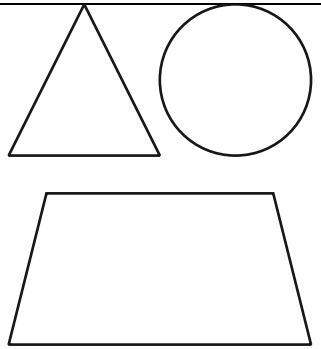
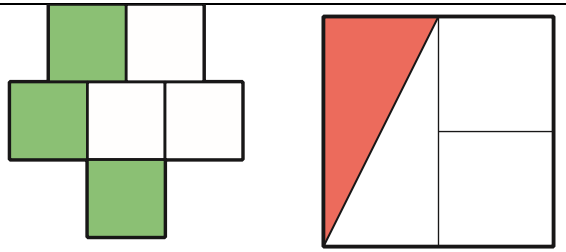
Knowledge Progression in Fractions, decimals and percentages

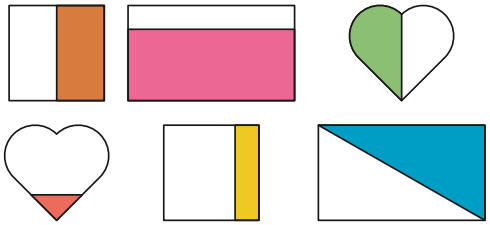
Early Learning Goals	

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Recognising Fractions Counting in fraction steps	•To be able to recognise and name a half as one of two equal parts of an object, shape or quantity and a quarter as 4 equal parts of an object, shape or quantity	• To be able to recognise , name and write fractions 1/3, 1/4 , 2/4 and 3/4 of a length, shape, set of objects or quantity •<u>To be able to count in halves and quarters up to 10</u>	• To recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10 •To be able to count up and down in tenths;	•To recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten. •To be able to count up and down in hundredths; •<u>To be able to count forwards and backwards in quarters and steps of 0.25</u>	•To be able to recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements > 1 as a mixed number <u>To be able to count in decimals and fractions (halves, tenths, quarters, three quarters)</u>	•<u>To be able to order fractions with different denominators, simplifying and converting to decimals where necessary</u>
Year 1 examples	**Working at** Colour half of each whole shape: Check that pupils do not think that just dividing a shape into any two pieces is halving but understand that they need to be equal pieces.			**Greater depth** What fraction of the whole shape is shaded? Explain your reasoning.		





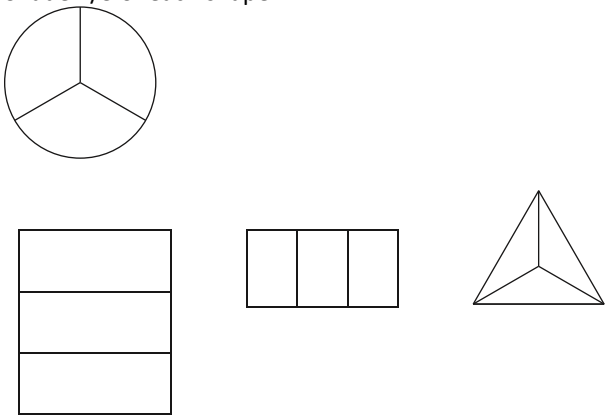
Which of these show half of each whole shape?
Explain your reasoning.
Children should talk about the two parts needing to be equal parts of the whole.



Year 2 example

Working at

Shade 1/3 of each shape



Greater depth

Use the pictures to complete the number sentences.

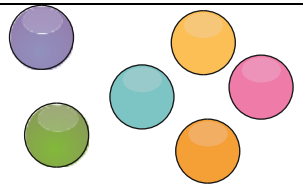
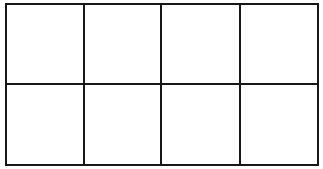
$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$

$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$

? is less than ?

? is greater than ?

<table>
<tr><td></td><td colspan="3"></td><td colspan="3">? < ?

