Here at St Peter and St Paul's we are following a mastery approach to mathematics.

What does this mean?

What is mastery?

- Mastering maths means pupils acquiring a deep, long-term, secure and adaptable understanding of the subject.
- The phrase ‘teaching for mastery’ describes the elements of classroom practice and school organisation that combine to give pupils the best chances of mastering maths.
- Achieving mastery means acquiring a solid enough understanding of the maths that’s been taught to enable pupils to move on to more advanced material.

Origins of mastery

- Until recently, teaching children to ‘follow a process’ had been at the core of Maths education. Explaining how or why something happened became merely an afterthought.
- As long as a child got the answer correct, their comprehension of the method was less important.
- However, by not teaching children conceptually, we left them incapable of making the necessary links required to problem solve
- More importantly, it denied children the opportunity to truly enjoy and engage with mathematics – as it became merely a memory test for many of them.
- With the 2014 new curriculum, this began to change. Increasingly children are required to reason, problem solve, and discuss methods.

What does Mastery look like?

- Variety of strategies
- Breaking the cycle of rote learning
- Gives children the opportunity to grasp 'real' maths
- Small steps
- Seeing patterns
- Reasoning
- Growth mindset is important

THE ESSENCE OF MATHS TEACHING FOR MASTERY

- Maths teaching for mastery rejects the idea that a large proportion of people just 'can't do maths'.
- All pupils are encouraged by the belief that by working hard at maths they can succeed.
- Pupils are taught through whole-class interactive teaching, where the focus is on **all** pupils working together on the same lesson content at the same time. This ensures that all can master concepts before moving to the next part of the curriculum sequence, allowing no pupil to be left behind.

THE ESSENCE OF MATHS TEACHING FOR MASTERY

- Early interventions ensure children are ready to move forward with the whole class.
- In a typical lesson pupils sit facing the teacher and the teacher leads back and forth interaction, including questioning, short tasks, explanation, demonstration, and discussion.
- Procedural fluency and conceptual understanding are developed in tandem because each support the development of the other.

THE ESSENCE OF MATHS TEACHING FOR MASTERY

- It is recognised that practice is a vital part of learning, but the practice used is intelligent practice that both reinforces pupils' procedural fluency and develops their conceptual understanding.
- Significant time is spent developing deep knowledge of the key ideas that are needed to underpin future learning.

