Year 7

Mastery Detailed SOL Spring

Overview

One of the most frequent requests we get as a Maths Hub is for a suggested long term curriculum plan for mathematics at KS3. We have listened to what teachers need and the following mastery overviews have been developed by secondary practitioners in conjunction with the White Rose Maths Hub to provide a curriculum plan that will support 'Teaching for Mastery'.

There is a termly plan for each year group from Year 7 to Year 9; each term is split into twelve weeks. You will see from the overviews that a significant amount of time in Year 7 Autumn and Spring term is devoted to developing key number concepts. This is to build their competency as number sense will affect their success in other areas of mathematics. Students who are successful with number are much more confident mathematicians.

We hope you find them useful. If you have any comments about this document or have any ideas please do get in touch.

***The White Rose Maths Hub Team***

Assessment

Alongside these curriculum plans, our aim is also to provide an assessment for each term. There are two versions of the assessment:

Paper A: Support for lower attaining students
Paper B: For the core with appropriate challenge

You can use these assessments to determine gaps in your students' knowledge and use them to plan support and intervention strategies.

Our assessments are designed to test students understanding. They support teaching approaches such as bar modelling and using concrete materials to introduce topics. The example below shows a question from paper A and a question from paper B using place value counters.
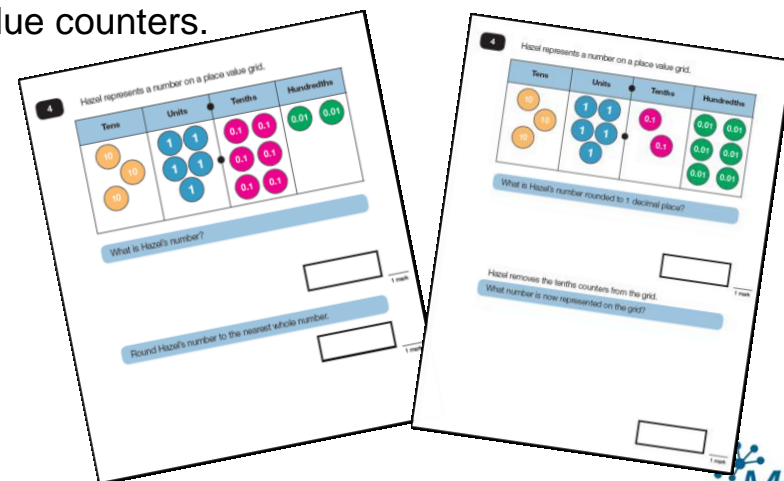
Teaching for Mastery

These schemes of learning are designed to support a mastery approach to teaching and learning and have been designed to support the aims and objectives of the National Curriculum.

The schemes of learning;

- have number at their heart. A large proportion of time in Year 7 is spent reinforcing number to build competency. Key number skills are then fed through the rest of the scheme so that students become more and more fluent.
- give teachers ideas for how to extend higher attaining students through depth rather than acceleration onto new content.
- ensure students have the opportunity to stay together as they work through the schemes as a whole group
- provide plenty of time to build reasoning and problem solving elements into the curriculum.

Concrete – Pictorial – Abstract

As a hub we believe that all students, when introduced to a key new concept, should have the opportunity to build competency in this topic by taking this approach.

Concrete – students should have the opportunity to use concrete objects and manipulatives to help them understand and explain what they are doing.

Pictorial – students should then build on this concrete approach by using pictorial representations. These representations can then be used to reason and solve problems.
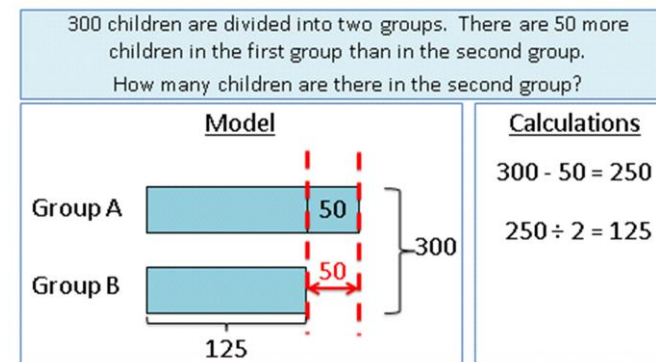
An example of a bar modelling diagram used to solve problems.

Abstract – with the foundations firmly laid, students should be able to move to an abstract approach using numbers and key concepts with confidence.

Frequently Asked Questions

Which assessment should we use?

Our Primary plans only include one assessment per term. However, we made the decision to include two at Secondary to help address already existing gaps in knowledge. The majority of students should aim for paper B. Paper A can be used for students who need more support. It does not omit any of the content, it is just more accessible; using simpler numbers or guiding them through the question a little more.

Is this scheme really suitable for all? What about very low attainers or very high attainers?

We firmly believe as a Hub that all students can achieve in mathematics. The scheme may be challenging for some, however we feel that the vast majority should be aiming for this standard. In extreme cases where students have considerable learning difficulties individual schools may want to put some alternatives in place.

In terms of high attainers, it is important that they fully understand key number concepts rather than memorise a process. This will reap its rewards looking into the future at GCSE and A level.

My students have completed the assessment but they have not done well. What are my next steps?

This is your call as a school, however our recommendation is that you would spend some time with the whole group focussing on the areas of the curriculum that they don't appear to have grasped. If a couple of students have done well then these could be given rich tasks and deeper problems to build an even deeper understanding. There is time built into the schemes for revising and improving key areas of the curriculum. Interleaving prior learning with new content is essential so that students can create links between different areas of maths. In addition recap starters and focussed homework are invaluable when consolidating prior learning.

Is it possible to compare data collected from the assessments with other schools?

Yes. There will be an option to share your data with us so that you can make comparisons with similar students. Over time it will become easier to use this data to make predictions for success at GCSE. If you are interested in sharing your data with us, please contact the Maths Hub team.

mathshub@trinityacademyhalifax.org

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My students are already confident with number. Can we move through the scheme quicker or skip sections?

