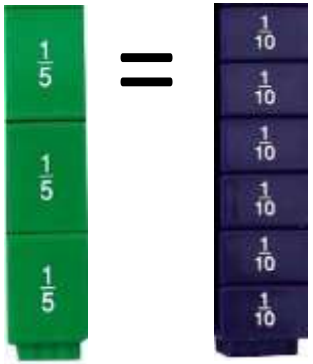
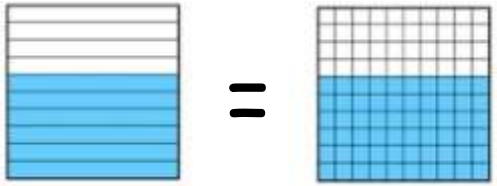
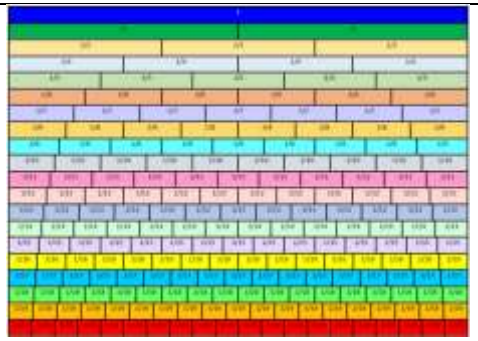
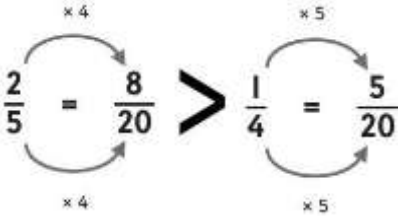
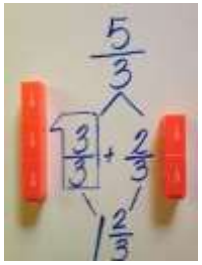
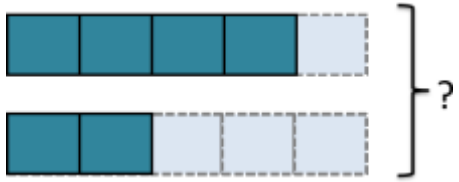
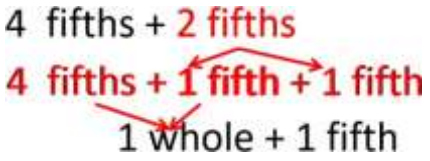
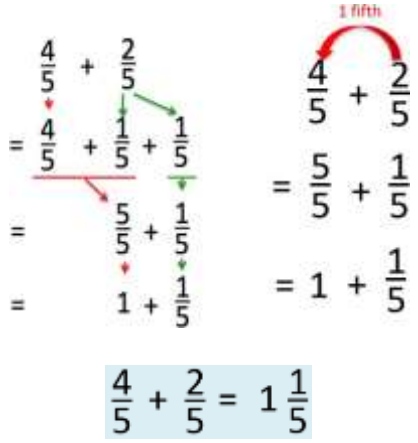
Power Maths White Rose Edition calculation policy

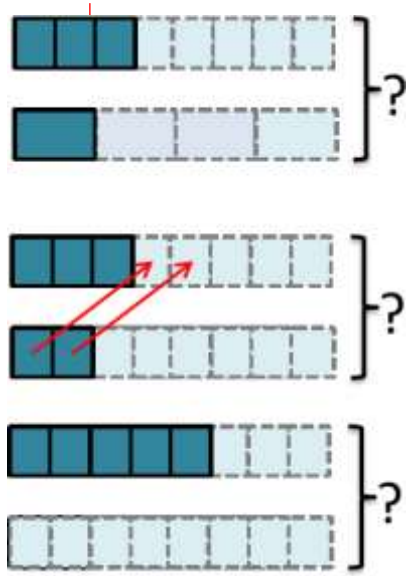
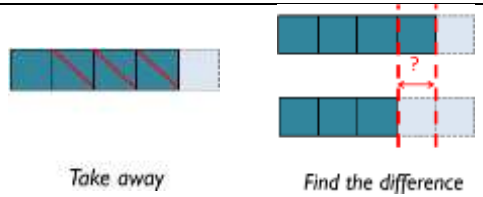
Powers Hall Academy

