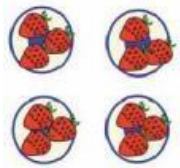
St Andrew's C of E Primary School

Mathematics

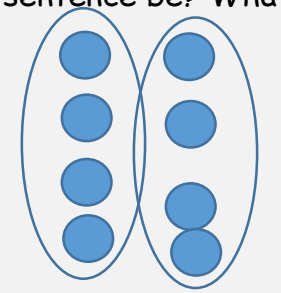
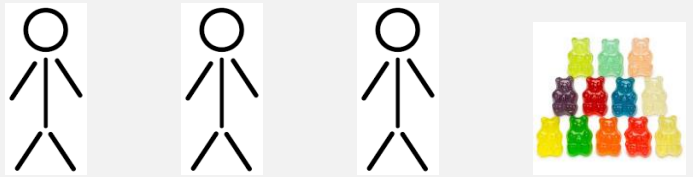
Fractions, decimals and percentages Policy

With faith, hope and love we can achieve greater things.

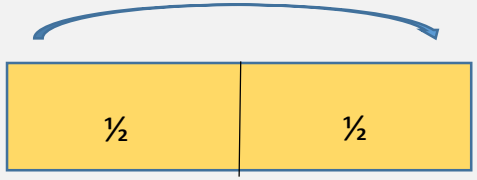
2023-2024

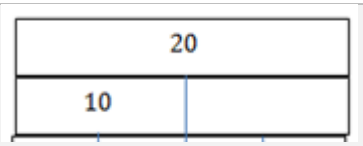
DEVELOPING UNDERSTANDING OF FRACTIONS, DECIMALS AND PERCENTAGES			
Year	**NC Objectives**	**Examples**	**Models and Images**
EYFS	• Share objects, shapes and count how many are in each group (early division) • Solve problems involving halving and sharing Key Language half double equal parts groups sharing bigger smaller (EXC greater than < less than >)	Fractions Adults to use fraction vocabulary of halves, quarters, thirds when describing the number of groups. Misconception "He's got a bigger half." Adults to ensure children understand that half means two equal groups. Misconception "You can't half one object." Adults to explain that 1 apple can be halved, a piece of paper can be halved.	What is *half of 8?* Half of 8 is 4.  What is double 4? Will these number be getting bigger or smaller? Show me this.   We need to share the strawberries equally between 4 people. How many strawberries will each person get? (Sharing)  There are 10 strawberries. Each child is allowed 2 strawberries. How many children will get strawberries? (Grouping)

		<u>Decimals and percentages</u> Links to place value and halving. Language to be used, but not explicitly taught. Children to have a solid understanding of place value, knowing that 5 is half of 10, linking to decimals later. Adults in the room to acknowledge numbers that are less 1. Discussion of money, if £1 is the whole then there must be numbers before this. Discuss of £1 = 100p. We got 100% on our phonics game that means we got them all right. Today we got 50% right that means we got half right.	What is half of this amount? 

Year 1	• Recognise, find and name a half as one of two equal parts of an object, shape or quantity • Recognise, find and name a quarter as one of four equal parts of an object, shape or quantity • Begin to learn sharing and grouping into equal parts. • Begin to recognise that the larger the denominator the smaller the fraction (unit	<u>Children use their knowledge of fractions of shape to find fractions of quantities.</u> <u>Misconception</u> Only a shape can be halved (1 object). Children unable to see a number greater than 1 as being 'the whole'. Children should be give practical apparatus to find halves and quarters of quantities within 20. Record work pictorially, developing this into formal arrays. The bar model is a great way of showing the whole and equal parts. STEM: The whole is split into 2 equal parts. Each part is half.	What does half mean? Can you show me? What would the number sentence be? What do you notice about the factors?  4 + 4 = 8 What does the 4 represent? What does the 8 represent? Sharing – I have 12 sweets and 3 friends. How many sweets does each person have?  Grouping – I have 20 cookies and I put 5 in a bag. How many bags will I have?

fractions or same numerator).





What is the missing number?