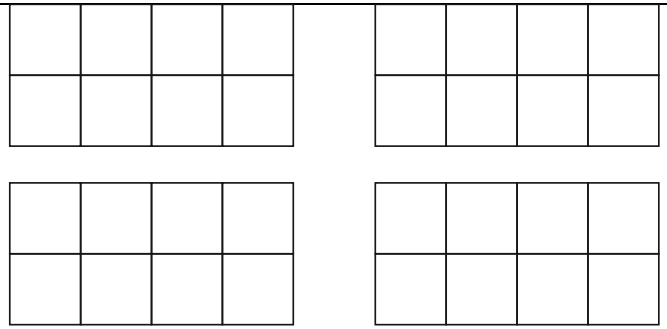
? > ?</td></tr>
<tr><td>Year 3 example</td><td colspan="3">Shade in 0·7 of this rectangle.
  </td><td colspan="3"> 
This is 2/5 or 0.4 of a bag of marbles. How many marbles are in a full bag?</td></tr>
<tr><td>Finding fractions of quantities</td><td>•To be able to find a half of an object, shape or quantity and a quarter of an object, shape or quantity</td><td>•To be able to write simple fractions for example, 1/2 of 6 = 3 and
• To be able to find fractions 1/3, 1/4 , 2/4 and 3/4 of a length, shape, set of objects or quantity</td><td>•To be able to recognise, find and write fractions of quantities, shapes and lengths including tenths
•<u>To be able to find 2/3 of an object or shape</u></td><td>•To be able to solve problems involving increasingly harder fractions to calculate quantities such as 2/5 of a number or 5/8</td><td><u>To be able to find a fraction of a quantity using known number facts e.g.
5/12 of 60 = 60 ÷12 x 5
1/20 of 80 = 1/10 of 80 ÷2</u></td><td><u>To be able to use their understanding of the relationship between unit fractions and division to work backwards by multiplying a quantity that represents a unit fraction to find the whole quantity (for example, if 1/4 of a length is 36cm, then the whole length is 36 × 4 = 144cm).</u></td></tr>
<tr><td>Year 1 examples</td><td colspan="3">Shade to show half of the whole shape.
  </td><td colspan="3">Shade each whole shape to show half in four different ways.</td></tr>
</table>

Circle half of this group of strawberries.

Complete this halving wall.

20	
10	

Choose any number and create your own halving wall.



What is half of this amount?

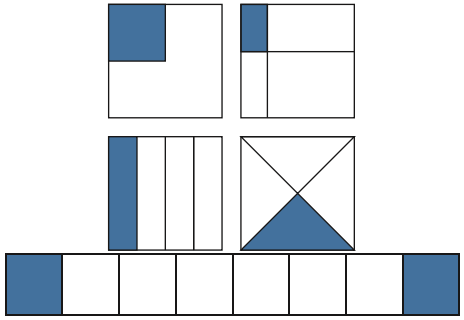
Complete this halving wall.

What is the relationship between the top row and one part of your final row? Explain your reasoning.

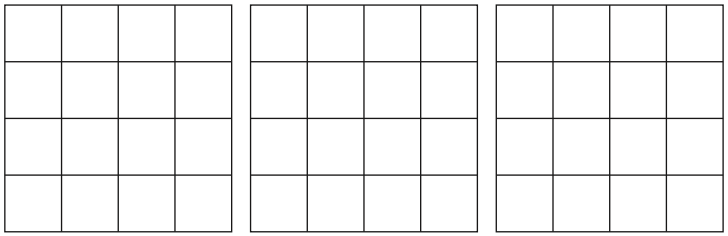
20			
10			

Choose any number and create your own halving wall.

Year 2 examples	Half of 12 is 2/ 4 of 12 is 1/ 4 of 20 = 3/ 4 of 20 = If you count in steps of starting from 0, how many steps will it take to reach: 2, 4 or 6 What do you notice?	Half of is 6 2/ 4 of ? is 6 1 /4 of ? = 5 3/ 4 of ? = 15 20 children are in a class and 1 /4 are girls. How many are boys? 1/ 3 of 3 = 1 1/ 3 of 6 = 2 1 /3 of 9 = 3 1 /3 of 12 = Continue the pattern. What do you notice?
Year 4 examples	Find: 1/10 of 10 1/10 of 20 1/10 of 30 1/10 of 40 1/10 of 50 What do you notice?	'To find a tenth of a number I divide by 10 and to find a fifth of a number I divide by 5.' Do you agree? Explain your reasoning.

