Fractional Thinking

Year 7

#MathsEveryoneCan

2019-20

White Rose Maths

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	**Algebraic Thinking**						**Place Value and Proportion**					
	Sequences		Understand and use algebraic notation		Equality and equivalence		Place value and ordering integers and decimals			Fraction, decimal and percentage equivalence		
Spring	**Applications of Number**						**Directed Number**			**Fractional Thinking**		
	Solving problems with addition & subtraction		Solving problems with multiplication and division			Fractions & percentages of amounts	Operations and equations with directed number			Addition and subtraction of fractions		
Summer	**Lines and Angles**						**Reasoning with Number**					
	Constructing, measuring and using geometric notation			Developing geometric reasoning			Developing number sense		Sets and probability		Prime numbers and proof	

Spring 2: Directed Number and Fractional Thinking

Weeks 1 to 3: Directed number

Students will only have had limited experience of directed number at primary school, so this block is designed to extend and deepen their understanding of this. Multiple representations and contexts will be used to enable students to appreciate the meaning behind operations with negative integers rather than relying on a series of potentially confusing "rules". As well as exploring directed number in its own right, this block provides valuable opportunities for revising and extending earlier topics, notably algebraic areas such as substitution and the solution of equations; in particular students will be introduced to two-step equations for the first time in this block.

National curriculum content covered:

- select and use appropriate calculation strategies to solve increasingly complex problems
- use the four operations, including formal written methods, applied to integers, both positive and negative
- recognise and use relationships between operations including inverse operations
- use square and square roots
- use a calculator and other technologies to calculate results accurately and then interpret them appropriately
- substitute numerical values into formulae and expressions, including scientific formulae
- understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors
- simplify and manipulate algebraic expressions to maintain equivalence
- understand and use standard mathematical formulae

<u>Interleaving/Extension of previous work</u>

- use conventional notation for the priority of operations
- forming and solving linear equations, including two-step equations

Weeks 4 to 6: Fractional thinking

This block builds on the Autumn term study of "key" fractions, decimals and percentages. It will provide more experience of equivalence of fractions with any denominators, and to introduce the addition and subtraction of fractions. Bar models and concrete representations will be used extensively to support this. Adding fractions with the same denominators will lead to further exploration of fractions greater than one, and for the Core strand adding and subtracting with different denominators will be restricted to cases where one is a multiple of the other.

National curriculum content covered:

- move freely between different numerical, graphical and diagrammatic representations [for example, equivalent fractions, fractions and decimals]
- express one quantity as a fraction of another, where the fraction is less than 1 and greater than 1
- order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols =, ≠, , ≤, ≥
- select and use appropriate calculation strategies to solve increasingly complex problems
- use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative
- work interchangeably with terminating decimals and their corresponding fractions

<u>Interleaving/Extension of previous work</u>

- finding the range and the median
- substitution into algebraic formulae
- forming and solving linear equations, including two-step equations

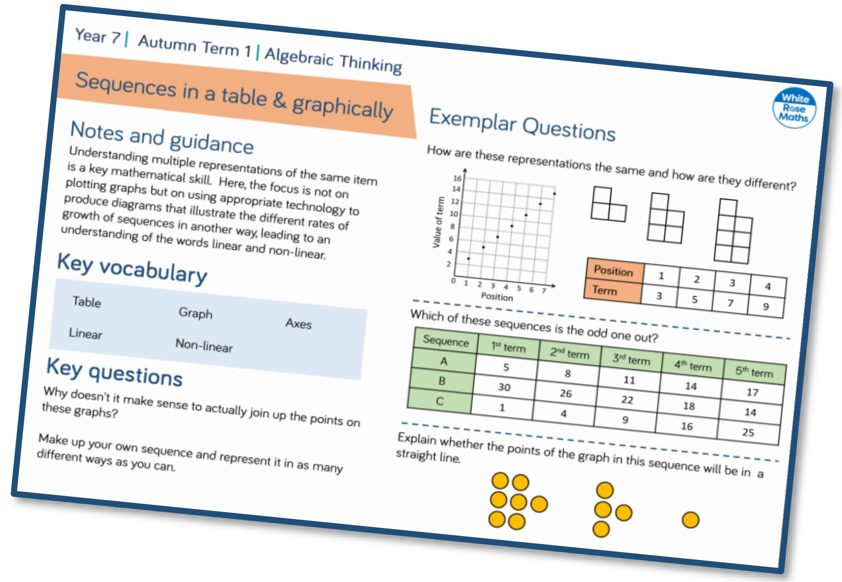
Why Small Steps?

We know that breaking the curriculum down into small manageable steps should help students to understand concepts better. Too often, we have noticed that teachers will try and cover too many concepts at once and this can lead to cognitive overload. We believe it is better to follow a "small steps" approach.