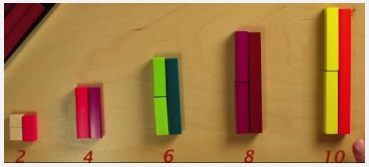
Key Language

Half, quarter, double, equal, parts, grouping, sharing, greater than, less than, whole, denominator, numerator.

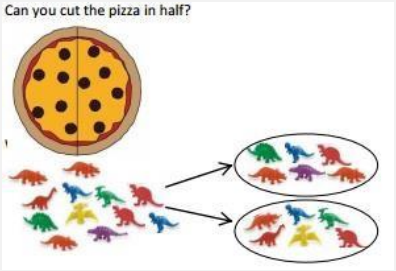
$\frac{1}{2} + \frac{1}{2} = 2/2 = 1$

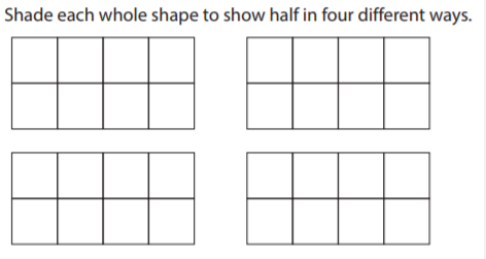
Misconception

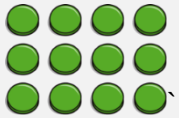
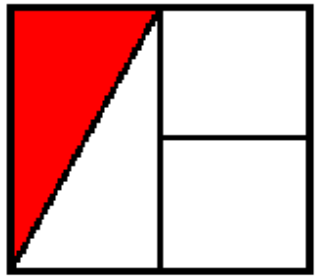
The bigger the denominator the bigger the fraction.

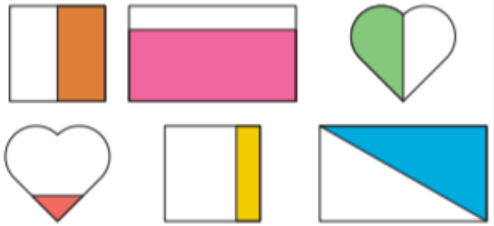
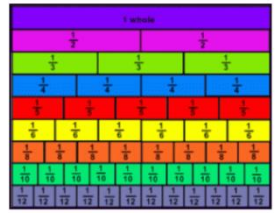


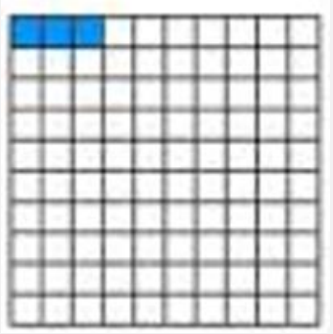
Using the Cuisenaire, find a half of the dark green. (reinforce equal parts)

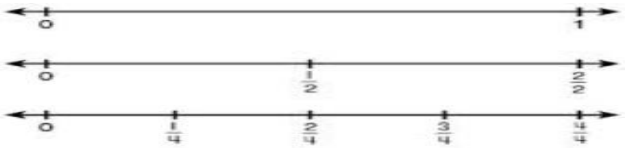
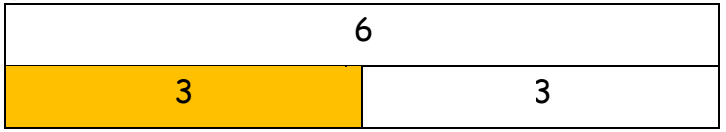
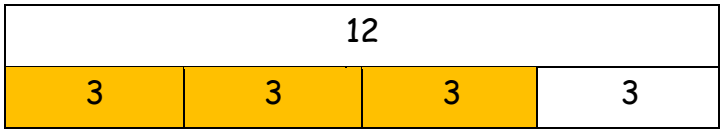




			   **An array can be used to demonstrate sharing.**  What fraction is this? What is the most peculiar way you could make this fraction?

