ST JOHN THE DIVINE PRIMARY SCHOOL

Medium Term Plans for Mathematics (revised 2022) - Year Six

Autumn Term Overview

Notes for guidance

- *Timescales may vary depending upon the emergent needs of the children/class. However, teachers are encouraged to ensure that coverage is achieved prior to commencement of Summer Term learning.*
- *In each sequence, time has been blocked for the completion of a baseline assessment at the beginning of each new block of learning. Teachers should use this assessment to inform planning – e.g. groups for pre-teaching, intervention and differentiation.*
- *Likewise, in each sequence, time has been blocked for the completion of an 'end of unit' assessment, to ensure that children are ready for progression and to plan any necessary interventions.*
- *Included in these medium-term-plans are references to prior learning objectives, teachers are encouraged to use these to help inform assessments, the planning for their inputs and potential interventions. Teachers may wish to make use of starters that revisit these areas of learning prior to the commencement of that block of learning (e.g. completing addition and subtraction questions related to learning from the previous year/term prior to beginning a new block of addition and subtraction) – examples are included in the 'starters' box for each unit.*
- *At the beginning of each block of learning, there is a table showing the progression of vocabulary in this area of Mathematics across all year groups.*

Number - Place Value

Suggested starters (ongoing, throughout the term) with links to relevant resources:

- *Whiterose Flashback 4 - WHOLE CLASS*
- *Daily 10 - Level 4 or 5 - https://www.topmarks.co.uk/maths-games/daily10 - WHOLE CLASS*
- *Times tables dice game - children roll dice; first to multiply together gets a point; keep score on mini whiteboard - PAIRS*
- *Rocket rounding - https://www.topmarks.co.uk/maths-games/rocket-rounding - WHOLE CLASS*
- *Tug Harder - https://nrich.maths.org/5898 - PAIRS*

- Roman numeral matching pairs - PAIRS
- Column addition and subtraction with 4 and 3 digit numbers – see Google Sheet - WHOLE CLASS
- Dicey Addition - https://nrich.maths.org/11863 - PAIRS
- Identify multiples and count from (and back to) 0 in multiples of 3, 4, 6, 7, 8, 9, 11,12, 25, 50, 100 and 1000
- Count from (and back to) 0 in multiples of 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9 (using known multiples and knowledge of place value)
- Recall and use multiplication and division facts for the 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 times tables (up to the 12th multiple)
- Find all factor pairs of a given number; find all common factors for a pair of numbers; identify common multiples
- Add, subtract, multiply and divide numbers mentally using known facts and a range of strategies **(See Mental Calculation Strategies, 2017)**
- Read, write, compare and order numbers within 5,000,000
- Read, write, compare and order numbers with up to three decimal places
- Multiply numbers by 10, 100 and 1000 and divide corresponding numbers by 10, 100 and 1000 (with up to three decimal places)
- Count forwards and backwards with positive and negative whole numbers, including through zero; calculate intervals across zero (in context)
- Recognise, describe and extend linear number sequences, including those involving decimals, e.g. 0.9, 1.8, 2.7; find the term to term rule
- Compare and order fractions, including those greater than one (consider the use of diagrams and fraction walls)
- Find unit and non-unit fractions of numbers and quantities e.g. 1/7 of £56; 3/7 of £56
- Know and use the vocabulary of prime numbers and establish whether a number up to 100 is a prime number
- Recognise and use square numbers (up to 12 x 12) and the notation e.g. $9^2 = 81$
- Convert between different units of measurement (including time), using decimal notation up to three decimal places when appropriate
- Consolidate telling the time to the nearest minute on an analogue clock and relate to 12/24 hour digital clocks; interpret timetables

Relevant learning/previous statutory objectives:

Year Five

- 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.

Also see NCETM National Curriculum resource tool: https://www.ncetm.org.uk/in-the-classroom/national-curriculum-resource-tool/

Current statutory objectives:

ST JOHN THE DIVINE PRIMARY SCHOOL

Medium Term Plans for Mathematics (revised 2022) - Year Six

- 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 problems and practical problems that involve all of the above.