As a result, for each block of content in the scheme of learning we will provide a "small step" breakdown. ***It is not the intention that each small step should last a lesson – some will be a short step within a lesson, some will take longer than a lesson.*** We would encourage teachers to spend the appropriate amount of time on each step for their group, and to teach some of the steps alongside each other if necessary.

What We Provide

- Some ***brief guidance*** notes to help identify key teaching and learning points
- A list of ***key vocabulary*** that we would expect teachers to draw to students' attention when teaching the small step,
- A series of ***key questions*** to incorporate in lessons to aid mathematical thinking.
- A set of questions to help ***exemplify*** the small step concept that needs to be focussed on.


Year 7 | Autumn Term 1 | Algebraic Thinking

Sequences in a table & graphically

Notes and guidance

Understanding multiple representations of the same item is a key mathematical skill. Here, the focus is not on plotting graphs but on using appropriate technology to produce diagrams that illustrate the different rates of growth of sequences in another way, leading to an understanding of the words linear and non-linear.

Key vocabulary

Table, Graph, Axes, Linear, Non-linear

Key questions

Why doesn't it make sense to actually join up the points on these graphs?

Make up your own sequence and represent it in as many different ways as you can.

Exemplar Questions

How are these representations the same and how are they different?

Position	1	2	3	4
Term	3	5	7	9

Which of these sequences is the odd one out?

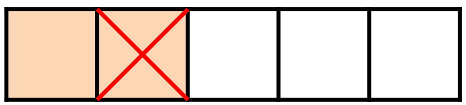
Sequence	1st term	2nd term	3rd term	4th term	5th term
A	5	8	11	14	17
B	30	26	22	18	14
C	1	4	9	16	25

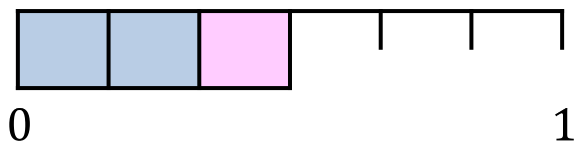
Explain whether the points of the graph in this sequence will be in a straight line.

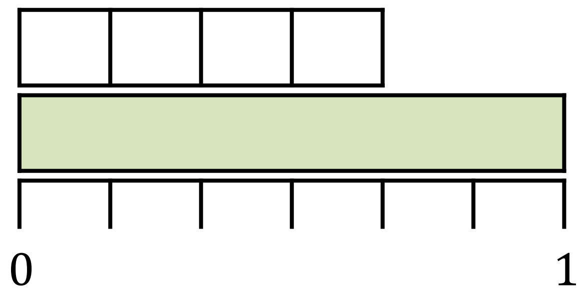
- These include reasoning and problem-solving questions that are fully integrated into the scheme of learning. Depending on the attainment of your students, you many wish to use some or all of these exemplars, which are in approximate order of difficulty. Particularly challenging questions are indicated with the symbol .
- For each block, we also provide ideas for key representations that will be useful for all students.

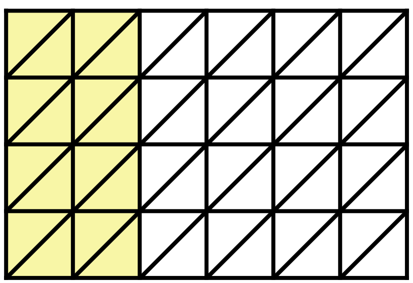
In many of the blocks of material, some of the small steps are in **bold**. These are content aimed at higher attaining students, but we would encourage teachers to use these with as many students as possible – if you feel your class can access any particular small step, then please include it in your planning.

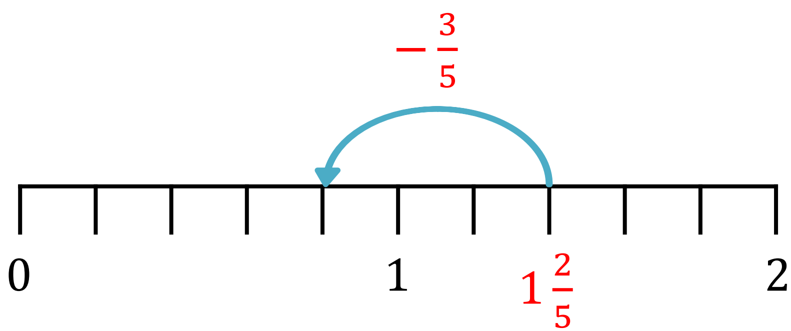
Key Representations



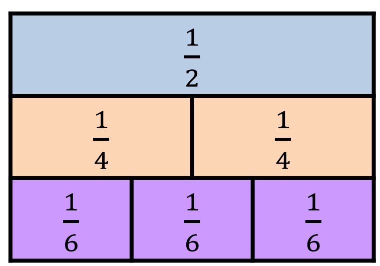








$$\frac{1}{3} = \frac{2}{6} = \frac{3}{9} = \frac{4}{12} = \frac{12}{36} = \frac{16}{48}$$



Concrete, pictorial and abstract representations are an important part of developing students' conceptual understanding.

