Power Maths White Rose Edition calculation policy

Powers Hall Academy

Fraction **calculation policy, LOWER KS2**

Key Stage 2

In lower Key Stage 2, children build on many of the topics covered in the year 2 unit on fractions and progresses to introduce fractions as a number. Children will learn to recognise and represent equivalent fractions using concrete, pictorial and abstract representations. They will compare and order fractions with different denominators, using a number line and the 'greater than' and 'less than' symbols. They will also begin adding and subtracting fractions, and use this skill to solve contextual problems, including those involving units of measure. Year 4 will introduce hundredths for the first time, and link these to children's understanding of tenths. Children will begin learning about fractions that are greater than 1. They will find equivalent fractions, using their understanding of pictorial representations to support this. They will also begin understanding how to simplify fractions and investigate where and why this is a necessary mathematical skill.

Key Language: numerator, denominator, fraction, whole number, mixed number, proper fraction, improper fraction, fraction of an amount h add (+), subtract (−), multiply (×), divide (÷), sign, greater than (>), less than (<), whole, part, find….of….

Fractions: In this unit, children will understand the concept of a unit fraction and a non-unit fraction and understand what the numerator and denominator represent. Children will compare and order simple unit fractions and also non-unit fractions where the denominators are equal. In addition to this, children will learn to recognise and show, using diagrams, equivalent fractions with small denominators. They will explore a fraction wall and use it to find equivalent fractions. They will learn to add and subtract two or more fractions with the same denominator, answering questions in more than one way and comparing the efficiency of each method. Children will learn to add and subtract two or more fractions with the same denominator, answering questions in more than one way and comparing the efficiency of each method. They will develop their understanding of solving fraction problems and will learn to solve problems involving fractions of an amount.

Year 4 introduces the concept of mixed numbers and improper fractions. Children will explore what happens when a fraction is more than 1 (that is, the numerator is greater than the denominator). They will use this to write, compare and order mixed numbers and will then look at how mixed numbers can be written as improper fractions and vice versa. Children realise that, as long as the denominators are equal, they can add the numerators. Children start to explore subtracting a fraction from a whole number, which will support their more in-depth exploration of fractions in Year 5. Finally, children continue to find a fraction of an amount, working with divisions within times-tables they have learnt.

The understanding of fractions is rooted in the CPA approach.

Concrete

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Pictorial

↓

Words

↓

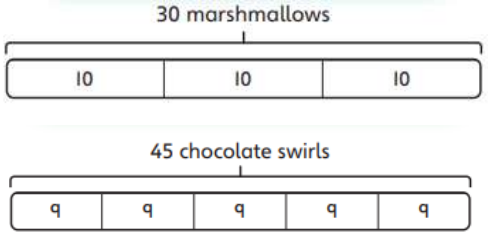
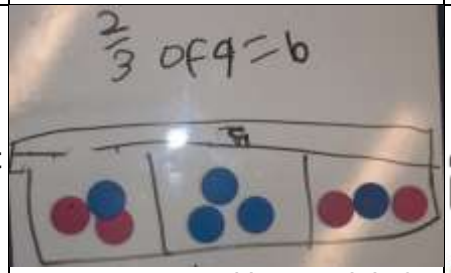
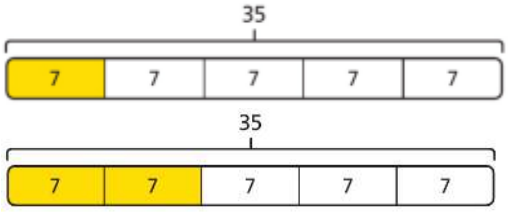
Abstract

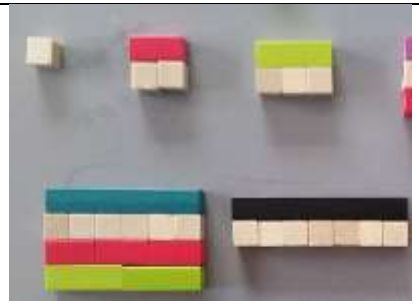
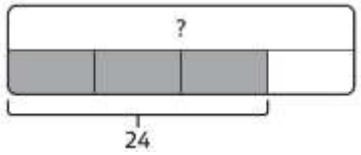
Concrete is the "**doing" stage**. This stage brings concepts to life by allowing children to experience and handle physical (concrete) objects.