Timings are there as a guide as all schools and contexts are different, however we recommend that you follow the scheme at roughly the pace indicated. Check that students can apply their understanding of number in a variety of contexts and link different areas of maths with each other before moving on. Check that students can explain what they are doing and why using correct mathematical language. Ensure the class are not rushed due to a few very high attaining students. Could these students work on a project or investigation together while the majority of the class work at a slightly slower pace?

Here are some examples of some challenging problems. Check that students can answer problems like this independently and in a clear, concise way.

The full bank of questions can be downloaded here:

https://www.tes.com/teaching-resource/reasoning-and-problem-solving-questions-collection-ks1-and-ks2-11249968

Weighty Problems

1 A football and toy train together weigh 360g.

Three footballs and two toy trains weigh 810g.

Find the weight of a toy train.

2 The mass of a box of chocolates is 290g.
The box contains 7 identical chocolates.

Chocolates

Manish eats 3 chocolates
The mass of the box is now 194g
Find the weight of the empty box.

Egg Problems

1 One egg and one slice of toast costs £1.94

Three eggs and two slices of toast costs £5

How much does one slice of toast cost?

You might find it useful to draw a bar model or other diagram to answer Q2

2 These three chicks lay some eggs.

Kelsey   Beth   Caroline

Beth lays twice as many as Kelsey.
Caroline lays 4 more than Beth.
They lay 44 eggs in total.
How many eggs does Caroline lay?

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We have followed your schemes of learning. Does this mean our students have mastered all the content?

Our schemes of learning support teaching for mastery, however following them does not guarantee mastery of the content.

Mastery of mathematics is a continuum. At each stage of learning students should be able to demonstrate a deep, conceptual understanding of the topic and be able to build on this over time. Mastery is not about just being able to memorise key facts and procedures, this tends to lead to a superficial understanding which can easily be forgotten.

A good indication of when a student has mastered content is when they can deal with questions that link multiple topics together. For example:

- Fractions with area, perimeter, collecting like terms, solving equations….
- Algebra with angles, area, perimeter, statistics…

Everyone Can Succeed

As a Maths Hub we believe that all students can succeed in mathematics. We don't believe that there are individuals who can do maths and those that can't. A positive teacher mindset and strong subject knowledge are key to student success in mathematics.

More Information

If you would like more information on 'Teaching for Mastery' you can contact the White Rose Maths Hub at mathshub@trinityacademyhalifax.org

We are offering courses on:

- Bar modelling
- Teaching for Mastery
- The subject specialism range - intensive courses, become a maths expert.
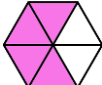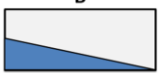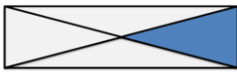
Our monthly newsletter also contains the latest initiatives we are involved with. We are looking to improve maths across our area and on a wider scale by working with the other Maths Hubs across the country.

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Term by Term Objectives

Year 7

Year 7 Overview
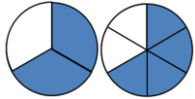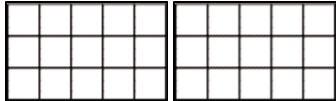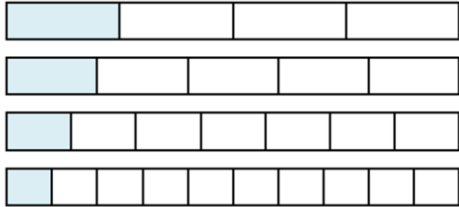
	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number - Place Value			Number - Addition & Subtraction			Number – Multiplication & Division					Revise & Improve
Spring	Number - Fractions 1						Statistics 1		Number – Negative numbers			Revise & Improve
Summer	Algebra 1						Geometry – Lines & Angles					Revise & Improve

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Term by Term Objectives

Year 7
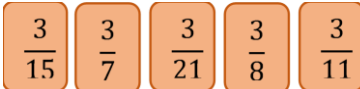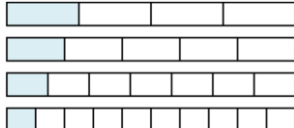
Year Group	Y7	Term	Spring

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12

Number: Fractions 1

Represent fractions using diagrams and on a number line.

Express one quantity as a fraction of another.

Identify and use equivalent fractions.

Compare and order fractions; use the symbols =, ≠, <, >, ≤, ≥

Convert between mixed numbers and improper fractions.

Simplify fractions.

Convert between fractions and decimals
- Tenths, hundredths, thousandths
- Associating a fraction with division to convert any fraction to a decimal.

Use the concepts and vocabulary of multiples and lowest common multiple (LCM).

Add and subtract any fraction.
- Fractions with the same denominator.
- Fractions with a denominator that is a multiple of the other.
- Fractions with different denominators

Find a fraction of an amount.

Statistics 1

Understand the data handling cycle.

Understand the different types of data.

Collect, organise and interpret data.
- Tally charts
- Two way tables
- Median, mode and range
- Consider outliers

Draw and interpret bar charts, pictograms and line graphs.

Number: Negative numbers

Use the four operations with negative numbers.

Understand the order of operations.