Here are a few ideas for how you might represent adding and subtracting fractions. Cuisenaire rods are a useful way to introduce adding and subtracting fractions alongside the pictorial representations, such as the bar model and number line.

Fraction tiles and pattern blocks can be useful in exploring equivalent fractions.

The number line is particularly useful for converting an improper fraction to a mixed number, and more generally to reinforce the fraction's position on the number line.

Fractional Thinking

Small Steps

- Understand representations of fractions
- Convert between mixed numbers and fractions
- Add and subtract unit fractions with the same denominator
- Add and subtract fractions with the same denominator
- Add and subtract fractions from integers expressing the answer as a single fraction
- Understand and use equivalent fractions
- Add and subtract fractions where denominators share a simple common multiple
- Add and subtract fractions with any denominator
- Add and subtract improper fractions and mixed numbers

H denotes higher strand and not necessarily content for Higher Tier GCSE

Fractional Thinking

Small Steps

- Use fractions in algebraic contexts
- Use equivalence to add and subtract decimals and fractions
- **Add and subtract simple algebraic fractions** H

H denotes higher strand and not necessarily content for Higher Tier GCSE

Representations of fractions

Notes and guidance

Students should be presented with, and be expected to represent, fractions in many ways to ensure conceptual understanding of what a fraction is and flexibility between forms. Emphasis should be placed on the need for equal parts, which can be explored and made explicit through the exemplar questions. Number lines can help reinforce that a fraction is a number with a position on the number line.

Key vocabulary

Equal parts	Congruent	Divide
Denominator	Numerator	

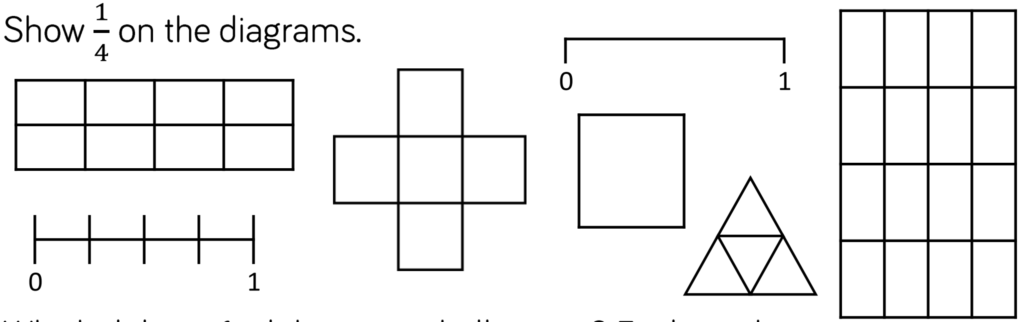
Key questions

How do you know each part is equal when they look different?

Where would this fraction be on a number line? How else can you represent this fraction?

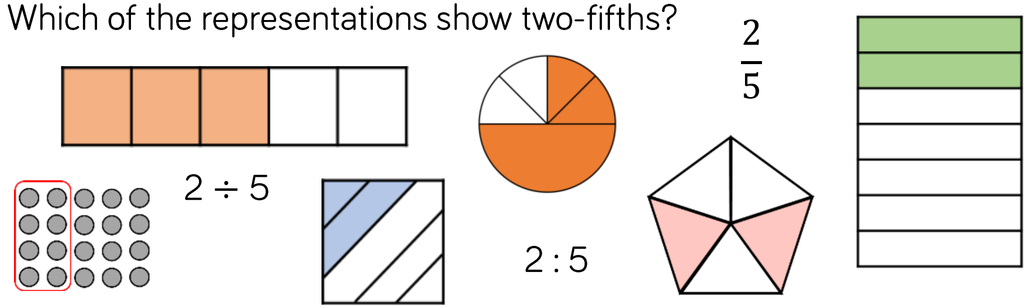
Exemplar Questions

Show $\frac{1}{4}$ on the diagrams.



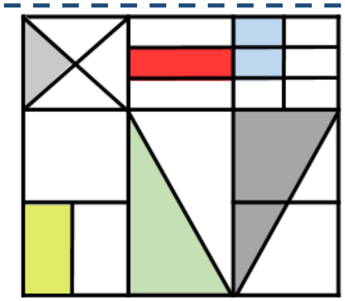
Which did you find the most challenging? Explain why.

Which of the representations show two-fifths?



Explain your reasons.
What are you assuming when answering this question?
Why might someone think all of these represent two-fifths?

Complete the sentence.



- $\frac{1}{18}$ of the shape is coloured __________.
- The colours ______ and ______ are equal in size. They both show $\frac{\square}{\square}$

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Convert mixed numbers

Notes and guidance

Students need to understand conceptually what a mixed number is. A common misconception is that a fraction is part of a whole one, so it is necessary to reinforce that fractions can be greater than one. Bar models and number lines are helpful to build conceptual understanding of how many wholes there are and what fractional part is remaining.