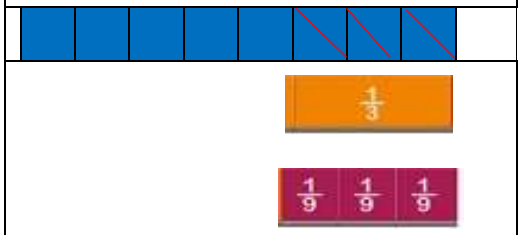
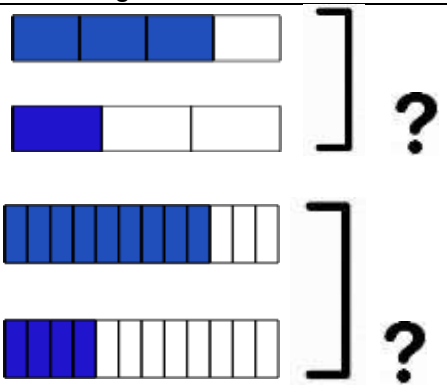
Fraction **calculation policy, UPPER KS2**

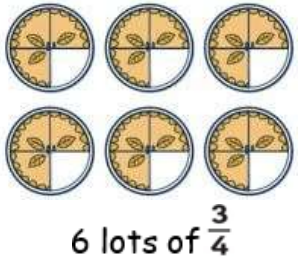
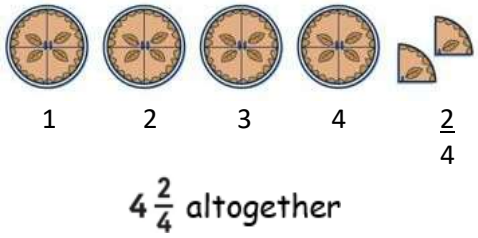
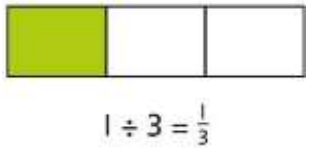
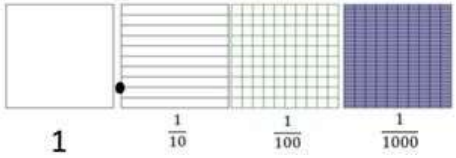
Key Stage 2	
In upper Key Stage 2, children build on secure foundations in calculation, and develop fluency, accuracy and flexibility in their approach to the four operations. They work with whole numbers and adapt their skills to work with decimals, and they continue to develop their ability to select appropriate, accurate and efficient operations.	
Key Language: fraction, halve, quarter, whole, part, equal parts, unit fraction, improper fraction, proper fraction, mixed number, numerator, denominator, equivalent, simplify, one-half, 0ne-quarter, three-quarters, multiple, decimal fractions, convert, tenth, hundredth, thousandth, decimal, percent %, percentage	
Fractions: Children find fractions of amounts, multiply a fraction by a whole number and by another fraction, divide a fraction by a whole number, and add and subtract fractions with different denominators. Children become more confident working with improper fractions and mixed numbers and can calculate with them. Understanding of decimals with up to 3 decimal places is built through place value and as fractions, and children calculate with decimals in the context of measure as well as in pure arithmetic. Children develop an understanding of percentages in relation to hundredths, and they understand how to work with common percentages: 50%, 25%, 10% and 1%.	The understanding of fractions is rooted in the CPA approach. **Concrete** ↓ **Pictorial** ↓ **Words** ↓ **Abstract** Concrete is the "**doing" stage**. This stage brings concepts to life by allowing children to experience and handle physical (concrete) objects. Pictorial is the **"seeing" stage**. Here, visual representations of concrete objects are used to model problems. Words is the **grammatical stage**. Here, a written representation of a pictorial or abstract concept is used to focus on denominators as nouns, which can be counted and compared. Abstract is the **"symbolic" stage**. Concepts are introduced at a symbolic level, using only numbers, notation, and mathematical symbols