		<u>Decimals and percentages</u> Links to place value and halving. Language to be used, but not explicitly taught. Children to have a solid understanding of place value, knowing that 50 is half of 100. Links can be made to half on a number line half being the same as 0.5, but not explicitly taught. Misconception "You cannot half an odd number." Investigation around money. Misconception 1.5kg < 900g	Which of these show half of each whole shape? Explain your reasoning. *Children should talk about the two parts needing to be equal parts of the whole.* 	Which of these show a half? How do you know? Show chn un-equal groups. Is this a quarter? Why?  'Whole' 'Part' in terms of countries, Devon, School, Class What is half of this amount?  'Real' practical experiences of cutting equal parts  $\frac{1}{2}$?

			 If 3/100 people in school horse ride, that is the same as 3% of people horse riding. What percent would it be if 7 children did? Links to fractions

Year 2	• Count in fractions up to 10 starting from any number and using the $\frac{1}{2}$ and 2/4 equivalence. *((Non Statutory Guidance)* • Recognise, find, name and write $\frac{1}{3}$, $\frac{1}{4}$, $\frac{2}{4}$ and $\frac{3}{4}$ of a length, shape, set of objects or quantity • Write simple fractions for example, of 6 = 3 and recognise the equivalence of $\frac{2}{4}$ and $\frac{1}{2}$	Use a number line or fraction pieces to count in fraction starting from any number up to 10. Misconception ¼ > ½ because 4 > 2 Children use their knowledge of unit and non-unit fractions of shapes to find fractions of quantities. Use bar model, fraction wall, fraction pieces, Numicon. Vary the shape of objects used e.g. not always 'pizzas' and 'chocolate bars'.	  Bar model $\frac{1}{2}$ of 6 = 3  $\frac{3}{4}$ of 12 = 9  If I can see $\frac{1}{4}$ how many quarters can you see?  If I can see 2/3 how many thirds can you see?

Key Language

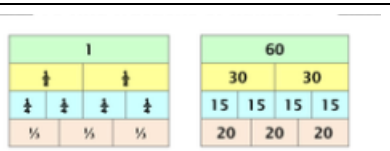
Half, double, half, quarters, thirds, unit fraction, equivalent, equal, parts, grouping, sharing, greater than, less than, whole, denominator, numerator.

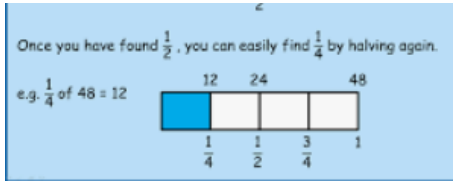
They relate this to find fractions of a length e.g. 2/4 of 1m =

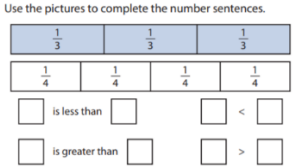
Children need to relate finding a quarter to halving and halving again.

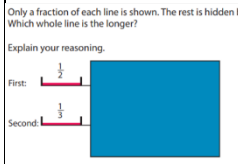
Misconception

Using arrays to find ¼, Not linking to halving and halving again.



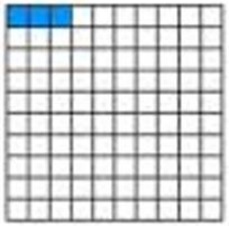


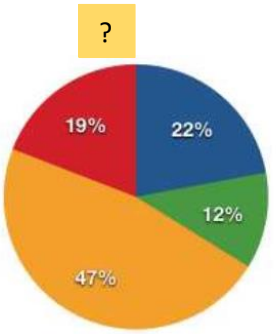


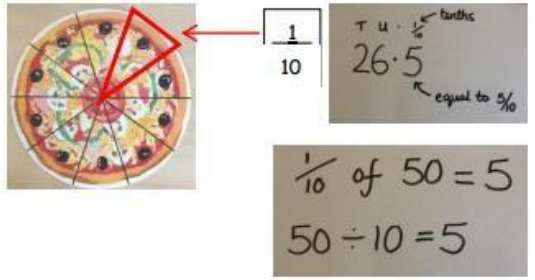
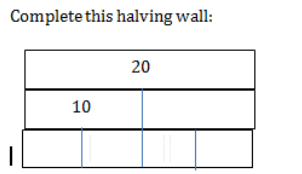
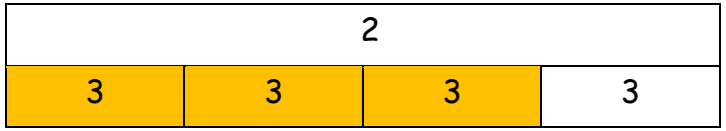