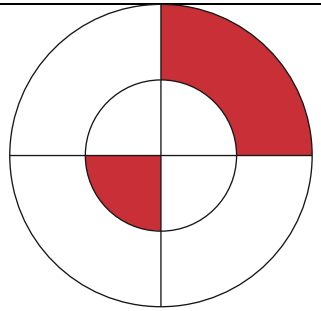
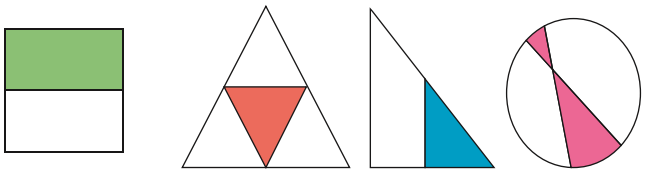
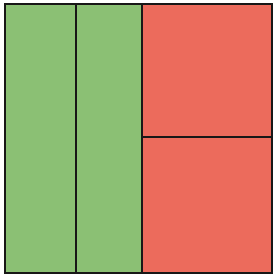
<table>
<tr><td>Comparing fractions</td><td></td><td>•Recognise the equivalence of 2/4 and 1/2.
•To be able to find equivalent fractions on a number line (1 2/4 or 1 ½)</td><td>•Compare and order unit and non- unit fractions and fractions with the same denominator
•To be able to recognise and show, using diagrams, families of common equivalent fractions
•To be able to find equivalent fractions on a number line</td><td>•To be able to recognise and show, using diagrams, families of common equivalent fractions
•To be able to to simplify fractions to find equivalences 6/9 = 2/3, ¼ = 2/8 .</td><td>•To be able to compare and order fractions whose denominators are all multiples of the same number
•Identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths</td><td>•To be able to use common factors to simplify fractions
•To be able to use common multiples to express fractions in the same denomination
•To be able to compare and order fractions, including fractions > 1</td></tr>
<tr><td>Year 2 examples</td><td colspan="3">Which of these diagrams have 1/4 of the whole shaded?
 
Explain your reasoning.

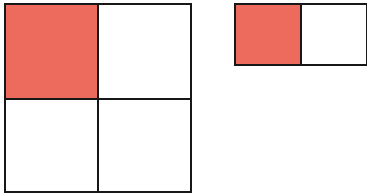
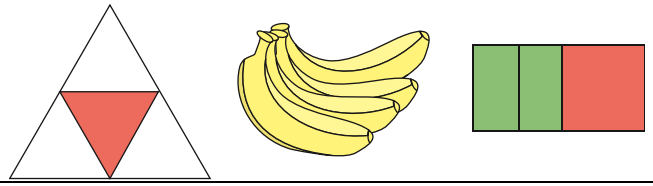
Jayne says that the shaded part of the whole square below does not show a half because there are three pieces, not two. Do you agree?

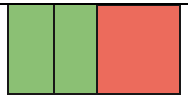
Explain your reasoning.
  </td><td colspan="3">Colour in 1/4 of each of these grids in a different way. Try to think of an unusual way.
 
How many squares did you colour each time?

What fraction is the red part of the whole circle?

Explain your reasoning.</td></tr>
</table>

		
Year 3 examples	True or false? Explain why.  $\frac{1}{2}$ $\frac{1}{3}$ $\frac{1}{2}$ $\frac{1}{4}$ On a number line labelled 0 to 1, mark 1/5, 2/5, 4/5 On a number line labelled 0 to 1, mark 1/6, 1/3, ½	The shape is divided into 4 equal parts. Do you agree? Explain why.  On a number line labelled 0 to 1, mark 1 /6 , 1/ 3 and 1 /2 . How big is the interval from 1 /6 to 1/ 3 ? How big is the interval from 1/ 6 to 1 /2 ?