Key vocabulary

Ascending	Descending	Smaller/bigger than
Positive	Negative	Greater/less than

Key questions

How many ________ are there in a whole?

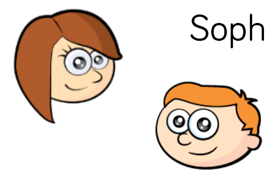
Is (e.g. $\frac{5}{4}$) greater than one or less than one? How do we know?

Why is it called a 'mixed' number?

Why is it called an 'improper' fraction?

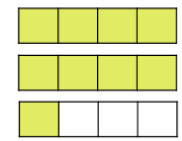
Exemplar Questions

Always, sometimes, or never true?
'A fraction is smaller than one'.



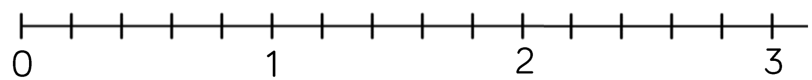
Sophie says that this diagram shows $2\frac{1}{4}$

Ron says that it shows $\frac{9}{4}$

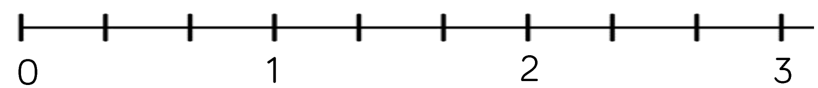


Who is correct? Explain your answer.

Show $\frac{8}{5}$ on the number line, and write it as a mixed number.



Show $2\frac{2}{3}$ on the number line, and write it as an improper fraction.



What's the same and what's different about the number lines?

Complete the statements.

$1\frac{\square}{3} = \frac{5}{\square}$ | $\frac{13}{\square} = 3\frac{\square}{\square}$ | $\frac{17}{\square} = \square\frac{1}{\square}$ | $b\frac{c}{a} = \frac{\square}{\square}$

Is there more than one answer to any of these questions?

Add and subtract unit fractions

Notes and guidance

In this small step, students build conceptual understanding of what it means to add and subtract fractions. The emphasis is on adding and subtracting unit fractions only, so bar models or number lines split into the same number of parts as the denominator will be useful representations.. The common misconception of adding both the numerators and denominators should be addressed here.

Key vocabulary

Unit fraction	Denominator	Equal parts
Whole	Numerator	Multiple

Key questions

How many ______ make a whole?

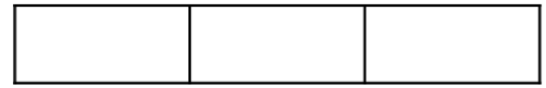
What happens when you subtract a unit fraction from the same unit fraction?

Would the answers to these questions be different if we performed the operations in a different order?

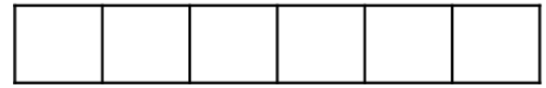
Exemplar Questions

Complete the following calculations:

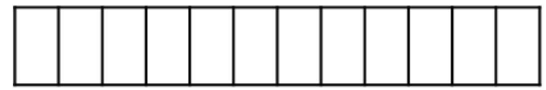
$\frac{1}{3} + \frac{1}{3} = \square$



$\frac{1}{6} - \frac{1}{6} = \square$



$\frac{1}{12} + \frac{1}{12} - \frac{1}{12} = \square$

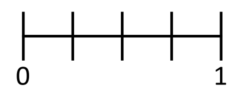


Evaluate the following:

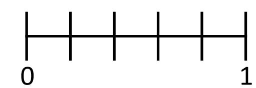
$\frac{1}{5} + \frac{1}{5} = \square$ $\frac{1}{5} - \frac{1}{5} = \square$ $\frac{1}{5} + \frac{1}{5} - \frac{1}{5} = \square$ $\frac{1}{5} + \frac{1}{5} - \frac{1}{5} - \frac{1}{5} = \square$

Complete the missing denominators. Show your answers on the number line.

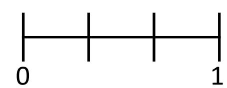
$\frac{1}{\square} + \frac{1}{\square} = \frac{2}{4}$



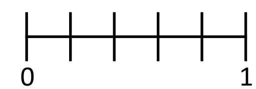
$\frac{1}{\square} - \frac{1}{\square} = \frac{0}{5}$



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



$\frac{1}{\square} + \frac{1}{\square} = \frac{2}{5}$



How many fifths will be added together to make one whole?
Use a diagram to justify your answer.
How many sixths or sevenths do you need to make a whole?
Can you generalise?

+/− fractions - same denominator

Notes and guidance

This small step helps to reinforce the idea of adding and subtracting a given number of equal parts. This will help students understand the need for a common denominator in the later small step. Cuisenaire rods, bar models and number lines are useful representations to use alongside the abstract calculation. Conversion between mixed numbers and improper fractions is revisited.