INCLUSIVITY — BUILDING SELF CONFIDENCE

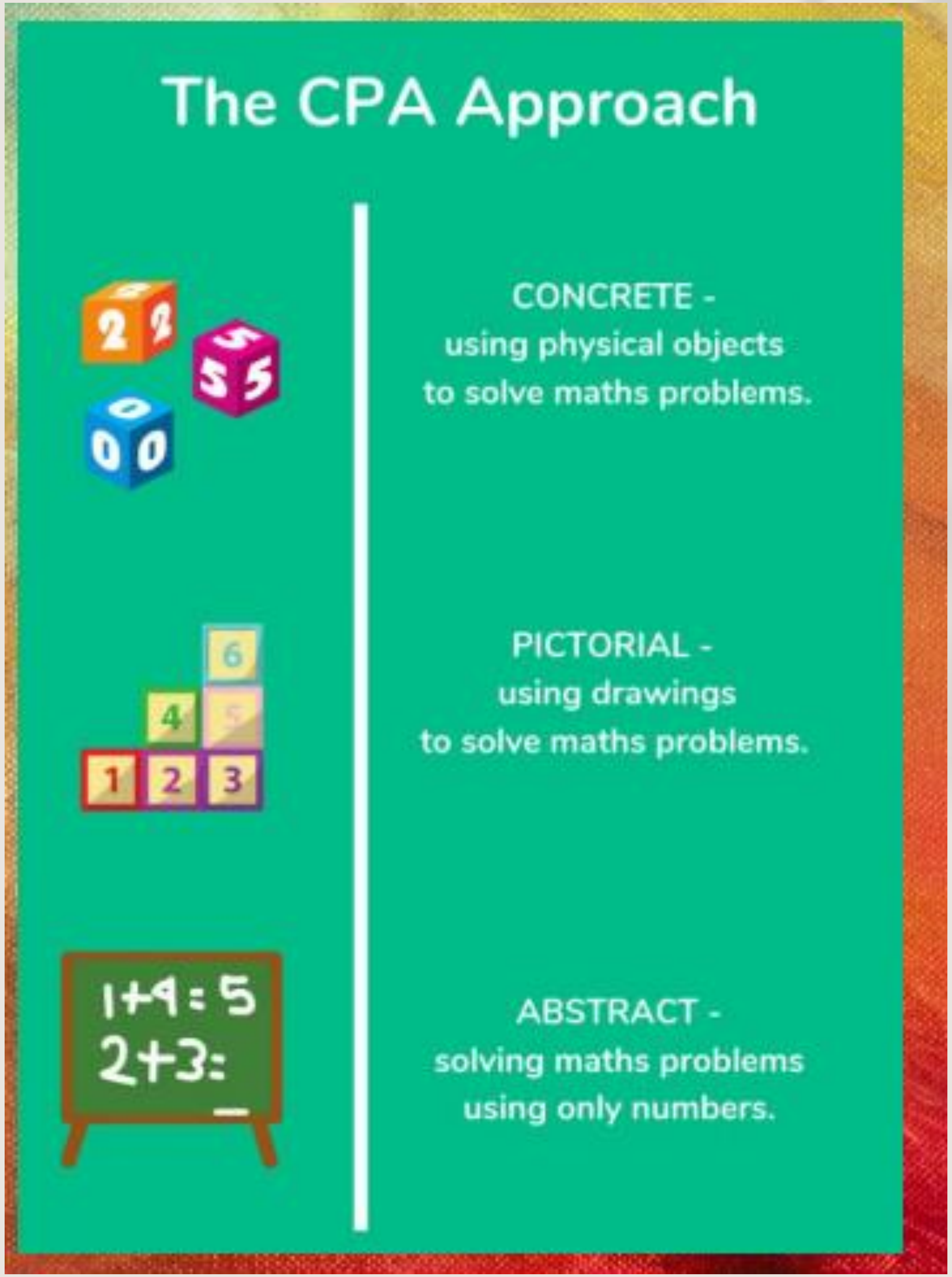
In primary school maths lessons in the past, children were put in different groups and given different content based on their anticipated ability. This meant that from an early age children were classed as those who can and can't "do maths".

Teaching maths for mastery is different because it offers all pupils access to the full maths curriculum. This inclusive approach, and its emphasis on promoting multiple methods of solving a problem, builds self-confidence and resilience in pupils.

CONCRETE – PICTORIAL – ABSTRACT APPROACH

Concrete, Pictorial, Abstract (CPA) is a highly effective approach to teaching that develops a deep and sustainable understanding of maths in pupils.

This approach is used from Reception through to Year 6.



CPA – CONCRETE STEP

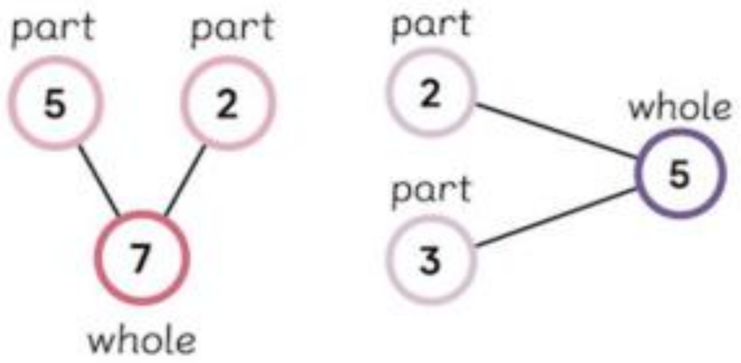
Concrete is the 'doing stage'. During this stage, children use concrete objects to model problems.

Unlike traditional maths teaching methods where teachers demonstrate how to solve a problem, the CPA approach brings concepts to life by allowing children to experience and handle physical (concrete) objects.