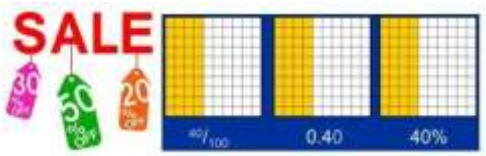
Year 5				
	Concrete	**Pictorial**	**Words**	**Abstract**
Identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths.	 Use fraction tower cubes to explore equivalency $\frac{3}{5} = \frac{6}{10}$	Use bar models and 100 squares to identify equivalent fractions  $\frac{6}{10} = \frac{60}{100}$	1 fifth is equal to 2 tenths 3 fifths is equivalent to 6 tenths	Use multiplication of the numerator and denominator to calculate equivalent fractions $\frac{3}{5} = \frac{6}{10} = \frac{60}{100}$ $\frac{3}{4} = \frac{75}{100}$ $\frac{1}{5} = \frac{2}{10} = \frac{20}{100}$
Compare and order fractions whose denominators are all multiples of the same number	You can only compare fractions when they have the same noun  Noun becomes twentieths	 Use a fraction wall to visually identify equivalencies	8 twentieths is greater than 5 twentieths Same noun	Use multiplication to convert to a common denominator. 

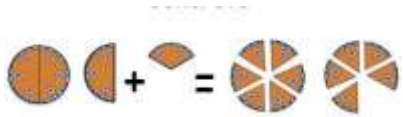
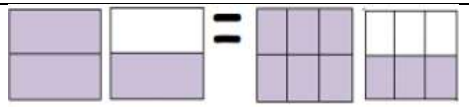
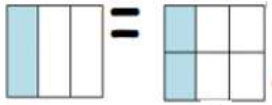
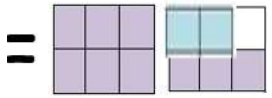
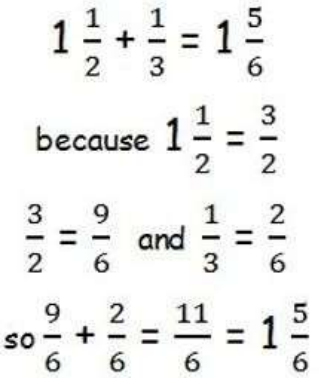
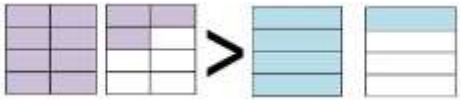
Recognise mixed numbers and improper fractions. Convert from one form to the other and write mathematical statements >1 as a mixed number.	 $\frac{4}{5} + \frac{2}{5}$ Use paper fraction strips or fraction frames covered with counters to represent calculations. Fraction parts from the second strip can be added to the first to create a mixed number answer.  Fraction tower represents the improper fraction which can then be split to make the mixed number	Bar models represent addition of two fractions $\frac{4}{5} + \frac{2}{5}$  	4 fifths + 2 fifths = 6 fifths  What can you count? What can you add together?	 Use number bonds to get a mixed number straight away
Add fractions with the same denominators	Fold paper strips to create bar models. Second strip can be folded and placed on top of the first to represent the answer.	Bar models represent addition of two fractions with the same denominator	1 quarter + 2 quarters=3 quarters 1+2 Noun remain the same	$\frac{1}{4} + \frac{2}{4} = \frac{3}{4}$ 1 + 2 Denominator remains the same