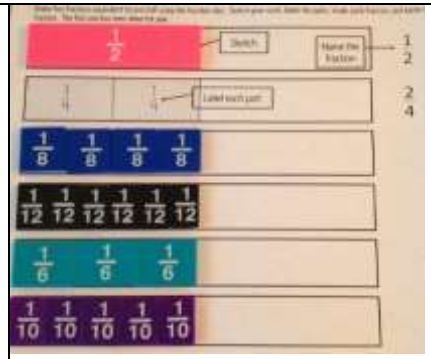
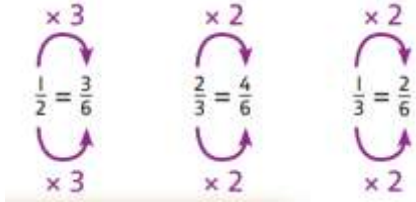
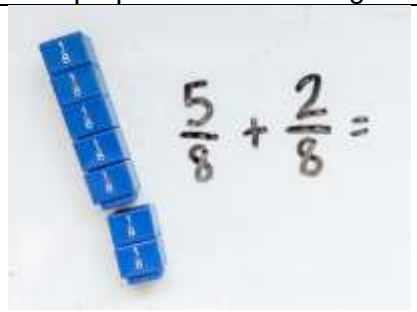
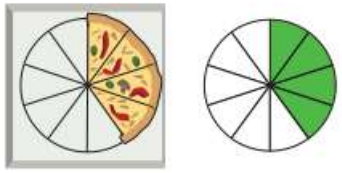
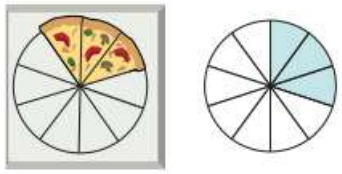
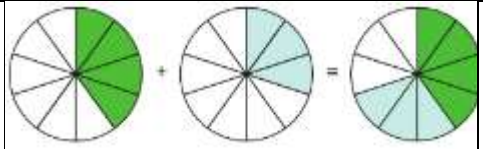
Pictorial is the **"seeing" stage**. Here, visual representations of concrete objects are used to model problems.

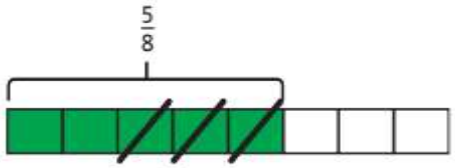
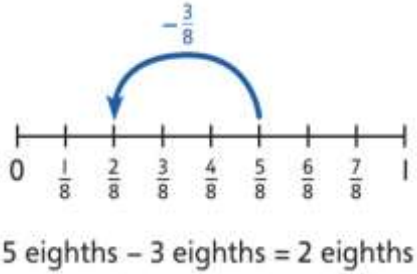
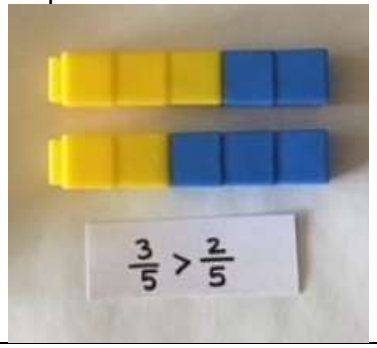
Words is the **grammatical stage**. Here, a written representation of a pictorial or abstract concept is used to focus on denominators as nouns, which can be counted and compared.

