

Our curriculum guide: Maths

Date: September 2023 and reviewed on an on-going basis

Introduction

This Curriculum Guide relates to Maths. It sits alongside similar documents for Early Years, Reading, Writing, Science, Topics and others.

We want Sphere Federation schools to be happy and healthy places to learn. This core aim permeates our schools and their ethos, whether in the classroom or around and about school. (At St James' CE Primary, this is expressed with one additional element: 'happy and healthy place to achieve and believe'.)

The knowledge and skills we are required to teach are set out in The National Curriculum. We set these out in a year-group based sequence of learning (age-related expectations). Alongside these statutory curriculum requirements, there is additional or explicit learning, too.



'Mathematics is a creative and highly inter-connected discipline that has been developed over centuries, providing the solution to some of history's most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. A high-quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.'

National curriculum in England (Department for Education, 2013)

Curriculum structure

The aims of the National Curriculum are to develop fluency and the ability to reason mathematically and solve problems:

fluency	reasoning	problem-solving
<ul style="list-style-type: none"> quick and efficient recall of facts quick and efficient recall of procedures flexibility to move between different contexts and representations of mathematics 	<ul style="list-style-type: none"> following a line of enquiry conjecturing relationships and generalisations developing an argument, justification or proof using mathematical language 	<ul style="list-style-type: none"> applying mathematics to a variety of routine and non-routine problems with increasing sophistication breaking down problems into a series of simpler steps persevering in seeking solutions.

The following page sets out the long-term plans we follow, which come from [White Rose Maths](#). Timings are included as a guide; teachers adjust based on the needs of the class. We use White Rose Maths as the starting point for our planning and use professional judgement to adapt these to meet the needs of each class. The schemes of learning include:

- Yearly Overview**

This is a year plan for each year group from Year 1 to Year 6; each term is split into twelve weeks. These are then divided into blocks of learning (eg Place Value, Geometry) with a significant amount of time devoted to developing key number concepts each year. This is to build fluency and number sense; both will affect their success in other areas of mathematics.

- Small Steps Guidance**

Each objective is then broken down into smaller steps to provide a coherent journey through the block. These

small steps typically become daily maths lessons. However, teachers are encouraged to use their professional judgement to re-order, adapt, extend or shorten where necessary to meet the needs of the class. Each ‘Small Step’ includes: notes and guidance to help focus on key points for teaching; questions to promote mathematical talk; examples of varied fluency; and suggestions for problem-solving and reasoning. To support all children to secure the maths they’re learning, we make careful decisions about the mathematical representations we use and the quality and quantity of practice we expect children to engage in.

Year 1

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number Place value (within 10)				Number Addition and subtraction (within 10)				Geometry Shape		Consolidation	
Spring	Number Place value (within 20)		Number Addition and subtraction (within 20)		Number Place value (within 50)		Measurement Length and height		Measurement Mass and volume			
Summer	Number Multiplication and division		Number Fractions		Geometry Position and direction		Number Place value (within 100)		Measurement Money		Measurement Time	
											Consolidation	

Year 2

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number Place value			Number Addition and subtraction				Geometry Shape				
Spring	Measurement Money		Number Multiplication and division				Measurement Length and height		Measurement Mass, capacity and temperature			
Summer	Number Fractions			Measurement Time			Statistics		Geometry Position and direction		Consolidation	

Year 3

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number Place value		Number Addition and subtraction					Number Multiplication and division A				
Spring	Number Multiplication and division B		Measurement Length and perimeter			Number Fractions A			Measurement Mass and capacity			
Summer	Number Fractions B		Measurement Money	Measurement Time		Geometry Shape		Statistics		Consolidation		

Year 4

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number Place value				Number Addition and subtraction			Measurement Area	Number Multiplication and division A			Consolidation
Spring	Number Multiplication and division B			Measurement Length and perimeter		Number Fractions			Number Decimals A			
Summer	Number Decimals B		Measurement Money		Measurement Time		Consolidation	Geometry Shape		Statistics	Geometry Position and direction	

Year 5

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number Place value		Number Addition and subtraction		Number Multiplication and division A			Number Fractions A				
Spring	Number Multiplication and division B		Number Fractions B		Number Decimals and percentages			Measurement Perimeter and area		Statistics		
Summer	Geometry Shape		Geometry Position and direction		Number Decimals			Number Negative numbers	Measurement Converting units		Measurement Volume	

Year 6

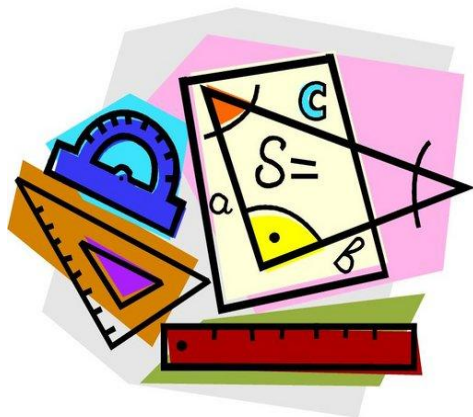
	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number Place value		Number Addition, subtraction, multiplication and division					Number Fractions A		Number Fractions B		Measurement Converting units
Spring	Ratio		Algebra		Number Decimals		Number Fractions, decimals and percentages		Measurement Area, perimeter and volume		Statistics	
Summer	Geometry Shape		Geometry Position and direction		Themed projects, consolidation and problem solving							

Key features

In Key Stage 1, there is a daily Maths lesson of between 45 and 60 minutes for all children. There is also a *Mastering Number* lesson of between 10 and 15 minutes four times a week.

In Key Stage 2, we have a daily Maths lesson of approximately 60 minutes for all children. In addition, teachers provide short fluency sessions (5-10 minutes) each day to practise key calculating skills, counting, times tables (and corresponding division facts) or addition and subtraction facts. In Y4 and Y5, there is also a 10 minute *Mastering Number* lesson five times a week.