Time at the beginning or end of the term for consolidation gap filling, seasonal activities, assessments, etc.
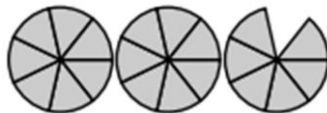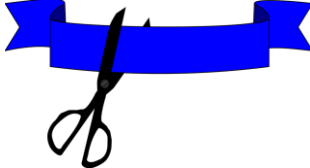
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Term by Term Objectives

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Fractions	Represent fractions using diagrams and on a number line.	• What fraction is shaded on these diagrams? o Can any be simplified? • Shade $\frac{1}{2}$ on each of the following diagrams. • What fraction is the arrow pointing too? 1 2 • Mark $\frac{1}{4}$ on the number line with an arrow. 0 1	• Which of the following diagrams represent $\frac{2}{3}$? Explain your answer $\frac{2}{3}$ • Can you represent $\frac{3}{8}$ in 5 different ways. You may use diagrams and number lines. • Discuss which diagram shows the fraction. Explain your reasoning. $\frac{1}{2}$ $\frac{1}{5}$ $\frac{1}{3}$ $\frac{1}{4}$	• The difference between A and C is $\frac{7}{10}$. A B C 0 o What is the value of A, B and C? o Show $-\frac{1}{5}$ on the number line. • Which diagrams represents $\frac{1}{4}$? A B C Explain your answer? • What fraction of the square is shaded: o Orange o Purple o Yellow o Green or orange

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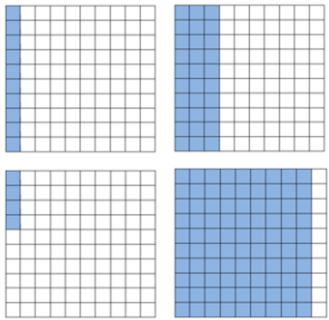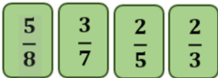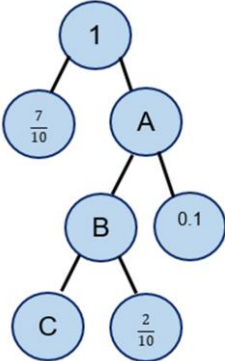| National Curriculum Statement	All students		
	Fluency	**Reasoning**	**Problem Solving**

Fractions
 	
Express one quantity as a fraction of another.
	• The diagram shows that £0.50 as a fraction of £2.50 is $\frac{1}{5}$.
	
	£2.50
	£0.50
	
	Label the following diagram to show that 50cm as a fraction of 2m is $\frac{1}{4}$.
	
	• Express the first quantity as a fraction of the second:
	  ○ £3, £18
	  ○ 96 hours, 12 days
	  ○ 40minutes, 2 hours
	  ○ 200g, 3kg
	
	• In a school production there are 48 pupils in the chorus. 20 of these pupils are boys. What fraction of the pupils are boys?
		• Amy scored 48 out of 75 in her Maths exam and 37 out of 60 in her Science exam. In which exam did she perform better?
		
		• Zoe and Jordan play in the same basketball team.
		
		Zoe scores 3 baskets from 10 attempts. Jordan scores 5 baskets from 20 attempts. Who is the better shooter? Explain your reasoning.
		
		• Paris earns £60 and saves £20 if it. Sabir earns £96 and saves £24 of it. Who saves the greatest proportion of money from their earnings?
			• Mrs Milthorpe, a basketball coach is trying to decide who is the better shooter, Zoe or Jordan. Zoe takes 36 shots and Jordan takes 24 shots.
			  ○ How many shots must each girl score so that Zoe is the better shooter?
			  ○ How many shots must each girl score so that Jordan is the better shooter?
			  ○ How many shots much each girl score so that they perform the same? Is there only one answer?
			
			• A science revision guide has 135 pages. 75 of the pages have pictures on them.
			
			On $\frac{1}{5}$ of these pages the pictures are in colour. How many pages of the book have coloured pictures? State the answer as a fraction of the whole book.
			
			• Two quantities are x and y. When expressing x as a quantity of y, the answer is $\frac{1}{5}$ in its simplest form.
			  ○ What are the possible values for x and y?
			  ○ Write a question that would give this answer.

National Curriculum Statement	All students		
	Fluency	**Reasoning**	**Problem Solving**
Fractions — Identify and use equivalent fractions.	• What equivalent fractions are shown in the diagrams? • Shade an equivalent fraction onto the blank diagram. • Find the missing numbers to make equivalent fractions. ○ $\frac{?}{11} = \frac{18}{66}$ $\frac{4}{?} = \frac{32}{56}$ ○ $\frac{3}{7} = \frac{?}{70} = \frac{6}{?} = \frac{27}{?} = \frac{?}{?}$ • State two fractions that are equivalent to: ○ $\frac{3}{4}$ ○ $\frac{2}{5}$ ○ $\frac{7}{9}$	• Explain which fraction is the largest, $\frac{3}{5}$ or $\frac{2}{3}$. You may use the grids to help you. • True or false? The following fractions are all equivalent? $\frac{36}{54}$ $\frac{135}{195}$ $\frac{28}{44}$ $\frac{125}{182}$ $\frac{49}{77}$ • Write down the fractions shaded in each diagram. Describe what similarities and differences you see. • I am equivalent to $\frac{1}{15}$ The product of my numerator and denominator is 60. What fraction am I?	• State all the equivalent fractions you can see. • Here are some fraction cards. All of the fractions are equal $\frac{6}{A}$ $\frac{10}{15}$ $\frac{12}{B}$ $\frac{C}{30}$ Find the value of A, B and C. • Here are some fraction cards. All of the fractions are equal. $\frac{4}{A}$ $\frac{B}{C}$ $\frac{20}{50}$ A + B = 16. Work out the value of C.

