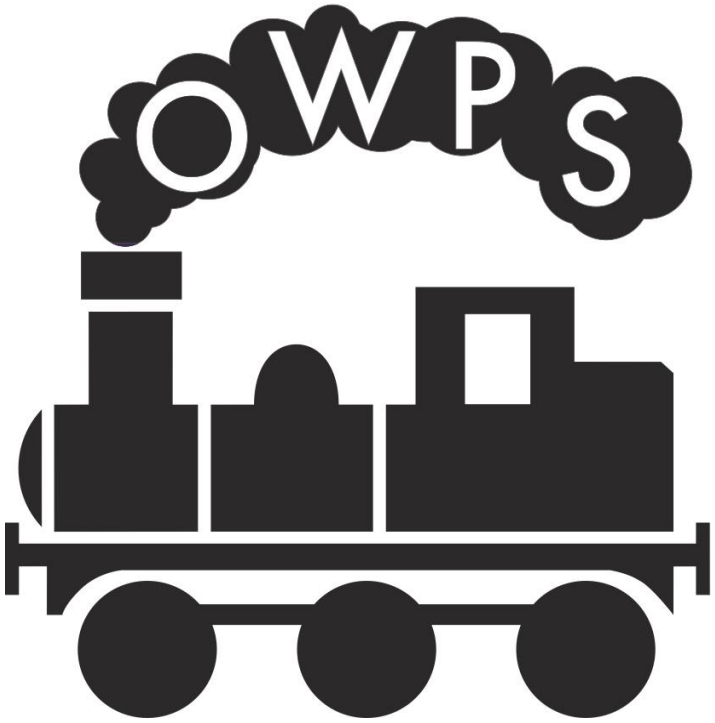
Orton Wistow Primary School



What does mathematics look like?

At Orton Wistow Primary School, we endeavour to deliver a rich and varied mathematics curriculum in line with national expectations.

We aim to develop confident mathematicians who are passionate about their learning. We do this by continuing to develop their conceptual understanding, by using manipulatives, models and images which develop pupils' fluency and by providing a range of opportunities for mathematical reasoning and problem solving, including 'real-life' mathematical scenarios.

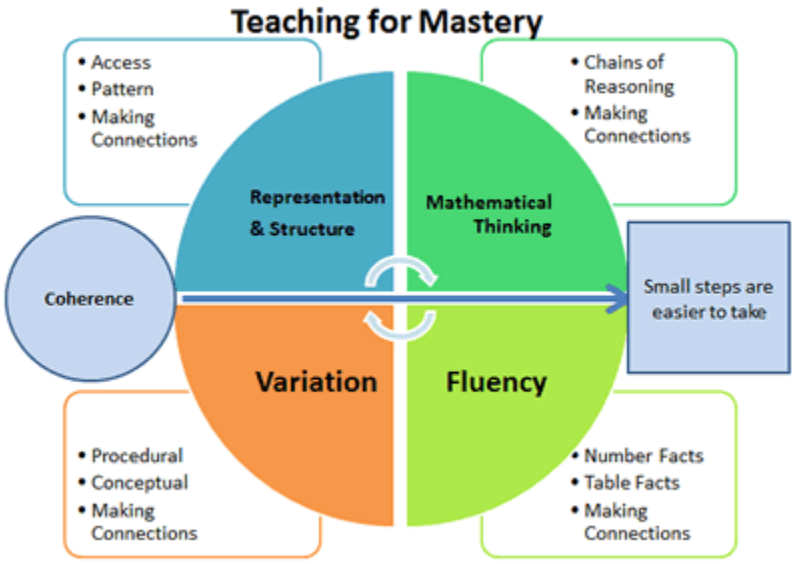
This document will outline how mathematics is taught across our school following the maths mastery approach and using the White Rose Maths scheme.

K Wyatt
Updated May 2023

Contents

Teaching for Mastery

At OWPS, we follow the teaching for mastery approach. Underpinning this are the Five Big Ideas:



Coherence
Lessons are broken down into small, connected steps that gradually unfold the concept, providing access for all children and leading to a 3ersonalized3n of the concept and the ability to apply the concept to a range of contexts.

Representation and Structure
Representations used in lessons expose the mathematical structure being taught, the aim being that students can do the maths without recourse to the representation

Mathematical Thinking
If taught ideas are to be understood deeply, they must not merely be passively received but must be worked on by the student: thought about, reasoned with and discussed with others

Fluency
Quick and efficient recall of facts and procedures and the flexibility to move between different contexts and representations of mathematics

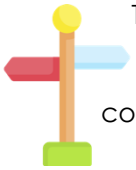
Variation
Variation is twofold. It is firstly about how the teacher represents the concept being taught, often in more than one way, to draw attention to critical aspects, and to develop deep and holistic understanding. It is also about the sequencing of the episodes, activities and exercises used within a lesson and follow up practice, paying attention to what is kept the same and what changes, to connect the mathematics and draw attention to mathematical relationships and structure.

The Five Big Ideas were first published by the NCETM in 2017.

Termly Mapping

The scheme of work we follow is taken from White Rose Maths Primary Maths Series, which is fully aligned with the 2014 English National Curriculum for maths. It outlines the content and topic order of the series.

The scheme of work demonstrates the spiral approach used in the programme, which builds pupils' depth of understanding and mathematical fluency without the need for rote learning. Learning is presented in small-step, logical sequences organised into individual lessons with a title indicating the focus of learning for that lesson. The sequence of lessons is carefully organised with clear lines of progression.



The time allocated to each topic is only provided as a guide and is not meant to be prescriptive. The concepts are broken down into a number of lessons, which offer small-step progression for the most struggling of learners. As such, teachers can use their professional judgement to combine two consecutive lessons into one session as appropriate for their learners.

We use the DFE Ready to Progress criteria to plan and prioritise learning. The aim of this publication is to:

- bring greater coherence to the national curriculum by exposing core concepts in the national curriculum and demonstrating progression from year 1 to year 6
- summarise the most important knowledge and understanding within each year group and important connections between these mathematical topics.

The Ready to Progress criteria do not address the whole of the primary curriculum, only the areas that have been identified as a priority. By following the scheme of work from White Rose, we will ensure we teach all the statutory requirements in the National Curriculum. However, by meeting the Ready to Progress criteria, pupils will be able to access many of the elements of the curriculum that are not covered in the guidance more easily.

Ready to Progress criteria will be used throughout all the stages of planning:

- At the **long-term planning stage**, the guidance will be used to ensure that the most important elements that underpin the curriculum are covered at the right time, and to ensure that there is continuity and consistency for pupils as they progress from one year group to the next.
- At the **medium-term planning stage**, the guidance will be used to inform decisions on how much teaching time to set aside for the various parts of the curriculum. Teaching time is weighted towards the Ready to Progress criteria.

  The Ready to Progress tables at the start of each year group and the 'Making connections' features both support our medium-term planning as they explain how to make connections between mathematical ideas and how to develop understanding based on logical progression.

  - At the **short-term planning stage**, the guidance is used to help us decide the most appropriate teaching strategy, representations and 'Language focus' features which can be used to make concepts more accessible to pupils.

Each year group is given **teaching guidance** which outlines the core mathematical representations, language structures and connections to other areas as well as **example assessment questions** and guidance on the development of **calculation and fluency.**

We follow the core set of representations set out by NCETM which have been selected to expose important mathematical structures and ideas, and to make them accessible to pupils. Consistent use of the same representations across year groups helps children to connect prior learning to new learning.

The example below demonstrates the use of tens frames and counters extended from Year 1, where each counter represents 1 and a filled frame represents 10, to Year 4 where each counter represents 100 and a filled frame represents 1,000.

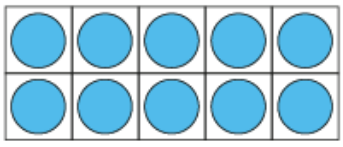


Figure 1: using a tens frame and counters

Figure 2: using a tens frame and counters

The development and use of precise and accurate language in mathematics is important, so we ensure our plans include sentence structures for pupils to use to capture, connect and apply important mathematical ideas.

Once pupils have learnt to use a core sentence structure, they should be able to adapt and reason with it to apply their understanding in new contexts. These sentence structures are found in the Ready to Progress documents **'Language Focus' features. The White Rose**

Language focus

"8 plus 6 is equal to 14, so 8 hundreds plus 6 hundreds is equal to 14 hundreds."

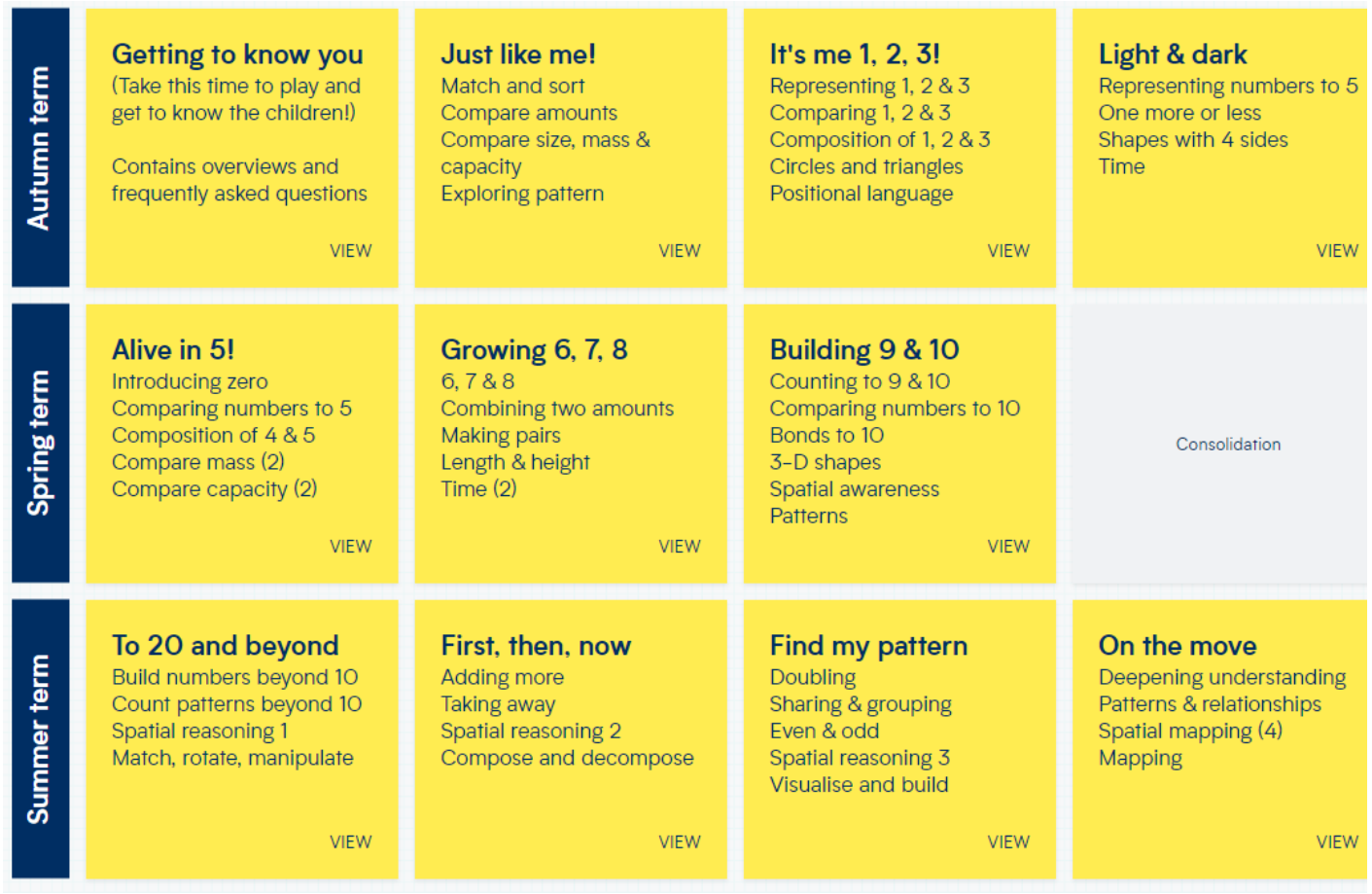
"14 hundreds is equal to 1,400."

EYFS

Developing a strong grounding in number is essential so that all children develop the necessary building blocks to excel mathematically. Children are taught to count confidently, develop a deep understanding of the numbers to 10, the relationship between them and the patterns within those numbers. Pupils in the EYFS use a range of manipulatives to develop a secure base of knowledge and vocabulary from which mastery of mathematics is built. Pupils also develop their spatial reasoning skills across all areas of maths including shape, space and measures. They are encouraged to look for patterns and relationships, spot connections and develop their maths talk.

Foundation Stage

Match and sort Compare amounts Compare size, mass & capacity Exploring pattern	Representing numbers to 5 Comparing numbers to 5 Composition of numbers to 5 Shapes Time – days of the week	Positional language One more or less Subitise numbers to 5 Number bonds to 5	Consolidation
Subtracting within 5 Bonds to 5 5 frames	Spatial Awareness Tens Frames Part whole models – number facts to 10 including doubles	Division by sharing equally 3D shapes Patterns Continue with Part Whole model and Ten Frames	
Build numbers beyond 10 Count patterns beyond 10 Adding and subtracting numbers beyond 10 Spatial reasoning	Match, rotate, manipulate – complex patterns including symmetry and growing patterns Length, height, distance and capacity	Doubling Sharing and grouping Even and odd	Consolidation


Autumn term
Getting to know you
(Take this time to play and get to know the children!)
Contains overviews and frequently asked questions
VIEW
Just like me!
Match and sort
Compare amounts
Compare size, mass & capacity
Exploring pattern
VIEW
It's me 1, 2, 3!
Representing 1, 2 & 3
Comparing 1, 2 & 3
Composition of 1, 2 & 3
Circles and triangles
Positional language
VIEW
Light & dark
Representing numbers to 5
One more or less
Shapes with 4 sides
Time
VIEW
Spring term
Alive in 5!
Introducing zero
Comparing numbers to 5
Composition of 4 & 5
Compare mass (2)
Compare capacity (2)
VIEW
Growing 6, 7, 8
6, 7 & 8
Combining two amounts
Making pairs
Length & height
Time (2)
VIEW
Building 9 & 10
Counting to 9 & 10
Comparing numbers to 10
Bonds to 10
3-D shapes
Spatial awareness
Patterns
VIEW
Consolidation
Summer term
To 20 and beyond
Build numbers beyond 10
Count patterns beyond 10
Spatial reasoning 1
Match, rotate, manipulate
VIEW
First, then, now
Adding more
Taking away
Spatial reasoning 2
Compose and decompose
VIEW
Find my pattern
Doubling
Sharing & grouping
Even & odd
Spatial reasoning 3
Visualise and build
VIEW
On the move
Deepening understanding
Patterns & relationships
Spatial mapping (4)
Mapping
VIEW