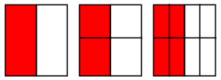
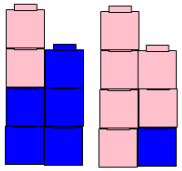
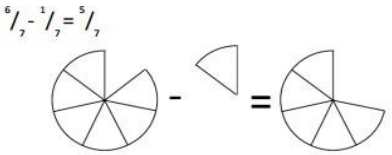
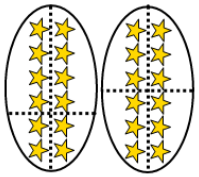
Jayne says that the shaded part of the whole square below does not show a half because there are three pieces, not two.
Do you agree?

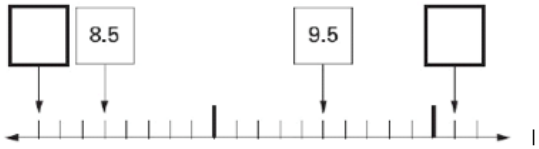
Explain your reasoning.

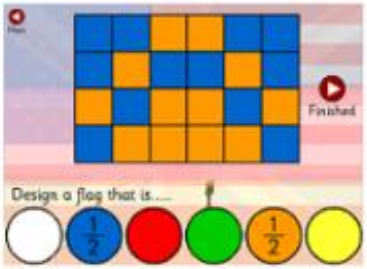
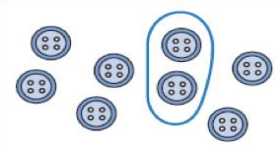
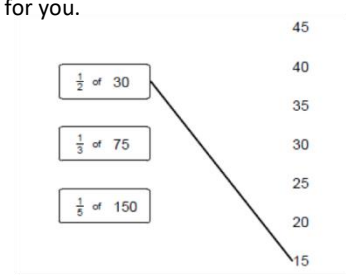


		Misconception This shape is 1/3 because it only has 3 parts. Decimals and percentages Children to understand that a percentage is just a fraction with a denominator of 100.	Non – Examples 3/100 = 30% Do you agree? Why? What is my misconceptions? 

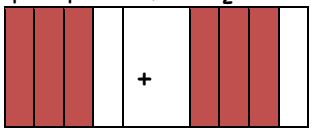
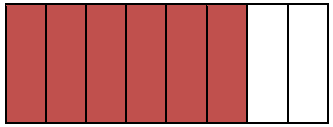
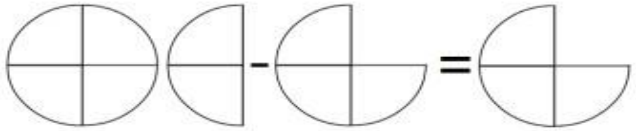
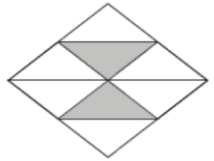
Year 3	• Count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one digit numbers or quantities by 10 • Recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators • Recognise and use fractions as numbers: unit fractions and non- unit fractions with small denominators , and fractions with the same denominators Securely understand that	Encourage children to count up and down in tenths. 1 ÷ 10 = 1/10 2 ÷ 10 = 2/10 3 ÷ 10 = 3/10 Continue the pattern. What do you notice? What's the same? What's different? Children can use fractions as an operator E.g. 1/4 of 12 = 12 ÷ 4 = 3 <u>Misconception</u> ¼ = 4 ÷ 1	1÷ 10 = 1/10 1/10 1/10 1/10 1/10 1/10 1/10 1/10 1/10 1/10 1/10 0 1 2 ÷ 10 = 2/10 2/10 2/10 2/10 2/10 2/10 2/10 2/10 2/10 2/10 2/10 0 2   ¾ of 12 = 9 