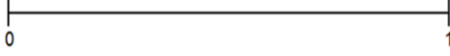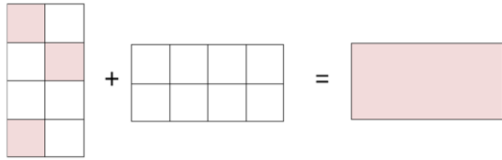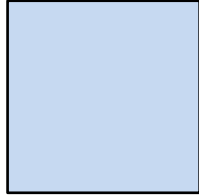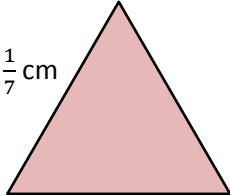|	All students		
National Curriculum Statement	**Fluency**	**Reasoning**	**Problem Solving**
Fractions Compare and order fractions; use the symbols $=, \neq, <, >, \leq, \geq$	• Choose one of these symbols $<, >$ or $=$ to fill in the circles. $\frac{1}{5} \bigcirc \frac{1}{7}$ $\frac{3}{5} \bigcirc \frac{4}{7}$ You may use the fraction strips below to help you. • Write the following fractions in ascending order: ○ $\frac{4}{5}, \frac{5}{8}$ and $\frac{3}{4}$ ○ $\frac{2}{3}, \frac{3}{5}$ and $\frac{3}{4}$ ○ $\frac{7}{12}, \frac{5}{6}$ and $\frac{2}{3}$ • At a bake sale $\frac{1}{6}$ of the cakes are brownies and $\frac{7}{18}$ of the cakes are cupcakes. Which cake is there more of?	• Rhys says, "To order fractions you need to make the denominator the same". Do you agree? Explain your answer. • Write two fractions with the same numerator. Explain how you can tell which one is larger. Write the fractions in ascending order: $\frac{3}{15}$ $\frac{3}{7}$ $\frac{3}{21}$ $\frac{3}{8}$ $\frac{3}{11}$ • Use the diagram to help you fill in the correct symbol between each pair of fractions. $(<, >, =)$ $\frac{1}{5} \bigcirc \frac{1}{4}$ $\frac{1}{4} \bigcirc \frac{1}{7}$ $\frac{1}{7} \bigcirc \frac{1}{10}$ $\frac{1}{5} \bigcirc \frac{1}{7}$ What do you notice about the size of the denominator when comparing the fractions?	• The following fractions are written from smallest to largest. $\frac{2}{5}, \frac{2}{\square}, \frac{2}{\square}$ Fill in the missing values. Is there only one answer? • A newspaper is made up of text, a photograph and white space. $\frac{2}{5}$ of the page is taken up by a photograph, $\frac{3}{7}$ of the page is taken up by text and the rest is just white space. What takes up most of the page? • Parts of two lines are shown. $\frac{1}{3}$ of the red line is showing and $\frac{1}{5}$ of the blue line is showing. Which line is the longest?

National Curriculum Statement	All students		
	Fluency	**Reasoning**	**Problem Solving**

Fractions — Convert between mixed numbers and improper fractions.	• Use the following diagram to show that $$2\frac{3}{4} = \frac{11}{4}$$ • Fill in the missing numbers. $2\frac{\square}{5} = \frac{11}{5}$ $\frac{\square 3}{4} = \frac{7}{4}$ • Convert these improper fractions to mixed numbers
	  ○ $\frac{8}{3}$
	  ○ $\frac{12}{5}$
	  ○ $\frac{21}{8}$ • Pizzas are eaten at a party. Each pizza is cut into 8 slices. 42 slices are eaten.
	  ○ How many whole pizzas are eaten at the party?
	  ○ How many more slices would make a whole pizza?
		• Fiona thinks that $\frac{127}{5}$ is bigger than $24\frac{1}{2}$. Is she correct? Explain your reasoning. • Convert $\frac{960}{20}$ to a mixed number.
		  ○ How could you make this question easier before converting? • Aisha thinks that the diagram shows $2\frac{6}{7}$, Marzena thinks the diagram shows $\frac{20}{7}$ and Jakub thinks the diagram shows $\frac{20}{21}$. Who is correct? Explain your answer.
			• Jamie has some number cards. He makes a fraction using two of the cards.
			  ○ He wants to make a number as close to 4 as he can. Which two numbers should he select for the fraction?
			  ○ He wants to make a number as close to $1\frac{1}{2}$ as he can. Which two numbers should he select for the fraction? • Find the value of a + b + c. $$\frac{15}{11} = 1\frac{a}{11}$$ $$\frac{29}{a} = b\frac{c}{a}$$ • Can you find the missing numbers? $4\frac{1}{\square} = \frac{\square}{2}$ $\frac{24}{\square} = \square\frac{\square}{7}$ How many different answers are there?

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National Curriculum Statement	All students		
	Fluency	**Reasoning**	**Problem Solving**

Fractions

Simplify fractions.

Fluency

- Shade $\frac{1}{2}$ of this shape.

- Shade $\frac{5}{10}$ of this shape.

  What do you notice?

- Simplify each fraction

  $\frac{3}{6} = \frac{\square}{\square}$

  $\frac{2}{10} = \frac{\square}{\square}$

- Write each fraction in its simplest form.

  o $\frac{12}{18}$

  o $\frac{5}{35}$

  o $\frac{30}{120}$

Reasoning

- Which fraction is not in its simplest form?

$\frac{3}{9}$	$\frac{1}{9}$	$\frac{6}{9}$
$\frac{6}{12}$	$\frac{4}{12}$	$\frac{1}{12}$
$\frac{1}{18}$	$\frac{6}{18}$	$\frac{3}{18}$

- True or false, $\frac{1}{?}$ is always a fraction in its simplest form?

- Beth says, "When you simplify a fraction you always divide the numerator and denominator by two." Is Beth Correct?

- Kelsey and Jenny have both simplified $\frac{16}{40}$

  Kelsey... $\frac{16}{40} = \frac{8}{20} = \frac{4}{10} = \frac{2}{5}$

  Jenny... $\frac{16}{40} = \frac{2}{5}$

  How many different ways can you simplify $\frac{30}{150}$?

Problem Solving

- Three friends each have 1 metre of ribbon.

  Hayley says, "I chop mine into 3 equal pieces."
  Kathryn says, "I chop mine into 4 pieces."
  Fiona says, "I chop mine into 2 pieces."
  o What size is each person's piece?
  o Who has the largest piece?

- Match up the each fraction with its simplified version and fill in the gaps
  .