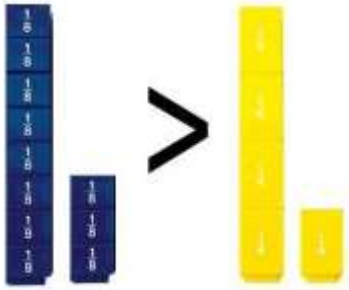
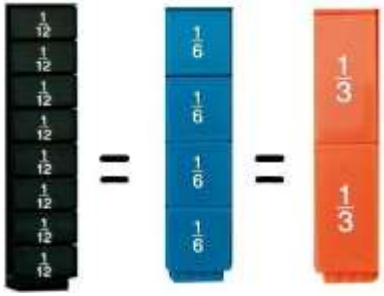
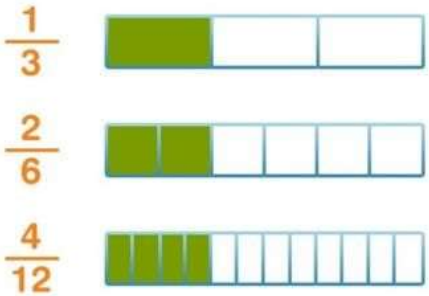
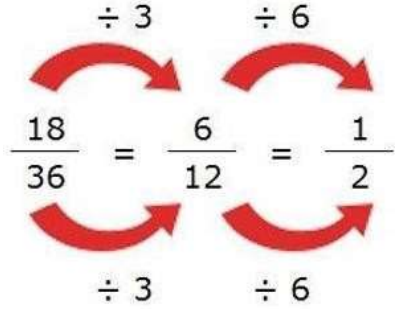
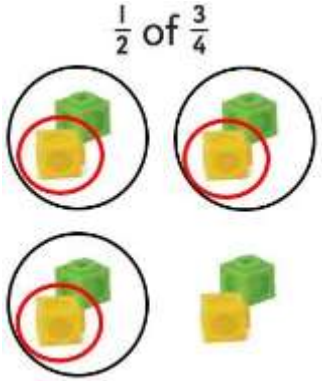
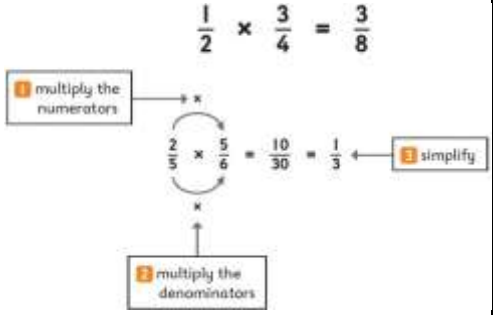
			Add the numerators and leave the denomnator the same.	
Add denominators that are multiples of the same numbers. (related denominators)	Use folded paper strips to create bar models and understand equivalencies between denominators based on direct comparison. $\frac{3}{8} + \frac{1}{4}$ $\frac{3}{8} + \frac{2}{8}$  Second strip can be placed directly on top of first to represent the answer	Bar models represent addition of two fractions with different denominators - visual link can be made 	3 eighths + 1 quarter = 3 eighths + 2 eighths = 5 eighths Eighths and quarters are different nouns – they must be the same for addition	$\frac{3}{8} + \frac{1}{4}$ x2 $= \frac{3}{8} + \frac{2}{8}$ $= \frac{5}{8}$ Use multipication to convert to a common denominator
Subtract fractions with the same denominators	Use counters, cubes or rectangles on a folded strip to represent subtraction 	 Take away Find the difference	4 fifths – 3 fifths = 1 fifth	$\frac{4}{5} - \frac{3}{5} = \frac{1}{5}$ 4 - 3 Denominator remains the same