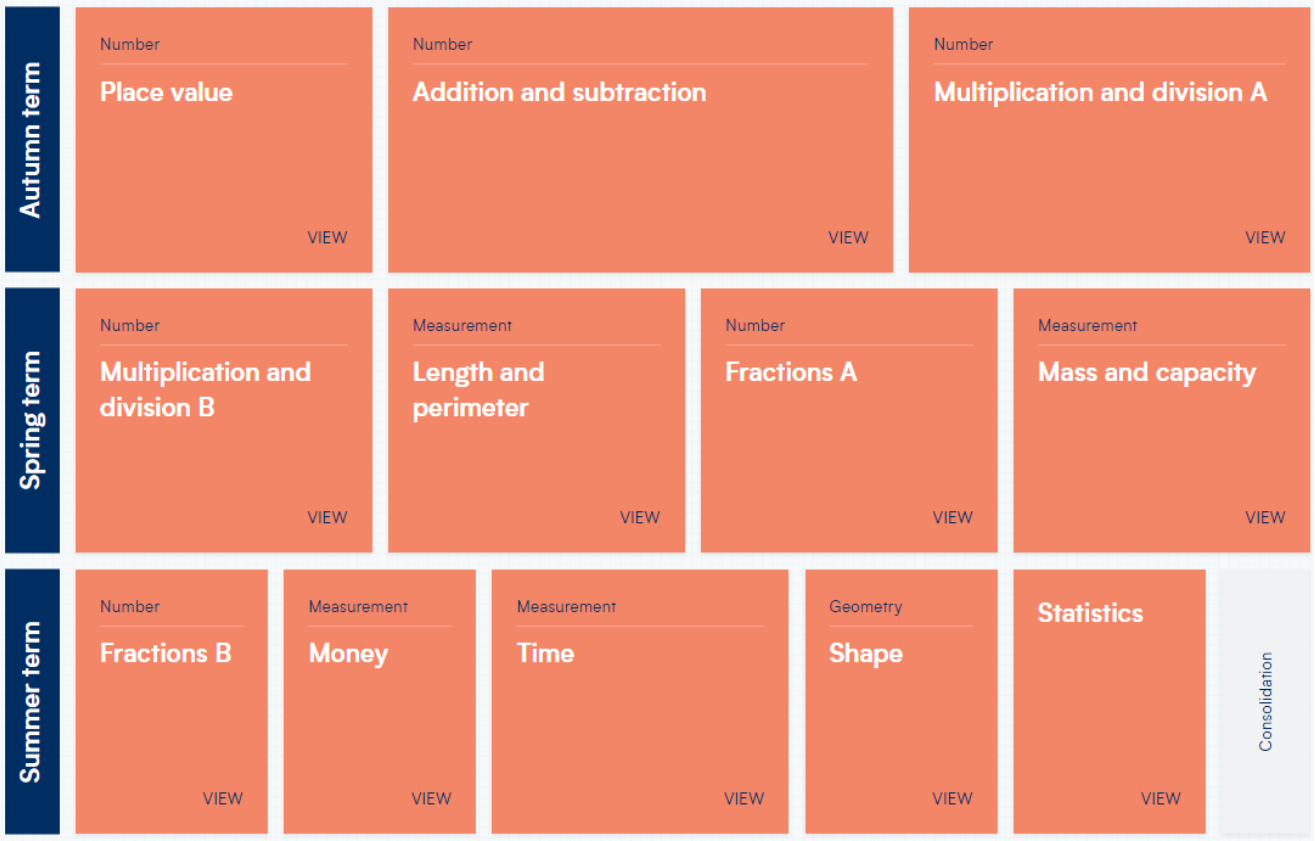
YEAR 1


Autumn term
Number
Place value
(within 10)
VIEW
Number
Addition and subtraction
(within 10)
VIEW
Geometry
Shape
VIEW
Consolidation
Spring term
Number
Place value
(within 20)
VIEW
Number
Addition and subtraction
(within 20)
VIEW
Number
Place value
(within 50)
VIEW
Measurement
Length and height
VIEW
Measurement
Mass and volume
VIEW
Summer term
Number
Multiplication and division
VIEW
Number
Fractions
VIEW
Geometry
Position and direction
VIEW
Number
Place value
(within 100)
VIEW
Measurement
Money
VIEW
Measurement
Time
VIEW
Consolidation

YEAR 2


Autumn term
Number
Place value
VIEW
Number
Addition and subtraction
VIEW
Geometry
Shape
VIEW
Spring term
Measurement
Money
VIEW
Number
Multiplication and division
VIEW
Measurement
Length and height
VIEW
Measurement
Mass, capacity and temperature
VIEW
Summer term
Number
Fractions
VIEW
Measurement
Time
VIEW
Statistics
VIEW
Geometry
Position and direction
VIEW
Consolidation

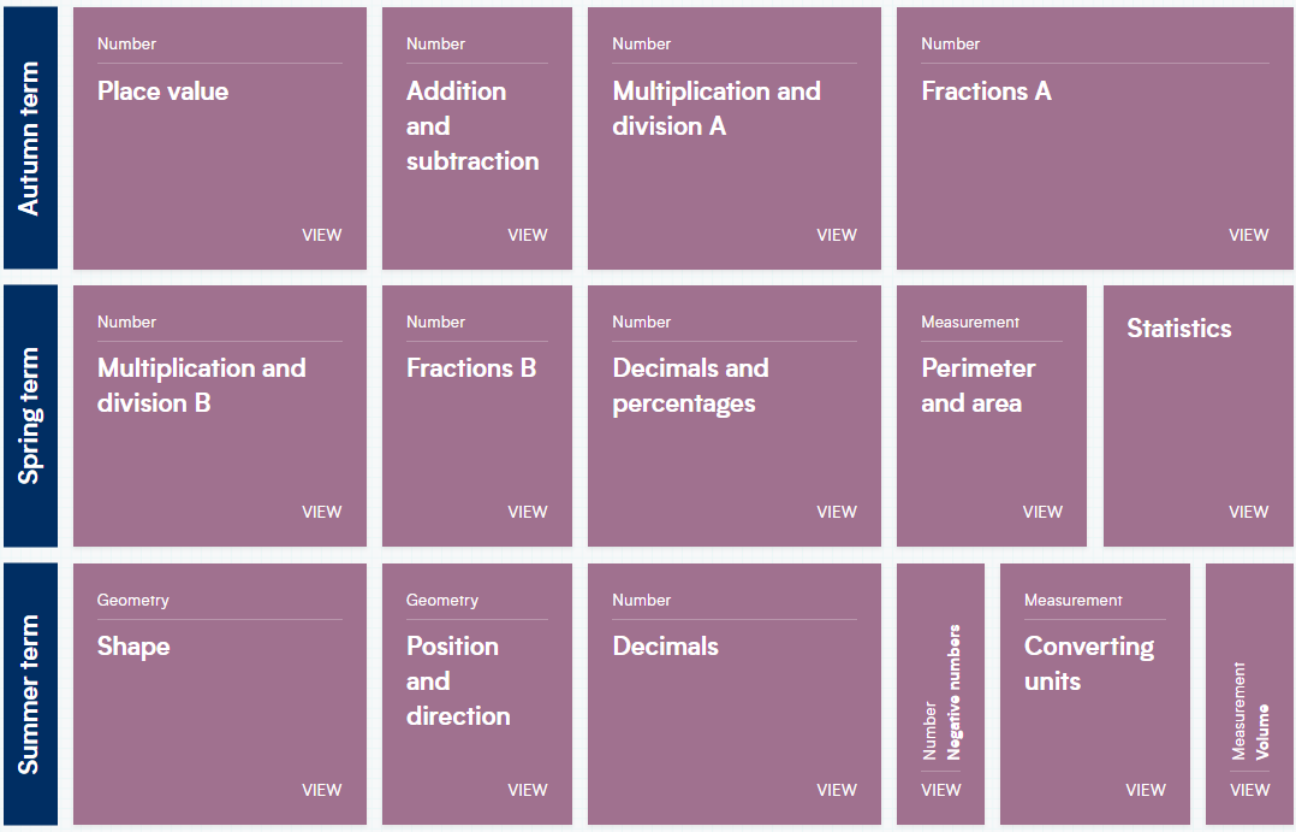
YEAR 3


Autumn term
Number
Place value
VIEW
Number
Addition and subtraction
VIEW
Number
Multiplication and division A
VIEW
Spring term
Number
Multiplication and division B
VIEW
Measurement
Length and perimeter
VIEW
Number
Fractions A
VIEW
Measurement
Mass and capacity
VIEW
Summer term
Number
Fractions B
VIEW
Measurement
Money
VIEW
Measurement
Time
VIEW
Geometry
Shape
VIEW
Statistics
VIEW
Consolidation

YEAR 4


Autumn term
Number
Place value
VIEW
Number
Addition and subtraction
VIEW
Measurement
Area
VIEW
Number
Multiplication and division A
VIEW
Consolidation
Spring term
Number
Multiplication and division B
VIEW
Measurement
Length and perimeter
VIEW
Number
Fractions
VIEW
Number
Decimals A
VIEW
Summer term
Number
Decimals B
VIEW
Measurement
Money
VIEW
Measurement
Time
VIEW
Consolidation
Geometry
Shape
VIEW
Statistics
VIEW
Geometry
Position and direction
VIEW

YEAR 5


Autumn term
Number
Place value
VIEW
Number
Addition and subtraction
VIEW
Number
Multiplication and division A
VIEW
Number
Fractions A
VIEW
Spring term
Number
Multiplication and division B
VIEW
Number
Fractions B
VIEW
Number
Decimals and percentages
VIEW
Measurement
Perimeter and area
VIEW
Statistics
VIEW
Summer term
Geometry
Shape
VIEW
Geometry
Position and direction
VIEW
Number
Decimals
VIEW
Number
Negative numbers
VIEW
Measurement
Converting units
VIEW
Measurement
Volume
VIEW

YEAR 6

Maths Lessons

We use the Maths Mastery approach to teach our mathematics lessons at Orton Wistow Primary School and follow the White Rose Maths Scheme of Learning. Each teacher is given a login for the White Rose Maths website where all the resources for the scheme can be found.

Teaching for Maths Mastery
The whole class works through the programme of study at the same pace with ample time on each topic before moving on. Ideas are revisited at higher levels as the curriculum spirals through the years.

Differentiated Activities
Tasks and activities are designed to be easy for pupils to enter while still containing challenging components. For advanced learners, the worksheets provided by White Rose also contain non-routine questions for pupils to develop their higher-order thinking skills.

Problem Solving
Lessons and activities are designed to be taught using problem-solving approaches to encourage pupils' higher-level thinking. The focus is on working with pupils' core competencies, building on what they know to develop their relational understanding, based on Richard Skemp's work.

Concrete Pictoral Abstract (CPA) Approach
Based on Jerome Bruner's work, pupils learn new concepts initially using concrete examples, such as counters, then progress to drawing pictorial representations before finally using more abstract symbols, such as the equals sign.

Lessons typically are broken into three parts and can last one or more days. Pupils master topics before moving on.

The three parts to a lesson are:

1. **In Focus Task**– the entire class spends time on a question guided by the teacher. The children are encouraged during this time to think of as many ways as possible to solve the question as possible. In Focus tasks can be taken from the Maths No Problem! Textbooks available in each classroom, or from NCETM and White Rose resources.

2. **Guided Practice** – practice new ideas in groups, pairs or individually guided by the teacher. Again these can be found from the Maths No Problem! Textbooks or using the NCETM or White Rose IWB resources.

3. **Independent Practice** – practice on your own. Once children have mastered the concept they use their reasoning and problem-solving skills to develop their depth of learning. White Rose provide worksheets which teachers can use. Maths No Problem! Workbooks are also available for teachers to use to create series of questions that build from routine to non-routine questions and finally a challenge to develop pupils' reasoning skills further.

Resources

Teachers have a bank of resources which they are able to use within their planning. These include Maths No Problem textbooks and workbooks

- White Rose IWB resources, PPTs and video lessons for small step lessons, worksheets, Flashbacks and True or False questions to develop thinking skills
- NCETM ready to progress PPTS. These PowerPoints include links to relevant resources and pupil-facing activities. They are ideal to be used with small groups of pupils to review, practise, and consolidate learning.
- Reasoning and Problem-Solving resources

NCETM

Teachers' subject knowledge is key to successful teaching for mastery, as well as their understanding of the learning steps required, and the order of those steps.

The NCETM have designed materials to assist in the professional development of staff and enable them to deliver teaching for mastery with confidence. The NCETM have split the curriculum up into a small number of areas, called 'spines'

Spine 1: *Number, Addition and Subtraction*
Spine 2: *Multiplication and Division*
Spine 3: *Fractions*.

An explanation of the structure of these materials, with guidance on how teachers can use them, is contained in a **Getting Started** video. The materials can support teachers to develop their subject and pedagogical knowledge and so help to improve mathematics teaching in combination with the MNP! Resources.

Journaling

Journaling can be a very effective tool to develop communication. Journaling can be incorporated into many parts of the maths lesson, depending on the type of entry, for example, to open a class with an investigative entry to engage students; consolidate learning and reflect on thinking with a mid-lesson descriptive or evaluative entry; enrich students with a creative entry for early finishers of independent practice.

The benefit of journaling for the teacher is to provide a concrete formative assessment. By evaluating student responses, you can determine their readiness to handle a new task and check for understanding of concepts.

Pupils will be expected to make notes in their maths journals about their learning through the lesson and the unit of work being covered. The journals may include;

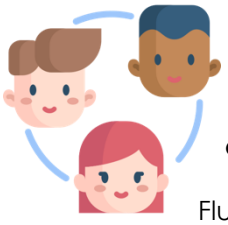
1. **Investigative work:** Students explore a new concept, solve a problem and make connections to prior learning.
2. **Descriptive work:** Students describe or explain a concept or mathematical vocabulary. This can be done using pictures, numbers and/or words.
3. **Evaluative:** Students argue for or against a strategy or solution to explain why they think an answer is right or wrong, explain their choice of strategies or justify the most efficient strategy.
4. **Creative:** Students write their own word problem or create their own number puzzle.

Reasoning Practise

Once children are fluent in the skills taught, they may then be given opportunities to apply these skills to additional Reasoning and Problem-Solving tasks planned by the class teacher (during the sequence of learning). There is a range of reasoning and problem-solving tasks for each year group saved in the maths folder in Staff Shared and include:

- Convince Me
- Dip and Pick
- I See Reasoning
- White Rose examples
- Discuss it
- What if
- Bar Model Activities

Fluency



One of the three aims of the new curriculum states that pupils (of all ages, not just primary children) will: ***become fluent in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.***

Fluency is made up of three parts:

- **Efficiency**: learners choose efficient strategies and don't get bogged down in too many steps
- **Accuracy**: learners are accurate in their workings, have great recall of facts and double check their answers
- **Flexibility**: learners understand that there are many ways to solve a problem

Fluency means that learners can do more than just memorise procedures. To be truly fluent, a child understands the meaning of the operations and their relationships to each other, they have a large knowledge bank of number facts, and a deep understanding of the base ten system.

Children can't instantly use their mathematical knowledge without having to think about what they are doing. It's the opportunities for practice that helps them reach an effortless stage of fluency where they can apply their knowledge to solve unfamiliar problems.

Fluency sessions are planned into the day to practise skills. These can be first thing in the morning, straight after lunch or after an assembly. These sessions can be used to revisit previously taught topics (last week, last month, last term, and last year) or practise specific skills such as:

- Counting forwards and backwards
- Reordering
- Partitioning: counting on or back
- Partitioning: bridging a multiple of 10
- Partitioning: compensating
- Partitioning: using 'near' doubles

Low stake quizzes can be used to recall skills of prior learning as well as regular arithmetic quizzes and assessments. White Rose produce Flashback questions which provide questions from previous learning across a wide range of topics. Additionally, Vocabulary Ninja Mathematics Tough Ten resources provide similar questions to practise arithmetic skills. These resources will ensure essential skills are regularly revisited and retrieved to strengthen retention.

Discrete Arithmetic sessions may also be planned into the week for some year groups in order to revise and rehearse specific skills using practise arithmetic questions from Vocabulary Ninja or Test Base.

The document: **Teaching Children to Calculate Mentally** gives lots of practical advice and guidance on teaching a variety of mental maths strategies and can be found in the Maths Planning Folder on the school drive.

Provision for children with SEND

When teaching maths for mastery, the whole class moves through topics at broadly the same pace. Each topic is studied in depth and the teacher does not move to the next stage until all children demonstrate that they have a secure understanding of mathematical concepts. However, there will be pupils in each class who do struggle with maths. Some pupils have gaps in their knowledge and others might misunderstand core concepts such as place value. Others struggle because they have a special educational need or disability (SEND), for example: a moderate learning difficulty, a speech and language need, or a **specific learning difficulty**.

Inclusive high-quality teaching is the first step in responding to pupils who have SEND. For pupils with SEND scaffolding learning is essential. This may include:

- Breaking small steps down even further into smaller more manageable chunks.
- The CPA (Concrete Pictorial Abstract) approach provides the ideal opportunity for pupils to learn maths concepts using hands-on, physical resources at the concrete stage. Some pupils will need to spend longer at the concrete or pictorial stage, or will need to continue having these stages reinforced alongside the abstract stage. We ensure concrete materials are not removed too early when pupils need to carry on using them to secure their conceptual understanding (it is okay for KS2 pupils to be using Unifix or Numicon!)
- Misconception are identified in the planning stage so that these can be addressed beforehand.
- Adaptations are also made explicit at the planning stage for those pupils who struggle with mathematics learning.
- Pre-teaching is a valuable approach which is used to reinforce concepts and specific vocabulary.
- Scaffolding involves using a range of strategies to provide temporary support for pupils, moving them towards increasing independence. For example, when pupils are tackling maths word problems, you can scaffold their learning by providing visual clues to help them understand the instructions, or by pre-highlighting the most important words within the problem.

Some pupil may be working significantly below the ability of their peers. These pupils will have a 14ersonalized curriculum which may include differentiating work using objectives from prior year groups.