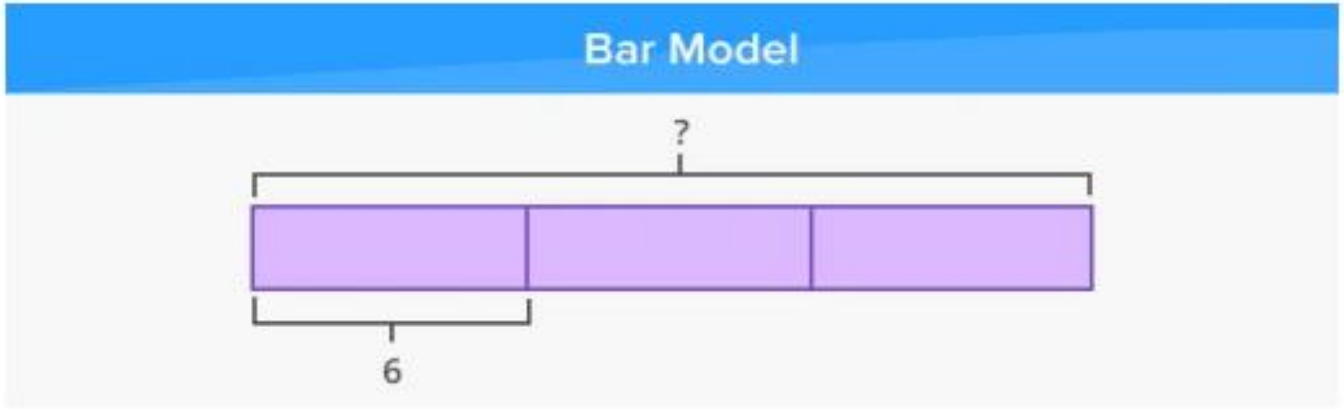
With the CPA framework, every abstract concept is first introduced using physical, interactive concrete materials (Maths No Problem, 2019).

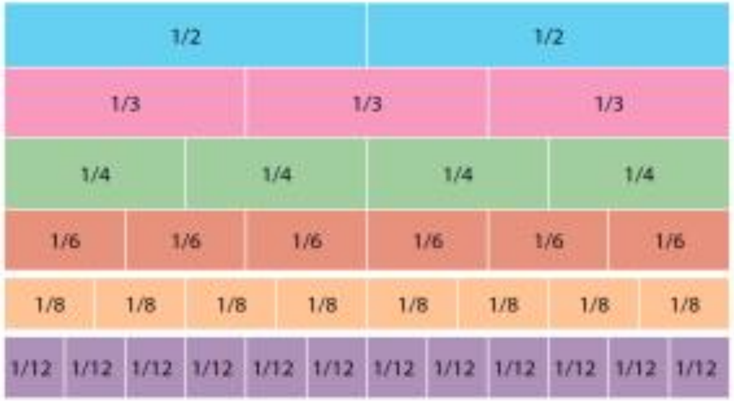
For example, if a problem involves adding paintbrushes, children can first handle paintbrushes. From there, they can progress to handling abstract counters or cubes which <u>represent</u> the paintbrushes.

EXAMPLES OF MODELS AND DIAGRAMS



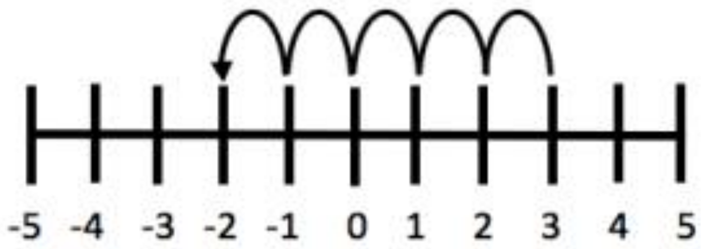
Part-whole model





Fraction wall

Question: What is 3 - 5?



Answer = -2

Number line

CPA – ABSTRACT STEP

Abstract is the 'symbolic' stage, where children use abstract symbols to model problems. They will not progress to this stage until they have demonstrated that they have a solid understanding of the concrete and pictorial stages of the problem.