Also see NCETM National Curriculum resource tool: https://www.ncetm.org.uk/in-the-classroom/national-curriculum-resource-tool/

Potential misconceptions:

-

Vocabulary - Number - Number and place value						
Reception	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
count	sort	count in steps	ascending	negative numbers	ten thousands	millions
subitise	represent	count in multiples	descending	roman numerals	one hundred thousands	ten millions
order/ordinal	multiples	place value	10 or 100 more	1000 more	powers of	
compare	partitioning	estimate	10 or 100 less	1000 less	integer	
forwards	ones	compare	hundreds	thousands		
backwards	tens			round		
numerals						

digit						
one more						
one less						
equal to						
more than						
less than (fewer)						

Area of Study	No of hrs	Suggested Sequence and Key Questions for Assessment	Suggested Concrete and Pictorial Resources	Extension tasks
Number Place Value **Week 1**	5	*Suggested sequence of learning:* - Baseline Assessment - To recognise and represent numbers to 1,000,000 - To recognise and represent numbers to 10,000,000 - To read and write numbers to 10,000,000 - To multiply and divide by 10, 100 and 1,000 *Key Questions:*		*Suggested grey tasks:* *Useful sentence stems:*
Number Place Value	5	*Suggested sequence of learning:* - To represent numbers to 10,000,000 on a numberline - To compare and order any integer - To round any integer - To recognise and represent negative numbers		*Suggested grey tasks:*

Week 2		- End of Unit Assessment		
		Key Questions:		Useful sentence stems:

Number - Addition, Subtraction, Multiplication and Division

Suggested starters (ongoing, throughout the term) with links to relevant resources:

- Identify multiples and count from (and back to) 0 in multiples of 3, 4, 6, 7, 8, 9, 11,12, 25, 50, 100 and 1000
- Count from (and back to) 0 in multiples of 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9 (using known multiples and knowledge of place value)
- Recall and use multiplication and division facts for the 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 times tables (up to the 12th multiple)
- Find all factor pairs of a given number; find all common factors for a pair of numbers; identify common multiples
- Add, subtract, multiply and divide numbers mentally using known facts and a range of strategies **(See Mental Calculation Strategies, 2017)**
- Read, write, compare and order numbers within 5,000,000
- Read, write, compare and order numbers with up to three decimal places
- Multiply numbers by 10, 100 and 1000 and divide corresponding numbers by 10, 100 and 1000 (with up to three decimal places)
- Count forwards and backwards with positive and negative whole numbers, including through zero; calculate intervals across zero (in context)
- Recognise, describe and extend linear number sequences, including those involving decimals, e.g. 0.9, 1.8, 2.7; find the term to term rule
- Compare and order fractions, including those greater than one (consider the use of diagrams and fraction walls)
- Find unit and non-unit fractions of numbers and quantities e.g. 1/7 of £56; 3/7 of £56
- Know and use the vocabulary of prime numbers and establish whether a number up to 100 is a prime number
- Recognise and use square numbers (up to 12 x 12) and the notation e.g. $9^2 = 81$
- Convert between different units of measurement (including time), using decimal notation up to three decimal places when appropriate
- Consolidate telling the time to the nearest minute on an analogue clock and relate to 12/24 hour digital clocks; interpret timetables

Relevant Prior learning/previous statutory objectives:

Year 5

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 multi-step problems in contexts, deciding which operations and methods to use and why.*

Multiplication and Division:

- *identify multiples and factors, including finding all factor pairs of a number, and common factors of 2 numbers*
- *know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers*
- *establish whether a number up to 100 is prime and recall prime numbers up to 19*
- *multiply and divide whole numbers and those involving decimals by 10, 100 and 1,000*

Also see NCETM National Curriculum resource tool: https://www.ncetm.org.uk/in-the-classroom/national-curriculum-resource-tool/

Algebra Current statutory objectives:

- *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*
- *solve problems involving addition, subtraction, multiplication and division*
- *use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.*

Also see NCETM National Curriculum resource tool: https://www.ncetm.org.uk/in-the-classroom/national-curriculum-resource-tool/

Potential misconceptions:

- *Children may not line the numbers up correctly when setting out an addition or a subtraction.*
- *Children may try to use formal methods when mental strategies would be more appropriate, for example adding 999 is more easily done by adding 1,000 and then subtracting 1*
- *When solving multi-step problems, children may need support to choose the type and order of operations needed.*
- *Children may confuse the ideas of factors and multiples.*
- *Children may not be familiar with the use of the word "common" in this context.*
- *Errors may be made with times-tables, resulting in incorrect factors.*

- *Children may forget 1 and the number itself when listing factors.*
- *Children may over-generalise rules, for example incorrectly applying the digit-sum rule for 3 and 9 or the final-digit rule for 5 to other numbers.*
- *Children may need support in understanding the combining of rules such as "a number is divisible by 12 if it is divisible by both 3 and 4"*
- *A common misconception is that 1 is a prime number.*
- *Children may think that all prime numbers are odd and not realise that 2 is a prime number.*
- *Numbers that are outside times-tables knowledge (e.g. 51) may be mistakenly thought of as prime. Encourage children to use divisibility rules from the previous step to check these.*

Vocabulary - Addition and subtraction						
Reception	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
add	addition/add	sum	column addition	4-digit number		
plus	subtraction	3-digit number	column subtraction	operations		
altogether	difference	commutative	exchange	methods		
total	equals		estimate			
take away /minus	facts					
number bonds	problems					
part	missing number problems					
whole	2-digit number					
digit	inverse					

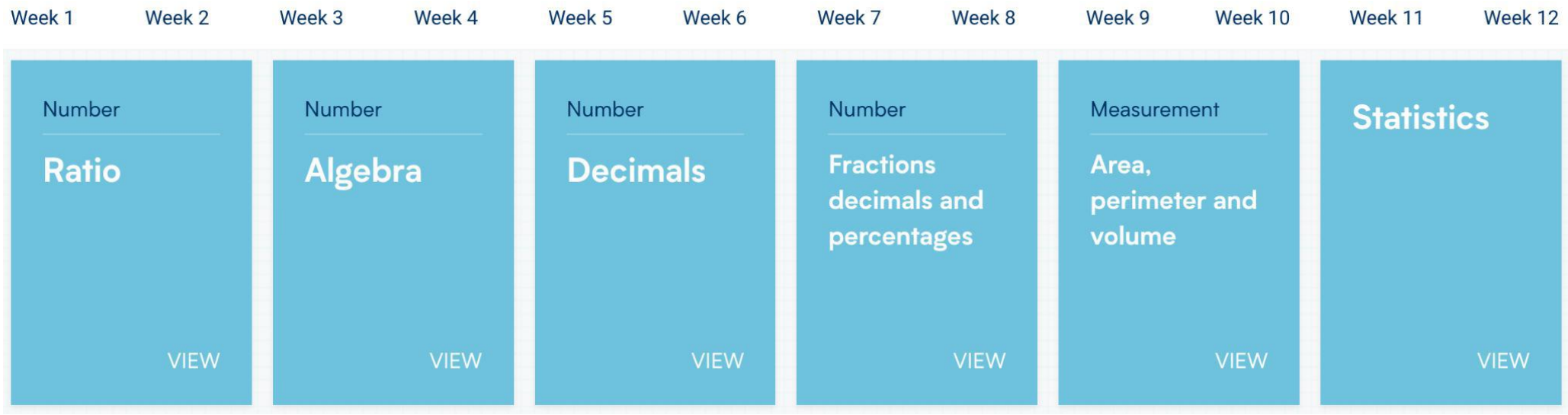
Vocabulary - Multiplication and division						
Reception	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
double	multiplication	multiplication tables	exchange	factor pairs	multiples	multi-digit numbers
half	division	commutative	mathematical statements	formal written layout	factors	long division
twice as many	arrays	repeated addition	missing number problems	distributive law	prime numbers	
equal			integer scaling problems	remainders	square numbers	
unequal			correspondence problems		cube numbers	
share			derived facts		short division	
group					product	
odd					dividend	
even					divisor	
					quotient	
					operations	

Area of Study	No of hrs	Suggested Sequence and Key Questions for Assessment	Suggested Concrete and Pictorial Resources	Extension tasks