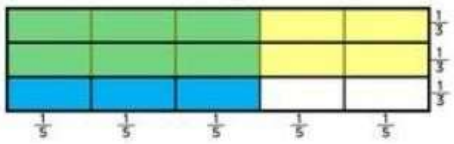
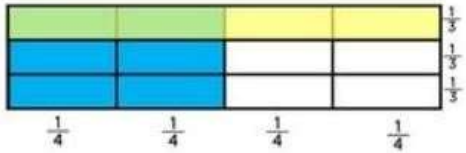
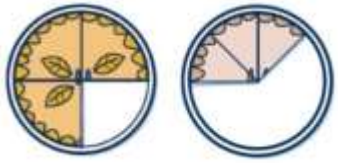
		$\frac{4}{5} - \frac{3}{5}$ Bar models represent subtracting	Subtract the numerators and leave the denomnator the same	
Subtract denominators that are multiples of the same numbers. (related denominators)	Use fraction towers, fraction wheels or tiles to explore equivalencies.  $\frac{1}{3} = \frac{3}{9}$	 Use knowledge of equivalent fractions to find out how many parts to cross out on the diagram when subtracting.	8 ninths – 1 third = 8 ninths – 3 ninths = 5 ninths Ninths and thirds are different nouns – they must be the same for subtraction.	$\frac{8}{9} - \frac{1}{3}$ $= \frac{8}{9} - \frac{3}{9}$ X 3 $= \frac{5}{9}$ Find a common denominator.
Subtract denominators that are multiples of the same numbers. (unrelated denominators)	Use fraction towers, circles tiles to explore equivalencies. 	 $\frac{3}{4} - \frac{1}{3} = \frac{9}{12} - \frac{4}{12}$ Use knowledge of equivalent fractions to find out how many parts to cross out on the diagram when subtracting.	3 quarters – 1 third = 9 twelfths – 4 twelfths = 5 twelfths Quarters and thirds are different nouns – they must be the same for subtraction.	Find a common denominator and then change both into an equivalent fraction, using multipication. $\frac{3}{4} - \frac{1}{3}$ X3 X4 $= \frac{9}{12} - \frac{4}{12}$ $= \frac{5}{12}$

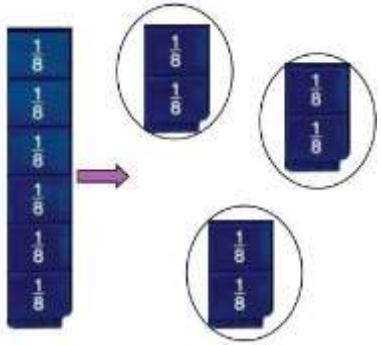
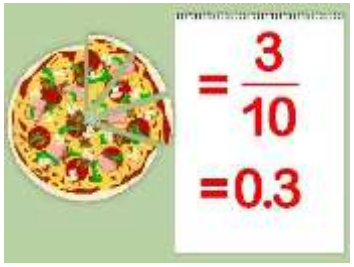
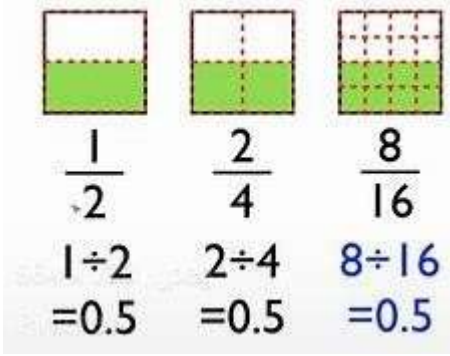
Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams	 Use practical equipment to explore multiplying by unitising.	 Represent multiplication, using bar models or faction circles.	3 quarters multiplied by 6 = 18 quarters 3 quarters 3 quarters 3 quarters 3 quarters 3 quarters 3 quarters 18 quarters Repeated addition means the denominators are the same so just add the numerators.	Use multiplication. numerator x whole number. $\frac{3}{4} \times 6 = \frac{18}{4} = 4\frac{2}{4}$
Understand the relationship between fractions and division	Use sharing to explore the link between fractions and division. *1 whole shared between 3 people.* *Each person receives one-third.* 	Use a bar model and other fraction representations to show the link between fractions and division. 		Use the link between division and fractions to calculate divisions. $5 \div 4 = \frac{5}{4} = 1\frac{1}{4}$ $11 \div 4 = \frac{11}{4} = 2\frac{3}{4}$
Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents	 Write numbers into a place value chart to recognise digit values and relationship between columns.	Use images and place value equipment to explore relationship between fractions and decimals. 		**67.513** **Use place value headings to identify digit value.** How many thousandths does this number have? How many more thousandths do you need to add to make 67.16?