The abstract stage involves the teacher introducing abstract concepts (e.g. mathematical symbols). Children are introduced to the concept at a symbolic level, using only numbers, notation, and mathematical symbols
(e.g. +, -, x, /) to indicate addition, subtraction, multiplication or division.

Some example questions that are used in the maths lesson.

<u>Year 1:</u>

Complete the number tracks.

1	2	

Three		Five

4	5	

Complete the number tracks.

1		3	4	5	6		8	9	10

one		three	four	five	six		eight	nine	ten

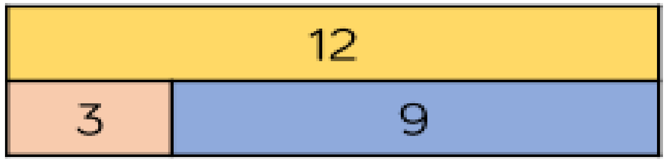
Fill in the missing numbers.

____, 1, 2, 3   3, 4, ____, 6

1, ____, 3, ____   six, ________, ________, nine

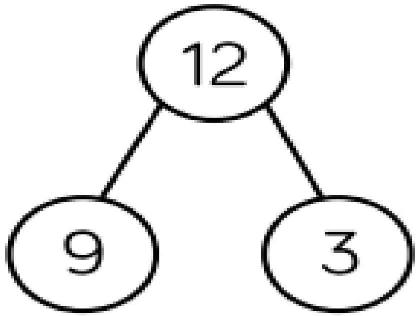
Year 2

Which of the representations are equivalent to the bar model?

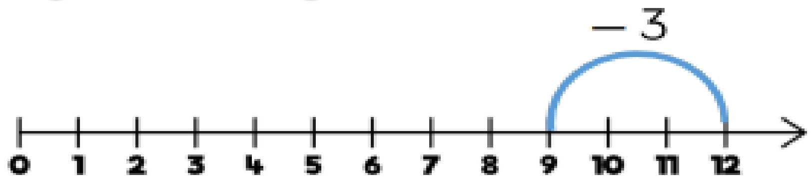


$12 = 9 + 3$

There are 9 cars in a car park, 3 cars leave.



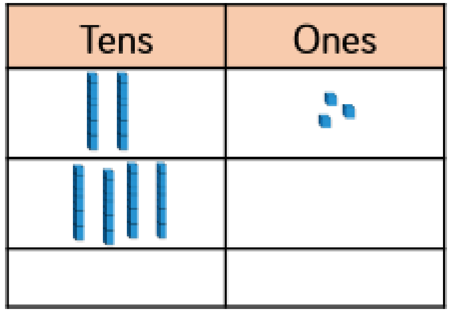
$9 - 3 = 12$



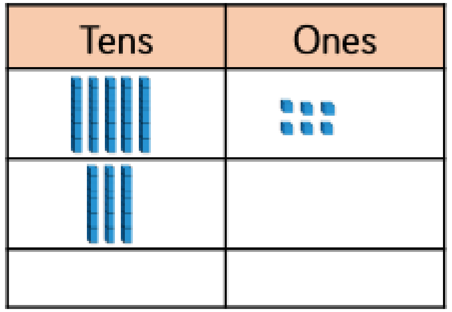
Continue the number track by adding 20 each time.

23				

Use the place value charts and concrete materials to complete the calculations.



$$\begin{array}{r} 2\ 3 \\ +4\ 0 \\ \hline \\ \hline \end{array}$$



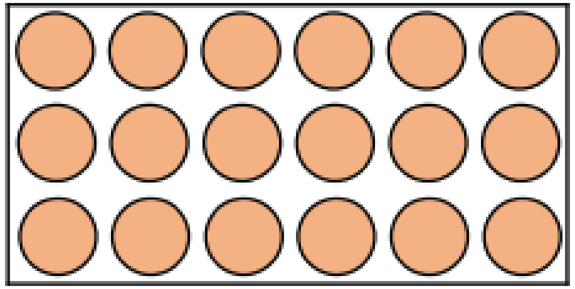
$$\begin{array}{r} 5\ 6 \\ -3\ 0 \\ \hline \\ \hline \end{array}$$

Using bar models and part models for addition and subtraction.