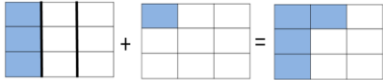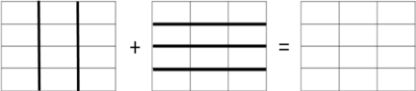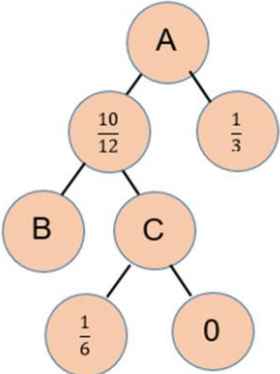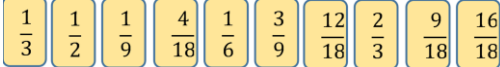 | $\frac{10}{25}$ | $\frac{2}{3}$ | $\frac{\square}{120}$ | $\frac{1}{7}$ |
  |---|---|---|---|
  | $\frac{4}{36}$ | $\frac{2}{10}$ | $\frac{3}{9}$ | $\frac{3}{11}$ |
  | $\frac{5}{20}$ | $\frac{8}{12}$ | $\frac{1}{3}$ | $\frac{\square}{9}$ |
  | $\frac{\square}{35}$ | $\frac{6}{22}$ | $\frac{20}{50}$ | $\frac{6}{30}$ |

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Term by Term Objectives
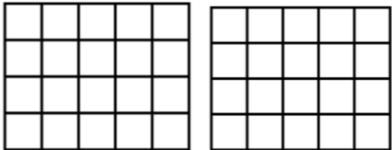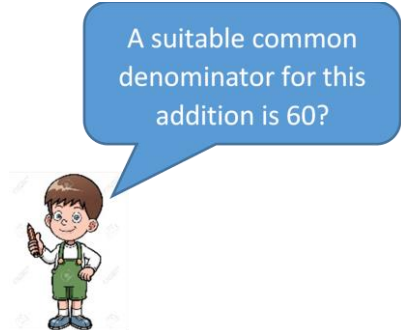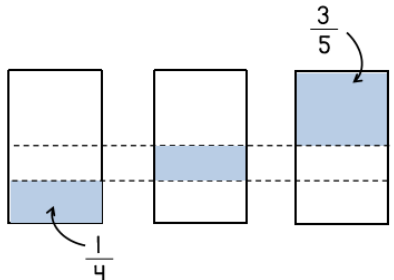
National Curriculum Statement	All students		
	Fluency	**Reasoning**	**Problem Solving**
Convert between fractions and decimals. ❖ Tenths, hundredths, thousandths ❖ Associating a fraction with division to convert any fraction to a decimal.	• Write down the value shown in each diagram as a fraction and a decimal. • Complete this table: • Work out the following: 5 ⟌ 4.00 8 ⟌ 7.000 • Convert the following fractions to decimals: $\frac{17}{25}$ $\frac{11}{20}$	• Tim has put the following fractions and decimal in ascending order. Is he correct? 0.625, $\frac{2}{3}$, $\frac{7}{10}$, 0.079 • True or false, $\frac{1}{7}$ is 0.143 rounded to three decimals places? Show your calculations. • Which of these fractions is closest to 0.5? $\frac{5}{8}$ $\frac{3}{7}$ $\frac{2}{5}$ $\frac{2}{3}$ • Work out the value of A, B & C	• Fill in the missing numbers: $$\frac{2}{?} + \frac{?}{8} = 0.625$$ • These bags of flour need to be ordered from lightest to heaviest. $\frac{4}{5}$kg $\frac{3}{10}$kg 250g 0.5kg One more bag is added. This bag is the third heaviest. What fraction of a kg could it be? Is this the only answer? • The following number cards have been ordered in ascending order. $\frac{1}{10}$ 0.17 ? $\frac{3}{5}$ 0.75 ? $\frac{39}{50}$ Using fractions and decimals, what numbers could the missing cards be? How many difference answers can you find?

Fractions

Complete this table:

Fractions	$\frac{1}{1000}$	$\frac{1}{100}$		$\frac{1}{1}$	$\frac{10}{1}$
Decimals			0.1		
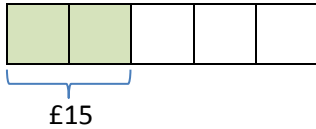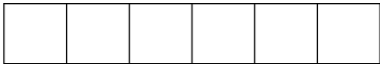
National Curriculum Statement	All students		
	Fluency	**Reasoning**	**Problem Solving**
Use the concepts and vocabulary of multiples and lowest common multiple (LCM).	• Here is part of a 100 square. Shade in the multiples of 3 in red. Shade in the multiples of 4 in blue. Three have been done for you. Put an X in the squares that are multiples of both 3 and 4. • Two horses, Tino and Rocky are in a race. The probability that Tino wins is $\frac{2}{5}$ The probability that Rocky wins is $\frac{1}{3}$ Which horse is more likely to win?	• By finding the lowest common denominator, estimate and label the following fractions on the number line. $\frac{2}{3}$ and $\frac{1}{4}$ $\frac{1}{3}$ and $\frac{1}{4}$ $\frac{4}{5}$ and $\frac{5}{6}$ • Here is a number line that goes from 0 to 100. Can you show all the multiples of both 3 and 5 on the number line?	• Meghan is having a BBQ. She is making hotdogs. For each hot dog she needs a break roll and hotdog. - Bread rolls are sold in packs of 12 - Hot dogs are sold in packs of 20 Meghan wants to buy the same number of hotdogs as bread rolls. What is the least number of each pack she has to buy in order to have the same number of hotdogs and bread rolls? • The lowest common multiple of 15 and A is 60. Find all the possible value of A.