The following are other features of our Maths curriculum which support learning.



The importance of mastery

A mastery approach is a set of principles and beliefs. Mastery is the belief that all pupils are capable of understanding and doing mathematics, given sufficient time. With good teaching, appropriate resources, effort and a 'can do' attitude, all children can achieve in and enjoy Maths.

Children's chances of success are maximised if they have a deep and lasting understanding of mathematical procedures and concepts. We use the phrase 'teaching for mastery' to describe elements of classroom practice that give pupils the best chances of mastering Maths. The essential idea behind mastery is that all children need a deep understanding of the mathematics they are learning so that future mathematical learning is built on solid foundations which do not need to be re-taught.

The importance of reasoning

The teaching of Maths focuses on fluency, reasoning and problem-solving.

Research by Nunes (Development of Maths Capabilities and Confidence in Primary School, 2009) identified the ability to reason mathematically as the most important factor in a pupil's success in Maths. Opportunities to develop mathematical reasoning skills are therefore integrated fully into the curriculum, enabling pupils to become more proficient at reasoning throughout all of their mathematics learning.

The importance of vocabulary and mathematical language

The quality and variety of language that pupils hear and speak are key factors in developing their mathematical vocabulary and presenting a mathematical justification, argument or proof.

We support children to use precise mathematical vocabulary and to express their mathematical thinking in complete sentences. The 'I say, you say, you say, you say, we all say' technique enables us to provide a sentence-stem for children to communicate their ideas with mathematical precision and clarity. These sentence structures often express key conceptual ideas or generalities and provide a framework to embed conceptual knowledge and build understanding.

Cross-curricular links

Maths is mainly taught in discrete lessons. However, there are opportunities to use, apply and practise Maths learning in other subjects. In addition, some specific aspects of the Maths curriculum are taught in different subjects. For example, Roman numerals are taught in Latin lessons; and constructing and presenting data in Science and topic subjects.

Revisiting prior learning

Number fact fluency and, more broadly, arithmetic is revisited regularly as part of a spiral curriculum:

'A spiral curriculum is one in which there is an iterative revisiting of topics, subjects or themes throughout the course. A spiral curriculum is not simply the repetition of a topic taught. It requires also the deepening of it, with each successive encounter building on the previous one.'

'What is a spiral curriculum?', R M Harden, 2009

Teachers provide regular opportunities to revisit prior learning; this learning could be from the previous lesson, week, term or year. This is often based on teacher assessment – revisiting a skill which the class need. For example, this could take the form of a short, focussed task at the beginning of a lesson. Occasionally, this may be a whole lesson or mini-series of lessons to address any identified gaps in knowledge or skills.

Adaptive teaching

Adaptive teaching is about being responsive: adjusting teaching to better match pupil need. The extent of adaptation varies depending on individual contexts. Adaptations might include:

- targeted/tailored support
- additional practice
- breaking down content into smaller components
- teaching carefully selected groups
- well-chosen resources

All three schools in Sphere Federation are inclusive and are committed to meeting the needs of children with SEND in **the most effective way** so that they achieve **the best possible outcomes**:

- we want pupils with SEND to acquire the knowledge and skills they need to reach their full potential,

- to be ready for the next stage in their education and,
- ultimately, to succeed in life.

To do this, we adapt how we implement the Maths curriculum to meet the needs of pupils with SEND so that we can develop their knowledge, skills and abilities to apply what they know and can do with increasing fluency and independence. The adaptations we make are appropriate and reasonable, and are made in accordance with the Equality Act 2010 and the SEND code of practice.

Similarly, teachers provide opportunities for challenge and deeper learning. Pupils benefit from this: whoever needs it, in whatever lesson. Challenge may be seen in pupils' exercise books: for example, teacher feedback which provides an additional task or thought-provoking question, or an open-ended activity that promotes reasoning. However, often the challenge may not be evident in books; for example, challenge might be provided by less support during the teacher input; an additional, practical task that isn't recorded; and teacher questioning which is targeted to meet the needs of different pupils.

Monitoring and evaluating

We continually review the Maths curriculum, evaluating its impact on children's learning over time.

We measure pupil achievement – the acquisition of knowledge and skills – and progress using a number of strategies, including:

- on-going teacher assessments, based on questioning in class, observations and pupil outcomes (which includes their work in books)
- number facts and times tables screening checks:
 - for children in Year 1 and 2, we assess children's rapid recall of addition and subtraction facts up to 20 (number bonds) each term
 - for children in Year 3 upwards, we assess children's rapid recall of tables facts each term; results are communicated to parents and are acted on in school
- in-year and end of year assessments; these are a combination of teacher assessments and external tests, including Key Stage 1 and Key Stage 2 National Curriculum tests – 'SATs' and the Y4 multiplication tables check

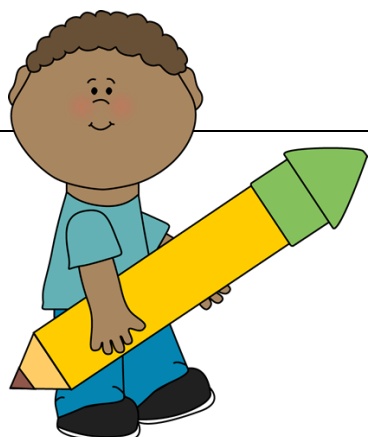
Scrutiny of progress in books and learning conversations with children are additional ways to assess impact. We explore how successful our children have been in acquiring knowledge and skills in relation to their stage of learning. In conversations with children, teachers and school leaders ask questions relating directly to age-related expectations and to times when they might have needed more support or when they experienced greater challenge. Lesson visits and the monitoring of planning support our assessment of impact.

We also evaluate impact through pupil attitudes using a number of strategies, including learning conversations and in pupil and parent/carer surveys; attitudes and behaviour in lessons across the curriculum; the quality of the work pupils produce, including taking pride in presentation.