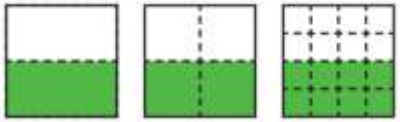
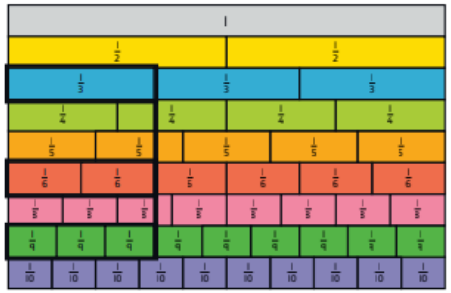
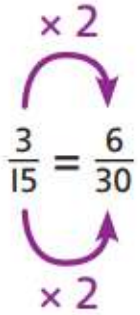
Abstract is the **"symbolic" stage**. Concepts are introduced at a symbolic level, using only numbers, notation, and mathematical symbols

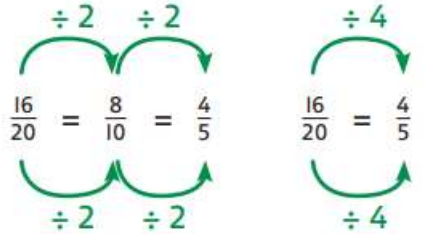
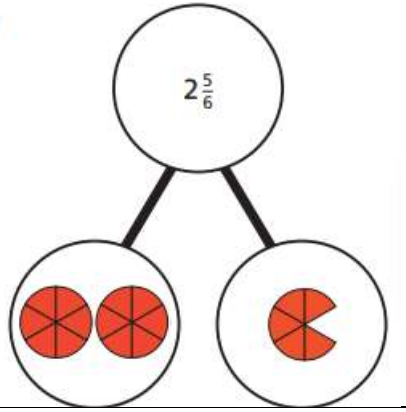
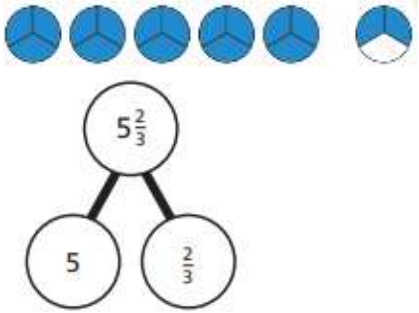
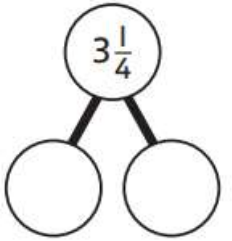
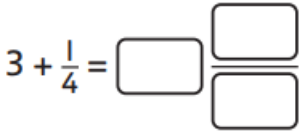
Year 3				
	Concrete	**Pictorial**	**Words**	**Abstract**
Recognise, find and write fractions of a discrete set of objects: unit fractions with small denominators	 Children should be allowed to use counters and objects for as long as necessary to help them to understand the concept of finding a fraction of an amount.	The bar model can be used to calculate a fraction of a quantity. 	There are 30 marshmallows. 1/3 of the marshmallows are used on each cake.	30 ÷ 3 = 10 10 marshmallows are needed for 1 cake. 45 ÷ 5 = 9 9 chocolate swirls are needed for 1 cake.
Recognise, find and write fractions of a discrete set of objects: non-unit fractions with small denominators	 Use counters and bar models for as long as necessary for them to understand the concept of finding a non-unit fraction of an amount. A multiplication square or similar resource may also be helpful.	Find 1/5 of 35.  Children may use bar models to support their understanding.		1/5 of 35 = 7 7 × 2 = 14 2/5 of 35 = 14 Divide the whole number involved by the denominator and multiply the answer by the numerator.