Maths Expectations by Year Group

EYFS

The level of development children should be expected to have attained by the end of the EYFS is defined by the early learning goals (ELGs)

ELG: Number

Children at the expected level of development will:

- Have a deep understanding of number to 10, including the composition of each number;
- Subitise (recognise quantities without counting) up to 5
- Automatically recall (without reference to rhymes, counting or other aids) number bonds to 5 (including subtraction facts) and some number bonds to 10, including doubles facts.

ELG: Numerical Patterns

Children at the expected level of development will:

- Verbally count beyond 20, recognising the pattern of the counting system;
- Compare quantities up to 10 in different contexts, recognising when one quantity is greater than, less than or the same as another quantity;
- Explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed equally.

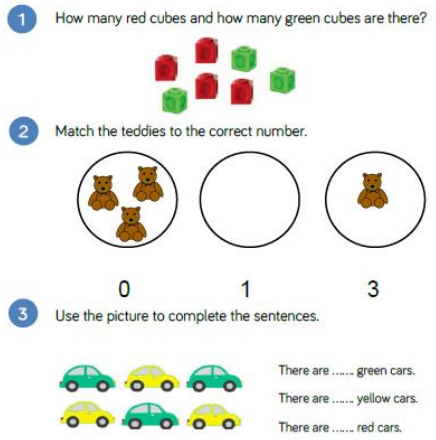
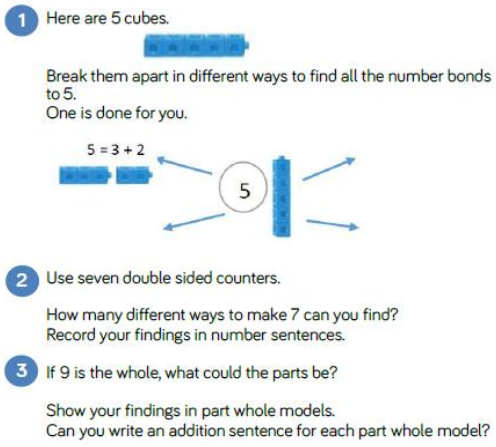
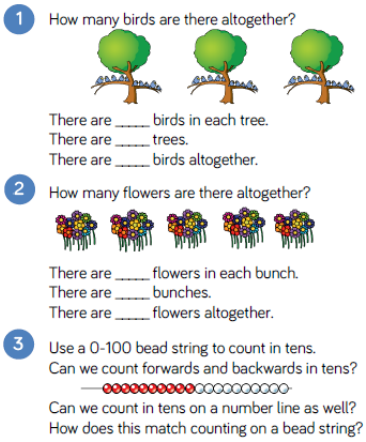
We follow the **Development Matters** Non-statutory guidance for the early years foundation stage:

Children in reception will be learning to:	Examples of how to support this:
Count objects, actions and sounds.	Develop the key skills of counting objects including saying the numbers in order and matching one number name to each item. Say how many there are after counting – for example, "…6, 7, 8. There are **8 balls**" – to help children appreciate that the last number of the count indicates the total number of the group. This is the cardinal counting principle. Say how many there might be before you count to give a purpose to counting: "I think there are about 8. Shall we count to see?" Count out a smaller number from a larger group: "Give me seven…" Knowing when to stop shows that children understand the cardinal principle. Build counting into everyday routines such as register time, tidying up, lining up or counting out pieces of fruit at snack time. Sing counting songs and number rhymes and read stories that involve counting. Play games which involve counting. Identify children who have had less prior experience of counting and provide additional opportunities for counting practice.
Subitise.	Show small quantities in familiar patterns (for example, dice) and random arrangements. Play games which involve quickly revealing and hiding numbers of objects. Put objects into five frames and then ten frames to begin to familiarise children with the tens structure of the number system. Prompt children to subitise first when enumerating groups of up to 4 or 5 objects: "I don't think we need to count those. They are in a square shape so there must be 4." Count to check. Encourage children to show a number of fingers 'all at once', without counting.
Link the number symbol (numeral) with its cardinal number value.	Display numerals in order alongside dot quantities or tens frame arrangements. Play card games such as snap or matching pairs with cards where some have numerals, and some have dot arrangements. Discuss the different ways children might record quantities (for example, scores in games), such as tallies, dots and using numeral cards.

Count beyond ten.	Count verbally beyond 20, pausing at each multiple of 10 to draw out the structure, for instance when playing hide and seek, or to time children getting ready. Provide images such as number tracks, calendars and hundred squares indoors and out, including painted on the ground, so children become familiar with two-digit numbers and can start to spot patterns within them.
Compare numbers.	Provide collections to compare, starting with a very different number of things. Include more small things and fewer large things, spread them out and bunch them up, to draw attention to the number not the size of things or the space they take up. Include groups where the number of items is the same. Use vocabulary: 'more than', 'less than', 'fewer', 'the same as', 'equal to'. Encourage children to use these words as well. Distribute items evenly, for example: "Put 3 in each bag," or give the same number of pieces of fruit to each child. Make deliberate mistakes to provoke discussion. Tell a story about a character distributing snacks unfairly and invite children to make sure everyone has the same.
Understand the 'one more than/one less than' relationship between consecutive numbers.	Make predictions about what the outcome will be in stories, rhymes and songs if one is added, or if one is taken away. Provide 'staircase' patterns which show that the next counting number includes the previous number plus one.
Explore the composition of numbers to 10.	Focus on composition of 2, 3, 4 and 5 before moving onto larger numbers Provide a range of visual models of numbers: for example, six as double three on dice, or the fingers on one hand and one more, or as four and two with ten frame images. Model conceptual subitising: "Well, there are three here and three here, so there must be six." Emphasise the parts within the whole: "There were 8 eggs in the incubator. Two have hatched and 6 have not yet hatched." Plan games which involve partitioning and recombining sets. For example, throw 5 beanbags, aiming for a hoop. How many go in and how many don't?

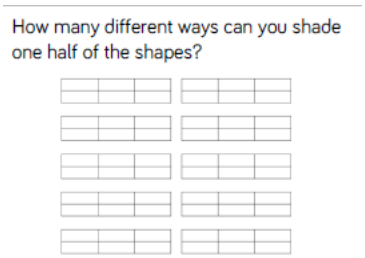
Automatically recall number bonds for numbers 0–5 and some to 10.	Have a sustained focus on each number to and within 5. Make visual and practical displays in the classroom showing the different ways of making numbers to 5 so that children can refer to these. Help children to learn number bonds through lots of hands-on experiences of partitioning and combining numbers in different contexts, and seeing subitising patterns. Play hiding games with a number of objects in a box, under a cloth, in a tent, in a cave, etc.: “6 went in the tent and 3 came out. I wonder how many are still in there?” Intentionally give children the wrong number of things. For example: ask each child to plant 4 seeds then give them 1, 2 or 3. “I’ve only got 1 seed, I need 3 more.” Spot and use opportunities for children to apply number bonds: “There are 5 of us but only 2 clipboards. How many more do we need?” Place objects into a five frame and talk about how many spaces are filled and unfilled.
Select, rotate and manipulate shapes to develop spatial reasoning skills.	Provide high-quality pattern and building sets, including pattern blocks, tangrams, building blocks and magnetic construction tiles, as well as found materials. Challenge children to copy increasingly complex 2D pictures and patterns with these 3D resources, guided by knowledge of learning trajectories: “I bet you can’t add an arch to that,” or “Maybe tomorrow someone will build a staircase.” Teach children to solve a range of jigsaws of increasing challenge.
Compose and decompose shapes so that children recognise a shape can have other shapes *within* it, just as numbers can.	Investigate how shapes can be combined to make new shapes: for example, two triangles can be put together to make a square. Encourage children to predict what shapes they will make when paper is folded. Wonder aloud how many ways there are to make a hexagon with pattern blocks. Find 2D shapes within 3D shapes, including through printing or shadow play.
Continue, copy and create repeating patterns.	Make patterns with varying rules (including AB, ABB and ABBC) and objects and invite children to continue the pattern. Make a deliberate mistake and discuss how to fix it.
Compare length, weight and capacity.	Model comparative language using ‘than’ and encourage children to use this vocabulary. For example: “This is heavier than that.” Ask children to make and test predictions. “What if we pour the jugful into the teapot? Which holds more?”

Year 1

Strand	Example questions
Number and Place Value • Count to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number. • Count, read and write numbers to 100 in numerals; count in multiples of 2s, 5s and 10s. θ Given a number, identify 1 more and 1 less. • Identify and represent numbers using objects and pictorial representations including the number line, and use the language of: equal to, more than, less than (fewer), most, least. • Read and write numbers from 1 to 20 in numerals and words.	
Addition and Subtraction • Read, write and interpret mathematical statements involving addition (+), subtraction (−) and equals (=) signs. • Represent and use number bonds and related subtraction facts within 20. • Add and subtract one-digit and two-digit numbers to 20, including 0. • Solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = ? – 9	
Multiplication and Division • Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.	

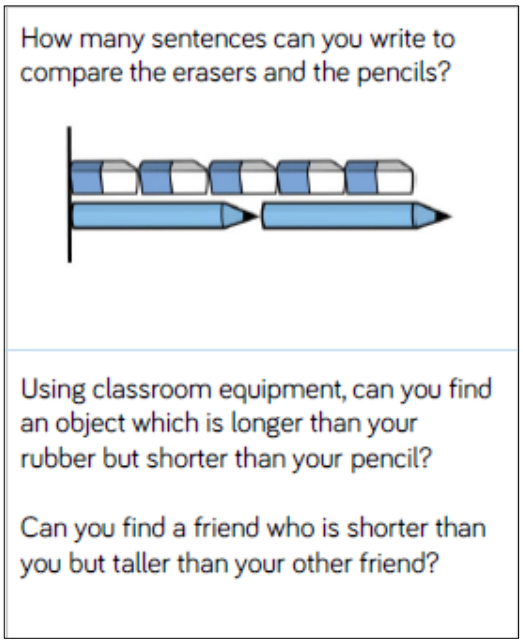
Fractions (including decimals)

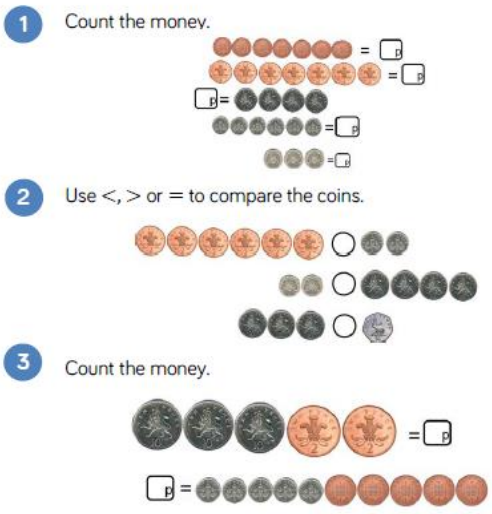
- Recognise, find and name a half as 1 of 2 equal parts of an object, shape or quantity.
- Recognise, find and name a quarter as 1 of 4 equal parts of an object, shape or quantity



Measures

- Compare, describe and solve practical problems for:
  - lengths and heights [for example, long/short, longer/shorter, tall/short, double/half]
  - mass/weight [for example, heavy/light, heavier than, lighter than]
  - capacity and volume [for example, full/empty, more than, less than, half, half full, quarter]
  - time [for example, quicker, slower, earlier, later]
- Measure and begin to record the following:
  - lengths and heights
  - mass/weight
  - capacity and volume
  - time (hours, minutes, seconds)
  - recognise and know the value of different denominations of coins and notes
  - sequence events in chronological order using language [for example, before and after, next, first, today, yesterday, tomorrow, morning, afternoon and evening] .
- Recognise and use language relating to dates, including days of the week, weeks, months and years.
- Tell the time to the hour and half past the hour and draw the hands on a clock face to show these times.



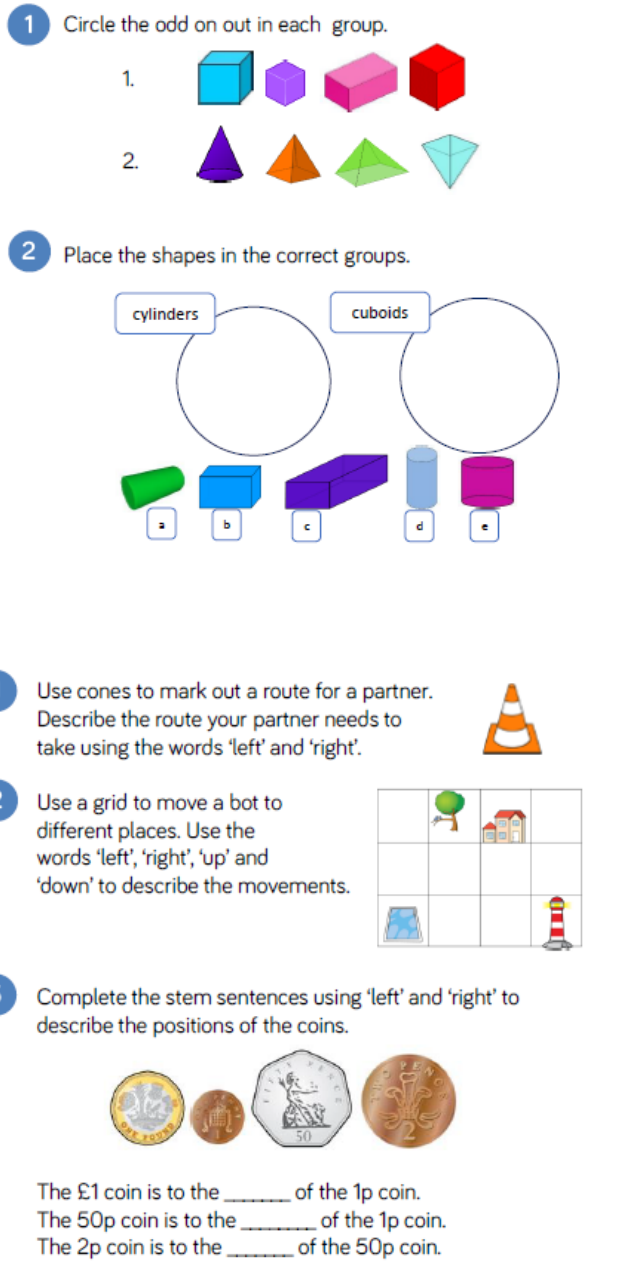


Geometry – Properties of shape

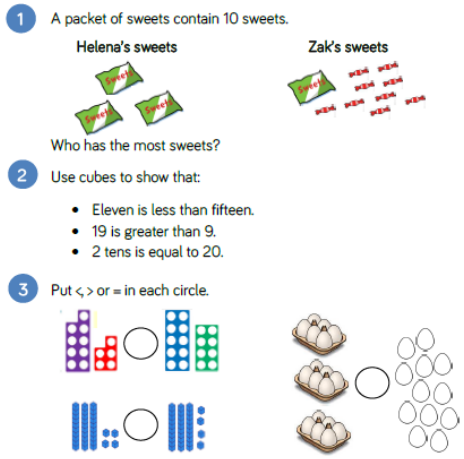
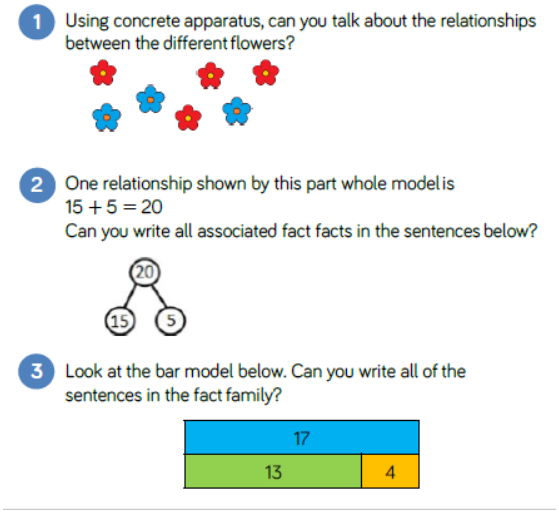
- Recognise and name common 2-D and 3-D shapes, including:
  - 2-D shapes [for example, rectangles (including squares), circles and triangles]
  - 3-D shapes [for example, cuboids (including cubes), pyramids and spheres].