Whole school areas for development and/or possible improvements to the curriculum may be identified as a result of evaluating the impact of what we do.

Age-related expectations: Maths in Early Years Foundation Stage

Nursery (expectations for the end of the year)	Reception (expectations for the end of the year)
Nursery and Reception learning experiences are taken from Development Matters: Non-statutory curriculum guidance for the Early Years Foundation Stage	
<p>N1 Fast recognition of up to 3 objects, without having to count them individually ('subitising').</p> <p>N2 Recite numbers past 5.</p> <p>N3 Say one number for each item in order: 1,2,3,4,5.</p> <p>N4 Know that the last number reached when counting a small set of objects tells you how many there are in total ('cardinal principle').</p> <p>N5 Show 'finger numbers' up to 5.</p> <p>N6 Link numerals and amounts: for example, showing the right number of objects to match the numeral, up to 5.</p> <p>N7 Experiment with their own symbols and marks as well as numerals.</p> <p>N8 Solve real world mathematical problems with numbers up to 5.</p> <p>N9 Compare quantities using language: 'more than', 'fewer than'.</p> <p>N10 Talk about and explore 2D and 3D shapes (for example, circles, rectangles, triangles and cuboids) using informal and mathematical language: 'sides', 'corners'; 'straight', 'flat', 'round'.</p> <p>N11 Understand position through words alone – for example, "The bag is under the table," – with no pointing.</p> <p>N12 Describe a familiar route.</p> <p>N13 Discuss routes and locations, using words like 'in front of' and 'behind'.</p> <p>N14 Make comparisons between objects relating to size, length, weight and capacity.</p> <p>N15 Select shapes appropriately: flat surfaces for building, a triangular prism for a roof etc.</p> <p>N16 Combine shapes to make new ones – an arch, a bigger triangle etc.</p> <p>N17 Talk about and identifies the patterns around them. For example: stripes on clothes, designs on rugs and wallpaper.</p> <p>N18 Use informal language like 'pointy', 'spotty', 'blobs' etc.</p> <p>N19 Extend and create ABAB patterns – stick, leaf, stick, leaf.</p> <p>N20 Notice and correct an error in a repeating pattern.</p> <p>N21 Begin to describe a sequence of events, real or fictional, using words such as 'first', 'then...'</p>	<p>R1 Fast recognition of up to 3 objects, without having to count them individually ('subitising').</p> <p>R2 Recite numbers past 5.</p> <p>R3 Say one number for each item in order: 1,2,3,4,5.</p> <p>R4 Know that the last number reached when counting a small set of objects tells you how many there are in total ('cardinal principle').</p> <p>R5 Show 'finger numbers' up to 5.</p> <p>R6 Link numerals and amounts: for example, showing the right number of objects to match the numeral, up to 5.</p> <p>R7 Experiment with their own symbols and marks as well as numerals.</p> <p>R8 Solve real world mathematical problems with numbers up to 5.</p> <p>R9 Compare quantities using language: 'more than', 'fewer than'.</p> <p>R10 Talk about and explore 2D and 3D shapes (for example, circles, rectangles, triangles and cuboids) using informal and mathematical language: 'sides', 'corners'; 'straight', 'flat', 'round'.</p> <p>R11 Understand position through words alone – for example, "The bag is under the table," – with no pointing.</p> <p>R12 Describe a familiar route.</p> <p>R13 Discuss routes and locations, using words like 'in front of' and 'behind'.</p> <p>R14 Make comparisons between objects relating to size, length, weight and capacity.</p> <p>R15 Select shapes appropriately: flat surfaces for building, a triangular prism for a roof etc.</p> <p>R16 Combine shapes to make new ones – an arch, a bigger triangle etc.</p> <p>R17 Talk about and identifies the patterns around them. For example: stripes on clothes, designs on rugs and wallpaper.</p> <p>R18 Use informal language like 'pointy', 'spotty', 'blobs' etc.</p> <p>R19 Extend and create ABAB patterns – stick, leaf, stick, leaf.</p> <p>R20 Notice and correct an error in a repeating pattern.</p> <p>R21 Begin to describe a sequence of events, real or fictional, using words such as 'first', 'then...'</p>



Age-related expectations: Maths, Year 1

Number and place value

1. count to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number
2. count, read and write numbers to 100 in numerals
3. count in multiples of twos, fives and tens
4. given a number, identify one more and one less
5. 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
6. read and write numbers from 1 to 20 in words

Addition and subtraction

7. know by heart number bonds to 20
8. represent and use number bonds and related subtraction facts within 20
9. add and subtract one-digit and two-digit numbers to 20, including zero
10. add and subtract more than two one-digit and two-digit numbers to 20, including zero
11. read, write and interpret mathematical statements involving addition (+), subtraction (−) and equals (=) signs
12. solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as $7 = \square - 9$

Multiplication and division

13. 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

14. recognise, find and name a half as one of two equal parts of an object, shape or quantity
15. recognise, find and name a quarter as one of four equal parts of an object, shape or quantity

Measurement

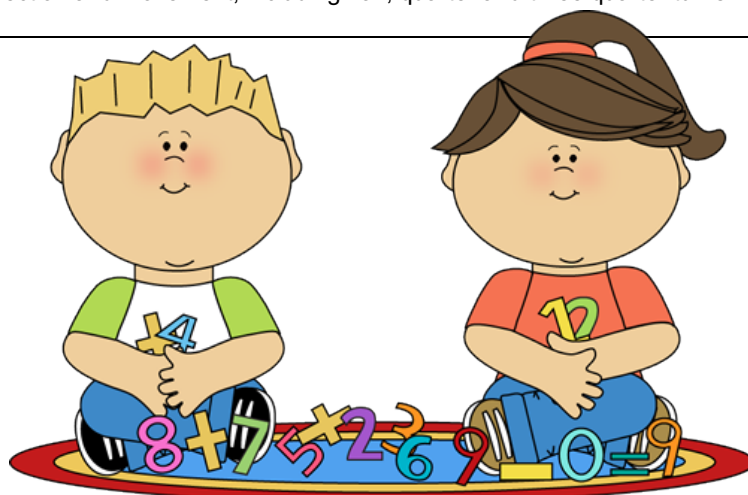
16. compare, describe and solve practical problems involving a full range of measures:
 - lengths and heights [eg long/short, longer/shorter, tall/short, double/half]
 - mass/weight [eg heavy/light, heavier than, lighter than]
 - capacity and volume [eg full/empty, more than, less than, half, half full,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