Number Week 1	5	**Suggested sequence of learning:** - To add and subtract integers - To recognise and find common factors - To recognise and find common multiples - To use and apply rules of divisibility	-	**Suggested grey tasks:**
		Key Questions: *What is the greatest digit you can have in a place value column? • How do you exchange when adding? • How do you exchange when subtracting? • Which columns are affected by the exchange? • How do you know whether to add or subtract the numbers? • How can you check your answer to the calculation?*		**Useful sentence stems:**
Number Week 2	5	**Suggested sequence of learning:** - To recognise and find primes to 100 - To recognise and represent square and cube numbers - To multiply up to a 4-digit number by a 2-digit number - To solve problems with multiplication	-	**Suggested grey tasks:**
		Key Questions: *What is a prime number? • What is a composite number? • How many factors does a prime number have? • Why is 1 not a prime number? • How can you find the prime factors of a number? • Are the multiples of prime numbers also prime?*		**Useful sentence stems:**
Number Week 3	5	**Suggested sequence of learning:** - To use short division - To divide using factors - To use long division	-	**Suggested grey tasks:**
		Key Questions: *• How many groups of 4 are there in 40/400/4,000? • How many groups of 4 are there in 80/800/8,000? • What do you do with any remaining ones at the end of a division? • If you cannot make a group in a column, what do you do? • What does the remainder mean in this question?*		**Useful sentence stems:**

Number Week 4	5	Suggested sequence of learning: - To use long division with remainders - To solve division problems - To solve multi-step division problems	-	Suggested grey tasks:
		Key Questions: *How can you use multiples to divide by a 2-digit number? • Why do we subtract as we go along? • What does the arrow represent in the long division? • Can this division be done using factors instead? Why or why not? • What is the first step when performing a long division?*		Useful sentence stems:
Number Week 5	5	Suggested sequence of learning: - To use and apply order of operations - To use mental calculations and estimation - To reason from known facts - End of Unit Assessment	-	Suggested grey tasks:
		Key Questions: *Does it make a difference if you perform the operations in a different order? • What do brackets in a calculation mean? What would happen if you did not use the brackets? • Which operation has greater priority, addition or multiplication? • How many pairs of operations do you know that have equal priority? • How do you find the square of a number?*		Useful sentence stems:

Spring Term Overview



Notes for guidance

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- Likewise, in each sequence, time has been blocked for the completion of an 'end of unit' assessment, to ensure that children are ready for progression and to plan any necessary interventions.
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- At the beginning of each block of learning, there is a table showing the progression of vocabulary in this area of Mathematics across all year groups.

Number - Ratio

Suggested starters (ongoing, throughout the term) with links to relevant resources:

- Whiterose Flashback 4 - WHOLE CLASS
- Daily 10 - Level 4 or 5 - https://www.topmarks.co.uk/maths-games/daily10 - WHOLE CLASS
- Times tables dice game - children roll dice; first to multiply together gets a point; keep score on mini whiteboard - PAIRS
- Rocket rounding - https://www.topmarks.co.uk/maths-games/rocket-rounding - WHOLE CLASS

- Tug Harder - https://nrich.maths.org/5898 - PAIRS
- Roman numeral matching pairs - PAIRS
- Column addition and subtraction with 4 and 3 digit numbers -- see Google Sheet - WHOLE CLASS
- Dicey Addition - https://nrich.maths.org/11863 - PAIRS
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- Recognise, describe and extend linear number sequences, including those involving decimals, e.g. 0.9, 1.8, 2.7; find the term to term rule
- Compare and order fractions, including those greater than one (consider the use of diagrams and fraction walls)
- Find unit and non-unit fractions of numbers and quantities e.g. 1/7 of £56; 3/7 of £56
- Know and use the vocabulary of prime numbers and establish whether a number up to 100 is a prime number
- Recognise and use square numbers (up to 12 x 12) and the notation e.g. $9^2 = 81$
- Convert between different units of measurement (including time), using decimal notation up to three decimal places when appropriate
- Consolidate telling the time to the nearest minute on an analogue clock and relate to 12/24 hour digital clocks; interpret timetables

Relevant learning/previous statutory objectives:

Year Six Aut Term – Fractions

- 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, ¼ × ½ = 1⁄8]
- divide proper fractions by whole numbers [for example, 1⁄3 ÷ 2 = 1⁄6]