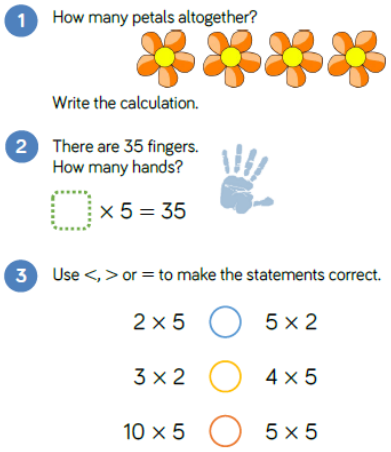
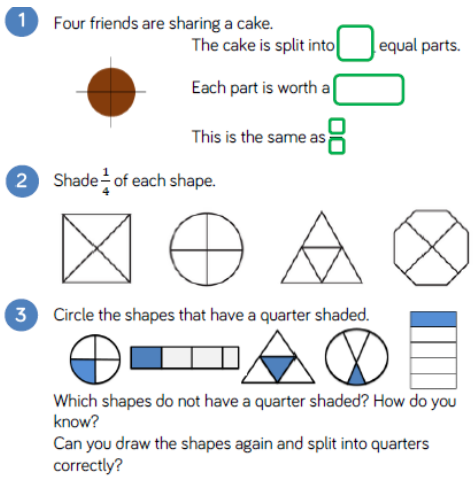
Geometry – Position and Movement

- Describe position, direction and movement, including whole, half, quarter and three-quarter turns.



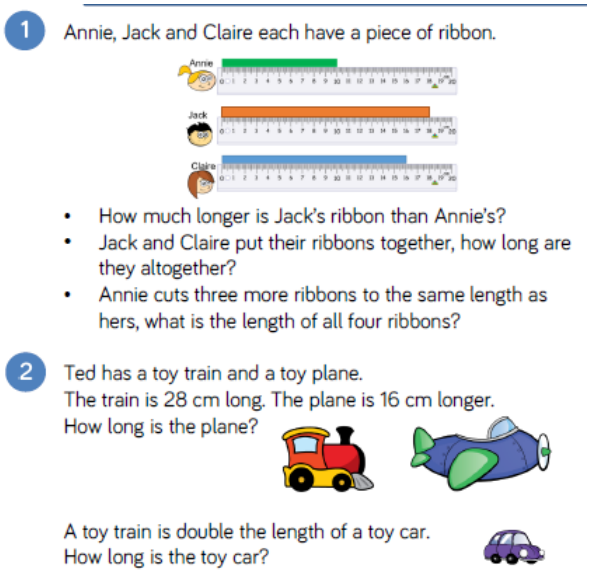
Year 2

Strand	Example questions
Number and Place Value • Count in steps of 2, 3, and 5 from 0, and in tens from any number, forward and backward. • Recognise the place value of each digit in a two-digit number (tens, ones). • Identify, represent and estimate numbers using different representations, including the number line. • Compare and order numbers from 0 up to 100; use and = signs. • Read and write numbers to at least 100 in numerals and in words. • Use place value and number facts to solve problems.	
Addition and Subtraction • Solve problems with addition and subtraction: using concrete objects and pictorial representations, including those involving numbers, quantities and measures applying their increasing knowledge of mental and written methods. • Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100. • Add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a two-digit number and ones, a two-digit number and tens, two two-digit numbers. • Add three one-digit numbers. • Show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot. • Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.	

Multiplication and Division • Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers. • Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs. • Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot. • Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.	
Fractions • Recognise, find, name and write fractions 1/2, 1/3, 1/4, 2/4, 3/4 of a length, shape, set of objects or quantity. • Write simple fractions for example, 1/2 of 6 = 3 and recognise the equivalence of 2/4 and ½.	

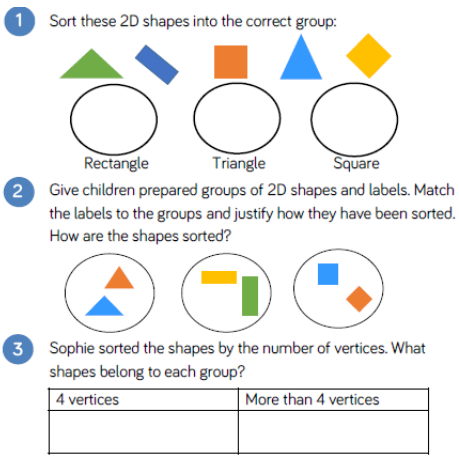
Measures

- Choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm); mass (kg/g); temperature (°C); capacity (litres/ml) to the nearest appropriate unit, using rulers, scales, thermometers and measuring vessels.
- Compare and order lengths, mass, volume/capacity and record the results using >, < and =.
- Recognise and use symbols for pounds (£) and pence (p); combine amounts to make a particular value
- Find different combinations of coins that equal the same amounts of money.
- Solve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change.
- Compare and sequence intervals of time.
- Tell and write the time to five minutes, including quarter past/to the hour and draw the hands on a clock face to show these times.
- Know the number of minutes in an hour and the number of hours in a day.



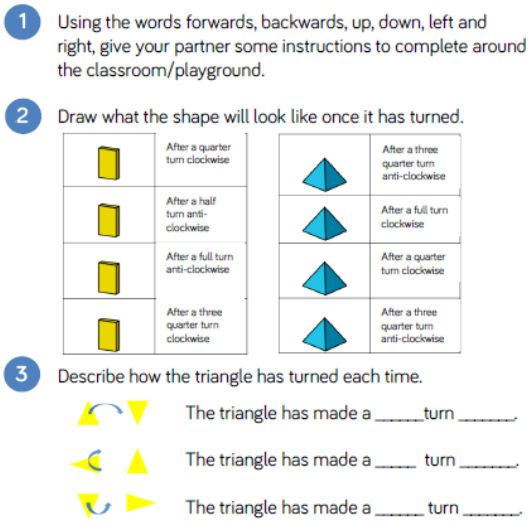
Geometry – Properties of Shapes

- Identify and describe the properties of 2-D shapes, including the number of sides and line symmetry in a vertical line.
- Identify and describe the properties of 3-D shapes, including the number of edges, vertices and faces.
- Identify 2-D shapes on the surface of 3-D shapes, [for example, a circle on a cylinder and a triangle on a pyramid].
- Compare and sort common 2-D and 3-D shapes and everyday objects.



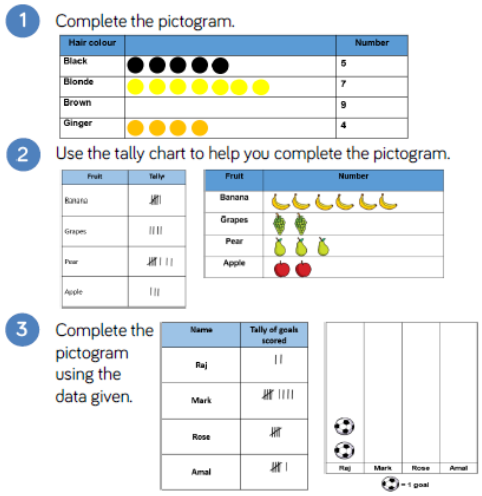
Geometry – Position and Movement

- Order and arrange combinations of mathematical objects in patterns and sequences.
- Use mathematical vocabulary to describe position, direction and movement, including movement in a straight line and distinguishing between rotation as a turn and in terms of right angles for quarter, half and three-quarter turns (clockwise and anticlockwise).

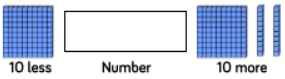
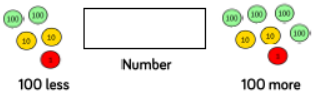
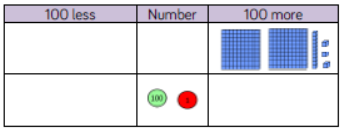
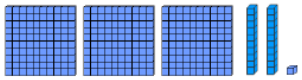
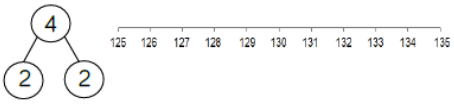
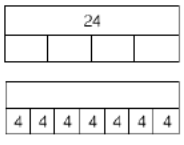


Statistics

- Interpret and construct simple pictograms, tally charts, block diagrams and simple tables.
- Ask and answer simple questions by counting the number of objects in each category and sorting the categories by quantity.
- Ask and answer questions about totalling and comparing categorical data.

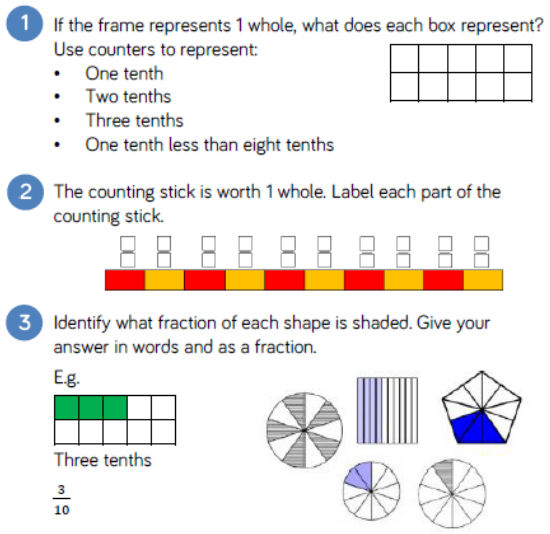


Year 3

Strand	Example questions
Number and Place Value • Count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number. • Recognise the place value of each digit in a threedigit number (hundreds, tens, ones). • Compare and order numbers up to 1000. • Identify, represent and estimate numbers using different representations. • Read and write numbers up to 1000 in numerals and in words. • Solve number problems and practical problems involving these ideas.	1 Put the correct number in each box.   2 Show ten more and ten less than the following numbers using Base 10 and place value counters. • 550 • 724 • 302 3 Complete the table. 
Addition and Subtraction • Add and subtract numbers mentally, including: a three-digit number and ones, a three-digit number and tens, a three-digit number and hundreds. • Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction. • Estimate the answer to a calculation and use inverse operations to check answers. • Solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction.	1 Using Base 10 solve 321 – 4  2 How could this part whole model help you solve 132 – 4? Show me on a number line.  3 Red Team had 672 team points this year and won the House Cup. Blue Team finished second with 7 less points than the red team. How many points did the Blue team finish on?
Multiplication and Division • Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables. • Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods. • Solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects.	1 Circle the buttons in groups of 4  Can you also split the buttons into 4 equal groups? How is it different? How is it the same? 2 There are some cars in a car park. Each car has 4 wheels. In the car park there are 32 wheels altogether. How many cars are there? 3 Complete the bar models and complete the calculations.  24 ÷ 4 = ☐ ☐ ÷ 4 = ☐

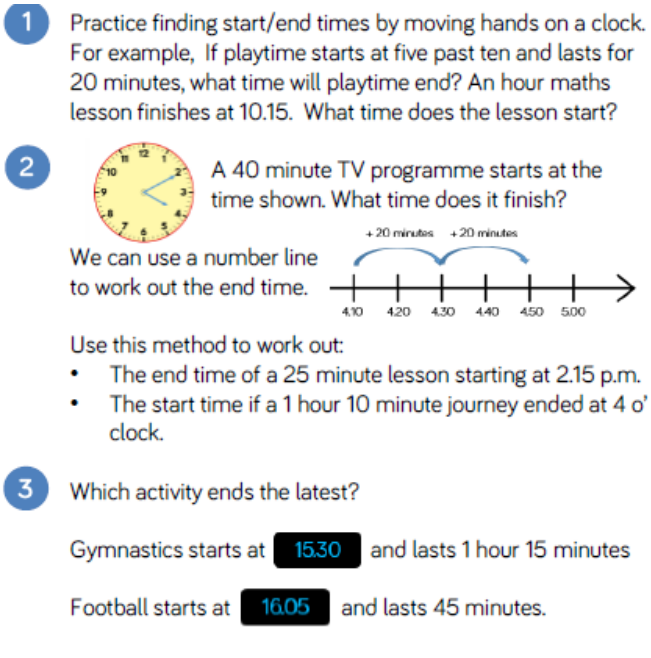
Fractions and Decimals

- Count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10.
- Recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators.
- Recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators.
- Recognise and show, using diagrams, equivalent fractions with small denominator.
- Add and subtract fractions with the same denominator within one whole [for example, 5/7 + 1/7 = 6/7].
- Compare and order unit fractions, and fractions with the same denominators.
- Solve problems that involve all of the above.



Measures

- Measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml).
- Measure the perimeter of simple 2-D shapes.
- Add and subtract amounts of money to give change, using both £ and p in practical contexts.
- Tell and write the time from an analogue clock, including using Roman numerals from I to XII, and 12-hour and 24-hour clocks.
- Estimate and read time with increasing accuracy to the nearest minute; record and compare time in terms of seconds, minutes and hours; use vocabulary such as o'clock, a.m./p.m., morning, afternoon, noon and midnight.
- Know the number of seconds in a minute and the number of days in each month, year and leap year.
- Compare durations of events [for example to calculate the time taken by particular events or tasks].



Geometry – Properties of Shape

- Draw 2-D shapes and make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them.
- Recognise angles as a property of shape or a description of a turn.
- Identify right angles, recognise that two right angles make a half-turn, three make three quarters of a turn and four a complete turn; identify whether angles are greater than or less than a right angle.
- Identify horizontal and vertical lines and pairs of perpendicular and parallel lines.

1

The angle between the hands is _____ than a right angle.
This is called an _____ angle.

The angle between the hands is _____ than a right angle.
This is called an _____ angle.

Explore other times where the hands make an acute/obtuse angle.

2 Find and draw 3 acute angles and 3 obtuse angles you can see in your classroom.
Use your 'Right Angle Tester' to check.

3 Label the angles in these images.

Geometry – Position and Movement

- Use mathematical vocabulary to describe position, direction and movement, including movement in a straight line and distinguishing between rotation as a turn and in terms of right angles for quarter, half and three-quarter turns (clockwise and anticlockwise).

Statistics

- Interpret and present data using bar charts, pictograms and tables solve one-step and two-step questions [for example, 'How many more?' and 'How many fewer?'].
- Use information presented in scaled bar charts and pictograms and tables.

1 The table shows which sport children play.

	Lottie	John	Chris	Ann	Joanne	Jack
Football	✓		✓	✓		✓
Rugby			✓		✓	
Tennis	✓	✓		✓		✓
Cricket			✓		✓	
Basketball		✓	✓	✓		✓

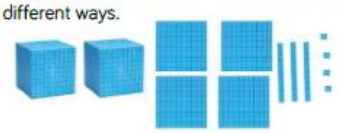
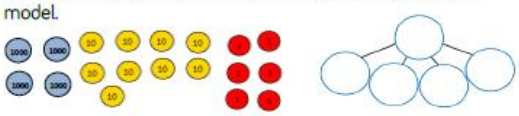
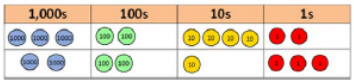
Which children play football and tennis?
Which is the most popular sport?
Which is the least popular sport?
Who plays the most sport?

2 The table shows the increase of bus ticket fairs.

1st January	
2016	2017
44p	49p
56p	60p
64p	69p
76p	85p
86p	93p
98p	£1.03
£1.05	£1.11

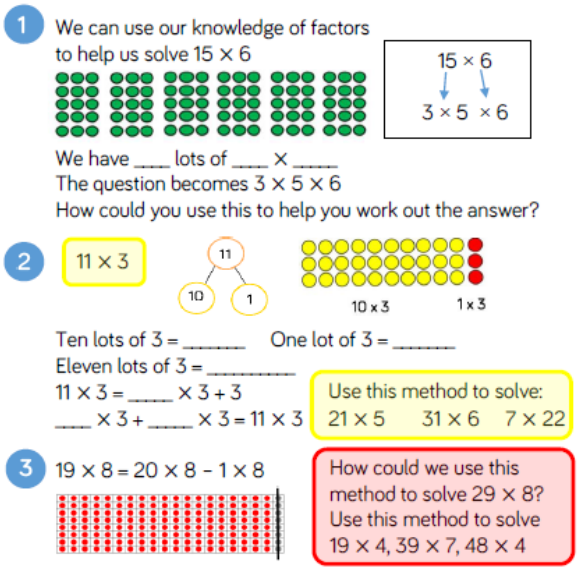
- The cost of Joel's new ticket is 85p. How much has his fare increased be?
- What was the largest increase in price of any ticket?
- What was the smallest increase in price of any ticket?