Geometry: properties of shapes

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

Geometry: position and direction

23. describe position, direction and movement, including half, quarter and three quarter turns



Age-related expectations: Maths, Year 2

Number and place value
<ol style="list-style-type: none"> count in steps of 2, 3, and 5 from 0, forward and backward count in tens from any number, forward and backward recognise the place value of each digit in a two-digit number (tens, ones) compare and order numbers from 0 up to 100 identify, represent and estimate numbers using different representations, including the number line use $<$, $>$ and $=$ signs correctly read and write numbers to at least 100 in numerals read and write numbers to at least 100 in words use place value and number facts to solve problems
Addition and subtraction
<ol style="list-style-type: none"> solve problems with addition and subtraction: <ul style="list-style-type: none"> 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 derive and use related facts up to 100 eg $30+70$ know 10 more / less add and subtract numbers using concrete objects, pictorial representations, and mentally, including: <ul style="list-style-type: none"> a two-digit number and ones a two-digit number and tens two two-digit numbers adding three one-digit numbers show that addition of two numbers can be done in any order (commutative) and subtraction 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
<ol style="list-style-type: none"> recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers calculate and write mathematical statements for multiplication and division within the multiplication tables, using multiplication (\times), division (\div) and equals ($=$) signs show that multiplication of two numbers can be done in any order (commutative) and division cannot recognise and use inverse solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts
Fractions
<ol style="list-style-type: none"> recognise, find, name and write fractions $\frac{1}{2}$, $\frac{1}{4}$ and of a length, shape, set of objects or quantity recognise equivalence of simple fractions eg $\frac{1}{2} = \frac{2}{4}$
Measurement
<ol style="list-style-type: none"> choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm); mass (kg/g); temperature ($^{\circ}\text{C}$); 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 the time to five minutes, including quarter past/to the hour 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
<ol style="list-style-type: none"> 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, [eg 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 direction
<ol style="list-style-type: none"> order and arrange combinations of mathematics objects in patterns and sequences use mathematical vocabulary to describe position, direction and movement in a straight line distinguish between rotation as a turn and in terms of right angles for quarter, half and three quarter turns (clockwise and anticlockwise)
Statistics
<ol style="list-style-type: none"> construct simple pictograms, tally charts, block diagrams and simple tables interpret 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

Age-related expectations: Maths, Year 3

Number and place value
<ol style="list-style-type: none"> 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 three-digit 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 read and write numbers up to 1000 in words solve number problems and practical problems involving these ideas
Addition and subtraction
<ol style="list-style-type: none"> add and subtract numbers mentally, including: <ul style="list-style-type: none"> a three-digit number and ones a three-digit number and tens a three-digit number and hundreds add numbers with up to three digits, using formal written methods of columnar addition subtract numbers with up to three digits, using formal written methods of columnar subtraction estimate the answer to a calculation use inverse operations to check answers solve problems, inc missing number problems, using number facts, place value, and more complex addition and subtraction
Multiplication and division
<ol style="list-style-type: none"> 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 multiply two-digit numbers by one-digit numbers, using mental and progressing to formal written methods divide two-digit numbers by 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
Fractions
<ol style="list-style-type: none"> as a vulgar and decimal fraction: count up and down in tenths; recognise that a tenth arises from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10 begin to recognise and understand decimals in relation to measures (money, length...) and simple unit fractions recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators recognise, find and write fractions as numbers: unit fractions and non-unit fractions with small denominators recognise and show, using diagrams, equivalent fractions with small denominators add and subtract fractions with the same denominator within one whole eg $\frac{1}{10} + \frac{2}{10} = \frac{3}{10}$ know pairs of fractions that total 1 compare and order unit fractions compare and order fractions with the same denominators solve problems that involve all of the above
Measurement
<ol style="list-style-type: none"> 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 with increasing accuracy to the nearest minute tell and write the time from a clock using Roman numerals from I to XII tell and write the time from a clock with 12-hour and 24-hour clocks estimate, record and compare 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, am/pm, morning, afternoon, noon and midnight know the number of days in each month know the number of seconds in a minute and the number of days in each year and leap year compare durations of events [eg to calculate the time taken by particular events or tasks]
Geometry: properties of shapes
<ol style="list-style-type: none"> 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
Statistics
<ol style="list-style-type: none"> present data using bar charts, pictograms and tables interpret and present data using bar charts, pictograms and tables solve 1-step and 2-step questions (eg How many more/fewer?) using data presented in scaled bar charts, pictograms, tables