Also see NCETM National Curriculum resource tool: https://www.ncetm.org.uk/in-the-classroom/national-curriculum-resource-tool/

Ratio Current statutory objectives:

- *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 use 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*

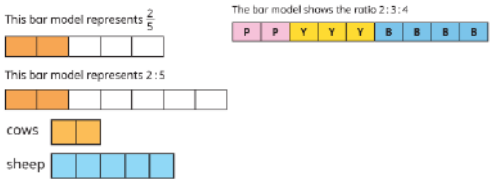
Also see NCETM National Curriculum resource tool: https://www.ncetm.org.uk/in-the-classroom/national-curriculum-resource-tool/

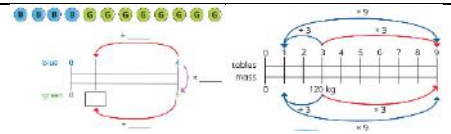
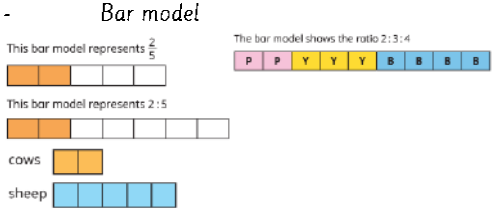
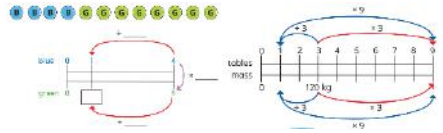
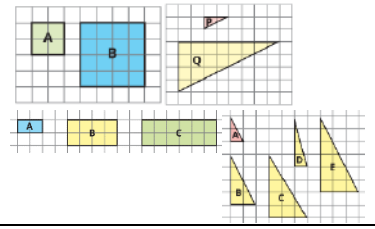
Potential misconceptions:

- *Children may see just additive relationships and not notice the multiplicative relationships.*
- *Children may not start double number lines from zero.*
- *When using double number lines, children may focus on the horizontal relationships and not notice the vertical relationships.*
- *Children may use additive rather than multiplicative relationships to make comparisons, for example "There is one more blue than red."*
- *Children may not understand the meaning of the ratio symbol, and may confuse it with a decimal point.*
- *When simplifying a ratio, children may try to use additive rather than multiplicative relationships.*
- *Children may not consider the whole when linking ratios and fractions. For example, they may think the 2 in 2 : 3 is 2/3 rather than ⅔*
- *Children may identify the correct scale of enlargement but still become confused by whether they need to multiply or divide.*
- *Children may not use the scale factor with all the dimensions of the shape.*
- *Children may use inaccurate measuring when working with shapes with diagonal lines rather than considering the vertical and horizontal distances.*
- *If shapes are in different orientations, children may struggle to identify corresponding sides or just believe the shapes cannot be similar because they do not look the same.*
- *It is important that children work systematically to ensure all corresponding sides are in the same proportion, rather than just one or two.*
- *Children may confuse the "total" amount for the value of a missing part.*
- *Children may use additive rather than multiplicative relationships.*
- *In one-step proportion problems, children may multiply by the wrong amount or add instead of multiply.*
- *When using a double number line in two-step proportion problems, children may count the step to zero and divide by the wrong amount.*
- *Children may only scale one of the ingredients instead of all of them.*
- *Children may not see efficient methods for two-step problems.*
- *Children may make errors when they need to convert between units of measure.*

Vocabulary =-Ratio and proportion						
Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
						relative size

						missing values
						integer multiplication
						percentages
						scale factor
						unequal sharing & grouping