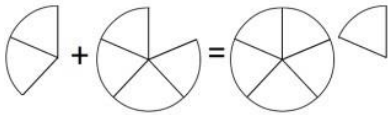
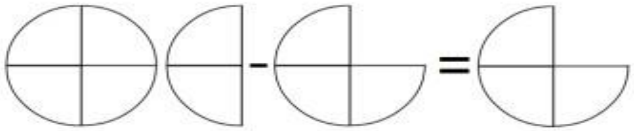
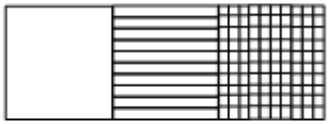
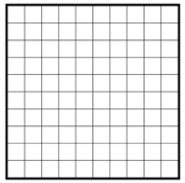
	the larger the denominator the smaller the fraction (if a unit fraction).	Children can relate fractions to the division of integers $1 \div 4 = \frac{1}{4}$ $4 \times \frac{1}{4} = 1$ $3 \div 4 = \frac{3}{4}$ Misconception $\frac{1}{4} + \frac{1}{4} = \frac{2}{8}$	Use Cuisenaire rods to develop vocabulary of equivalence.  What do you notice about these?   $\frac{5}{7} + \frac{1}{7} = \frac{6}{14}$ Visual images needed to explain Equal parts: Equal shape Equal area Equal amount    Which one shows $\frac{1}{4}$? Why? Use a bar of chocolate -bar of cubes to show that although its one object it's 12 pieces – $\frac{1}{4}$

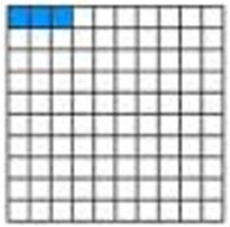
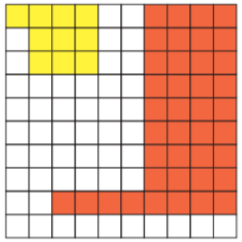
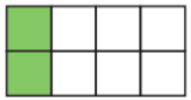
		Decimals and percentages – Children to use knowledge of halving 100 and 10. Introduce 0.5 as an alternative to half.	  Write and order these fractions as percentages. 70/100, 45/100, 32/100, 20/50.

Year 4	Recognise and show using diagrams, families of common equivalent fractions count up and down in hundredths; Recognise that hundredths arise when dividing an object by one hundred and dividing tenths by tenths solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number add and subtract fractions with the same denominator	1 ÷ 100 = 1/100 2 ÷ 100 = 2/100 3/7 of 56 = 24 3/10 of 120 = 36 $\frac{1}{4}$ = 12 $\frac{3}{4}$ = ___ 3/10 + 4/10 = 7/10 9/100 – 7/100 = 2/100 Children can record on a number line equivalents between 1/10 and 0.1 Count on and back in tenths as decimals and relate to counting on/back in 10ths (fractions).	 Use the rows of a multiplication square to show equivalence e.g: $\frac{1}{2}$, 2/4, 3/6, 4/8 2/3, 4/6. 6/9, 8/12.  What should I cut my pizza into if I have 100 people to serve?    Count back in 1 and 1/10 from 101. Recognise that two eighths (⅔) or one quarter (¼) of the  Match each box to the correct number. One has been done for you. 