Age-related expectations: Maths, Year 4

Number and place value <ol style="list-style-type: none"> 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, 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 the numeral system changed to include concept of zero and place value
Addition and subtraction <ol style="list-style-type: none"> add numbers with up to 4 digits using the formal written methods of columnar addition where appropriate subtract numbers with up to 4 digits using the formal written methods of columnar 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
Multiplication and division <ol style="list-style-type: none"> recall multiplication and division facts for multiplication tables up to 12×12 (aim for rapid recall within five seconds) use place value, known and derived facts to multiply and divide mentally (eg $3 \times 6 = 18$ so $30 \times 6 = 180$) multiply by 0 and 1; divide by 1; multiply together three numbers recognise and use factor pairs (eg 12×20 is the same as $12 \times 2 \times 10$) and commutativity in mental calculations multiply two-digit and three-digit numbers by a one-digit number using formal written layout divide 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 (including decimals) <ol style="list-style-type: none"> recognise and show, using diagrams, families of common equivalent fractions as a vulgar and decimal fraction: count up and down in hundredths; recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten recognise and write decimal equivalents: any number of tenths or hundredths recognise and write decimal equivalents to $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$ 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 same denominator find the effect of (<i>ie begin to do the following</i>) multiplying and 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 (<i>ie this means understand the concept, know vocabulary such as 'ten times smaller', and the procedure of moving digits, place holders etc</i>) 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
Measurement <ol style="list-style-type: none"> convert between different units of measure [eg 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 shapes <ol style="list-style-type: none"> 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 direction <ol style="list-style-type: none"> 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 <ol style="list-style-type: none"> interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs solve comparison, sum and difference problems using data presented in bar charts, pictograms, tables and other graphs

Age-related expectations: Maths, Year 5

Number and place value

1. read, write, order and compare numbers to at least 1 000 000 and determine the value of each digit
2. count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000
3. interpret negative numbers in context
4. count forwards and backwards with positive and negative whole numbers, inc through zero
5. round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000
6. solve number problems and practical problems that involve all of the above
7. read Roman numerals to 1000 (M) and recognise years written in Roman numerals

Addition and subtraction

8. add whole numbers with more than 4 digits, including using formal written methods (columns)
9. subtract whole numbers with more than 4 digits, including using formal written methods (columns)
10. add and subtract numbers mentally with increasingly large numbers
11. use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy
12. solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.



Multiplication and division

13. identify multiples and factors, including finding all factor pairs of a number
14. identify common factors of two numbers
15. know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers
16. establish whether a number up to 100 is prime
17. recall prime numbers up to 19
18. 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
19. multiply and divide numbers mentally drawing upon known facts
20. divide numbers up to 4 digits by a one-digit number using the formal written method
21. interpret remainders appropriately for the context
22. multiply and divide whole numbers and those involving decimals by 10, 100 and 1000
23. recognise and use square numbers and cube numbers, and notation for squared (2) and cubed (3)
24. solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign
25. solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes, scaling by simple fractions and problems involving simple rates

Fractions (including decimals and percentages)

26. compare and order fractions whose denominators are all multiples of the same number
27. identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths
28. recognise mixed numbers and improper fractions and convert from one to the other
29. write mathematical statements > 1 as a mixed number [eg $+ = 1$]
30. add and subtract fractions with the same denominator and denominators that are multiples of the same number
31. multiply proper fractions by whole numbers, supported by materials and diagrams
32. multiply mixed numbers by whole numbers, supported by materials and diagrams
33. read and write decimal numbers as fractions [eg $0.71 =$]
34. recognise, use and count in thousandths and relate them to tenths, hundredths and decimal equivalents
35. round decimals with two decimal places to the nearest whole number and to one decimal place
36. read, write, order and compare numbers with up to three decimal places
37. solve problems involving number up to two decimal places
38. solve problems involving number up to three decimal places
39. recognise the per cent symbol (%) and understand that per cent relates to 'number of parts per hundred', and write percentages as a fraction with denominator 100, and as a decimal
40. solve problems which require knowing percentage and decimal equivalents of , , , and those fractions with a denominator of a multiple of 10 or 25.

Measurement

41. convert between different units of metric measure (eg kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre)
42. understand and use approximate equivalences between metric units and common imperial units such as inches, pounds and pints
43. measure and calculate perimeter of composite rectilinear shapes in centimetres and metres
44. calculate and compare the area of rectangles (including squares), and including using standard units, square centimetres (cm^2) and square metres (m^2) and estimate the area of irregular shapes
45. estimate volume [eg using 1 cm^3 blocks to build cuboids (inc cubes)] and capacity [eg using water]
46. solve problems involving converting between units of time
47. use all four operations to solve problems involving measure [eg length, mass, volume, money] using decimal notation, including scaling

Geometry: properties of shapes

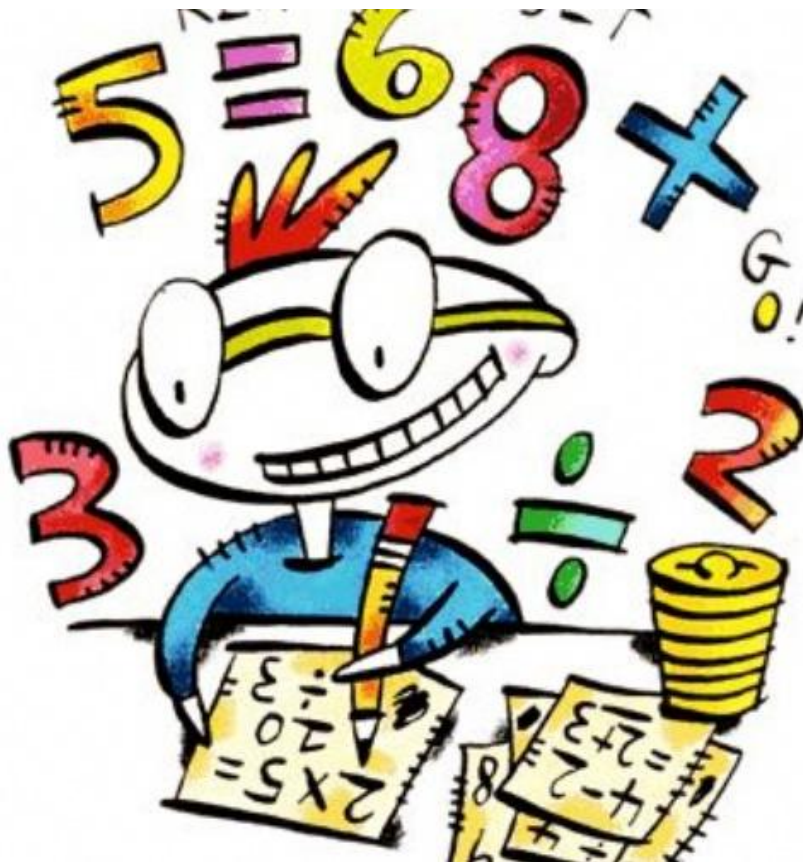
48. identify 3-D shapes, including cubes and other cuboids, from 2-D representations (nets and other drawings)
49. know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles
50. draw given angles, and measure them in degrees ($^\circ$)
51. identify:
 - angles at a point and one whole turn (total 360°)
 - angles at a point on a straight line and a turn (total 180°)
 - other multiples of 90°
52. use the properties of rectangles to deduce related facts and find missing lengths and angles
53. distinguish between regular and irregular polygons based on reasoning about equal sides and angles

