Yate	d		1401					1501	
Cam & Dursley	d		1413					1513	
Gloucester	⑦ a		1430					1532	
Gloucester	⑦ d				1446		1513	1537	
Cheltenham Spa	d	1412		1442	1456	1512	1525	1548	1542
Ashchurch for Tewkesbury	d						1532	1555	1555
Worcester Shrub Hill	⑦ a						1552	1622	1622
Worcester Foregate St	± ⑦ a							1642	1642
Malvern Link	± a								
Great Malvern	± a								
Birmingham New Street	⑫ a	1456		1526	1545	1556			1626
Train continues to		DEE		MAN	NOT	GLC			MAN

I need to get to Worcester Shrub Hill for 4.30pm. I'm not sure which is the best train to get from Gloucester!

The half past one train from Bristol Temple Meads takes 82 minutes to get to Cheltenham Spa.

What is the shortest journey time from Bath Spa to Birmingham New Street?

I don't think the 2 o'clock train from Bristol goes to Birmingham!

Can you help?

Timetable

HANDLING DATA

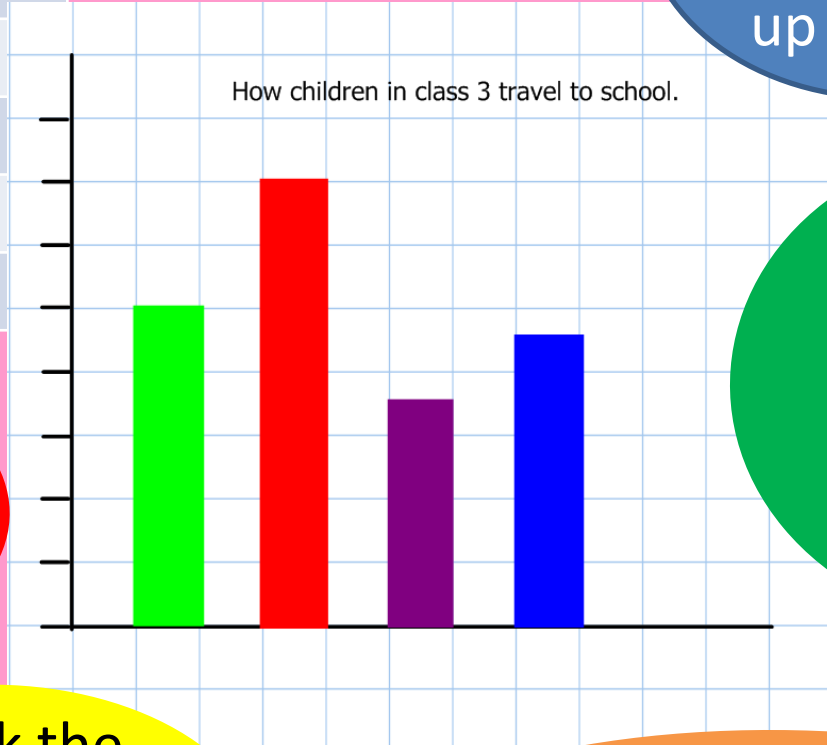
Discussion mat	Suggested year group/KS	APP link
School Travel	Lower KS2	L3 HD 2 – Construct bar charts and pictograms, where the symbol represents a group of units
Beans	Lower KS2	L3 HD 4 – Extract and interpret information presented in simple tables, lists, bar charts and pictograms
Pictogram	Lower KS2	L3 HD 4 – Extract and interpret information presented in simple tables, lists, bar charts and pictograms

How children in class 3 travel to school	
Method of travel	Number of children
Walk	14
Bus	7
Car	10
Bike	?

Which one is correct?

I think the scale should go up in ones

I think the scale needs to start at one.



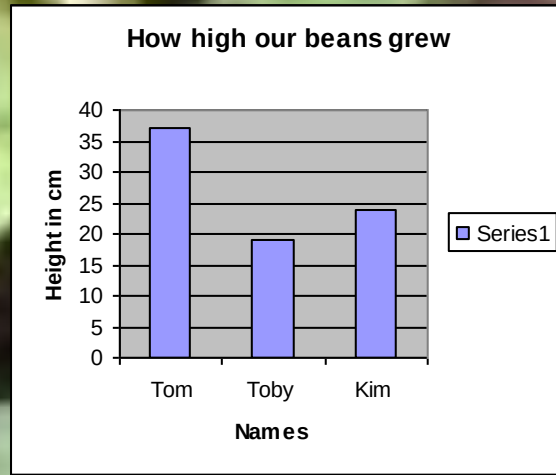
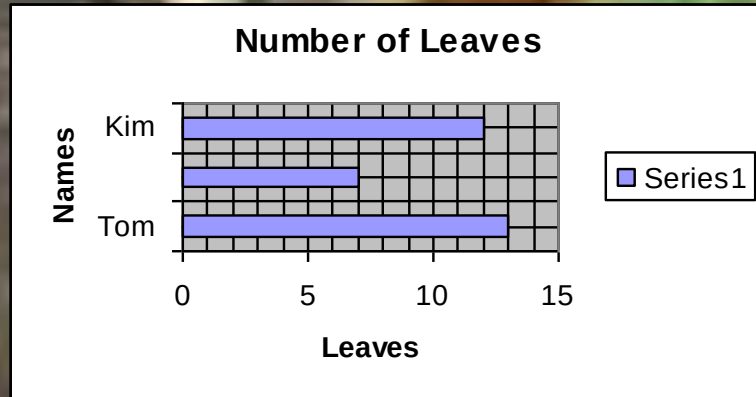
I think four more people walk to school than go by bike.

I think the total number of children is 40.

I think the horizontal axis should be labelled walk, bus, car, bike

In Class 3 we all grew beans from seeds. After 5 weeks we measured their height and counted the leaves.

Here are some ways to show the results.



Name	Height In cm	Leaves
Tom	37	13
Toby	7	19
Kim	21	12

Toby

My bean plant
had 7 leaves
and was 19cm
high

Tom

My bean plant
was 37 cm tall
and had 13
leaves

Kim

Mine grew
21cm, had 3
flowers and 12
leaves

Beans

Do you think the data has been presented correctly?