Year 4

Strand	Example questions
Number and Place Value • Count in multiples of 6, 7, 9, 25 and 1000 find 1000 more or less than a given number. • Count backwards through zero to include negative numbers. • Recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones). • Order and compare numbers beyond 1000. • Identify, represent and estimate numbers using different representations. • Round any number to the nearest 10, 100 or 1000. • Solve number and practical problems that involve all of the above and with increasingly large positive numbers. • Read Roman numerals to 100 (I to C) and know that over time, the numeral system changed to include the concept of zero and place value.	1 Move the Base 10 around and make exchanges to represent the number in different ways.  2000 + 400 + ☐ + 4 1000 + ☐ + ☐ + 14 1000 + 1300 + ☐ + ☐ 2 Represent the number in two different ways in a part whole model.  3 Lily describes a number. She says, **"My number has 4 thousands and 301 ones"** What is Lily's number? Can you describe it in a different way?
Addition and Subtraction • Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate. • Estimate and use inverse operations to check answers to a calculation. • Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why.	1 Add the place value counters together.  Can you write this as a calculation? (3,242 + 2,213) Now complete the question 3,242 + 213 in the same way. What is the same and what's different? Look at how the place value columns are lined up in the new question. How is our answer different? Why? 2 Complete the missing numbers. 4☐6☐ +2 5☐1 ☐7 8 9

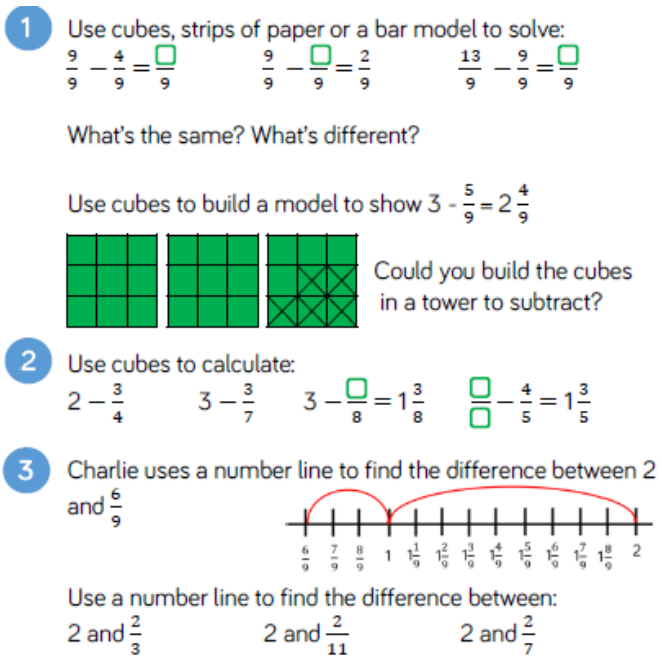
Multiplication and Division

- Recall multiplication and division facts for multiplication tables up to 12 × 12.
- Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers.
- Recognise and use factor pairs and commutativity in mental calculations.
- Multiply two-digit and three-digit numbers by a one digit number using formal written layout.
- Solve problems involving multiplying and adding, including using the distributive law to multiply two-digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.



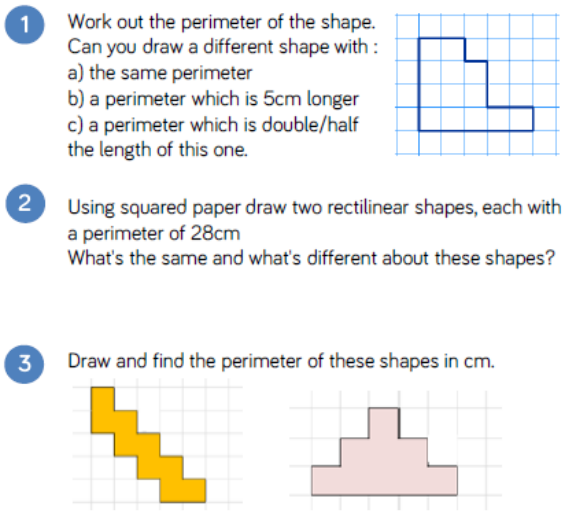
Fractions and Decimals

- Recognise and show, using diagrams, families of common equivalent fractions count up and down in hundredths; recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten.
- Solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number.
- Add and subtract fractions with the same denominator.
- Recognise and write decimal equivalents of any number of tenths or hundredths.
- Recognise and write decimal equivalents to 1/4 , 1/2 , ¾.
- Find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths.
- Round decimals with one decimal place to the nearest whole number.
- Compare numbers with the same number of decimal places up to two decimal places.
- Solve simple measure and money problems involving fractions and decimals to two decimal places.



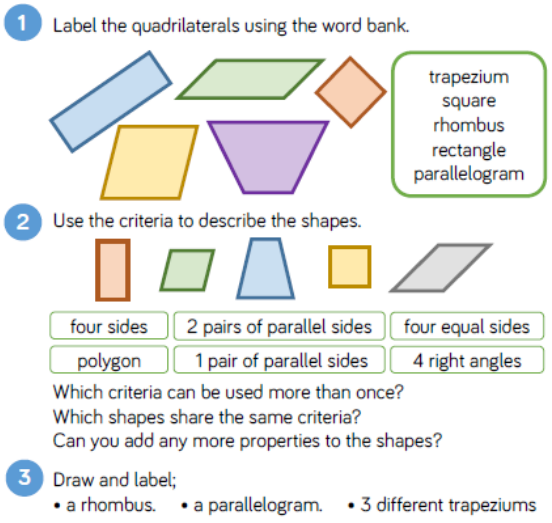
Measures

- Convert between different units of measure [for example, kilometre to metre; hour to minute].
- Measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres.
- Find the area of rectilinear shapes by counting squares.
- Estimate, compare and calculate different measures, including money in pounds and pence.
- Read, write and convert time between analogue and digital 12- and 24-hour clocks.
- Solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days.



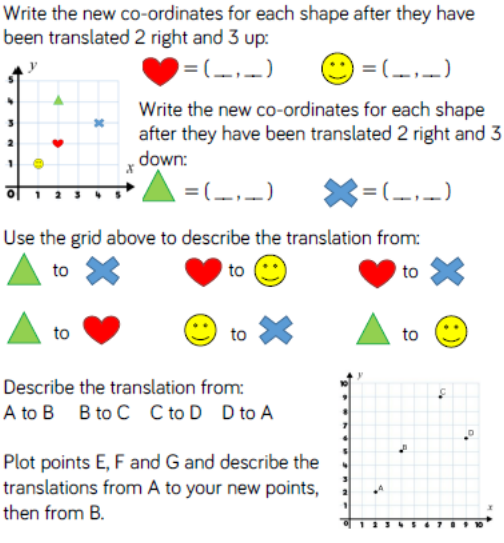
Geometry – Properties of Shape

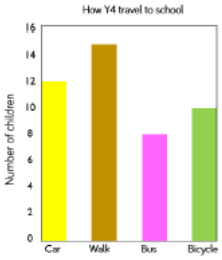
- Compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes.
- Identify acute and obtuse angles and compare and order angles up to two right angles by size.
- Identify lines of symmetry in 2-D shapes presented in different orientations.
- Complete a simple symmetric figure with respect to a specific line of symmetry.



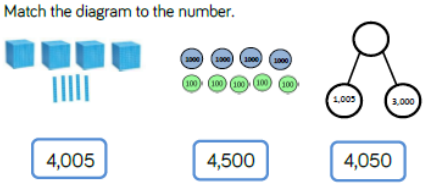
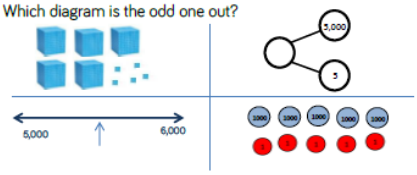
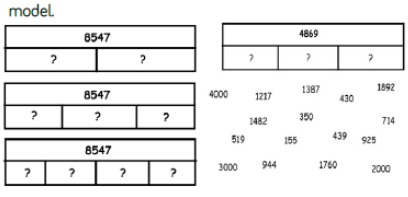
Geometry – Position and Movement

- Describe positions on a 2-D grid as coordinates in the first quadrant.
- Describe movements between positions as translations of a given unit to the left/right and up/down.
- Plot specified points and draw sides to complete a given polygon.



Statistics • Interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs. • Solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs.	Complete the table using the information in the bar chart.  Transport / Number of children: Car; Walk; Bus; Bicycle What is the most/least popular way to get to school? How many children walk to school? Produce your own table/bar chart/pictogram showing how the children in your class travel to school. Represent the data in each table as a bar chart. ■ = 20 house points Team / Number of house points: Sycamore; Oak; Beech; Ash Day / Number of tickets sold: Monday 55; Tuesday 30; Wednesday 45; Thursday 75; Friday 85

Year 5

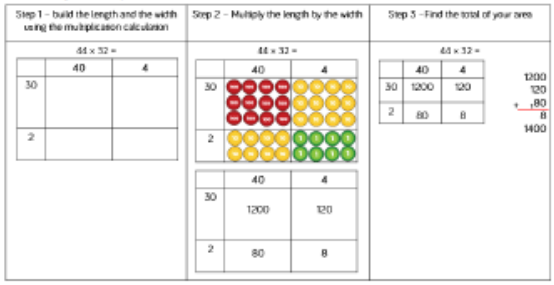
Strand	Example questions
Number and Place Value • Read, write, order and compare numbers to at least 1 000 000 and determine the value of each digit count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000. • Interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers, including through zero. • Round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000. • Solve number problems and practical problems that involve all of the above. • Read Roman numerals to 1000 (M) and recognise years written in Roman numerals.	1 Match the diagram to the number.  4,005 4,500 4,050 2 Which diagram is the odd one out?  3 Complete the table. Add 10 / Add 100 / Add 1,000 2,506 7,999 6,070
Addition and Subtraction • Add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction). • Add and subtract numbers mentally with increasingly large numbers. • Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy. • Solve addition and subtraction multistep problems in contexts, deciding which operations and methods to use and why.	When Claire opened her book, she saw two numbered pages. The sum of these two pages was 317. What would the next page number be? Adam is twice as old as Barry. Charlie is 3 years younger than Barry. The sum of all their ages is 53. How old is Barry? Solve the following. Find two examples for each bar model. 

Multiplication and Division

- Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers.
- Know and use the vocabulary of prime numbers, prime factors and composite (nonprime) numbers.
- Establish whether a number up to 100 is prime & recall prime numbers up to 19.
- Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers.
- Multiply and divide numbers mentally drawing upon known facts.
- Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context
- Multiply and divide whole numbers and those involving decimals by 10, 100 &1000.
- Recognise and use square numbers and cube numbers, and the notation for squared (2) and cubed (3).
- Solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes.
- Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign.
- Solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates.

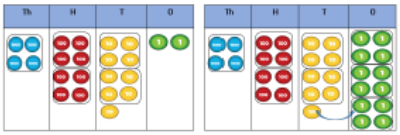
Use Base 10 to solve 32 × 24, 25 × 31, 34 × 23

Sammy adapts the Base 10 method to solve 44 × 32



Use place value counters and a grid to solve
45 × 42, 52 × 24, 34 × 43

Here is a method to solve 4,892 divided by 4 using place value counters and short division.



Use this method to solve the following questions.

6,610 ÷ 5 2,472 ÷ 3 9,360 ÷ 4

Mr Porter has saved £8,934 pounds.
He shares it between his three grandchildren.
How much does each grandchild receive?

Use < > or = to compare the statements

3,495 ÷ 5 ◯ 3,495 ÷ 3

8,064 ÷ 7 ◯ 9,198 ÷ 9

7,428 ÷ 4 ◯ 5,685 ÷ 5

Fractions, Decimals and Percentages

- Compare and order fractions whose denominators are all multiples of the same number.
- Identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths.
- Recognise mixed numbers and improper fractions and convert from one form to the other & write mathematical statements > 1 as a mixed number[2/5 + 4/5 = 6/5 = 1 1/5].
- Add and subtract fractions with the same denominator and denominators that are multiples of the same number.
- Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams.
- Read and write decimal numbers as fractions [for example, 0.71 = 71/100].
- Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents.
- Round decimals with two decimal places to the nearest whole number and to one decimal place.
- Read, write, order & compare numbers with up to three decimal places.
- Solve problems involving number up to three decimal places.
- Recognise the percent symbol (%) and understand that percent relates to 'number of parts per hundred', write percentages as a fraction with denominator 100, & as a decimal.
- Solve problems which require knowing percent & decimal equivalents of 1/2, 1/4 , 1/5 , 2/5 , 4/5 and those fractions with a denominator of a multiple of 10 or 25.

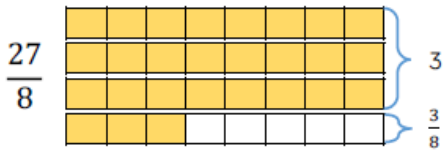
Claire converts the improper fraction $\frac{14}{5}$ into a mixed number using cubes. She groups the cubes into 5s, then has 4 left over.

$\frac{5}{5}$ is the same as ☐ $\frac{10}{5}$ is the same as ☐

$\frac{14}{5}$ as a mixed number is ☐ ☐/☐

Use Claire's method to convert $\frac{19}{3}, \frac{19}{4}, \frac{19}{5}$ and $\frac{19}{6}$

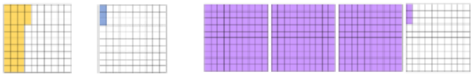
Steve converts the improper fraction $\frac{27}{8}$ into a mixed number using bar models.



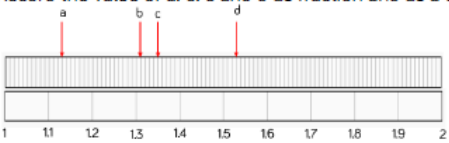
Use Steve's method to convert $\frac{38}{8}, \frac{27}{6}, \frac{47}{7}$ and $\frac{32}{4}$

Use the models to record equivalent decimals and fractions.

$0.3 = \frac{3}{10} = \frac{30}{100}$



Record the value of a. b. c and d as fraction and as a decimal.



Complete the table.

Pictorial Representation	Decimal	Decimal – expanded form	Fraction	Fraction – expanded form	In words
	3.24	3 + 0.2 + 0.04	$3\frac{24}{100}$	$3 + \frac{2}{10} + \frac{4}{100}$	Three ones, two tenths and four hundredths
	3.01		$3\frac{1}{100}$		
				$3 + \frac{6}{10} + \frac{2}{100}$	
					Two ones, three tenths and two hundredths.

Measures

- Convert between different units of metric measure (for example, kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre & millilitre).
- Understand and use approximate equivalences between metric units and common imperial units such as inches, pounds and pints.
- Measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres.
- Calculate and compare the area of rectangles (including squares), and including using standard units, square centimetres (cm2) and square metres (m2) and estimate the area of irregular shapes.
- Estimate volume [for example, using 1 cm3 blocks to build cuboids (including cubes)] and capacity [for example, using water].
- Solve problems involving converting between units of time.
- Use all four operations to solve problems involving measure [for example, length, mass, volume, money] using decimal notation, including scaling.

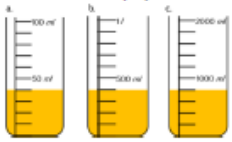
Take 4 cm cubes. How many different solids can you make? What's the same? What's different?

Make these shapes.

Complete the table to describe your shapes.

Shape	Width	Height	Length	Volume (cm^3)
A				
B				
C				

Compare the capacity and the volume. Use the sentence stems to help you.



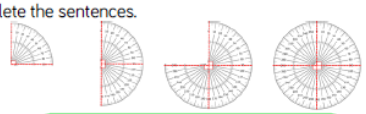
Container ___ has a capacity of ____ ml

The volume of juice in container ___ is ___ cm^3

Geometry – Properties of Shape

- Identify 3-D shapes, including cubes and other cuboids, from 2-D representations.
- Know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles.
- Draw given angles, and measure them in degrees (˚).
- Identify: angles at a point and one whole turn (total 360˚) angles at a point on a straight line & 1/2 a turn (total 180˚) and other multiples of 90˚.
- Use the properties of rectangles to deduce related facts and find missing lengths and angles distinguish between regular and irregular polygons based on reasoning about equal sides and angles.

Complete the sentences.



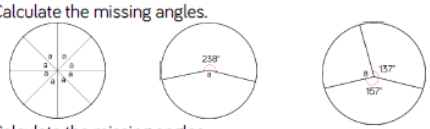
$\frac{1}{4}$ of a turn = 1 right angle = 90°

$\frac{1}{2}$ of a turn = __ right angles = _____°

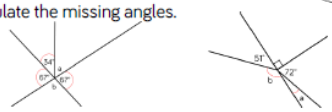
— of a turn = 3 right angles = _____°

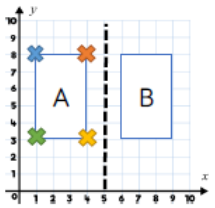
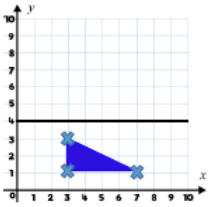
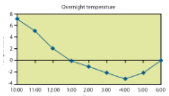
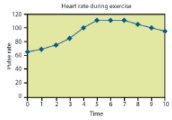
A full turn = __ right angles = _____

Calculate the missing angles.