Geometry: position and direction

54. 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

Statistics

55. solve comparison, sum and difference problems using information presented in a line graph
56. complete, read and interpret information in tables, including timetables



Age-related expectations: Maths, Year 6

Number and place value

1. order and compare numbers up to 10 000 000
2. read and write numbers up to 10 000 000 and determine the value of each digit
3. round any whole number to a required degree of accuracy
4. use negative numbers in context
5. calculate intervals across zero
6. solve number and practical problems that involve all of the above

Addition and subtraction, multiplication and division

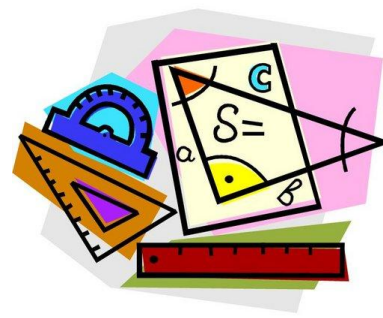
7. multiply numbers up to 4 digits by a two-digit whole number using formal written method
8. divide numbers up to 4 digits by a two-digit whole number using formal written method
9. interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context
10. divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate
11. perform mental calculations, including with mixed operations and large numbers
12. identify common factors, common multiples and prime numbers
13. use their knowledge of the order of operations to carry out calculations involving the four operations
14. solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why
15. solve problems involving addition, subtraction, multiplication and division
16. use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy

Fractions (including decimals and percentages)

17. use common factors to simplify fractions; use common multiples to express fractions in the same denomination
18. compare and order fractions, including fractions > 1
19. add and subtract fractions with different denominators and mixed numbers, using equivalent fractions
20. multiply simple pairs of proper fractions, writing the answer in its simplest form eg $\times =$
21. divide proper fractions by whole numbers eg $\div 2 =$
22. associate a fraction with division
23. calculate decimal fraction equivalents for a simple fraction [eg $=0.375$]
24. 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
25. multiply one-digit numbers with up to two decimal places by whole numbers
26. use written division methods in cases where the answer has up to two decimal places
27. solve problems which require answers to be rounded to specified degrees of accuracy
28. recall and use equivalences between simple fractions, decimals and percentages, in different contexts

Ratio and proportion

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



Algebra

33. use simple formulae
34. generate and describe linear number sequences
35. express missing number problems algebraically
36. find pairs of numbers that satisfy an equation with two unknowns
37. enumerate possibilities of combinations of 2 variables

Measurement

38. solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate
39. 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
40. convert between miles and kilometres
41. recognise that shapes with the same areas can have different perimeters and vice versa
42. recognise when it is possible to use formulae for area and volume of shapes
43. calculate the area of parallelograms and triangles
- calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm^3) and cubic metres (m^3), and extending to other units [eg mm^3 and km^3]

Geometry: properties of shapes

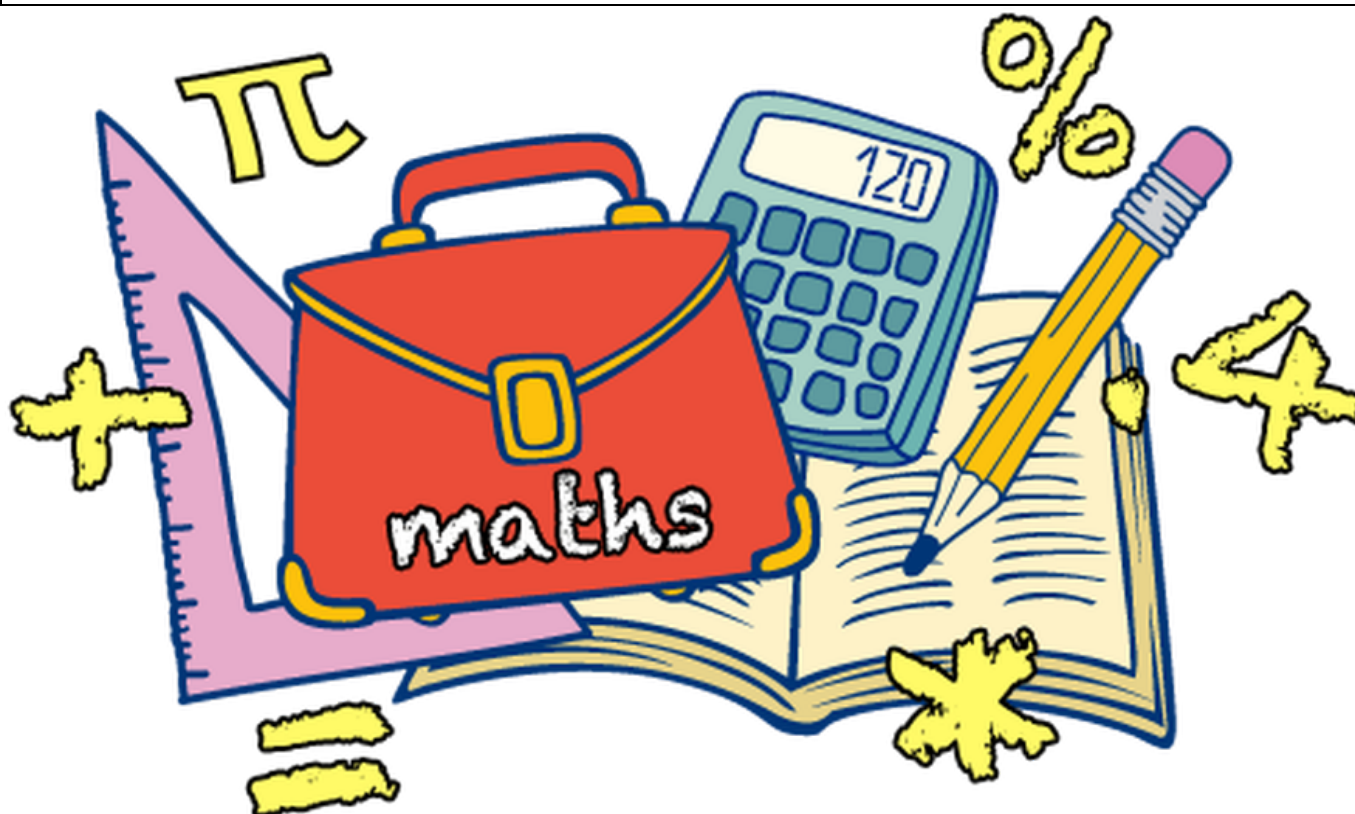
- 44. draw 2-D shapes using given dimensions and angles
- 45. recognise, describe and build simple 3-D shapes, including making nets
- 46. compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons
- 47. illustrate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