Area of Study	No of hrs	Suggested Sequence and Key Questions for Assessment	Suggested Concrete and Pictorial Resources	Extension tasks
Number Ratio **Week 1**	5	**Suggested sequence of learning:** - Baseline Assessment - To recognise additive and multiplicative relationships - To accurately use ratio language - To recognise and use the ratio symbol - To convert between ratio and fractions - To draw to scale **Key Questions:** *How can you describe the relationship between these two numbers using addition/multiplication? What is the inverse of addition/multiplication? Is the relationship in the sequence additive or multiplicative? For every _____, how many _____ are there? What number is a common factor of ____ and ____? How can you use this to make the ratio simpler? How many _____ would there be if there were _____? What does the : symbol mean in the context of ratio? Are the ratios 2 : 3 and 3 : 2 the same? How many parts are there altogether? How can you represent the ratio/fraction as a bar model? How do you know if a diagram is drawn*	- Double sided counters  - Relational diagram  - Bar model  - Numberline	**Suggested grey tasks:** Pumpkin Pie Problem – https://nrich.maths.org/1026 What Numbers Can We Make? – https://nrich.maths.org/7405 **Useful sentence stems:** ___ × ___ = ___and ___ + ___ = ___ ___ is ___ times the size of ___ ___ is ___ the size of ___ For every ___, there are ___ If there were ___, there would be ___ A common factor of ___ and ___ is ___ For every ___, there are ___, which can be written as ___: ___ The ratio of ___ to ___ is ___:___

		to scale? Why might you need to draw a scale diagram? How is a scale like a ratio?		*In the ratio ___:___, the first number represents ___ and the second number represents ___* *There are ___ parts altogether.*
Number *Ratio* **Week 2**	5	***Suggested sequence of learning:*** - *To use scale factors* - *To recognise similar shapes* - *To solve ratio problems* - *To solve proportion problems* - *To solve problems involving ingredients for recipes* - *End of Unit Assessment* ***Key Questions:*** *What does "scale factor" mean? How do you draw an enlargement of a shape? How can you work out the scale factor of enlargement between two shapes? Do you need to multiply or divide to find the missing length? How do you know? Have all the sides been enlarged by the same amount? What do you notice about corresponding angles in similar shapes? Does it matter that the shapes are in a different orientation? What is the multiplicative relationship between ___ and ____?*	- *Bar model*  - *Numberline*  - *Squared paper* 	***Suggested grey tasks:*** Number the Sides – https://nrich.maths.org/5639 Four Triangles Puzzle – https://nrich.maths.org/141 ***Useful sentence stems:*** *___ squares represents ___, so each square represents ___* *Each square represents ___, so ___ squares represent ___ × ___ = ___* *OR ___ ÷ ___ = ___* *The shape is ___ times as big, so the scale factor of the enlargement is ___* *If a shape has been enlarged by a scale factor of ___, I need to ___ by ___ to find the original dimensions.* *Each side of the shape is ___ times the size, so the shape has been enlarged by a scale factor of ___. Therefore, the shapes are ___* *I know that the shapes are similar, because the corresponding sides have been enlarged by the same ___, and the corresponding angles are ___*

Number - Algebra

Suggested starters (ongoing, throughout the term) with links to relevant resources:

- *Identify multiples and count from (and back to) 0 in multiples of 3, 4, 6, 7, 8, 9, 11,12, 25, 50, 100 and 1000*
- *Count from (and back to) 0 in multiples of 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9 (using known multiples and knowledge of place value)*

- Recall and use multiplication and division facts for the 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 times tables (up to the 12th multiple)
- Find all factor pairs of a given number; find all common factors for a pair of numbers; identify common multiples
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- Convert between different units of measurement (including time), using decimal notation up to three decimal places when appropriate
- Consolidate telling the time to the nearest minute on an analogue clock and relate to 12/24 hour digital clocks; interpret timetables

Relevant Prior learning/previous statutory objectives:

Year 5

Number and place value

- 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 through zero
- solve number problems and practical problems that involve all of the above

Multiplication and division

- 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.

Measurement

- measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres
- calculate and compare the area of squares and rectangles including using standard units, square centimetres (cm2) and square metres (m2) and estimate the area of irregular shapes
- use all four operations to solve problems involving measure (e.g. length, mass, volume, money) using decimal notation including scaling.