Key vocabulary

Denominator	Numerator	Mixed number
Whole	Addition	Subtraction

Key questions

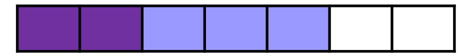
How many ______ make a whole?

If I have three-fifths and I take away two of those fifths, how many fifths do I have now?

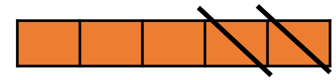
Is it possible to have a negative fraction? Where would it be on the number line?

Exemplar Questions

Use the bar model to work out: $\frac{2}{7} + \frac{3}{7}$



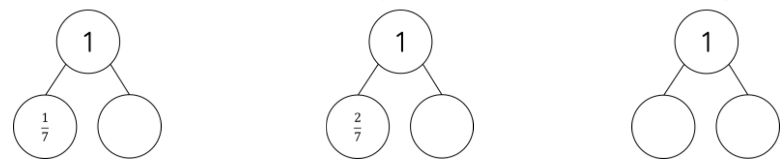
Use this bar model to complete the following $\frac{\square}{5} - \frac{2}{\square} = \frac{\square}{\square}$



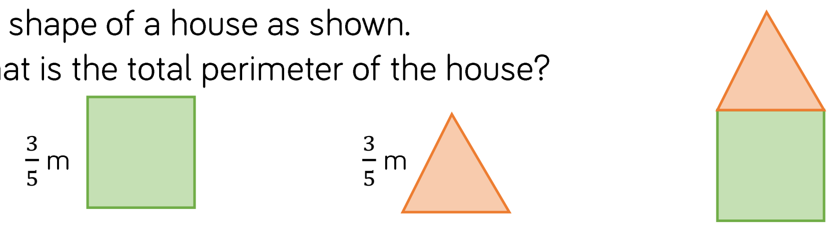
Represent the calculations pictorially and work out each answer:

$\frac{2}{5} + \frac{3}{5}$ $\quad \frac{2}{4} + \frac{3}{4} - \frac{1}{4}$ $\quad \frac{2}{4} + \frac{3}{4} + \frac{2}{4}$ $\quad \frac{7}{23} - \frac{3}{23} - \frac{4}{23}$ $\quad \frac{3}{5} - \frac{4}{5}$

How many different ways can you make a whole using sevenths?



The following equilateral triangle and square are put together to make the shape of a house as shown.
What is the total perimeter of the house?



What is the term-to-term rule for the following sequences?

$\frac{1}{3}, 1, 1\frac{2}{3}, 2\frac{1}{3}, 3, \ldots$ $\qquad 4\frac{1}{5}, 3\frac{3}{5}, 3, 2\frac{2}{5}, 1\frac{4}{5}, \ldots$

What would the next two terms for each sequence be?
Are the sequences linear or geometric?

+/− fractions from integers

Notes and guidance

Students begin by subtracting a fraction from one whole. They then can use partitioning to subtract from other integers e.g. $4 - \frac{2}{5} = 3 + 1 - \frac{2}{5} = 3\frac{3}{5}$

Students should continue to use bar models and number lines to both support their thinking and conceptual understanding.

Key vocabulary

Integer	Whole	Partition
Subtract		

Key questions

How many ______ are there in a whole?

How can a number line or diagram be used to represent this calculation?

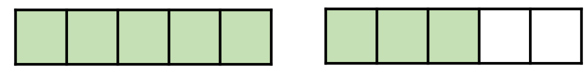
How does partitioning help us to subtract fractions from integers?

Exemplar Questions

Calculate the following. Draw a bar model to show your answer.

- $1-\frac{3}{5}$
- $1-\frac{4}{7}$
- $1-\frac{7}{10}$
- $1-\frac{12}{17}$

Complete the number sentences below that are represented by the diagram.



$1 + \frac{\square}{\square} = \frac{\square}{\square}$ $\qquad$ $2 - \frac{\square}{\square} = \frac{\square}{\square}$

Work out the answers to the questions below.
Use bar models to help you.

$4 + \frac{5}{9}$ $\qquad$ $4 - \frac{5}{9}$ $\qquad$ $6 + \frac{2}{3} + \frac{1}{3}$ $\qquad$ $6 - \frac{3}{5} - \frac{2}{5}$

Work out the missing fractions.

$4 + \frac{\square}{\square} = 4\frac{2}{5}$ $\qquad$ $4 - \frac{\square}{\square} = 3\frac{3}{5}$ $\qquad$ $6 + \frac{\square}{\square} + \frac{\square}{\square} = 6\frac{5}{7}$

$7 - \frac{\square}{\square} - \frac{\square}{\square} = 5\frac{5}{8}$ $\qquad$ $6 + \frac{\square}{\square} - \frac{\square}{\square} = 5\frac{8}{9}$

James, Simon and Chris ordered two pizzas to share.
James ate $\frac{5}{8}$ of a pizza, Simon ate $\frac{7}{8}$ of a pizza and Chris ate the rest.
How much did Chris eat?