Geometry: position and direction

- 49. describe positions on full coordinate grid (4 quadrants)
- 50. draw and translate simple shapes on the coordinate plane, and reflect them in the axes

Statistics

- 51. interpret pie charts and line graphs and use these to solve problems
- 52. construct pie charts and line graphs and use these to solve problems
- 53. calculate and interpret the mean as an average



Appendix: Resources

TIMES TABLES

x	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10	11	12
2	0	2	4	6	8	10	12	14	16	18	20	22	24
3	0	3	6	9	12	15	18	21	24	27	30	33	36
4	0	4	8	12	16	20	24	28	32	36	40	44	48
5	0	5	10	15	20	25	30	35	40	45	50	55	60
6	0	6	12	18	24	30	36	42	48	54	60	66	72
7	0	7	14	21	28	35	42	49	56	63	70	77	84
8	0	8	16	24	32	40	48	56	64	72	80	88	96
9	0	9	18	27	36	45	54	63	72	81	90	99	108
10	0	10	20	30	40	50	60	70	80	90	100	110	120
11	0	11	22	33	44	55	66	77	88	99	110	121	132
12	0	12	24	36	48	60	72	84	96	108	120	132	144

Top tips when you're learning your tables:

Look for patterns in the table.

Turn around facts eg $3 \times 4 = 4 \times 3$ (this halves the amount of facts you need to learn).

Shade in the facts you definitely know.

Use doubling: double the 2s to help you know the 4s; double the 3s to help with the 6s.

Learn the square numbers – they're the ones shaded in grey.

Look for the patterns in the 9s.

100 SQUARE

0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99

MENTAL CALCULATIONS



Addition

Number bonds

Knowing (not working out) pairs of numbers which total to 10, 20 and 100

$3 + 7$, $13 + 7$, $30 + 70$...

Counting on and back

Counting in steps of 1, 10, 100, 1000...

$86 + 52 = 138$ by counting on in 10s then in 1s

Rounding and adjusting

Add the nearest multiple of 10, 100, 1000 and adjust

$24 + 19 = 24 + 20 - 1 = 43$

Relationships

Addition and subtraction are inverse operations so you can 'work backwards'

$23 - 17 = 6$ so we know $17 + 6 = 23$

Doubles and near doubles

$6 + 6 = 12$, $6 + 7 = \text{double } 6 \text{ and } 1 \text{ more} = 13$

Partitioning

Splitting a number up and then recombining it

$34 + 45 = (30 + 40) + (4 + 5) = 70 + 9 = 79$

Bridging

Using number bonds to split numbers

$17 + 7 \square 17 + (3 + 4) = 20 + 4 = 24$

Using related facts

$4 + 9 = 13$ so we know $40 + 90 = 130$

Equivalent calculations

Use knowledge of structure: increase one number and decrease the other by the same amount

$49 + 6 = 50 + 5$

Multiplication

Times tables

Knowing (not working out) facts

Y2 $\square \times 2$, $\times 5$ $\times 10$ **Y3** $\square \times 3$, $\times 4$, $\times 8$

Y4 \square all facts up to 12×12 quickly

Knowing the effect of $\times 0$ and $\times 1$

Doubling... and doubling again

$13 \times 2 = 26$, so $13 \times 4 = 52$ and $13 \times 8 = 104$

Using related facts

8×6 is double 4×6

$24 \times 5 = (24 \times 10)$ then half it = 120

$12 \times 15 = 12 \times 5 \times 3 = 60 \times 3 = 180$

Multiplying by 10, 100, 1000...

$63 \times 10 = 630$ (and $6.3 \times 10 = 63$ etc)

Partitioning

$23 \times 6 \square (20 \times 6) + (3 \times 6) = 120 + 18 = 138$

$13 \times 12 \square (13 \times 10) + (13 \times 2) = 130 + 26 = 156$

Relationships

Multiplication is repeated addition

$14 \times 3 = 14 + 14 + 14 = 42$

Multiplication and division are inverse operations so you can 'work backwards'

Rounding and adjusting

$99 \times 5 \square 100 \times 5 - 5 = 495$

Equivalent calculations

Use knowledge of structure: apply a multiplicative increase to one factor and a corresponding decrease the other

$18 \times 6 = 9 \times 12$

Subtraction

Number bonds

Using number facts we know

$20 - 17 = 3$, $100 - 70 = 30$

Counting on and back

Counting on and back in repeated steps of 1, 10, 100...