	Hamsa says the diagrams below show that $\frac{1}{4} > \frac{1}{2}$ Do you agree? Explain why. 	What fraction of the square is shaded? Explain your reasoning.
Year 4 example	Put these fractions on the number line: 2/3, 1/2, 3/6, 4/9  Put these fractions on the number line: 4/5, 7/ 10, 5/10, 2/5  What's the same? What's different? 	Insert the symbol >, < or = to make each statement correct. 2/5 of 5 of 4 1/7 of 7 2/7 of 14 2/3 of 9 1/3 of 18 Make up three similar statements using >, < or =.



Children should be able to express the ideas that:

- *They are all divided into 4 equal parts.*
- *Each part represents a quarter of the whole.*
- *Each of the parts in the triangle are the same shape and area (congruent).*
- *The shapes in the square are different but each has the same area (not congruent).*

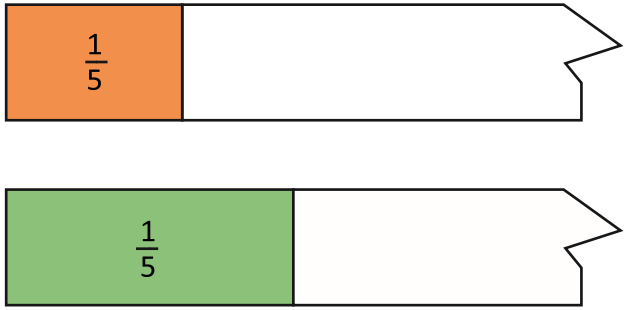
The bananas represent fractions of quantities.

Draw diagrams to show two fractions that are equivalent to 2 /8

.

Two paper strips are ripped. Identify which original paper strip is longer.

Explain your answer.



How many ways can you express 2/ 8 as a fraction

Year 5 examples

Make each number sentence correct using =, > or <.

$\frac{3}{4} \bigcirc \frac{1}{2}$

$\frac{3}{8} \bigcirc \frac{1}{2}$

$\frac{3}{4} \bigcirc \frac{3}{8}$

$1\frac{3}{4} \bigcirc 2\frac{1}{2}$

$\frac{3}{2} \bigcirc 1\frac{1}{2}$

$3\frac{3}{4} \bigcirc 3\frac{3}{8}$

$\frac{2}{4} \bigcirc \frac{1}{2}$

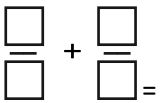
$\frac{2}{5} \bigcirc \frac{4}{1}$

$\frac{2}{5} \bigcirc \frac{5}{1}$

Write down two fractions where the denominator of one is a multiple of the denominator of the other.

Which is the larger fraction?

Explain your reasoning.

Fraction calculations			•To be able to add and subtract fractions with the same denominator within one whole [for example, 5/7 + 1/7 = 6/7]	• To be able to add and subtract fractions with the same denominator over one whole •To be able to convert improper fractions to mixed numbers and back	•To be able to add and subtract fractions with the same denominator and denominators that are multiples of the same number •multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams	•To be able to add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions •To be able to multiply simple pairs of proper fractions, writing the answer in its simplest form • To be able to divide proper fractions by whole numbers
Year 3 examples	Fill in the numerators to make the answer less than 1. Find three different ways to complete the calculation. /8 + /8 =			Fill in the numerators to make the calculation correct. How many ways can you do it? Explain how you know you have found them all. /8 + /8 = 1		
Year 4 examples	True or false? 1 /5 + 2/ 5 = 3 /5 1/5 + 2/5 = 3/10 1/5 + 2/5 = 6/10 Explain your reasoning.			Peter wrote down two fractions. He subtracted the smaller fraction from the larger and got 1 /8 as the answer. Write down two fractions that Peter could have subtracted. Can you find another pair?		
Year 5 examples	/15 + /10 = Using the numbers 5 and 6 only once, make this sum have the smallest possible answer			Using the numbers 3, 4, 5 and 6 only once, make this sum have the smallest possible answer: 		