Fractions

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National Curriculum Statement	All students		
	Fluency	**Reasoning**	**Problem Solving**
Fractions Add and subtract any fraction. ❖ Fractions with the same denominator.	• Draw a diagram to show $\frac{4}{6} + \frac{1}{6} = \frac{5}{6}$ • Work out. Give your answer in the simplest form. $\frac{3}{8} + \frac{2}{2}$ $\frac{2}{9} + \frac{6}{9}$ $\frac{3}{4} - \frac{2}{4}$ $\frac{7}{11} + \frac{4}{11}$ $1 - \frac{5}{7}$ $\frac{5}{27} + \frac{8}{27} - \frac{13}{27}$ $\frac{4}{9} + \frac{8}{9} - 1$ $\frac{5}{7} + \frac{1}{15} + \frac{2}{7} + \frac{14}{15}$ $\frac{3}{4} - \frac{1}{2} + \frac{1}{4}$ • Rob ate $\frac{1}{12}$ of a chocolate bar. Riz ate $\frac{3}{12}$ of a chocolate bar and Mark ate $\frac{7}{12}$ of a chocolate bar. ○ How much have they eaten all together? ○ How much of the chocolate bar is left?	• Joseph ate $\frac{1}{7}$ of a pizza more than Mubeen. What fraction of the pizza could Joseph and Mubeen have eaten? • Suleman says, $$\frac{2}{9} + \frac{2}{9} = \frac{4}{18}$$ Convince Suleman that he is wrong. • Can you shade in the middle rectangle so that the fraction sum is correct Explain your answer. 	• Here is a square. $\frac{5}{7}$ cm Here is an equilateral triangle. $\frac{1}{7}$ cm Find the difference between the perimeter of the square and the perimeter of the equilateral triangle. • What could the values of A, B and C be? $$\frac{4}{9} + \frac{A}{6} + \frac{B}{9} + \frac{C}{6} = 1\frac{5}{6}$$ How many different values can you find?

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Fractions	Add and subtract any fraction. ❖ Fractions with a denominator that is a multiple of the other.	• The following diagram shows $\frac{1}{3} + \frac{1}{9}$ Shade these diagrams to work out $\frac{1}{4} + \frac{5}{12}$ Draw your own diagram to show $\frac{1}{5} + \frac{11}{25} = \frac{16}{25}$ • Work out these calculations: ○ $\frac{3}{10} - \frac{1}{5} + 1$ ○ $2 - \frac{1}{2} - \frac{5}{6}$ • Robbie and Chris share a pizza. Robbie ate $\frac{3}{5}$ and Chris ate $\frac{3}{10}$ Who ate more? How much more?	• Prove that A + B + C = 2 • **Always true, sometimes true or never true?** When adding or subtracting fractions, always change the smaller numbered denominator to match the larger one. • Place either < or > symbols in the boxes to make the statements correct. $\frac{2}{5} + \frac{7}{10}$ ☐ 1 $\frac{1}{3} + \frac{1}{6}$ ☐ $\frac{3}{4}$	• Here are 10 fractions cards. $\frac{1}{3}$ $\frac{1}{2}$ $\frac{1}{9}$ $\frac{4}{18}$ $\frac{1}{6}$ $\frac{3}{9}$ $\frac{12}{18}$ $\frac{2}{3}$ $\frac{9}{18}$ $\frac{16}{18}$ By pairing the cards up can you put them into three categories? <table><tr><td>Have a sum of less than 1</td><td>Have a sum of 1</td><td>Have a sum of more than 1</td></tr><tr><td></td><td></td><td></td></tr></table> • Fill in the missing numbers in each case. $\frac{3}{4} - \frac{\square}{8} = \frac{1}{2}$ $\frac{4}{11} + \frac{\square}{66} = \frac{17}{\square}$

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	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Fractions	Add and subtract any fraction. ❖ Fractions with different denominators.	• Use the grids to calculate $\frac{1}{4} + \frac{2}{5}$ • Draw your own diagram to show $\frac{2}{3} + \frac{1}{6} = \frac{5}{6}$ • Work out. Give your answer in the simplest form. ○ $\frac{3}{4} + \frac{1}{6}$ ○ $\frac{5}{6} - \frac{1}{5}$ ○ $\frac{1}{2} + \frac{1}{5} - \frac{1}{7}$ • Casey eats $\frac{1}{12}$ of a cake and Jacub eats $\frac{1}{8}$ of the same cake. What fraction of the cake was eaten in total? What fraction of the cake is left? Who ate the most? By how much?	• Jimmy is trying to add these fractions, $\frac{2}{3} + \frac{1}{6} + \frac{5}{5}$ A suitable common denominator for this addition is 60? Do you agree with Jimmy? Explain your reasoning. • **Always, sometimes, never?** When we add or subtract fractions we multiply the denominators together to get the common denominator.	• Here are 3 identical rectangles. Part of each shape has been shaded. What fraction of the middle shape is shaded? $\frac{3}{5}$ $\frac{1}{4}$ • Muhammed is driving from Leeds to Manchester. The distance between these places is 45 miles. He drives 12.5 miles and then fills up with petrol. He then drives $18\frac{2}{3}$ miles more. How far does he still have to drive? Give your answer as a fraction.

National Curriculum Statement	All students		
	Fluency	**Reasoning**	**Problem Solving**

Fractions — Find a fraction of an amount.	• Calculate the following:
	
	  ○ $\frac{1}{2}$ of 60
	  ○ $\frac{1}{5}$ x £35
	  ○ $\frac{2}{5}$ of £1.25
	  ○ $\frac{2}{3}$ x 27cm
	  ○ $\frac{3}{8}$ of 2.4 litres
	
	• Use the diagram to find $\frac{5}{6}$ of 42
	
	• Highlight on the pictures the fraction shown.
	
	$\frac{1}{3}$ $\frac{1}{4}$
	
	• Complete the missing number
	  ○ $\frac{1}{3}$ of ? = 9
	  ○ ? of 60 = 10
	  ○ $\frac{3}{5}$ of ? = 30
	
	• A box contains 28 chocolates. $\frac{3}{4}$ of them are eaten. How many chocolates are left?
		• Create **two** questions based on the diagram.
		
		£15
		
		• Alison says that $\frac{1}{9}$ of £350 is £38.89 rounded to the nearest penny. Is Alison correct?
		
		• Find the missing numbers
		
		  ○ $\frac{1}{3}$ of 60 = $\frac{1}{4}$ of ?
		  ○ ? of 48 = $\frac{4}{5}$ of 20
		  ○ $\frac{1}{8}$ of ? = 30 x $\frac{1}{6}$
		
		• Hayley gets £5 pocket money every week. She spends $\frac{3}{10}$ of the money and saves the rest.
		Sammy thinks she will save £14 after 4 weeks.
		Is Sammy correct?
			• Find the missing numbers or fractions
			
			? of 48 = $\frac{4}{5}$ of ?
			