$86 - 32 = 54$ by counting back in 10s and in 1s

Find a small difference by counting up

$101 - 98 \square$ from 98, jump to 99, 100, 101...three jumps

Rounding and adjusting

Subtract the nearest multiple of 10, 100... and adjust

$74 - 19 = 74 - 20$ and then add the 1 back on = 55

Relationships

Addition and subtraction are inverse operations so you can 'work backwards'

$17 + 6 = 23$ so we know $23 - 6 = 17$

Partitioning

Splitting a number up then recombining it

$89 - 36 \square (80 - 30) + (9 - 6) = 50 + 3 = 53$

Bridging

Using number bonds to split numbers up

$14 - 6 \square 14 - 4 - 2 = 10 - 2 = 8$

Equivalent calculations

Use knowledge of structure: increase or decrease both numbers by the same amount

$601 - 278 = 599 - 276$

Division

Times tables

Multiplication and division are inverse operations so you can 'work backwards'

$8 \times 7 = 56$ so we know $56 \div 8 = 7$

Halving

Halving is $\div 2$

Halving and halving again is $\div 4$ (and finding $\frac{1}{4}$ or 25%)

$64 \div 4 = 16$ halved (32) and then halved again = 16

Dividing by 10, 100, 1000...

$750 \div 10 = 75$ (and $750 \div 100 = 7.5$)

Relationships

Division can be seen as repeated subtraction

$24 \div 6 \square$ starting at 24, we take off 6s $\square 18, 12, 6, 0 = 4$ groups

Division can be worked out by repeatedly adding, too

$24 \div 6 \square$ from 0, we jump to 6, 12, 18, 24...

4 jumps = 4

If I know $3 \times 7 = 21$, what else do I know?

$30 \times 7 = 210$,

$0.3 \times 7 = 2.1$ etc

Equivalent calculations

Use knowledge of structure: apply a multiplicative increase or decrease to both numbers

$600 \div 50 = 60 \div 5$

ADDITION FACTS

Year 1 the 87 facts contained in the outer rectangle

Adding 1 (eg $7 + 1$ and $1 + 7$)
 Doubles of numbers to 5 (eg $4 + 4$)
 Adding 2 (eg $4 + 2$ and $2 + 4$)
 Number bonds to 10 (eg $8 + 2$ and $2 + 8$)
 Adding 10 to a number (eg $5 + 10$ and $10 + 5$)
 Adding 0 to a number (eg $3 + 0$ and $0 + 3$)
 The ones without a family: $5 + 3$, $3 + 5$, $6 + 3$, $3 + 6$

Year 2 the 34 facts in the inner 'triangle'

Know or derive a quick strategy (not counting):
 Near doubles: $8 + 9 = 8 + 8 + 1$
 Bridging: $8 + 9 = 8 + 2 + 7$
 Compensation: $8 + 9 = 8 + 10 - 1$
 Doubles: $7 + 7$
 Near doubles: $5 + 6$

+	0	1	2	3	4	5	6	7	8	9	10
0	$0 + 0$	$0 + 1$	$0 + 2$	$0 + 3$	$0 + 4$	$0 + 5$	$0 + 6$	$0 + 7$	$0 + 8$	$0 + 9$	$0 + 10$
1	$1 + 0$	$1 + 1$	$1 + 2$	$1 + 3$	$1 + 4$	$1 + 5$	$1 + 6$	$1 + 7$	$1 + 8$	$1 + 9$	$1 + 10$
2	$2 + 0$	$2 + 1$	$2 + 2$	$2 + 3$	$2 + 4$	$2 + 5$	$2 + 6$	$2 + 7$	$2 + 8$	$2 + 9$	$2 + 10$
3	$3 + 0$	$3 + 1$	$3 + 2$	$3 + 3$	$3 + 4$	$3 + 5$	$3 + 6$	$3 + 7$	$3 + 8$	$3 + 9$	$3 + 10$
4	$4 + 0$	$4 + 1$	$4 + 2$	$4 + 3$	$4 + 4$	$4 + 5$	$4 + 6$	$4 + 7$	$4 + 8$	$4 + 9$	$4 + 10$
5	$5 + 0$	$5 + 1$	$5 + 2$	$5 + 3$	$5 + 4$	$5 + 5$	$5 + 6$	$5 + 7$	$5 + 8$	$5 + 9$	$5 + 10$
6	$6 + 0$	$6 + 1$	$6 + 2$	$6 + 3$	$6 + 4$	$6 + 5$	$6 + 6$	$6 + 7$	$6 + 8$	$6 + 9$	$6 + 10$
7	$7 + 0$	$7 + 1$	$7 + 2$	$7 + 3$	$7 + 4$	$7 + 5$	$7 + 6$	$7 + 7$	$7 + 8$	$7 + 9$	$7 + 10$
8	$8 + 0$	$8 + 1$	$8 + 2$	$8 + 3$	$8 + 4$	$8 + 5$	$8 + 6$	$8 + 7$	$8 + 8$	$8 + 9$	$8 + 10$
9	$9 + 0$	$9 + 1$	$9 + 2$	$9 + 3$	$9 + 4$	$9 + 5$	$9 + 6$	$9 + 7$	$9 + 8$	$9 + 9$	$9 + 10$
10	$10 + 0$	$10 + 1$	$10 + 2$	$10 + 3$	$10 + 4$	$10 + 5$	$10 + 6$	$10 + 7$	$10 + 8$	$10 + 9$	$10 + 10$

Colours represent:

adding 1 and 2
bonds to 10
adding 10
adding 0
doubles
near doubles
bridging / compensating