Year 6 examples	Sam added two fractions together and got 7 /8 as the answer. Write down two fractions that Sam could have added. Tom wrote down two fractions. He subtracted the smaller fraction from the larger and got 1/ 5 as the answer. Write down two fractions that Tom could have subtracted. Tom and Sam shared equally one third of a chocolate bar. What fraction of the chocolate bar did each child get? What's the same, and what's different about these number statements? Double one third of 15 One third of 30 2 × 5 15 × 2 ÷ 3 15 ÷ 3 × 2 15 × 2/3 In each number sentence, replace the boxes with different whole numbers less than 20 so that the number sentence is true.	Roland cuts a sandwich into two pieces. First, Roland gives one piece to Ayat and the other piece to Claire. Then Claire gives Ayat half of her piece. Now Ayat has 7 /8 of the original sandwich. Did Roland cut the sandwich into two equal pieces? If not, how did he cut the sandwich? Amira says, 'To work out a fraction of a number, you multiply the number by the numerator of the fraction and then divide the answer by the denominator of the fraction.' Do you think that this is always, sometimes or never true? Explain your reasoning. True or false? ■ The sum of two fractions is always greater than their product. ■ If I divide a fraction by a whole number, the quotient is always smaller than the dividend. Explain your reasoning.

	$\frac{1}{\square} \times \frac{3}{\square} = \frac{\square}{\square}$ $\frac{\square}{\square} \times \frac{\square}{\square} = \frac{8}{15}$ $\frac{2}{\square} \times \frac{5}{\square} < \frac{10}{\square}$ $\frac{\square}{\square} \div 3 = \frac{1}{\square}$ $\frac{\square}{\square} \div 3 > \frac{1}{4}$					
Fraction problems	•To be able to solve fraction problems involving 1/2	•To be able to solve fraction problems involving ½, ¼, ¾, 1/3	•To be able to solve fraction problems including using tenths and thirds	•To be able to solve simple measure and money problems involving fractions and decimals to two decimal places	•To be able to solve problems involving number up to three decimal places and fractions of amounts • To be able to solve problems which require knowing , fraction and decimal equivalents of ½ , ¼ , ¾, 1/5 , 2/5 , 4/5	•To be able to solve problems which require answers to be rounded to specified degrees of accuracy •To be able to recall and use equivalences between simple fractions, decimals and percentages, including in different contexts.
Year 1 examples	There are 12 children in a class. Sammy says half of the class is 7. Do you agree? Explain your reasoning.			Half the children at a party are girls. How many children could be at the party? Give four different answers. Explain your reasoning.		
Year 2 examples	Jo bought a bag of 12 cherries. Jo ate half the number of cherries in the bag. How many cherries did Jo eat?			Jo bought a bag of cherries. Jo ate half the number of cherries in the bag. Jo had 7 cherries left. How many cherries did Jo buy?		

<table>
<tr><td></td><td>Sam bought a bag of 18 cherries.
Sam ate 6 cherries.
What fraction of the bag of cherries did Sam eat?</td><td>Sam bought a bag of cherries.
Sam ate 9 cherries and had 3 left over.
What fraction of the bag of cherries did Sam eat?</td></tr>
<tr><td>Year 3 examples</td><td>Six girls share three bars of chocolate equally.
Four boys share two bars of chocolate equally.

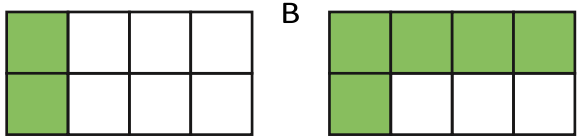
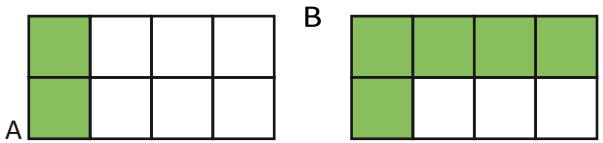
Does each girl get more chocolate, less chocolate or the same amount of chocolate as each boy?
Draw a picture to show that your reasoning is correct.</td><td>Jo ate 1/ 4 of a pizza and Sam ate 1/2 of what was left. Mike ate the rest of the pizza. Draw a diagram to show how much pizza Jo, Sam and Mike each ate.</td></tr>
<tr><td>Year 4 examples</td><td>8 girls share 6 bars of chocolate equally.
12 boys share 9 bars of chocolate equally.
Who gets more chocolate to eat, each boy or each girl? How do you know?
Draw a diagram to explain your reasoning.

A soup recipe uses 3/ 4 as many onions as carrots. Jo is making the soup and has 8
carrots.
How many onions does Jo use?</td><td>8 girls share 6 bars of chocolate equally.
12 boys share 9 bars of chocolate equally.