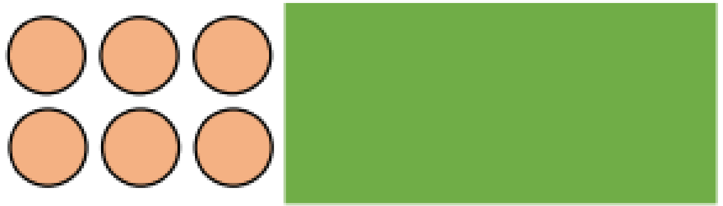
Using base 10 for adding

Year 3

Find different ways to solve six lots of three.



Part of this array is hidden.

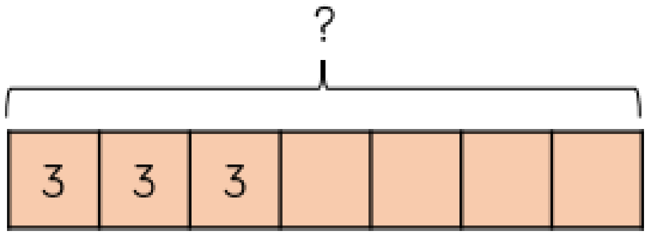


The total is less than 16

What could the array be?

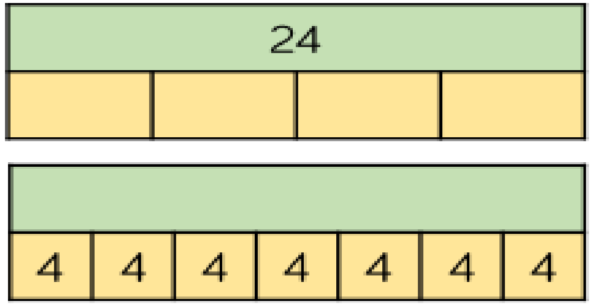
Using arrays for multiplying.

There are 7 tricycles in a playground.
How many wheels are there altogether?
Complete the bar model to find the answer.



Using a bar model for multiplying.

Complete the bar models and the calculations.