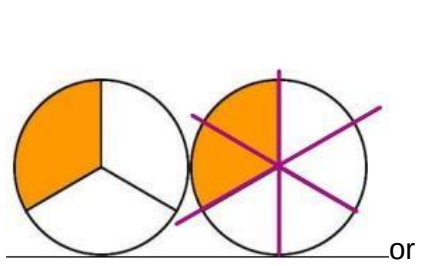
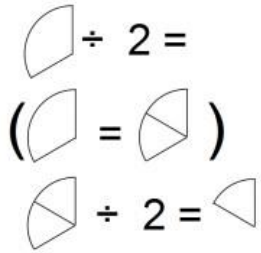
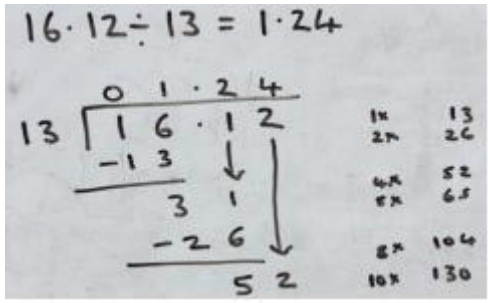
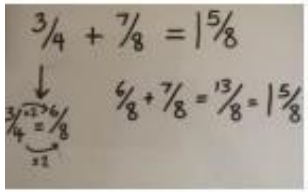
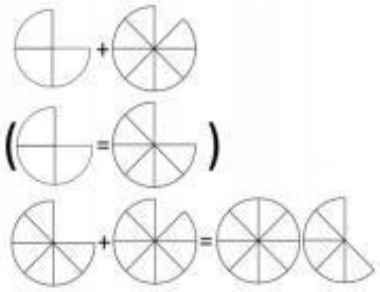
	Find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths	Misconception $\frac{2}{8} + \frac{5}{16} = \frac{7}{24}$	

		25 ÷ 10 = 2.5 2 ones and 5 tenths 25 ÷ 100 = 0.25 0 ones, 2 tenths and 5 hundredths or 25 hundredths Misconception Children not making links between fractions, division, place value Misconception Larger denominator = larger the fraction is	$\frac{3}{4} + \frac{3}{4} = {}^{6}/_{4} = 1\ \frac{1}{2}$.   add and subtract fractions with the same denominator For example: $\frac{1}{2} + \frac{1}{2}$, $\frac{1}{4} + \frac{3}{4}$, $\frac{3}{8} + \frac{5}{8}$, $\frac{3}{5} + \frac{4}{5} + \frac{1}{5}$, ${}^{7}/_{10} + {}^{3}/_{10} + {}^{5}/_{10} + {}^{8}/_{10}$, $\frac{3}{4} - \frac{1}{3}$, ${}^{6}/_{7} - {}^{4}/_{7}$, ${}^{9}/_{10} + {}^{4}/_{10}, -{}^{3}/_{10}$ ${}^{6}/_{4} - {}^{3}/_{4} = {}^{3}/_{4}$  Recognise that one whole is equivalent to two halves, three thirds, four quarters… For example, build a fraction 'wall' using a computer program and then estimate parts. Recognise patterns in equivalent patterns, such as: $\frac{1}{2} = {}^{2}/_{4} = {}^{3}/_{6} = {}^{4}/_{8} = {}^{5}/_{10} = {}^{6}/_{12} = {}^{7}/_{14}$ And similar patterns for $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, ${}^{1}/_{10}$.  What fraction of the square is shaded?

Y5	- Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents. - Compare and order fractions whose denominators are all multiples of the same number - Read, write, order and compare numbers with up to three decimal places round decimals with two decimal places to the nearest whole number and to one decimal place. - Identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths read	e.g. 8/10 = 4/5= 16/20= 24/30 E.g. 6/20 + 3/10. Find common denominator and then add together. Encourage chn to simplify answer where possible. 2 4 6 1 (e.g. / + / = / = 1 /) 5 5 5 5  Initially 2/5 x 2 4/5 x 6 = (6 x 4) ÷ 5 = 24/5. Then convert to a mixed number = 80/100 = 0.8	 I eat 1 more piece of this cake. What fraction would be left? $^{6}/_{4}$ - $^{3}/_{4}$ = $^{3}/_{4}$  Decimal cake imagery for relative value, PV charts, PV cards  Recognise that 0.007 is equivalent to $^{7}/_{1000}$ 6.305 is equivalent to $^{6305}/_{100}$ How many halves in: 1 ½ 3 ½ 9 ½ …? Represent this. How many quarters in 1 ¼ 2 ¼ 5 ¼ ….? Represent this.  Use blank hundred squares to model and explore percentages, tenths and hundredths. Decimals, fractions and percentages can be represented by colouring in blank hundred squares which children can use to support addition and subtraction.