Equivalent fractions

Notes and guidance

Students will have some experience of equivalent fractions from their work in the Autumn term and at KS2. The relationship between the numerator and the denominator with unit fractions should be explored, as in the first exemplar question. The relationships between the numerators and denominators of two equivalent fractions should also be explored.

Key vocabulary

Equivalent	Numerator	Denominator
Multiple		

Key questions

How do we find a fraction that is equivalent to a given fraction?

Which is the greater/smaller fraction? (e.g. $\frac{3}{4}, \frac{6}{8}$)

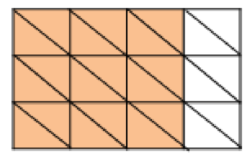
How many fractions can you find are there that are equivalent to one-half? How many are there altogether?

Exemplar Questions

How many equivalent fractions can you find for $\frac{1}{2}$?

How many equivalent fractions can you find for $\frac{1}{3}$?

What is the relationship between the numerator and the denominator in each set of equivalent fractions?



How many ways can you express the fraction shown?

Mo says $\frac{10}{20}$ is twice a big as $\frac{5}{10}$. Do you agree? Explain your answer.

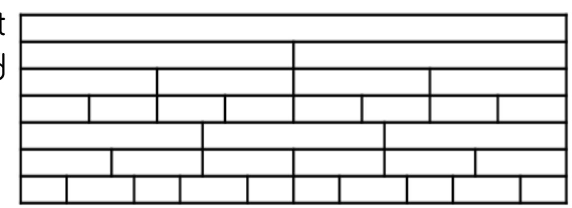
Use a bar model to show these equivalences.

$\frac{2}{3} = \frac{4}{6}$ $\qquad$ $\frac{2}{3} = \frac{6}{9}$ $\qquad$ $\frac{2}{3} = \frac{8}{12}$

Explain the relationship between each pair of equivalent fractions and how this connects to the bar model.

Write down as many equivalent fractions pairs that you can find in this fraction wall.

For example: $\frac{3}{6} = \frac{1}{2}$



+/− fractions – common multiples

Notes and guidance

Students should build from their understanding of lowest common multiple and adding and subtracting fractions with the same denominator.

An explicit connection should be made to the earlier small step and how finding a common denominator aids in addition and subtraction of fractions.

Key vocabulary

Lowest Common Multiple   Common denominator

Equivalent

Key questions

Why do we need a common denominator to add fractions?

Why is $\frac{1}{10}+\frac{7}{10}$ easier to calculate than $\frac{1}{10}+\frac{7}{15}$?

Is it possible to subtract a larger fraction from a smaller one e.g. $\frac{1}{4}-\frac{1}{2}$?

Exemplar Questions

What is the lowest common multiple of each of the pairs of numbers?

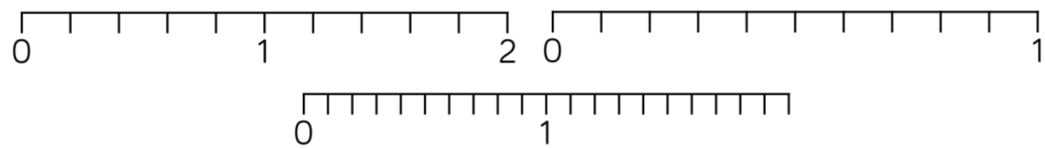
3 , 12   15 , 20   6 , 9   12 , 18

Always, sometimes, or never true?

'You can find the lowest common denominator of a pair of fractions by multiplying their denominators'.

Use number lines to show your calculations:

$\frac{5}{6}-\frac{1}{3}$ $\frac{3}{5}+\frac{7}{10}$ $\frac{2}{3}+\frac{1}{6}-\frac{9}{12}$



What is $\frac{3}{10}+\frac{3}{5}$?

A $\frac{6}{15}$ B $\frac{9}{10}$ C $\frac{6}{10}$ D $\frac{45}{50}$

Draw a diagram to convince me your answer is correct.
Is there more than one correct answer?
Can you identify what the mistake is in each of the wrong answers?

Jane has 3 bars of chocolate.
She gives $\frac{3}{5}$ of a bar to one friend , $\frac{7}{10}$ of a bar to another and $1\frac{1}{5}$ of a bar to another friend.
How much of the chocolate does she have left for herself?

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+/− fractions – any denominator

Notes and guidance

In this small step, students will now need to use equivalent fractions for both fractions in order to calculate. They will use their knowledge from the previous steps to extend to add and subtract fractions with any denominator.

Pictorial representations such as fraction walls will help understanding.

Key vocabulary

Lowest common multiple

Common denominator

Equivalent

Key questions

What's the same and what's different about the way we approach $\frac{1}{8}+\frac{3}{4}$ and $\frac{1}{6}+\frac{3}{4}$?