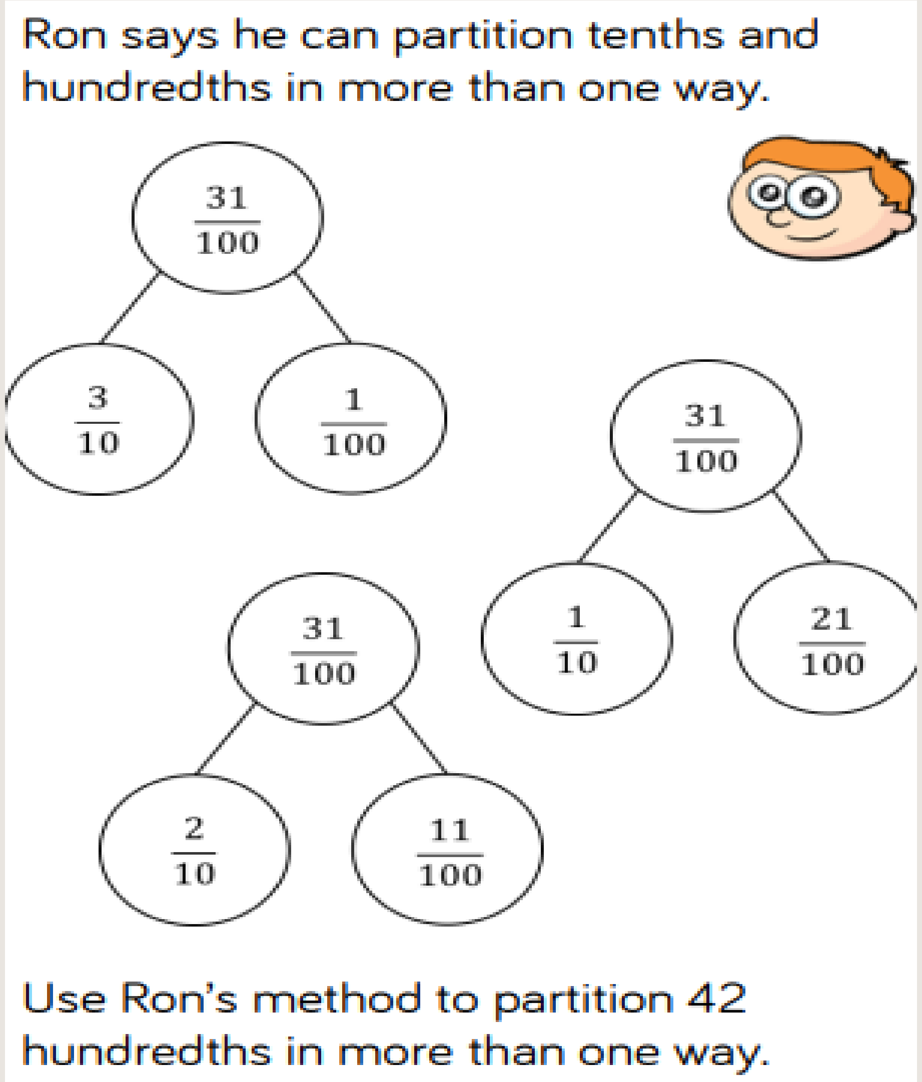


24 ÷ 4 = ____

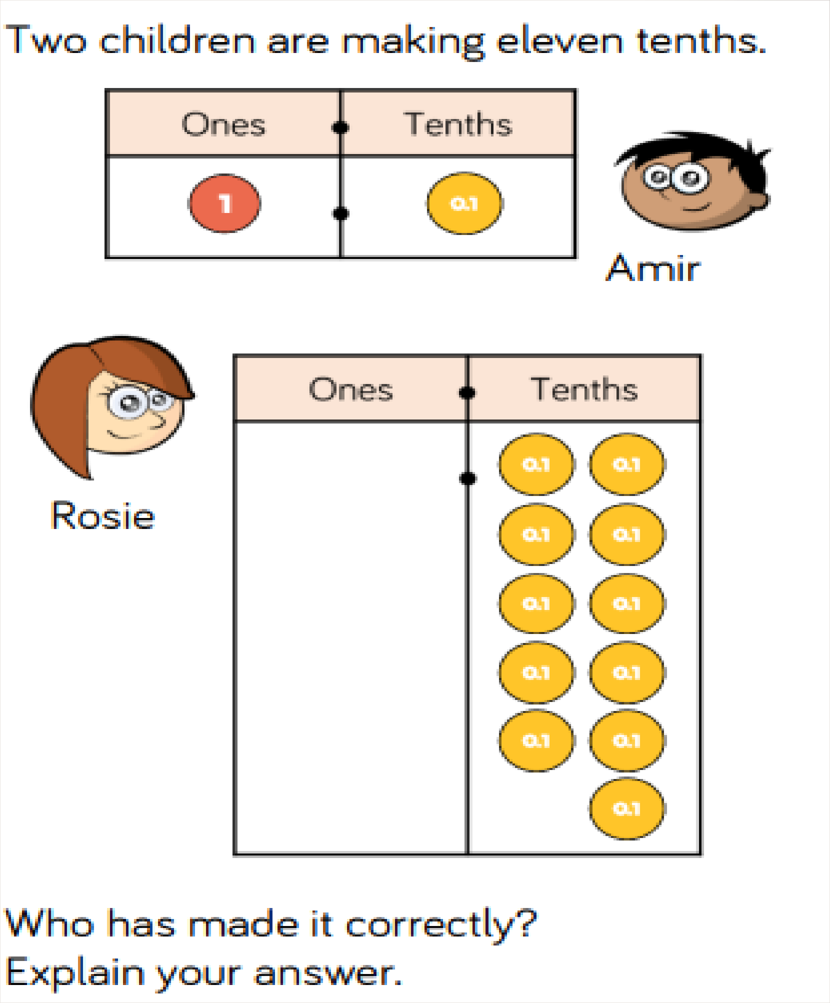
____ ÷ 4 = ____

Using a bar model for division.