			Is there more than one answer?
			
			• Barney's younger sister is 1.1 metres tall. Barney is $\frac{1}{5}$ taller than his younger sister. His older sister is $\frac{1}{6}$ taller than Barney. How tall is his older sister?
			
			• There are 120 counters in a bag. $\frac{1}{6}$ of the counters are blue, $\frac{1}{4}$ of the counters are red and the rest are green. How many counters are green?
			
			• Martha receives some money for her birthday. She spends $\frac{2}{5}$ of the money on clothes, she saves $\frac{1}{4}$ of the money and she spends $\frac{2}{10}$ of the money on a rug for the house. She has £37.50 left. How much did Martha receive for her birthday?

National Curriculum Statement	All students		
	Fluency	**Reasoning**	**Problem Solving**

Statistics
 	
Understand the data handling cycle.
 	
Understand the different types of data.
	• Dawson wants to test this hypothesis:
	
	"Girls use their phones more often than boys"
	
	Use the data handling cycle to write a plan for Dawson.
	
	• What is the definition of a hypothesis?
	
	• Decide whether the data below is discrete or continuous.
	
	  o The number of Y7 children who are absent from school each day.
	  o The time taken for Y7 pupils to travel to school.
	  o The amount of money spent at break time by Y7 pupils.
	  o The marks on a maths test for Y7 pupils.
	
	Devise some possible groupings for each data set.
		• Fiona has ordered the following components of the data handling cycle.
		
		Collect data using a survey or experiment.
		
		Specify a problem and write a hypothesis.
		
		Interpret your results and make conclusions.
		
		Analysis and present your data.
		
		Do you agree with her order?
		
		• What data could you collect to test the hypotheses below? Which would be the most difficult to investigate?
		  o Football fans spend more money on replica kits than rugby fans.
		  o Skate boarding is more difficult than cycling.
		  o People who are left handed are also left footed.
			• Design a data collect sheet for a traffic survey to be carried out near a children's hospital.
			  o What is the purpose of conducting this survey?
			  o What are they types of data you will need to collect?
			
			• Anna is working on a project about a local park. She has collected three sorts of data:
			The number of children in the playground at six different times during a weekend.
			The favourite playground equipment of 20 children she interviewed.
			The opinions of 20 parents who she interviewed about the park.
			  o How could she analyse and present each type of data?
			
			• A journalist reads Anna's project and sees this table of data.
			
			<table><tr><td></td><td>10am</td><td>1pm</td><td>4pm</td><td></td></tr><tr><td>Sat</td><td>12</td><td>7</td><td>30</td><td>49</td></tr><tr><td>Sun</td><td>37</td><td>41</td><td>38</td><td>116</td></tr></table>
			She writes a headline "Children don't play in parks on Saturdays." Comment on her headline.

National Curriculum Statement	All students		
	Fluency	**Reasoning**	**Problem Solving**

Statistics
 	
Collect, organise and interpret data.
 	
❖ Tally charts
❖ Two way tables
❖ Median, mode and range
❖ Consider outliers
	• Find the mode, range and median of the following data sets.
	  ○ 2, 11, 8, 3, 9, 2, 5, 2, 3
	  ○ 2, 2.1, 2.23, 2.12, 2.01, 2.1
	
	• The data below is the hand span for 8 children. Identify any outliers:
	  ○ 12cm, 15cm, 11cm, 8cm, 13cm, 13cm, 12cm, 11cm
	
	• The table below shows the data from a survey of Y7 pupils.
		• Complete the table
		
		| Average
			Advantages	Disadvantages

---	---	---
Mode		

Median		|
		
		• What characteristic of a set of data does the range measure?
		
		• Sally did a survey of ice creams sold in her park café. Part of her recording sheet is shown below. What advice would you give Sally?
			• A set of seven numbers has:
			  ○ A range of 13
			  ○ A median of 8
			  ○ A mode of 7
			What could the seven numbers be? How many different conbinations can you make?
			
			• Here is a number line.
			
			Three numbers A, B and C are marked.
			If B is equal to 16, what is the range of A and C? What is the median?
			
			• The table shows the ages of some English monarchs at their death.

Fluency table:

	Bus/car	Walk/cycle
Leave home before 8am	~~IIII IIII~~ IIII	~~IIII IIII IIII~~ ~~IIII~~ III
Leave home after 8am	~~IIII IIII IIII IIII IIII IIII~~ II	~~IIII IIII~~ II

How many Y7 pupils were in the survey?
What fraction of those who walk or cycle left home before 8am?

Reasoning table:

Type	Number
Choc	~~1 2 4 5 6~~ 9
Strawberry	~~1 2 3~~ 4
Mint	
Vanilla	~~2~~ 5 ~~6~~ 7
Toffee	~~1 2 3 4~~ 5
~~Banana~~	
Raspberry	
~~Mango~~	
Bubblegum	
Tuttifruits	1
marshmallow	3

Problem Solving table:

Mary II	33	William IV	71
Anne	49	Victoria	81
George I	67	Edward VII	68
George II	77	George V	70
George III	81	Edward VIII	77
George IV	67	George VI	56
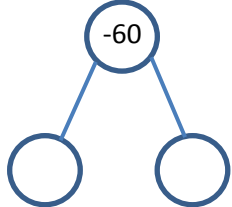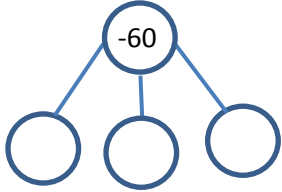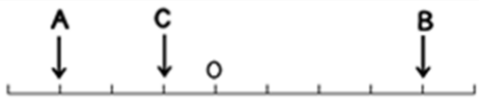
Is there any evidence to support the hypothesis that queens live longer than kings?