Why don't we always multiply two numbers to find their lowest common multiple?

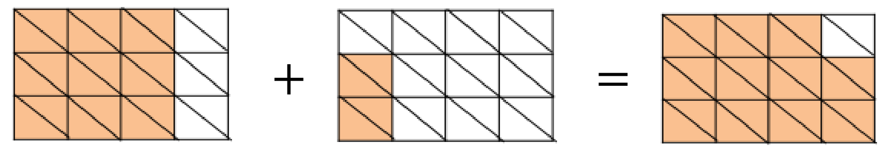
How would approach adding and subtracting with mixed numbers?

Exemplar Questions

What is the lowest common multiple of each of the following pairs?

8 , 12   6 , 12   16 , 24   6 , 9   4 , 10

How does this diagram represent $\frac{3}{4}+\frac{1}{6}=\frac{11}{12}$?



By using equivalent fractions, show your steps to calculate the answer numerically. Can you find more than one way to do this?

Calculate the following. Write your answer as a mixed number where possible. Give your answers in their simplest form.

$\frac{1}{5}+\frac{1}{3}$ $\frac{4}{5}+\frac{2}{3}$ $\frac{4}{5}-\frac{2}{3}$

$\frac{3}{4}+\frac{4}{10}$ $\frac{8}{9}-\frac{3}{7}$ $\frac{3}{5}+\frac{5}{8}-\frac{7}{10}$

Using the number cards and addition and subtraction only, make the totals. You may use the cards only once for each calculation.

$\frac{1}{2}$ $\frac{2}{3}$ $\frac{1}{4}$ $\frac{5}{6}$ $\frac{1}{12}$

- $\frac{1}{6}$
- $\frac{1}{3}$
- $\frac{5}{12}$
- 1
- 0

White Rose Maths

+/− fractions – improper & mixed

Notes and guidance

Students should explore different ways of adding and subtracting mixed numbers. so they can be flexible when choosing methods.
If students are confident with directed number, then using negative fractions can be introduced as a model for subtraction. It is best to keep the denominators small whilst learning this step.

Key vocabulary

Commutative	Mixed number
Common denominator	Improper fraction

Key questions

Which method is most efficient for this question and why?

Is it possible to have a negative fraction? Where would this be on the number line?

What could we do if we need to add a negative fraction to a positive integer?

Exemplar Questions

Rosie and Mo have both correctly answered the same question, but in different ways. Explain each method. Can you show them on a bar model?

Rosie's Method

$2\frac{1}{3} - 1\frac{2}{3} = \frac{7}{3} - \frac{5}{3} = \frac{2}{3}$

Mo's Method

$2\frac{1}{3} - 1\frac{2}{3} = 2\frac{1}{3} - 1 - \frac{2}{3} = 1\frac{1}{3} - \frac{2}{3} = \frac{2}{3}$

Which do you think is more efficient? Why?

$11\frac{3}{4} + 5\frac{7}{8}$

$11\frac{3}{4} - 5\frac{7}{8}$

Is it more efficient to convert the mixed numbers to improper fractions before adding/subtracting? Or, should I add/subtract my integers first, before the fractions?

Use Whitney's methods to calculate the answers.
What would your advice to Whitney be?

Teddy thinks the difference between the answers is 11.68

Is Teddy right? Explain your answer.

Work out the missing numbers in this linear sequence

$?, \quad 3\frac{1}{3}, \quad 5\frac{5}{6}, \quad ?$

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Fractions in algebraic contexts

Notes and guidance

This small step will give students the opportunity to interleave the previous unit of algebraic thinking in the context of fractions, further deepening students' understanding of both. Substitution, sequences, function machines and solving are all explored within the exemplar questions.

Key vocabulary

Sequence	Substitute	Solve	Equation
Linear	Geometric	Inverse	Expression

Key questions

How do we substitute numbers into an expression?

Is it possible to substitute fractions into expressions?

What is the inverse operation of _________ ?

How can you tell if a sequence is linear or not?

Exemplar Questions

If $p = 4$ and $d = 6$, work out the values of these expressions.

$\frac{1}{p} + \frac{1}{d}$ $\quad p - \frac{5}{d}$ $\quad \frac{1}{p^2} - \frac{1}{p}$ $\quad \frac{p}{d} + \frac{d}{p}$

Write the first five terms for the sequence given by the rule $\frac{2n}{5}$

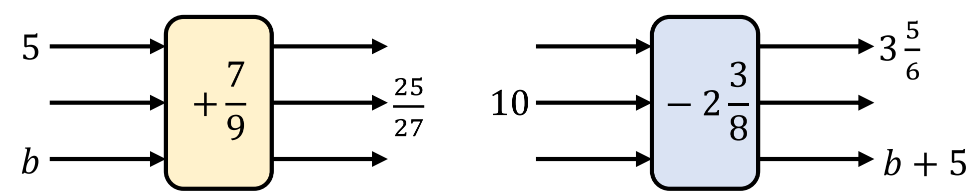
What's the term-to-term rule of the sequence?