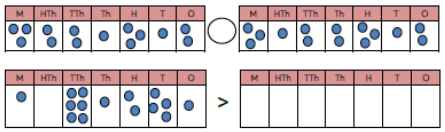
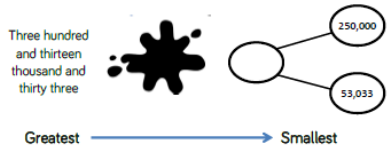


Calculate the missing angles.



Geometry – Position and Movement • Identify, describe and represent the position of a shape following a reflection or translation, using the appropriate language, and know that the shape has not changed.	Shape A is reflected in the mirror line to position B. Write the coordinates of the vertices for each shape.  Original Coordinate / Reflected Coordinate Write the coordinates of the shape after it has been reflected in the mirror line. (,) (,) (,) 
Statistics • Solve comparison, sum and difference problems using information presented in a line graph. • Complete, read and interpret information in tables, including timetables.	Use the line graph to answer the following questions.  What was the highest/lowest temperature? What time did they occur? What is the difference between the highest and lowest temperature? How long did the temperature stay at freezing point or less?  How long did it take for the pulse rate to reach the highest level? Explain using the graph to help. When do you think the person stopped exercising? Convince me. Estimate what the pulse rate was after 2 and a half minutes. How did you get an accurate estimate?

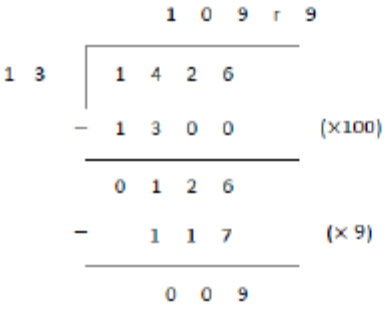
Year 6

Strand	Example questions
Number and Place Value • Read, write, order and compare numbers up to 10 000 000 and determine the value of each digit. • Round any whole number to a required degree of accuracy. • Use negative numbers in context, and calculate intervals across zero. • Solve number and practical problems that involve all of the above.	Complete the statements to make them true.  What number could the splat be covering?  A house costs £250,000. A motorised home costs £100,000. A bungalow is priced half way between the two. Work out the price of the bungalow.

Addition, Subtraction, Multiplication and Division

- Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication.
- Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context.
- Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context.
- Perform mental calculations, including with mixed operations and large numbers.
- Identify common factors, common multiples and prime numbers.
- Use their knowledge of the order of operations to carry out calculations involving the four operations.
- Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.

Simon used this method to calculate 1426 divided by 13. He wrote down his multiples key facts to help him work out the answer.



Using Simon's metho
answer the following:

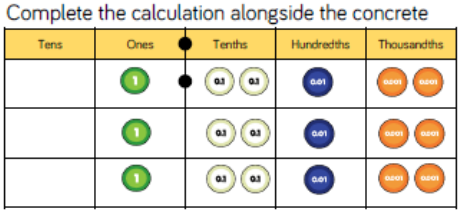
2,637 ÷ 16 =
4,231 ÷ 22 =
4,203 ÷ 18 =

There are 7,849 people going to a concert. Each coach holds 64 people. How many coaches are needed to transport all the people?

Fractions, Decimals and Percentages

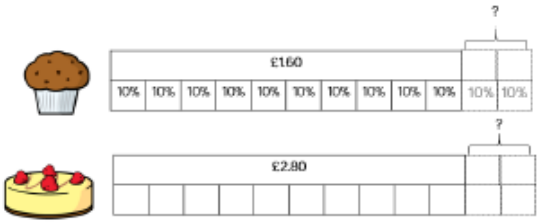
- Use common factors to simplify fractions; use common multiples to express fractions in the same denomination.
- Compare and order fractions, including fractions > 1.
- Add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions.
- Multiply simple pairs of proper fractions, writing the answer in its simplest form. [For example, 1/2 × 1/2 = 1/8].
- Divide proper fractions by whole numbers. 1/3 ÷ 2= 1/6
- Associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [e.g. 3/8].
- Identify the value of each digit in numbers given to three decimal places and multiply and divide numbers by 10, 100 and 1000 giving answers up to three decimal places.
- Multiply one-digit numbers with up to two decimal places by whole numbers.
- Use written division methods in cases where the answer has up to two decimal places.
- Solve problems which require answers to be rounded to specified degrees of accuracy.
- Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts.

Use the place value counters to multiply 1.212 by 3
Complete the calculation alongside the concrete



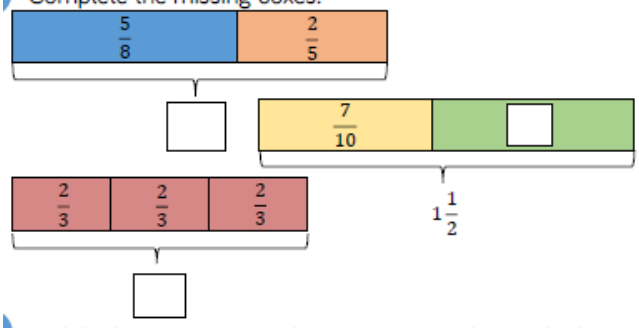
A jar of sweets weighs 1.23 kg.
How much would 4 jars weigh?

Janet is increasing the prices in her café by 20%
Calculate the percentage increase for the following items:



Use the same models to calculate the new cost for each item.

Complete the missing boxes.

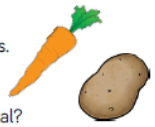


Jack had one quarter of a bag of sweets and Harry had two thirds of the sweets. They shared their sweets with Sophie. What fraction of the sweets do they all receive?

Ratio and Proportion

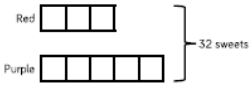
- Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts.
- Solve problems involving the calculation of percentages [for example, of measures, and such as 15% of 360] and the use of percentages for comparison.
- Solve problems involving similar shapes where the scale factor is known or can be found.
- Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples.

A farmer plants some crops in a field.
For every 12 carrots he plants 5 potatoes.
He plants 60 carrots in total.
How many potatoes did he plant?
How many vegetables did he plant in total?



Beth mixes 2 parts of red paint with 3 parts blue paint to make purple paint.
If she uses 12 parts blue paint, how much red paint did she use?

Emily has a packet of sweets.
For every 3 red sweets there are 5 purple sweets.
If there are 32 sweets in the packet in total, how many of each colour are there? You can use a bar model to help you.



Algebra

- Use simple formulae.
- Generate and describe linear number sequences.
- Express missing number problems algebraically.
- Find pairs of numbers that satisfy an equation with two unknowns.
- Enumerate possibilities of combinations of two variables.

If ★ = 7 ♥ = 5 what is the value of:

★ + ♥ + ♥

What is the same and what is different about this question?
If $a = 7$ and $b = 5$ what is the value of:

$$a + b + b$$

Substitute into the following expressions when,

$w = 3 \quad x = 5 \quad y = 2.5$

- $w + 10$
- $w + x$
- $y - w$
- $w + x + y$
- $w - x - y$
- $y + y + y$

Substitute into the following expressions when,

$w = 10 \quad x = \frac{1}{4} \quad y = 2.5$

- $3y$
- wx
- $12 + 8.8w$
- $x \times (w + 2y)$

Measures

- Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate.
- Use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to three decimal places.
- Convert between miles and kilometres.
- Recognise that shapes with the same areas can have different perimeters and vice versa.
- Recognise when it is possible to use formulae for area and volume of shapes.
- Calculate the area of parallelograms and triangles.
- Calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm3) and cubic metres (m3), and extending to other units [for example, mm3 and km3].

Choose the unit of measure that would be the most appropriate to measure the items.

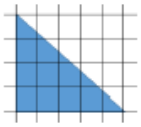
cm kg km g tonnes ml mm litres

- The weight of an elephant
- The volume of water in a bath
- The length of an ant
- The length of a football pitch
- The weight of an apple

Estimate how much juice the glass holds:

250 ml 2 litres 0.5 litres $\frac{1}{2}$ kg

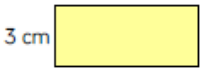
Calculate the area of the triangle by counting the squares. Make the triangle into a rectangle with the same height and width, and calculate the area of the rectangle.
Complete: The area of the triangle is _____ the area of the rectangle.

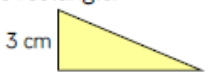


If l represents length and h represents height:

$$\text{Area of a rectangle} = l \times h$$

Use this to calculate the area of the rectangle.



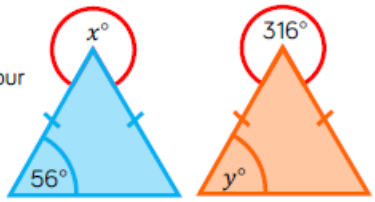


What do you need to do to your answer to work out the area of the triangle?
Therefore, what is the formula for the area of a triangle?

Geometry – Properties of Shape

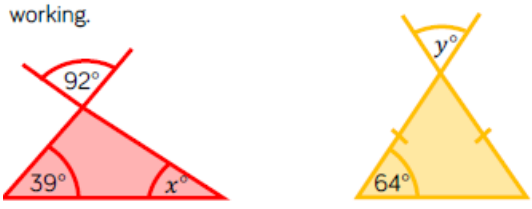
- Draw 2-D shapes using given dimensions and angles.
- Recognise, describe and build simple 3-D shapes, including making nets.
- Compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons.
- Illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles.

Calculate the missing angles.
Explain each step of your working.



Calculate the missing angles. Explain each step of your working.

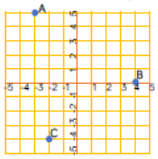
Calculate the missing angles. Explain each step of your working.



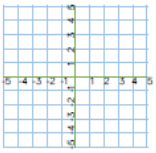
Geometry – Position and Movement

- Describe positions on the full coordinate grid (all four quadrants).
- Draw and translate simple shapes on the coordinate plane, and reflect them in the axes.

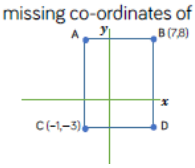
Emily plotted three co-ordinates.
Work out the co-ordinates of A, B and C.



Draw the shape with the following co-ordinates (-2, 2) , (-4, 2) , (-2, -3) and (-4, -2).
What kind of shape have you drawn?



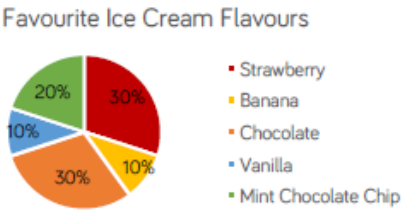
Work out the missing co-ordinates of the rectangle.



Statistics

- Interpret and construct pie charts and line graphs and use these to solve problems.
- Calculate and interpret the mean as an average.

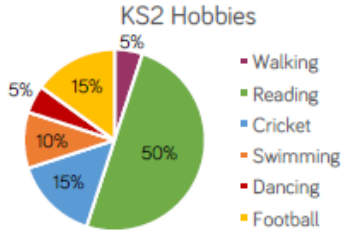
150 children voted for their favourite ice cream flavours.
Here are their results:



How many people voted for Vanilla?
How many more people voted for Chocolate than Mint Chocolate chip?
How many people chose Chocolate, Banana and Vanilla altogether?

There are 200 pupils in Key Stage 2 who chose their favourite hobbies.

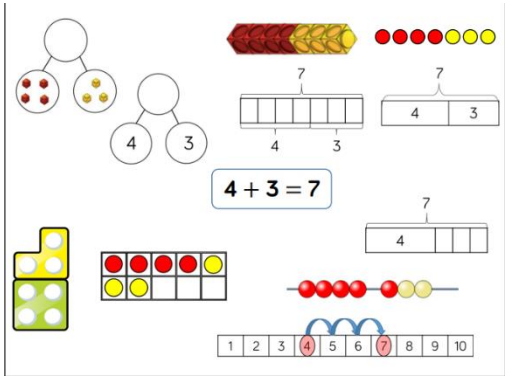
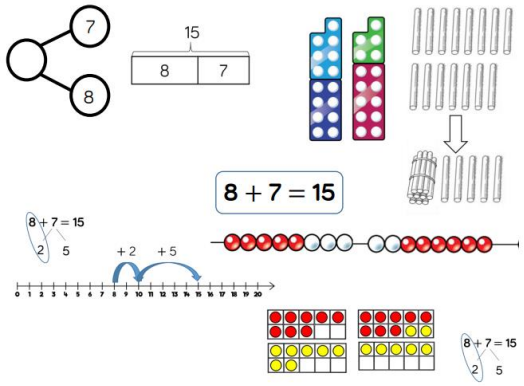
How many pupils chose each hobby?

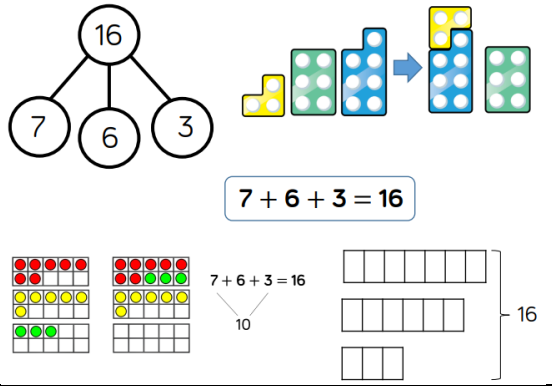
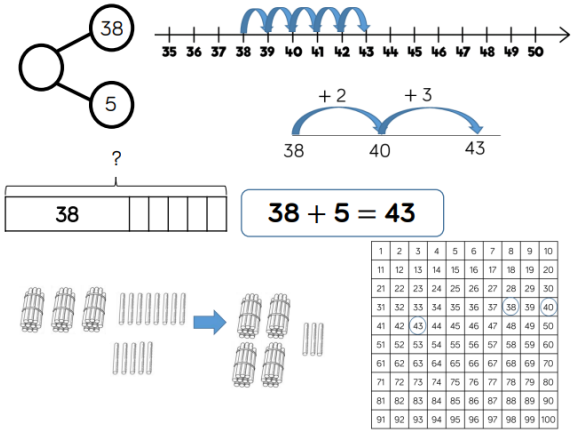


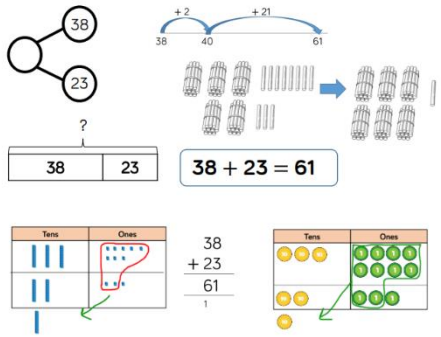
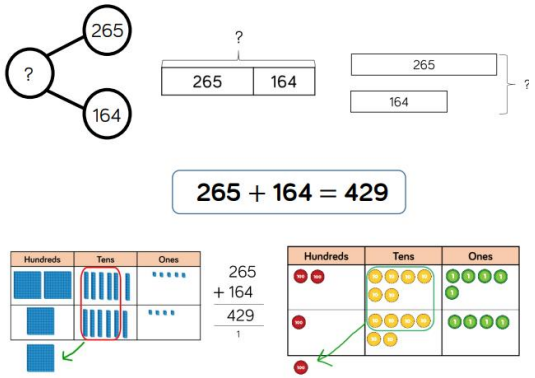
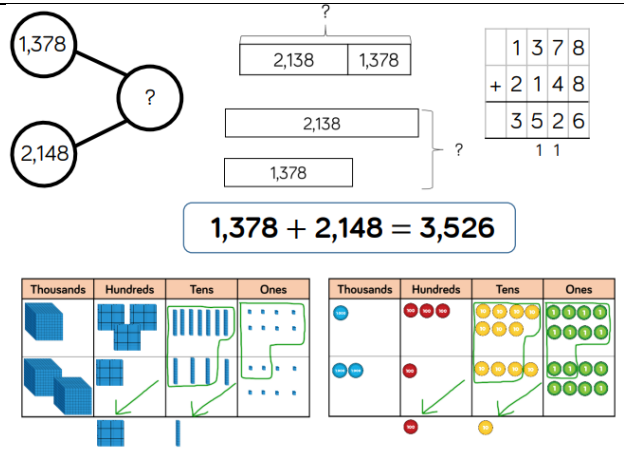
Learning Intentions and Success Criteria	Retrieval/Maths Fluency activity/ In Focus	Teaching Input (Key questions, Possible Misconceptions, CPA,)	Activities (adaptive teaching, Scaffolding and challenge)	Pre-Key Stage Children (Learning Intention/ Activity)
Day 1 L.I: S.C:				
Day 2 L.I: S.C:				
Day 3 L.I: S.C:				
Day 4 L.I: S.C:				
Day 5 L.I: S.C:				