Year 4



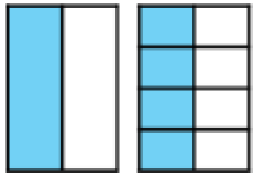
Using a part/whole model for partitioning tenths and hundredths.



Using place value counters for making decimals.

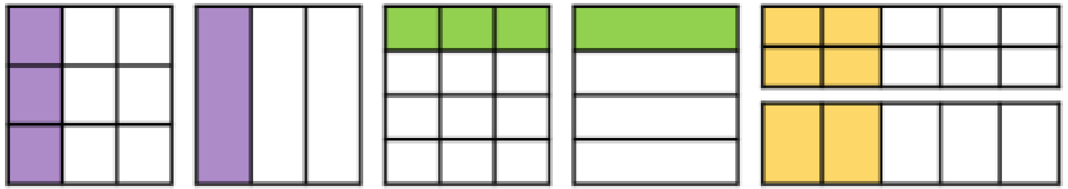
Year 5

Take two pieces of paper the same size.
Fold one piece into two equal pieces.
Fold the other into eight equal pieces.
What equivalent fractions can you find?

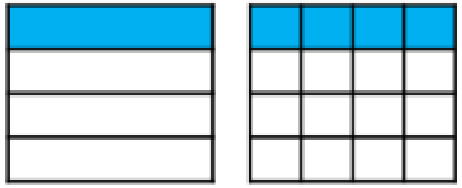


$\frac{1}{2} = \frac{4}{8}$

Use the models to write equivalent fractions.



Eva uses the models and her multiplication and division skills to find equivalent fractions.



$\frac{1}{4} \overset{\times 4}{\underset{\times 4}{=}} \frac{4}{16}$

Use this method to find equivalent fractions to $\frac{2}{4}$, $\frac{3}{4}$ and $\frac{4}{4}$ where the denominator is 16

Using pictorial representations for understanding equivalent fractions.

Jack uses bar models to convert a mixed number into an improper fraction.

$2\frac{3}{5} = \square$ wholes + $\square$ fifths

2 wholes = $\square$ fifths

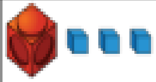
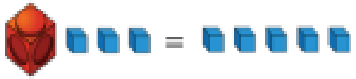
$\square$ fifths + $\square$ fifths = $\square$ fifths

Use Jack's method to convert $2\frac{1}{6}$, $4\frac{1}{6}$, $4\frac{1}{3}$ and $8\frac{2}{3}$

Using bar models to convert from improper fractions to mixed numbers.

Year 6

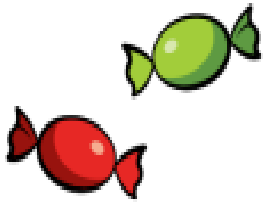
Amir represents a word problem using cubes, counters and algebra.

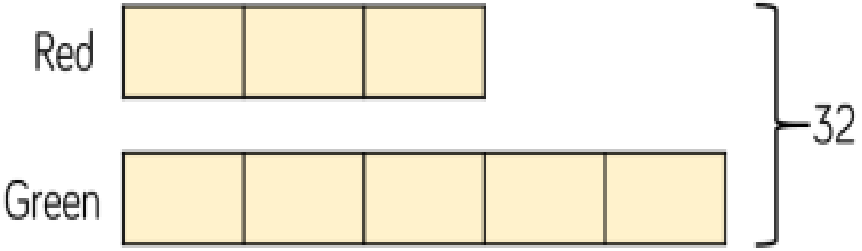
Words	Concrete	Algebra
I think of a number		x
Add 3		$x + 3$
My answer is 5		$x + 3 = 5$

Complete this table using Amir's method.

Words	Concrete	Algebra
I think of a number		
Add 1		
My answer is 8		

Eva has a packet of sweets.
For every 3 red sweets there are 5 green sweets.
If there are 32 sweets in the packet in total, how many of each colour are there?
You can use a bar model to help you.





Using a bar model to understand ratio.

Going form concrete to abstract to understand algebra.