	and write decimal numbers as fractions - Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents recognise the per cent symbol (%) and understand that per cent relates to "number of parts per hundred", and write percentages as a fraction with denominator 100 as a decimal fraction. - Add and subtract fractions with the same denominator and denominators that are multiples of the same number recognise mixed numbers and improper fractions and convert from one form to the	71 (e.g. 0.71 = /). 100  This could represent 100 or 1. <u>Misconception.</u> Children not making links between fractions, decimal and percentages. E.g. 2/5 = 40% <u>Misconception.</u> Children not making links between prior knowledge. e.g. 34% of 60. Can I find 10%, therefore can I find 1%. How will this help me?	Suggest another way to colour the grid to show clearly each fraction that is shaded. What fraction of the grid is shaded in total? How many different ways can you express the fraction of the grid that is shaded?  How could I show this as a fraction? Decimal? Percentage? True or false? 1·5 kg + 600 g = 2·1 kg + 300 g 32 cm + 1·05 m = 150 cm – 0·13 m $\frac{3}{4}$ ℓ + 0.05 ℓ = half of 1·6 ℓ Explain your reasoning. Graham is serving pizzas at a party. Each person is given $\frac{3}{4}$ of a pizza. Graham has six pizzas. How many people can he serve? Draw on the pizzas to show your thinking.  Write your answer as a multiplication sentence. Each bar of toffee is the same. On Monday, Sam ate the amount of toffee shown shaded in A. On Tuesday, Sam ate the amount of toffee shown shaded in B. A  B  Sam says he ate $\frac{7}{8}$ of a bar of toffee. Jo says Sam ate $\frac{7}{16}$ of the toffee. Explain why Sam and Jo are both correct.

	other and write mathematical statements > 1 as a mixed number - Multiply proper fractions and mixed numbers by whole	<u>Misconception.</u> Finding a common multiple to compare these numbers rather than thinking about what the numbers represent. $\frac{3}{8}$ $\frac{3}{7}$	

Y6	- Compare and order fractions, including fractions >1 - Identify the value of each digit in numbers given to three decimal places - Solve problems which require answers to be rounded to specified degrees of accuracy - use common factors to simplify fractions; use common multiples to express fractions in the same denomination associate a fraction with division and calculate decimal fraction equivalents - recall and use equivalences between simple fractions, including in different contexts. - add and subtract fractions with different	(e.g. 0.375) for a simple 3 fraction (e.g. /) 8 3÷8 using bus stop method. Turn them into equivalent fractions with common denominators. Then add and subtract as applicable. Find simplest form where possible. 1 1 1 (e.g. / × / = /) 4 2 8 ¾ x 8/9 = 24/36. Then simplify to 2/3 by finding a common denominator. 3.25 x 4 What is an efficient way of solving	 or    

denominators and mixed numbers, using the concept of equivalent fractions
- multiply simple pairs of proper fractions, writing the answer in its simplest form [for example, $\frac{1}{4} \times \frac{1}{2} = {}^{1}/_{8}$]
- multiply one-digit numbers with up to two decimal places by whole numbers