Is the sequence linear or geometric?

What would the 100th term of the sequence be?

How often are the terms in the sequence integers?

Find the missing inputs and outputs for the following function machines:



Solve the equations

$k - \frac{5}{8} = 2$ $\quad \frac{5}{8} + y = 2$ $\quad 5\frac{1}{5} = 2g - \frac{4}{5}$ $\quad \frac{r}{4} - \frac{7}{5} = -\frac{2}{5}$

+/− fractions and decimals

Notes and guidance

This step gives the students an opportunity to revisit fraction and decimal equivalence in the context of addition and subtraction, reinforcing all the skills involved.

Students should be encouraged to estimate before they calculate in order to avoid misconceptions

e.g. $0.5 + \frac{6}{10} = 0.11$

Key vocabulary

Place value	Tenths	Hundredths
Decimal	Equivalent	

Key questions

How could a number line help with addition and subtraction of fractions and decimals?

If we know $\frac{1}{4} = 0.25$, how could this help us find $\frac{1}{8}$?

Which fractions would be more difficult to give your answer in decimal form?

Exemplar Questions

Using your knowledge of place value, calculate the following. Give your answer in both fractional and decimal form.

$\frac{6}{10} + 0.3$ $\quad 0.6 + \frac{4}{10}$ $\quad 0.5 + \frac{6}{10}$ $\quad 1.1 - \frac{7}{10}$

$0.63 + \frac{7}{100}$ $\quad \frac{7}{100} + 0.07$ $\quad \frac{7}{10} + 0.07$ $\quad \frac{79}{100} + 0.21$

Change the fractions to decimals.

$\frac{1}{4} = \square$ $\quad \frac{1}{5} = \square$ $\quad \frac{1}{8} = \square$

Use this knowledge to complete these statements **in decimal form:**

$\frac{3}{4} + \square = 1$ $\quad \square + \frac{2}{5} = 1$ $\quad 1 = \square + \frac{5}{8}$

Calculate the following. In each case, decide whether it is easier to work in fractions or decimals.

$\frac{2}{5} + 0.25$ $\quad \frac{2}{3} + 0.375$ $\quad \frac{5}{7} + 0.75$

$\frac{3}{4} - 0.125$ $\quad \frac{1}{5} + 0.25 - 0.2$ $\quad 2\frac{1}{3} - 1.7$

$5\frac{3}{4} + 2.4$ $\quad 3\frac{4}{5} + 2.4 - 6\frac{1}{5}$ $\quad 2.1 - 5\frac{3}{5}$

+/− algebraic fractions

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Notes and guidance

Students will further deepen their understanding of fractions within the context of algebra. They should compare adding expressions with fractions to adding those integer form. This step is intended as an introduction to the idea, so fractions should be kept simple rather than dealing with complex multi-term possibilities.

Key vocabulary

Simplify	Like terms	Collect
In terms of	Common denominator	

Key questions

What's the same/different about e.g. $\frac{1}{2}a$ and $\frac{a}{2}$?

What does 'in terms of m' mean? Is it possible to get a numeric answer?

How would I do this if algebra were not involved? Now how would I do this algebraically?

Exemplar Questions

Match the equivalent expressions.

$\frac{1}{x}+\frac{1}{x}$ | $\frac{1}{4}x+\frac{1}{4}x$ | $\frac{2x}{5}$ | $\frac{2}{x}+\frac{3}{x}$ | $\frac{3}{4}x$

$\frac{2}{x}$ | $\frac{x}{5}+\frac{x}{5}$ | $\frac{1}{2}x$ | $\frac{5}{x}$ | $\frac{1}{2}x-\frac{1}{4}x$ | $\frac{1}{4}x$

$\frac{3}{x}$ | $\frac{1}{2}x+\frac{1}{4}x$

Write $\frac{3}{m}+\frac{4}{m}$ as a single fraction in terms of m:

For what integer values of m are these statements true?

- $\frac{3}{m}+\frac{4}{m}>1$
- $\frac{3}{m}+\frac{4}{m}<1$
- $\frac{3}{m}+\frac{4}{m}=1$

Simplify the following expressions.

$\frac{1}{2}a+\frac{1}{4}a$ $\quad \frac{a}{2}-\frac{a}{4}$ $\quad \frac{1}{a}+\frac{1}{a}+\frac{1}{a}$ $\quad \frac{3a^2}{8}+\frac{a^2}{2}$ $\quad \frac{5}{a}+\frac{1}{2a}$

Solve the equations.

$\frac{1}{x}+\frac{2}{x}=1$ $\quad \frac{1}{y}+\frac{2}{y}+\frac{3}{y}=1$ $\quad \frac{4}{x}+\frac{2}{x}=3$