Also see NCETM National Curriculum resource tool: https://www.ncetm.org.uk/in-the-classroom/national-curriculum-resource-tool/

Algebra Current statutory objectives:

- *use simple formulae*
- *generate and describe linear number sequences*
- *express missing number problems algebraically*
- *find pairs of numbers that satisfy number sentences involving two unknowns*
- *enumerate possibilities of combinations of two variables*

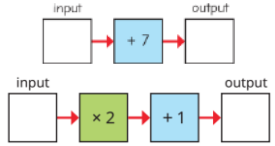
Also see NCETM National Curriculum resource tool: https://www.ncetm.org.uk/in-the-classroom/national-curriculum-resource-tool/

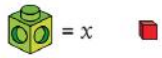
Potential misconceptions:

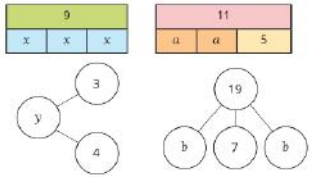
- *Children may carry out the function on the output when working out the missing input, rather than using the inverse operation.*
- *Children may find a function that works for some of the numbers given, but not all.*
- *Children may not follow the order of the functions, and it is important to explore the effect this can have.*
- *When finding the input, children may do the inverse of the first function first.*
- *Children may assume that certain letters always represent specific numbers, for example a means 1, b means 2, c means 3 and so on.*
- *Children may not see $a \times 3$ and $3a$ as the same thing.*
- *Children may think that a is always equal to 1, b always equal to 2 and so on.*
- *If $a = 3$, children may see $2a$ as 23 rather than $2 \times 3 = 6$*
- *Children may misinterpret expressions such as $2a + 3$ as $5a$.*
- *Children may mix up the variables in a formula, for example using $w = 7d$ to represent the formula for the number of days in a given number of weeks*
- *Children may look to work out the value rather than represent the information as an equation.*
- *Children may make errors using algebraic notation, for example confusing $3x$ and $x + 3$*
- *Children may not use the inverse operation to solve an equation, for example $x + 3 = 5$, so $x = 8$*
- *Children may think that the values of letters are permanently fixed. For example, having solved an equation for x, they may apply this value for x to a different equation.*
- *Children may think the values of letters are permanently fixed. For example, having solved an equation for x, they may apply this value for x to a different equation.*
- *When "working backwards" to solve equations, children may do the inverse operations in the wrong order.*
- *Children may not consider zero as a possible value for one of the unknowns.*
- *Children may need support to work systematically to find all possible solutions.*
- *Children may use trial and error rather than a bar model approach.*
- *Children may think that there are several possible solutions, as in the last step.*

Vocabulary - Algebra

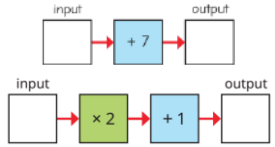
Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
						formulae
						linear number sequences
						algebraically
						equation
						unknowns
						combinations
						variables

Area of Study	No of hrs	Suggested Sequence and Key Questions for Assessment	Suggested Concrete and Pictorial Resources	Extension tasks
Number Algebra **Week 1**	5	**Suggested sequence of learning:** - Baseline Assessment(s) - To use 1-step function machines - To use 2-step function machines - To form expressions - To use substitution - To use formulae	- Function machines  - Tables Input 3 4 5 10 Output - Equipment for representing values	**Suggested grey tasks:** https://nrich.maths.org/5714 Shape Times Shape https://nrich.maths.org/6554 Coded Hundred Square (1 or R) https://nrich.maths.org/consecutivenumbers (Consecutive numbers)

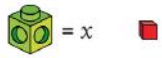
<table>
<tr>
<td></td>
<td></td>
<td>Key Questions:
What is the difference between an input and an output? If you know the input and function, how can you work out the output? If you know the output and function, how can you work out the input? What is the inverse of _____? Which function should you apply first? When given the output, which function should you do first to find the input? Does it always matter what order you apply the functions? What could x represent? How can you represent this expression using a bar model? How else can you write a + a? What is the same and what is different about the expressions x + 5 and 5x? What does "substitute" mean? What is a formula? How is a formula similar to/different from an expression?</td>
<td> 

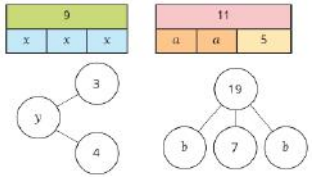
- Part-whole models (inc. bar models)
 
</td>
<td>Useful sentence stems:
If the input is ___, the output is ___
If I know the output, I need to …
If the input is ___ and the output is ___, then the function is ___
First, I am going to ___, then I am going to ___
The inverse of ___ then ___ is ___ then ___
___ more than x can be written as ___
___ + ___ + ___ = 3 × ___ = ___
If I have ___x and I add/subtract ___x, then I have ___x altogether
If ___ is worth ___, then ___ is worth ___
To work out the value of ___, I need to replace the letter ___ with the number ___ and then calculate ___
To work out ___ when I know ___, I substitute ___ into the formula.</td>
</tr>
<tr>
<td rowspan="2">Number