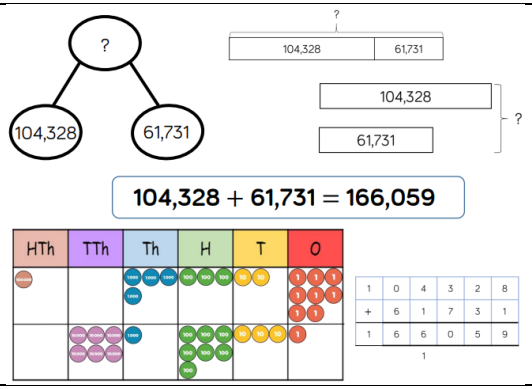
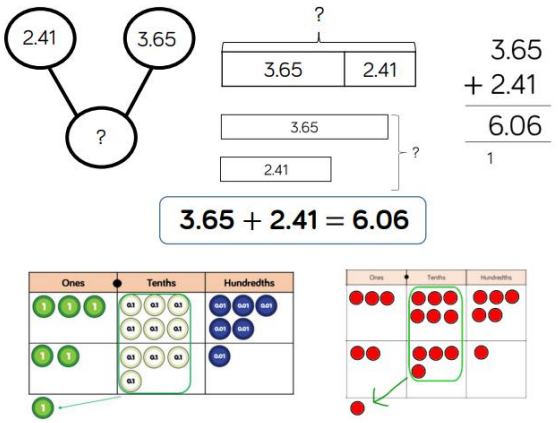
Calculation Progression Yr 1 – 6 (Taken from White Rose)

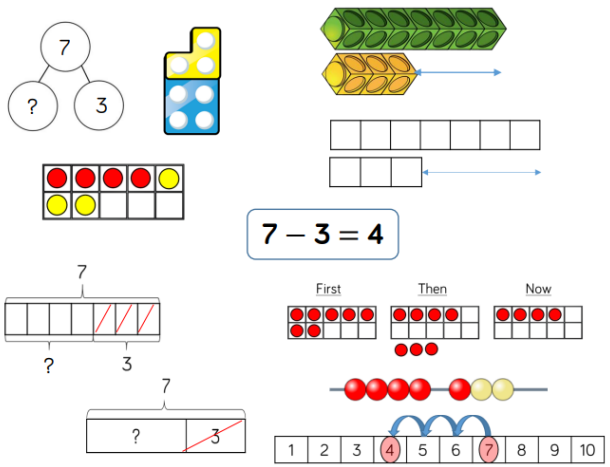
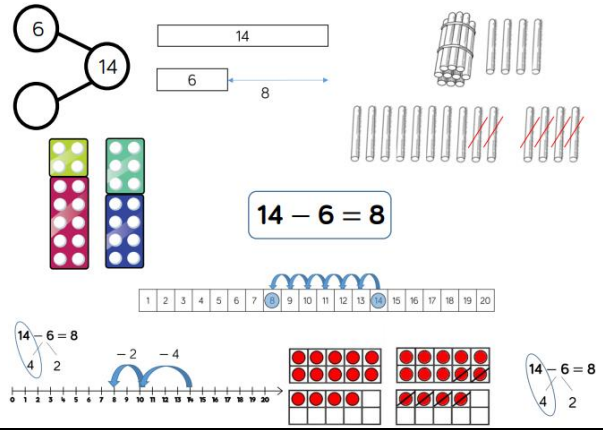
Addition and Subtraction

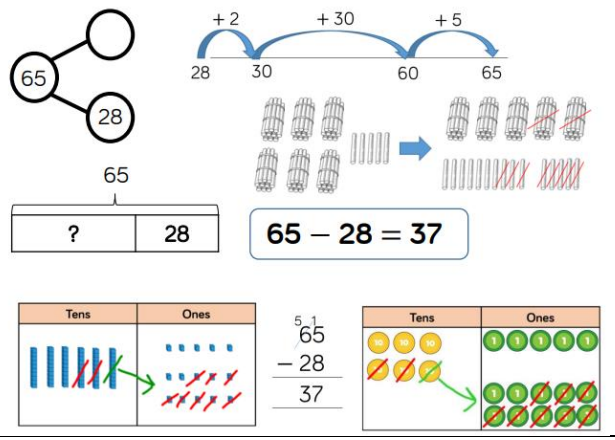
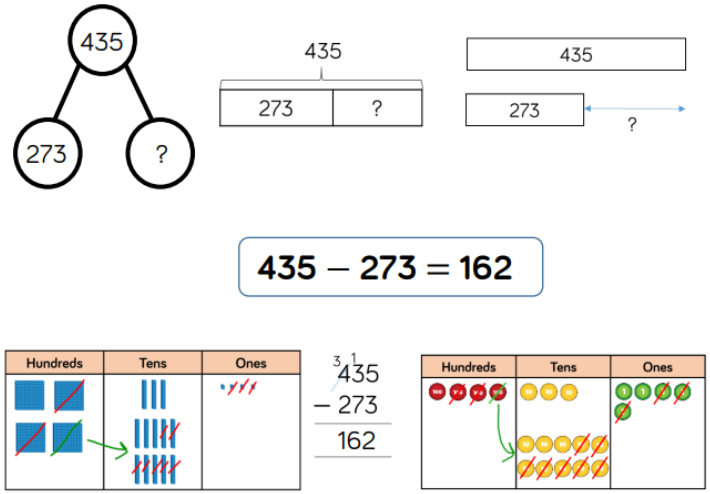
Year Group	Skill	Representations and models	
1	Add 1-digit numbers within 10		When adding numbers to 10, children can explore both aggregation and augmentation. The part-whole model, discrete and continuous bar model, number shapes and ten frame support aggregation. The combination bar model, ten frame, bead string and number track all support augmentation.
1/2	Add 1 and 2 -digit numbers to 20		When adding one – digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten. In Year 1, this is only done just by counting on. From Year 2, use different manipulatives can be used to represent this exchange alongside number lines to support children in understanding how to partition their jumps.

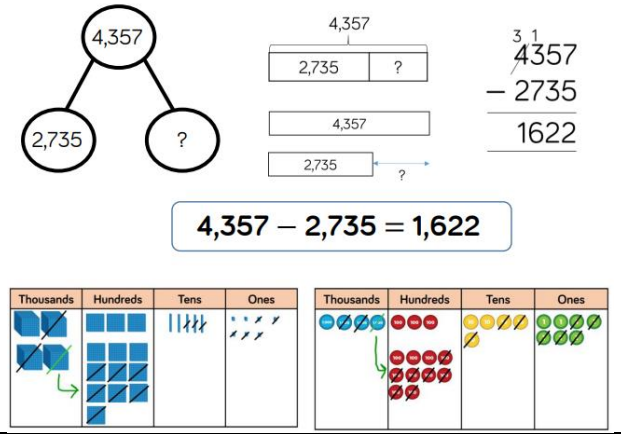
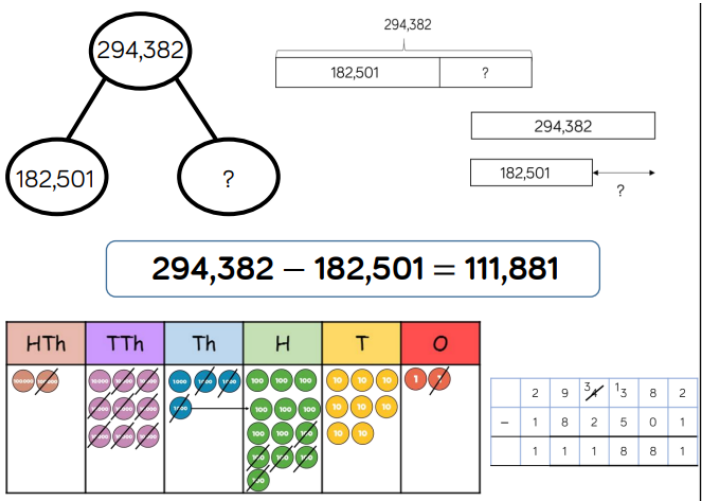
2	Add three 1 -digit numbers		When adding three 1 – digit numbers, children should be encouraged to look for number bonds to 10 or doubles to add the numbers more efficiently. This supports children in their understanding of commutativity. Manipulatives that highlight number bonds to 10 are effective when adding three 1 -digit numbers.
2/3	Add 1-digit and 2-digit numbers to 100		When adding single digits to a two-digit number, children should be encouraged to count on from the larger number. They should also apply their knowledge of number bonds to add more efficiently e.g. 8 + 5 = 13 so 38 + 5 = 43. Hundred squares and straws can support children to find the number bond to 10.

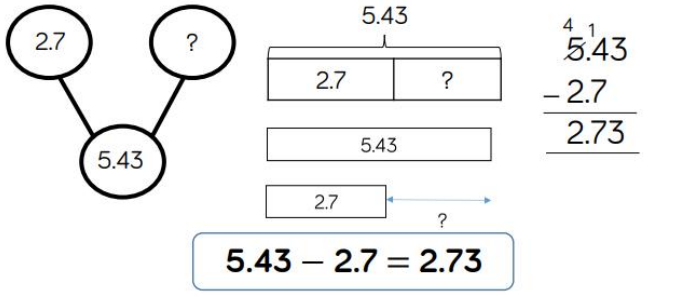
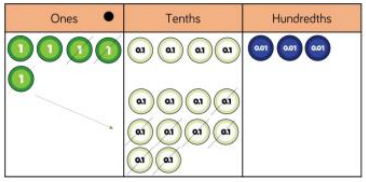
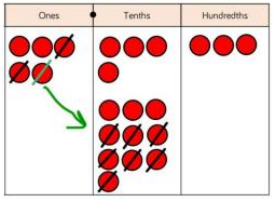
2/3	Add two 2-digit numbers to 100		Children can use a blank number line and other representations to count on to find the total. Encourage them to jump to multiples of 10 to become more efficient. From Year 3, encourage children to use the formal column method when calculating alongside straws, base 10 or place value counters. As numbers become larger, straws become less efficient.
3	Add numbers with up to 3 digits		Base 10 and place value counters are the most effective manipulatives when adding numbers with up to 3 digits. Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method. Plain counters on a place value grid can also be used to support learning
4	Add numbers with up to 4 digits		Base 10 and place value counters are the most effective manipulatives when adding numbers with up to 4 digits. Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method. Plain counters on a place value grid can also be used to support learning.

5/6	Add numbers with more than 4 digits		Place value counters or plain counters on a place value grid are the most effective concrete resources when adding numbers with more than 4 digits. At this stage, children should be encouraged to work in the abstract, using the column method to add larger numbers efficiently.
5	Add with up to 3 decimal places		Place value counters and plain counters on a place value grid are the most effective manipulatives when adding decimals with 1, 2 and then 3 decimal places. Ensure children have experience of adding decimals with a variety of decimal places. This includes putting this into context when adding money and other measures.

1	Subtract 1-digit numbers within 10		Part-whole models, bar models, ten frames and number shapes support partitioning. Ten frames, number tracks, single bar models and bead strings support reduction. Cubes and bar models with two bars can support finding the difference.
1/2	Subtract 1 and 2-digit numbers to 20		In Year 1, subtracting one-digit numbers that cross 10, is done by counting back, using objects, number tracks and number lines. From Year 2, children should be encouraged to find the number bond to 10 when partitioning the subtracted number. Ten frames, number shapes and number lines are particularly useful for this.

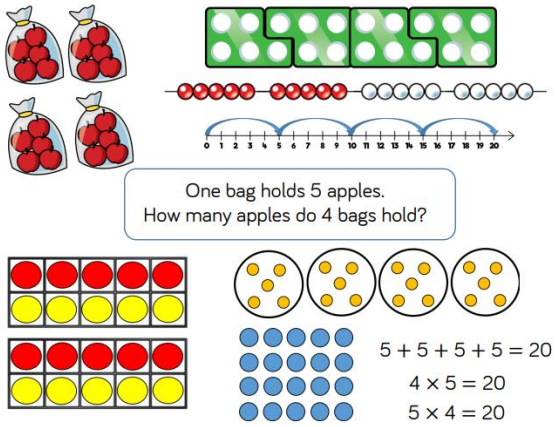
2/3	Subtract 1 and 2-digit numbers to 100		Children can also use a blank number line to count back to find the difference. Encourage them to jump to multiples of 10 to become more efficient. From Year 3, encourage children to use the formal column method when calculating alongside straws, base 10 or place value counters. As numbers become larger, straws become less efficient.
3	Subtract numbers with up to 3 digits		Base 10 and place value counters are the most effective manipulative when subtracting numbers with up to 3 digits. Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method. Plain counters on a place value grid can also be used to support learning.

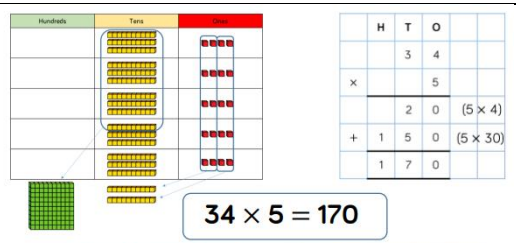
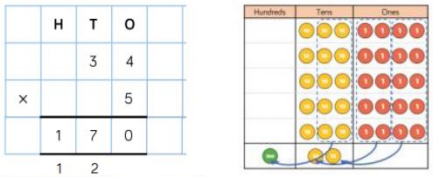
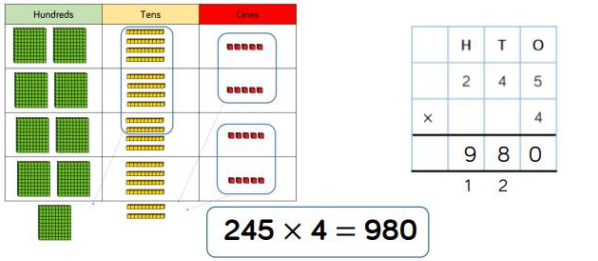
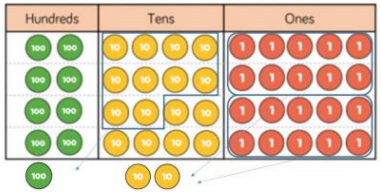
4	Subtract numbers with up to 4 digits		Base 10 and place value counters are the most effective manipulatives when subtracting numbers with up to 4 digits. Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method. Plain counters on a place value grid can also be used to support learning.
5/6	Subtract numbers with more than 4 digits		Place value counters or plain counters on a place value grid are the most effective concrete resource when subtracting numbers with more than 4 digits. At this stage, children should be encouraged to work in the abstract, using column method to subtract larger numbers efficiently.

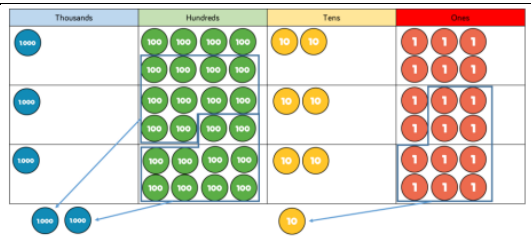
5/6	Subtract with up to 3 decimal places	  	Place value counters and plain counters on a place value grid are the most effective manipulative when subtracting decimals with 1, 2 and then 3 decimal places. Ensure children have experience of subtracting decimals with a variety of decimal places. This includes putting this into context when subtracting money and other measures.

Calculation Progression Yr 1 – 6 (Taken from White Rose)

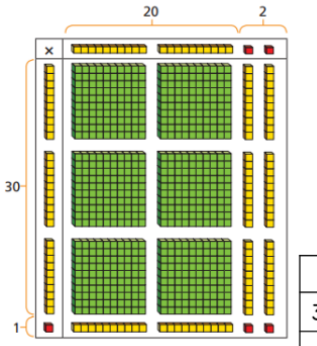
Multiplication and Division

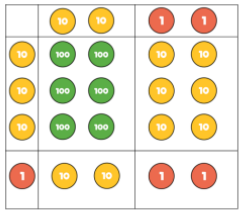
Year Group	Skill	Representations and models	
1/2	Solve 1-step problems using multiplication		Children represent multiplication as repeated addition in many different ways. In Year 1, children use concrete and pictorial representations to solve problems. They are not expected to record multiplication formally. In Year 2, children are introduced to the multiplication symbol.