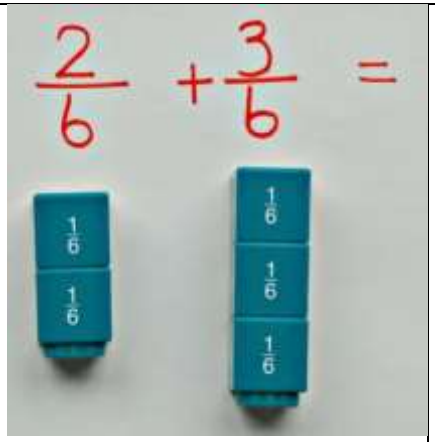
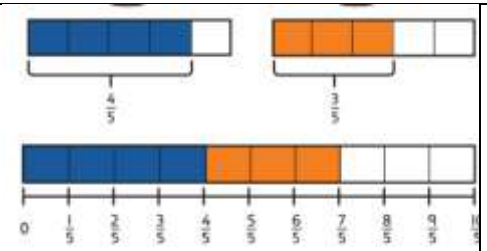
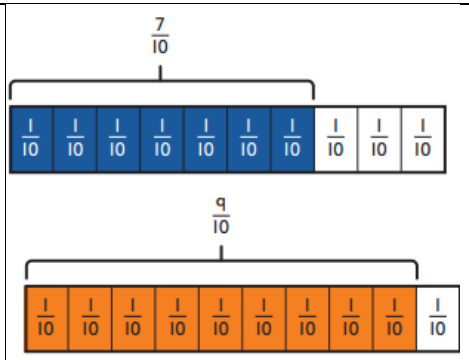
Recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators	 Children may find it useful to use coloured rods to physically make a bar model and manipulate its parts	$\frac{3}{4}$ of a number is 24. What is the number?  Use bar model diagrams to help children conceptualise what they are being asked to work out and the steps that are needed to find a solution. Ask children what each number in a calculation tells them and where this information can go on the bar model.		**$24 \div 3 = 8$** **$8 \times 4 = 32$**

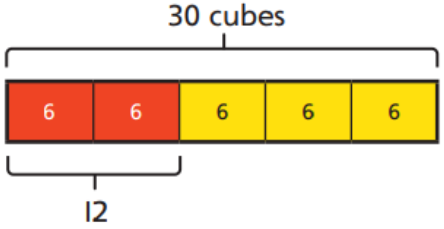
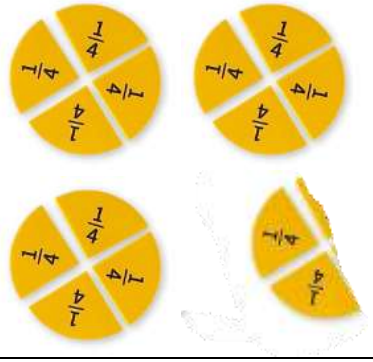
Recognise and show, using diagrams, equivalent fractions with small denominators	 Use number lines and fraction strips to make each of the fractions presented in the question. Once they have a clear visual representation in their heads, help them develop their proportional reasoning.	Children can use a fraction wall to identify and give equivalent fractions. Children begin to see the links between equivalent fractions and multiples.  $\frac{1}{2} = \frac{2}{4}$ and $\frac{1}{2} = \frac{3}{6}$		The numerator and denominator should be multiplied or divided by the same number for the fractions to be equivalent. 
Add fractions with the same denominator within one whole	 Use fraction circles or fraction strips to show what happens when you add two fractions together.	Zac has $\frac{4}{10}$ of the pizza left.  Isla has $\frac{3}{10}$ of the pizza left. 		$\frac{4}{10} + \frac{3}{10} = \frac{7}{10}$ If the denominators are the same, simply add the numerators.