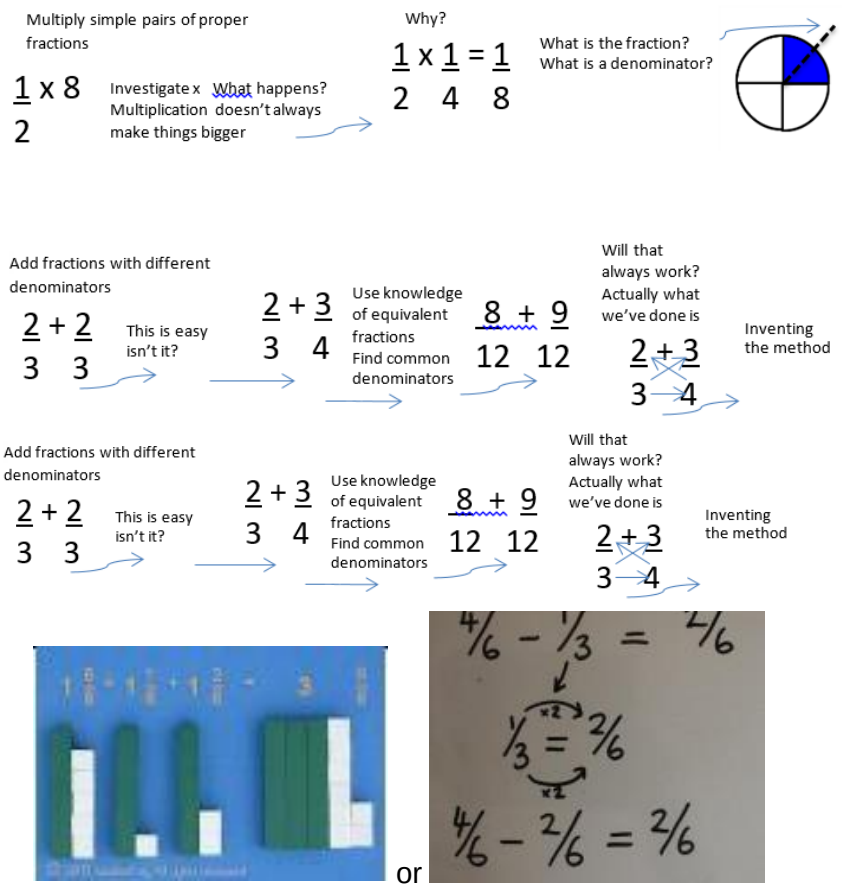
divide proper fractions by whole numbers [for example, ${}^{1}/_{3} \div 2 = {}^{1}/_{6}$]
- multiply one-digit numbers with up to two decimal places by whole numbers x and ÷numbers by 10, 100 and 1000 up to three decimal places
- identify the value of each digit to three decimal

this without using short multiplication?

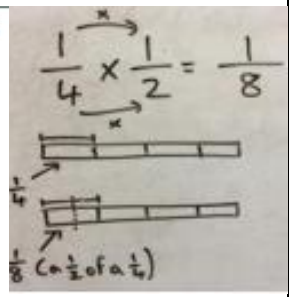
Misconception.

Children not making links between prior knowledge.

e.g. 34% of 60. Can I find 10%, therefore can I find 1%. How will this help me?



or

		places associate a fraction with division and calculate decimal fraction equivalents	<u>Misconception</u> 0.02 = 20% 3/14 + 3/14 = 6/28. Converting between decimals, fractions and percentages.	Only a fraction of each whole rod is shown. Using the given information, identify which whole rod is longer  Explain your reasoning. 

Write these as a percentage →

Which is the odd one out?

$\frac{2}{5}$, 0·4, $\frac{4}{10}$, $\frac{3}{6}$, $\frac{6}{15}$

Explain your choice.

Put the following numbers into groups:

$\frac{3}{4}$, $\frac{3}{2}$, 0·5, 1·25, $\frac{3}{8}$, 0·125.

Explain your choices.

In each number sentence, replace the boxes with different whole numbers less than 20 so that the number sentence is true:

$\frac{1}{\square} = \frac{3}{\square}$

$\frac{\square}{3} = \frac{\square}{12}$

$\frac{\square}{\square} = \frac{\square}{\square}$

$\square \div \square = \square \cdot \square$

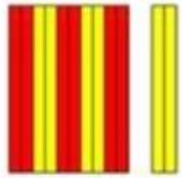
$\frac{30}{\square} = \frac{45}{\square}$

What's the same, and what's different about these number statements?

Double one third of 15
One third of 30
2 x 5
15 x 2 ÷ 3
15 ÷ 3 x 2
$15 \times \frac{2}{3}$

1.2 ÷ 0.2 =

How many 0.2's are in 1.2?



5 groups of 0.2 + 1 group of 0.2 = 6 groups of 0.2

1.2 ÷ 0.2 = 6