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National Curriculum Statement	All students		
	Fluency	**Reasoning**	**Problem Solving**
Statistics — Draw and interpret bar charts, pictograms and line graphs.	• Class 7 are doing a survey. They ask 20 people this question. "How many pets do you own?" The results are shown in this bar chart. How many pets in total do these people own? • A nurse takes the temperature of a feverish baby. How often is the temperature taken? What is the median temperature?	• Ed wants to draw a graph to show the attendance at home matches of Sheffield Wednesday. Which sort of graph should he choose? • Explain why the pictogram below is misleading. • What data might the graph below represent? 	• The bar charts below show the number of lengths that Laura and Simon swam each day for 5 days. Each length is 25 metres long. How many more metres did Laura swim than Simon?

National Curriculum Statement	All students		
	Fluency	**Reasoning**	**Problem Solving**

Negative Numbers

Use the four operations with negative numbers.

❖ Addition and Subtractions.

Fluency

- Complete the number lines

- Use the number lines to find the difference between 4 and -4
- Use the number line to solve 8 - - 6

- Fill in the missing numbers.
  The two numbers below add to make the number above.

- Calculate the following

  - 4 – 10   -5 + 8
  - -9 + 1 – 5   2 - (+8)
  - -3 + (-2)   -2 + (+3)
  - 5 – (-1)   -7 – (-3)

Reasoning

- Naomi thinks that 6 is the missing number in this calculation but Matthew thinks 16 is the missing number.

  -5 + ☐ - -5 = 6

  Who is correct? Explain your reasoning.

- The two blocks below add up to the block above.

-5 -7
-2 -2
5   7

  Prove that the numbers on the right fit into the table correctly?
  Create your own question but with 10 blocks.

- Alice thinks -2 - 8 = 6
  What mistake has she made.
  You may explain your answer on a number line.

Problem Solving

- Three numbers are marked on a number line.

  The difference between A and B is 28
  D is 19 less than C.
  - What is the value of D?
  - Can you mark D on the number line?

- If ⭐ + 🔺 = -10

  what could the value of the

  ⭐ & 🔺 be?

- Here is some information about four number cards.

  They increase in order of size, starting with the smallest. When you subtract the smallest from the largest you get 12
  All four cards add up to make 0

  Using this information can you find the three missing cards. Is there just one answer?

  -7 ☐ ☐ ☐

National Curriculum Statement	All students		
	Fluency	**Reasoning**	**Problem Solving**
Negative Numbers Use the four operations with negative numbers. ❖ Multiplication and division	• Calculate the following ○ 5 x -6 -27 ÷ 4 ○ -9 x -3 100 ÷ -20 ○ -5 x -2 x 4 -12 ÷ -3 x -4 ○ $\frac{14 \times 2}{-7}$ • Put the correct symbol <, > or = between the numbers -5 x 3 ☐ -5 x -3 -32 ÷ 4 ☐ -2 x 2 x -2 (-6)² ☐ -9 x -4 • The number above is the product of the two numbers below. Fill in the missing boxes. • What number do you multiply -7 by the get each number? | 70	-14	42	-31.5		• Courtney says that if you square a negative number you always get a positive answer. Is Courtney correct? • Show that (–3)³ is equal to -27. • In this part-whole model the top number is the product of the two numbers below. William says there are 5 different combinations. Is he correct? Here is a second part-whole model with the same rule. How many combinations is there now?	• Here are three number cards **A** **B** **C** The sum of A and B is -10 The difference between A and B is 4 The product of all three numbers is 40 Work out the value of C. • Three numbers are marked on a number line. A divided by B = $-\frac{3}{4}$ What could the value of C be? • If ⭐ x 🔺 = 24 and the value of the star and the triangle are integers. What are all the possible values of the star and the triangle? How do you know you have all the different combinations?

National Curriculum Statement	All students		
	Fluency	**Reasoning**	**Problem Solving**

Negative Numbers
 	
Use the four operations with negative numbers.
 	
❖ Understanding the order of operations
	• Calculate the following, then put them in order of size:
	  ○ -2 – (3 – 1)
	  ○ -7 x -5 – 6
	  ○ -2 + 7 – (-5)
	  ○ 5 + 10 ÷ -2
	  ○ (-3 + 8) x 6
	  ○ 27 ÷ 9 + (-6)²
	
	• Put the correct symbol <, > or = between the numbers
	
	16 ☐ 4 x (-8 ÷ -2)
	
	6 - (-3) + 2 ☐ 11
	
	-5 x 3 - 2 ☐ 7 + (-60 ÷ 3)
	
	2 + (3 - 7) ☐ 4 ÷ -3 + 10
	
	• Place brackets in the calculations to make them true:
	(Do they all need brackets?)
	  ○ 3 x -2 + 5 = 9
	  ○ 14 - - 4 ÷ 2 = 8
	  ○ 5 + - 5 ÷ 5 - 5 = -5
	  ○ 8 – 2 – 5 x 1 = 11
	  ○ 4 ÷ - 2 - (-3) + 1 = 0
		• What is the missing number in this calculation?
		
		$6 - \boxed{} \times \boxed{-2} = 16$
		
		How did you find the answer? Describe your thought process.
		
		• Jake thinks all these calculations equal -20. What mistakes has Jake made??
		1. -5 x (8 – (-4)
		2. -5 – (7 – (-8))
		3. -32 + (-2)² x -3
		4. 8 ÷ -4 + (-6) x 3
		
		• Can you create 10 calculations that all have an answer of -4. You can use all four operations, brackets and index numbers.
		
		e.g. -6 + (-2)³ ÷ -4 = -4
		
		• Work out the value of y to make this equation true.
		
		$5 + 2 \times (y - 35) = (5 + 2) \times y - 35$
		
		Explain your reasoning.
			•
			
			If ⭐ ☐? 🔺 = -12,
			
			what could the value of the
			
			⭐ 🔺 & ☐? be?
			
			The ☐? could be any of the four operations. How do you know you have all the different combinations?
			
			• Here are some number cards.
			
			☐10 ☐-5 ☐-3 ☐9
			
			By using any of the four operations and all four number cards can you make:
			  ○ 365?
			  ○ 45?