Subtract fractions with the same denominator within one whole	 A fraction strip split into the correct number of equal parts will help children to visualise a whole. It will also allow children to count along the strip if need.	 Use the crossing out method to subtract one fraction from another to find out the difference. Children should shade in the relevant parts and cross out what they are subtracting. Children should begin to notice that when the denominators are the same, they can just subtract the numerators.	Show calculations with fractions on a number line.  5 eighths – 3 eighths = 2 eighths	$\frac{5}{8} - \frac{3}{8} = \frac{2}{8}$ If the denominators are the same, simply subtract the numerators.
Compare and order unit fractions, and fractions with the same denominators	Provide children with fraction strips or cubes divided into the correct number of parts. Ask them what they notice about the fraction strips. 	 To support children comparing two non-unit fractions, provide them with fraction strips divided into the correct number of parts. They should set them directly above each other to make the comparison easier.	If the denominators are the same, then the **greater** the numerator, the **greater** the fraction.	$\frac{6}{8} > \frac{4}{8}$ Children need to compare non-unit fractions by looking at the size of the numerators. They complete the sentences using less than and greater than statements.

Year 4				
	Concrete	**Pictorial**	**Words**	**Abstract**
Recognise and show, using diagrams, families of common equivalent fractions	Provide children with fraction strips so that they can directly compare fractions with the same or different numerators and denominators.   $\frac{1}{2}$ $\frac{2}{4}$ $\frac{8}{16}$ Give children paper and ask them to fold it in half and shade 1 2 . They can then fold the paper in half again and identify how many quarters make a half. They can continue folding to find other equivalent fractions.	 Children can use a fraction wall to identify and give equivalent fractions. Children begin to see the links between equivalent fractions and multiples.		The numerator and denominator should be multiplied or divided by the same number for the fractions to be equivalent.  **To simplify fractions,** look for the highest times-table in which both the numerator and denominator appear, rather than dividing in successive steps using the smallest factor they can see.

				
Reason about the location of mixed numbers in the linear number system	Provide paper circles cut into fraction parts to match those in the scenario, but for different mixed numbers. Children can use these as simple jigsaws which they then put back together to try and make complete wholes. 	Use a part-whole model to complete a partition of a mixed number and show which is the whole part and which is the fraction part 		 Explore how partitioning can be shown as addition sentences. 

Add fractions with the same denominator	 Use concrete objects such as base 10 equipment, counters or even everyday objects such as coloured pencils	 Encourage them to draw bar models to represent their answers, as doing this will consolidate their understanding.	$\frac{3}{9}$ is three lots of $\frac{1}{9}$ $\frac{4}{9}$ is four lots of $\frac{1}{9}$ I know that $3 + 4 = 7$.... so, I know that $\frac{3}{9} + \frac{4}{9} = \frac{7}{9}$. Equation: $\frac{3}{9} + \frac{4}{9} = \frac{7}{9}$	Express answers as either improper fractions or mixed numbers, using a number line to help them. $\frac{4}{5} + \frac{3}{5} = \frac{7}{5}$ $1\frac{2}{5}$
Subtract fractions with the same denominator	 Use concrete objects such as fraction circles, counters or even everyday objects such as coloured pencils.	 Encourage children to show this using a bar model.		$\frac{9}{10} - \frac{7}{10} = \frac{2}{10}$.

Calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number	Use folded paper strips to create bar models. 	Represent problems visually, with a fraction strip. Children can use the fraction strip to work out whether they have to find a fraction of an amount or whether they have to find the whole 		Danny has 30 cubes in his tower. $\frac{2}{5}$ of the cubes are red. $30 \div 5 = 6$ $2 \times 6 = 12$
Convert mixed numbers to improper fractions and vice versa.	Provide children with concrete shapes that they can arrange to create 'wholes' and 'parts' and make the mixed numbers 	 Draw diagrams to represent conversion of an improper fraction to a mixed number. Ask them to identify the wholes and the parts in their diagram and to link this to the mixed number notation.	How many 1/3s are shaded in total? What is this as an improper fraction?	$\frac{7}{3} = \frac{3}{3} + \frac{3}{3} + \frac{1}{3} =$ $1 + 1 + \frac{1}{3} = 2\frac{1}{3}$