Clare says each girl got more to eat as there were fewer of them.
Rob says each boy got more to eat as they had more chocolate to share.

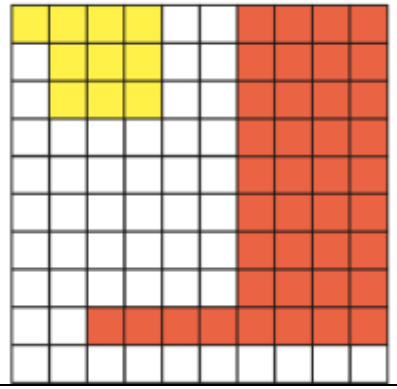
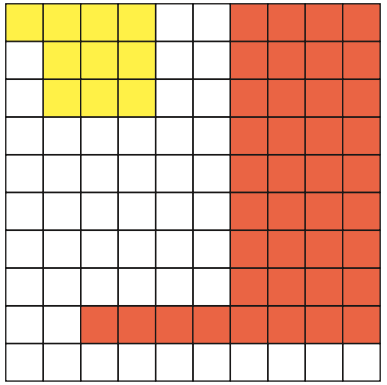
Explain why Clare and Rob are both wrong.

A soup recipe uses 3/4 as many onions as carrots. Complete the table below.
<table><tr><th>Carrots</th><th>Onions</th></tr><tr><td>1</td><td></td></tr><tr><td>2</td><td></td></tr><tr><td>3</td><td></td></tr><tr><td>4</td><td></td></tr></table></td></tr>
</table>

		<table><tr><td>5</td><td></td></tr><tr><td>6</td><td></td></tr></table> Explain how you worked out the number of onions. Did you use the same method each time?
Year 5 examples	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. How much more, as a fraction of a bar of toffee, did Sam eat on Tuesday?  Krysia wanted to buy a coat that cost £80. She saw the coat on sale in one shop at 1/ 5 off. She saw the same coat on sale in another shop at 25% off. Which shop has the coat at a cheaper price? Explain your reasoning.	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.  Sam says he ate $\frac{7}{8}$ of a bar of toffee. Jo says Sam ate 7/16 of the toffee. Explain why Sam and Jo are both correct. Jack and Jill each go out shopping. Jack spends 1/ 4 of his money. Jill spends 20% of her money. Frank says Jack spent more because 1/ 4 is greater than 20%. Alice says you cannot tell who spent more. Who do you agree with, Frank or Alice? Explain why.
Year 6 examples	On Monday I ran 1 and 2 /3 km and on Tuesday I ran 2 and 2/ 5 km. How far did I run altogether on these two days? On Wednesday I ran 1 and 2 /3 km and my sister ran 2 and 2 /5 km.	Altogether on Monday and Tuesday I ran 3 and 1/ 2 km. On neither day did I run a whole number of km. Suggest how far I ran on Monday and how far on Tuesday. On Wednesday I ran some km and my sister ran 1 and 1/ 6 km further than I did.

	How much further did my sister run than I did? Curtis used 1/ 3 of a can of paint to cover 3·5 square metres of wall. How much wall will one whole can of paint cover?			Altogether we ran 4 and 1/ 2 km. How far did I run on Wednesday? Puja shares 6 apples between some friends. Each friend gets 0·75 of an apple. How many friends does she share the apples with?		
Decimals as fractional amounts				• To recognise and write decimal equivalents of any number of tenths or hundredths • To recognise and write decimal equivalents to ¼, ½ and ¾, <u>1/10, 1/5</u> •To be able to 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	• To be able to read and write decimal numbers as fractions <u>for tenths , hundredths and thousandths</u>	•To be able to associate a fraction with division and calculate decimal fraction equivalents e.g. know that 7 divided by 21 is the same as 7/21 which is equivalent to 1/3 and that 0.375 is equivalent to 3/8 •To identify the value of each digit in numbers given to three decimal places
Year 4 examples	Match each fraction to its decimal equivalent. ½ 4/10 ¾ ¼ 0·25 0·75 0·4 0·5 Circle the equivalent fraction to 0·25 . 2/5 5/2 ½ 25/100, 100/25 Round to the nearest whole number. 8 3/ 8, 8·38, 8·83			Using these cards can you make a number between 4·1 and 4·61? 1 4 6 · What is the smallest number you can make using all four cards? What is the largest number you can make using all four cards?		