3/4	Multiply 2-digit numbers by 1-digit numbers	 	Informal methods and the expanded method are used in Year 3 before moving on to the short multiplication method in Year 4. Place value counters should be used to support the understanding of the method rather than supporting the multiplication, as children should use times table knowledge.
4	Multiply 3-digit numbers by 1-digit numbers	 	When moving to 3- digit by 1-digit multiplication, encourage children to move towards the short, formal written method. Base 10 and place value counters continue to support the understanding of the written method. Limit the number of exchanges needed in the questions and move children away from resources when multiplying larger numbers.

<table>
<tr>
<td>5</td>
<td>Multiply 4-digit numbers by 1-digit numbers</td>
<td>


1,826 × 3 = 5,478
<table>
<tr><td></td><td>Th</td><td>H</td><td>T</td><td>O</td></tr>
<tr><td></td><td>1</td><td>8</td><td>2</td><td>6</td></tr>
<tr><td>×</td><td></td><td></td><td></td><td>3</td></tr>
<tr><td></td><td>5</td><td>4</td><td>7</td><td>8</td></tr>
<tr><td></td><td></td><td>2</td><td>1</td><td></td></tr>
</table>
</td>
<td>When multiplying 4- digit numbers, place value counters are the best manipulative to use to support children in their understanding of the formal written method.

If children are multiplying larger numbers and struggling with their times tables, encourage the use of multiplication grids so children can focus on the use of the written method.</td>
</tr>
<tr>
<td>5</td>
<td>Multiply 2-digit numbers by 2-digit numbers</td>
<td>



<table>
<tr><td>×</td><td>20</td><td>2</td></tr>
<tr><td>30</td><td>600</td><td>60</td></tr>
<tr><td>1</td><td>20</td><td>2</td></tr>
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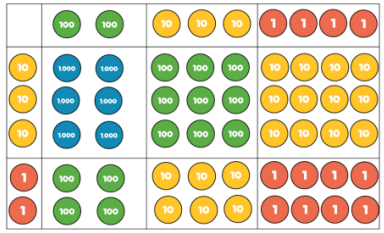
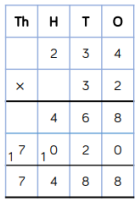
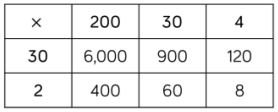
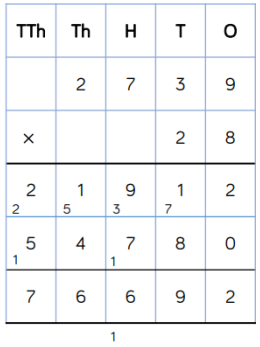
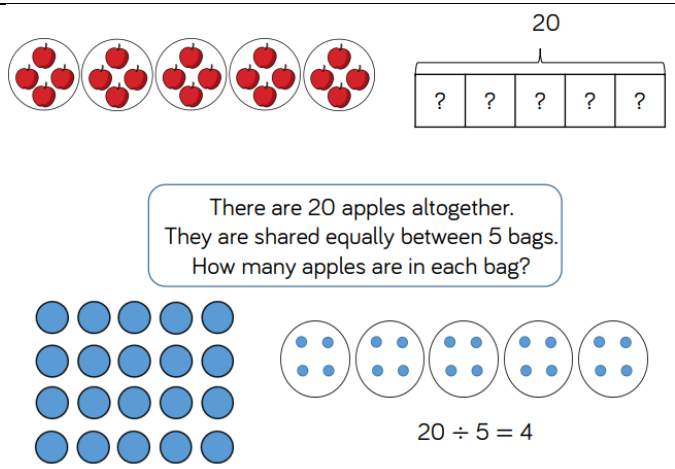
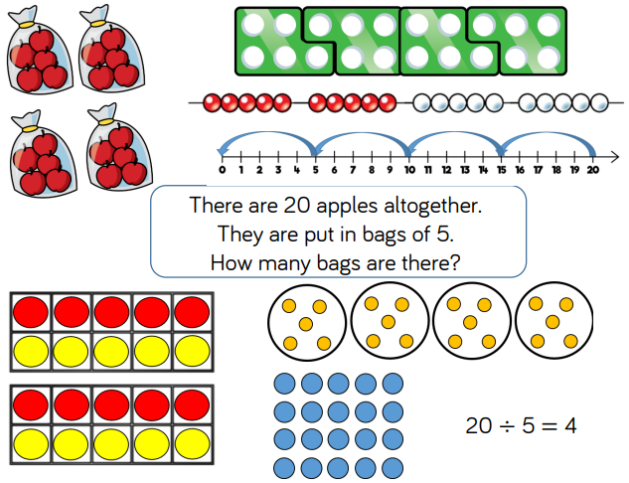
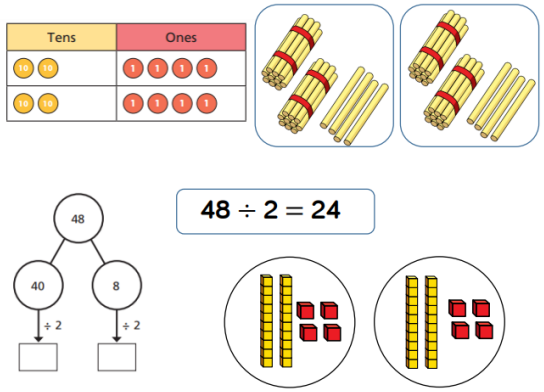
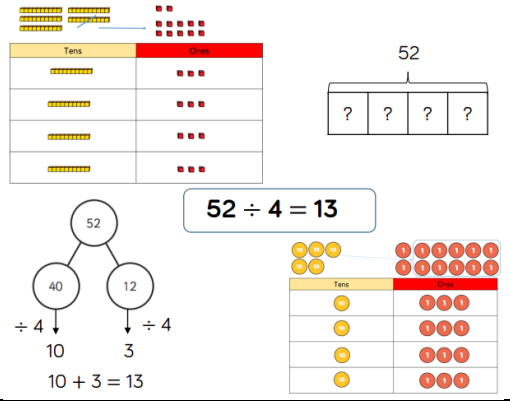
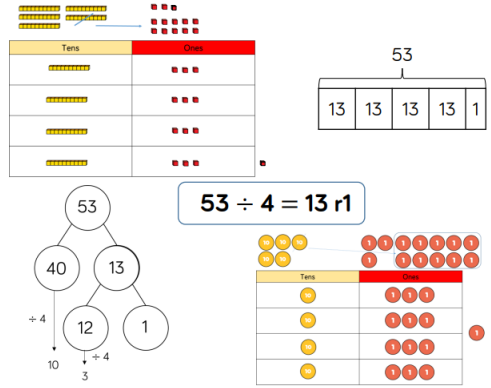
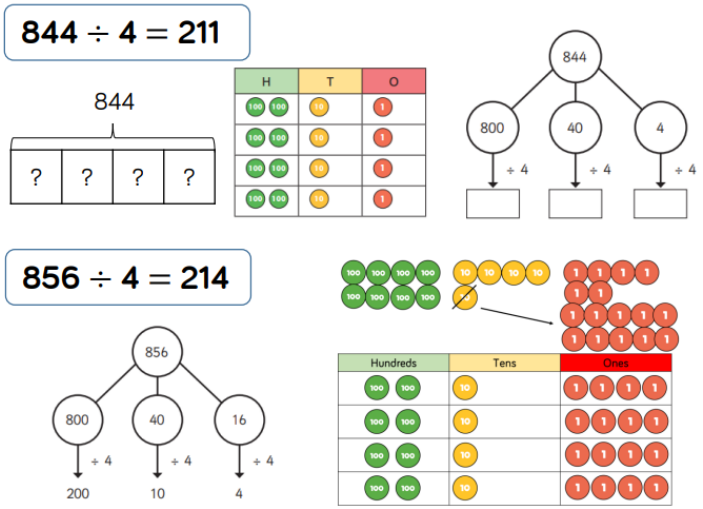
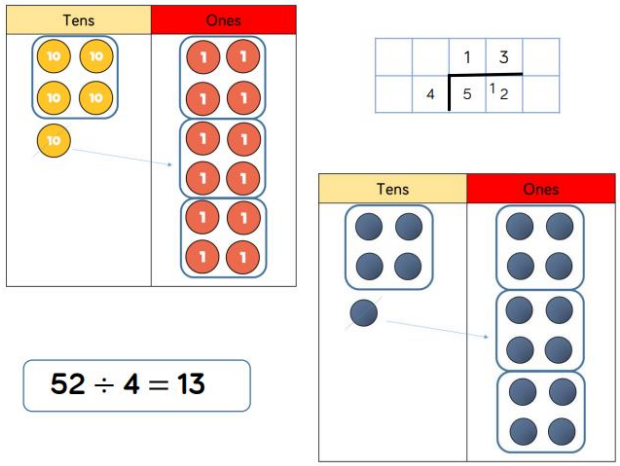
<table>
<tr><td></td><td>H</td><td>T</td><td>O</td></tr>
<tr><td></td><td></td><td>2</td><td>2</td></tr>
<tr><td>×</td><td></td><td>3</td><td>1</td></tr>
<tr><td></td><td></td><td>2</td><td>2</td></tr>
<tr><td></td><td>6</td><td>6</td><td>0</td></tr>
<tr><td></td><td>6</td><td>8</td><td>2</td></tr>
</table>
22 × 31 = 682
</td>
<td>When multiplying a multi-digit number by 2-digits, use the area model to help children understand the size of the numbers they are using. This links to finding the area of a rectangle by finding the space covered by the Base 10.

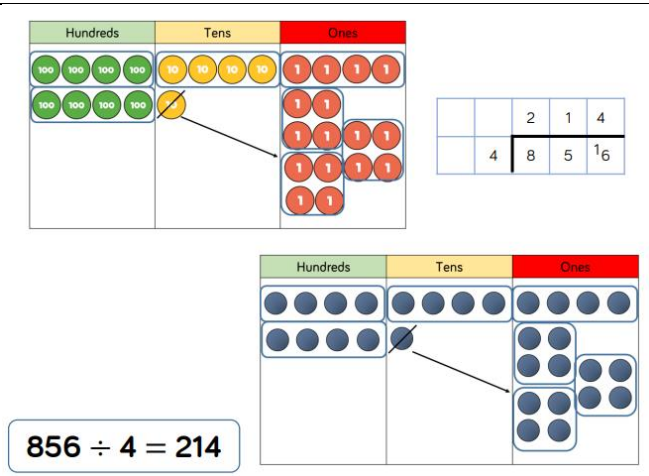
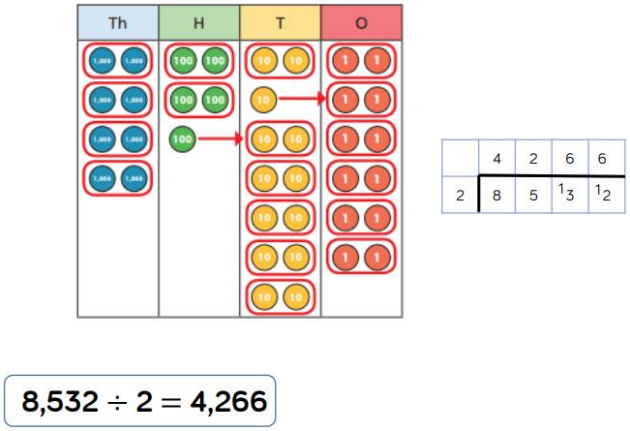
The grid method matches the area model as an initial written method before moving on to the formal written multiplication method.</td>
</tr>
</table>

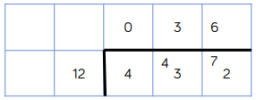
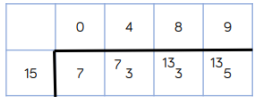
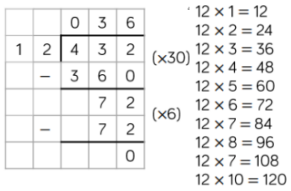
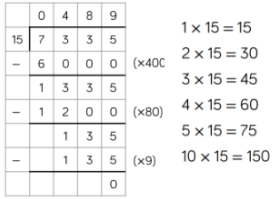
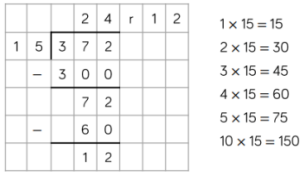
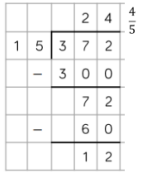
5	Multiply 3-digit numbers by 2-digit numbers	   **234 × 32 = 7,488**	Children can continue to use the area model when multiplying 3- digits by 2-digits. Place value counters become more efficient to use but Base 10 can be used to highlight the size of numbers. Children should now move towards the formal written method, seeing the links with the grid method.
5/6	Multiply 4-digit numbers by 2-digit numbers	 **2,739 × 28 = 76,692**	When multiplying 4- digits by 2-digits, children should be confident in using the formal written method. If they are still struggling with times tables, provide multiplication grids to support when they are focusing on the use of the method. Consider where exchanged digits are placed and make sure this is consistent.

1/2	Solve 1-step problems using multiplication (sharing)		Children solve problems by sharing amounts into equal groups. In Year 1, children use concrete and pictorial representations to solve problems. They are not expected to record division formally. In Year 2, children are introduced to the division symbol.
1/2	Solve 1-step problems using division (grouping)		Children solve problems by grouping and counting the number of groups. Grouping encourages children to count in multiples and links to repeated subtraction on a number line. They can use concrete representations in fixed groups such as number shapes which helps to show the link between multiplication and division.

3	Divide 2-digits by 1-digit (sharing with no exchange)		When dividing larger numbers, children can use manipulatives that allow them to partition into tens and ones. Straws, Base 10 and place value counters can all be used to share numbers into equal groups. Part-whole models can provide children with a clear written method that matches the concrete representation.
3/4	Divide 2-digits by 1-digit (sharing with exchange)		When dividing numbers involving an exchange, children can use Base 10 and place value counters to exchange one ten for ten ones. Children should start with the equipment outside the place value grid before sharing the tens and ones equally between the rows. Flexible partitioning in a part-whole model supports this method.
3/4	Divide 2-digits by 1-digit (sharing with remainders)		When dividing numbers with remainders, children can use Base 10 and place value counters to exchange one ten for ten ones. Starting with the equipment outside the place value grid will highlight remainders, as they will be left outside the grid once the equal groups have been made. Flexible partitioning in a part-whole model supports this method.

4	Divide 3-digits by 1-digit (sharing)		Children can continue to use place value counters to share 3- digit numbers into equal groups. Children should start with the equipment outside the place value grid before sharing the hundreds, tens and ones equally between the rows. This method can also help to highlight remainders. Flexible partitioning in a part-whole model supports this method.
5	Divide 2-digits by 1-digit (grouping)		When using the short division method, children use grouping. Starting with the largest place value, they group by the divisor. Language is important here. Children should consider 'How many groups of 4 tens can we make?' and 'How many groups of 4 ones can we make?' Remainders can also be seen as they are left ungrouped.

5	Divide 3-digits by 1-digit (grouping)		Children can continue to use grouping to support their understanding of short division when dividing a 3-digit number by a 1-digit number. Place value counters or plain counters can be used on a place value grid to support this understanding. Children can also draw their own counters and group them through a more pictorial method.
5	Divide 4-digits by 1-digit (grouping)		Place value counters or plain counters can be used on a place value grid to support children to divide 4- digits by 1-digit. Children can also draw their own counters and group them through a more pictorial method. Children should be encouraged to move away from the concrete and pictorial when dividing numbers with multiple exchanges.

6	Divide multi digits by 2-digits (short division)	 **432 ÷ 12 = 36** **7,335 ÷ 15 = 489**  15 30 45 60 75 90 105 120 135 150	When children begin to divide up to 4-digits by 2-digits, written methods become the most accurate as concrete and pictorial representations become less effective. Children can write out multiples to support their calculations with larger remainders. Children will also solve problems with remainders where the quotient can be rounded as appropriate.
6	Divide multi-digits by 2-digits (long division)	 **432 ÷ 12 = 36** **7,335 ÷ 15 = 489** 	Children can also divide by 2-digit numbers using long division. Children can write out multiples to support their calculations with larger remainders. Children will also solve problems with remainders where the quotient can be rounded as appropriate.
6	Divide multi digits by 2-digits (long division)	**372 ÷ 15 = 24 r12**   **372 ÷ 15 = 24 4/5**	When a remainder is left at the end of a calculation, children can either leave it as a remainder or convert it to a fraction. This will depend on the context of the question. Children can also answer questions where the quotient needs to be rounded according to the context.