Recognise % symbol and understand the meaning: write % as a fraction, decimal and percentage	Use fraction towers to identify and write percentages as a fraction and a decimal. 	Use hundred square to represent a percentage, making links with equivalent fractions and decimals. 		$\frac{4}{10} = 40\% = 0.4$ $\frac{32}{100} = 32\% = 0.32$ $\frac{75}{100} = 75\% = 0.75$ $\frac{2}{25} = \frac{8}{100} = 8\% = 0.08$ Use place value to write fractions, decimals and percentages.

Year 6				
	Concrete	**Pictorial**	**Words**	**Abstract**
Add and subtract fractions with different denominators and mixed numbers using the concept of equivalent fractions.	Use fraction wheels to represent calculations. $1\frac{1}{2} + \frac{1}{3}$ 	 1 $\frac{1}{2}$ 1 $\frac{3}{6}$  $\frac{1}{3}$ $\frac{2}{6}$  1 $\frac{5}{6}$ Use bar model to find a common denominator.	1 and a half + 1 third = 1 and 3 sixths + 2 sixths = 1 and 5 sixths What can we count? What can we add? Halves and thirds are different nouns – they must be the same for addition.	 $1\frac{1}{2} + \frac{1}{3} = 1\frac{5}{6}$ because $1\frac{1}{2} = \frac{3}{2}$ $\frac{3}{2} = \frac{9}{6}$ and $\frac{1}{3} = \frac{2}{6}$ so $\frac{9}{6} + \frac{2}{6} = \frac{11}{6} = 1\frac{5}{6}$ Find a common denominator and then convert into an equivalent fraction.
Compare and order fractions, including fractions >1	Represent the fractons using cubes. Direct comparison can then be made between the simple fractions.	Use bar models to represent fractions, visually showing which simple fraction is larger or snaller than the other. 	4 sixteenths < 6 sixteenths Same noun so which numerator is greater or less than the other?	Which is greater? $\frac{2}{8} < \frac{6}{16}$ $\frac{4}{16} < \frac{6}{16}$

				Ordering from smallest to largest by using equivalent fractions: $\frac{5}{12}, \frac{2}{3}, \frac{5}{6}$ $\frac{5}{12}, \frac{8}{12}, \frac{10}{12}$ Find equivalent fractions, using the lowest common multiple (LCM)
Use common factors to simplify fractions; use common multiples to express fractions in the same denomination .	Use fraction tower cubes to explore equivalency 	Bar models represent equivalent fractions 		 Use division to simply fractions.
Multiply simple pairs of proper fractions, writing the answer in its simplest form	 Use cubes to explore division of sets.	Use a labelled grid to represent the multiplication calculation. Shade in part of the grid where the simple fractions line up/over lap.		

		$\frac{2}{3} \times \frac{3}{5}$  $\frac{1}{3} \times \frac{2}{4}$ 		
Recall and use equivalences between simple fractions, decimals and percentages including in different contexts.	Use fraction towers to identify and equivalent fraction, decimal and percentage 	Which would you prefer 75% or $\frac{3}{8}$ of a pie?  75% = 75/100 = 3/4 3/8 Bar models and pie charts represent percentage, decimal and fraction amounts for comparison.		Reason from known facts and place value understanding. One paving slab is 0.3m and the other is 1/4 of a metre. Which one is longer? **1/4 = 0.25m 0.3m is larger than 0.25**
Divide proper fractions by whole numbers.	6/8 ÷ 3 = 2/8			

	 Use fraction cubes or counters to group and share	 $\frac{1}{2} \div 4 = \frac{1}{8}$ Use a bar model to represent the fraction, which is divided into the number of equal parts identified by the whole number. How many equal parts are there now?		$\frac{1}{2} \div 3 = \frac{1}{6}$ Keep it, change it, flip it! $\frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$
Associate fractions with division and calculate decimal fraction equivalents	Use pictorial representations of a whole to divide into equal parts, representing both the frction and decimal equivalents. 	Use a bar model and other fraction representations to show the link between fractions and division. 		$\frac{3}{8}$ 3 'out of' 8 is the same as 3 'divided by' 8 3 ÷ 8 = 0·375 So $\frac{3}{8}$ = 0·375