Ordering decimals				•To be able to round decimals with one decimal place to the nearest whole number •To be able to compare and order numbers with the same number of decimal places up to two decimal places	• To recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents •To round decimals with two decimal places to the nearest whole number and to one decimal place •To read, write, order and compare numbers with up to three decimal places	
Calculating with decimals			•To be able to muktiply and divide a multiple of 10 by 10	•To be able to multiply and divide a whole number by 10/ 100 •To be able to add two tenths numbers 0.3 + 0.8 =	•To be able to multiply and divide whole numbers and decimal numbers by 10, 100, •To be able to add and subtract decimals, including a mix of whole numbers and decimals, decimals with different numbers of decimal places, and complements of 1 e.g. 0.83 + 0.17	•To be able to multiply and divide numbers by 10, 100 and 1000 giving answers up to three decimal places •To be able to multiply and divide one-digit numbers with up to two decimal places by whole numbers •To be able to use written division methods in cases where the answer has up to two decimal places
Percentages					•To be able to recognise the per cent symbol (%) and understand that per cent	•To be able to solve problems involving the calculation of percentages [for example, of measures,

					relates to 'number of parts per hundred', and write percentages as a fraction with denominator 100, and as a decimal • To be able to solve problems which require knowing percentage and decimal equivalents of ½, ¼, 1/5, 2/5, 4/5 and those fractions with a denominator or a multiple of 10 or 25	such as 15% of 360] and the use of percentages for comparison
Year 5 example	Express the yellow section of the grid in hundredths, tenths, as a decimal and as a percentage of the whole grid. Do the same for the red section. 			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? 		

New vocabulary for each year group is in **bold**	Progression in vocabulary – Fractions, decimals and percentages
Year 1	Fraction, equal, part, equal, grouping, equal, sharing, parts of a whole, half, one of two equal parts, quarter one of four equal parts
Year 2	Fraction, **equivalent fraction, mixed number numerator, denominator,** equal part, equal grouping, equal sharing, parts of a whole, half, **two halves,** one of two equal parts, quarter, **two quarters, three quarters** one of four equal parts, **one third, two thirds one of three equal parts,**

Year 3	Fraction, equivalent fraction, mixed number, numerator, denominator, equal part, equal grouping, equal , parts of a whole, half, two halves, one of two equal parts, quarter, two quarters, three quarters, one of four equal parts, one third, two thirds one of three equal parts **sixths, sevenths, eighths, tenths …**
Year 4	Fraction, equivalent fraction, mixed number, numerator, denominator, equal part, equal grouping, equal sharing, parts of a whole, half, two halves, one of two equal parts, quarter, two quarters, three quarters one of four equal parts one third, two thirds one of three equal parts sixths, sevenths, eighths, tenths … **hundredths decimal, decimal fraction, decimal point, decimal place, decimal equivalent proportion**
Year 5	fraction, **proper/improper fraction** equivalent fraction mixed number numerator, denominator equivalent, **reduced to, cancel, simplify** equal part, equal grouping, equal sharing, parts of a whole half, two halves, one of two equal parts, quarter, two quarters, three quarters, one of four equal parts, one third, two thirds, one of three equal parts, sixths, sevenths, eighths, tenths … hundredths, **thousandths,** decimal, decimal fraction, decimal point, decimal place, decimal equivalent proportion, **in every, for every percentage, per cent, %**
Year 6	fraction, proper/improper fraction, equivalent fraction, mixed number, numerator, denominator equivalent, reduced to, **simplify,** cancel, equal part, equal grouping, equal sharing, parts of a whole half, two halves, one of two equal parts, quarter, two quarters, three quarters, one of four equal parts, one third, two thirds one of three equal parts, sixths, sevenths, eighths, tenths … hundredths, thousandths, decimal, decimal fraction, decimal point, decimal place, decimal equivalent proportion, in every, for every **ratio** percentage, per cent, %, **degree of accuracy**