Algebra

Week 2</td>
<td rowspan="2">5</td>
<td>Suggested sequence of learning:
- To recognise and form equations
- To solve 1-step equations
- To solve 2-step equations
- To find pairs of values
- To solve problems with two unknowns</td>
<td>- Function machines
 

- Tables
 

- Equipment for representing values
 

- Part-whole models (inc. bar models)
 
</td>
<td>Suggested grey tasks:
https://nrich.maths.org/5714 Shape Times Shape

https://nrich.maths.org/5633 Four Go (game)

https://nrich.maths.org/13452 Number Lines in Disguise (I or R)</td>
</tr>
<tr>
<td>Key Questions:
Is an equation the same as or different from a formula? What is the difference between an equation and an expression? Can you write the equation a different way? How can you represent the problem as a bar model? How can you represent the problem as an equation? Is there more than one possible solution? Why are there several possible answers for this question? Have you found all the possible pairs of values? How do you know?</td>
<td>Useful sentence stems:
The equation ___ means that the expression ___ is equal to ___
The inverse of ___ is ___
If ___ has been added to a number to give ___, then to work out the number I need to ___ from ___
The first step in solving the equation is to ___. The second step in solving the equation is to ___.
In the equation x + y = ___, if x = ___ then y = ___
If the product of p and q is ___, then p could be ___ and q could be ___</td>
</tr>
</table>

Number - Decimals

Suggested starters (ongoing, throughout the term) with links to relevant resources:

- Identify multiples and count from (and back to) 0 in multiples of 3, 4, 6, 7, 8, 9, 11,12, 25, 50, 100 and 1000
- Count from (and back to) 0 in multiples of 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9 (using known multiples and knowledge of place value)
- Recall and use multiplication and division facts for the 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 times tables (up to the 12th multiple)
- Find all factor pairs of a given number; find all common factors for a pair of numbers; identify common multiples
- Add, subtract, multiply and divide numbers mentally using known facts and a range of strategies **(See Mental Calculation Strategies, 2017)**
- Read, write, compare and order numbers within 5,000,000
- Read, write, compare and order numbers with up to three decimal places
- Multiply numbers by 10, 100 and 1000 and divide corresponding numbers by 10, 100 and 1000 (with up to three decimal places)
- Count forwards and backwards with positive and negative whole numbers, including through zero; calculate intervals across zero (in context)
- Recognise, describe and extend linear number sequences, including those involving decimals, e.g. 0.9, 1.8, 2.7; find the term to term rule
- Compare and order fractions, including those greater than one (consider the use of diagrams and fraction walls)
- Find unit and non-unit fractions of numbers and quantities e.g. 1/7 of £56; 3/7 of £56
- Know and use the vocabulary of prime numbers and establish whether a number up to 100 is a prime number
- Recognise and use square numbers (up to 12 x 12) and the notation e.g. $9^2 = 81$
- Convert between different units of measurement (including time), using decimal notation up to three decimal places when appropriate
- Consolidate telling the time to the nearest minute on an analogue clock and relate to 12/24 hour digital clocks; interpret timetables

Decimals Prior learning/previous statutory objectives:

Year Five

- 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 and compare numbers with up to three decimal places
- solve problems involving number up to three decimal places

Year Four

- 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

Also see NCETM National Curriculum resource tool: https://www.ncetm.org.uk/in-the-classroom/national-curriculum-resource-tool/

Decimals Current statutory objectives:

- associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [for example, 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
- Also see NCETM National Curriculum resource tool: https://www.ncetm.org.uk/in-the-classroom/national-curriculum-resource-tool/

Potential misconceptions:

- Children may confuse the words "thousand" and "thousandth", "hundred" and "hundredth", and "ten" and "tenth".
- Children may use the incorrect number of placeholders, and so write the incorrect number.
- Children may confuse the words "thousand" and "thousandth", "hundred" and "hundredth", and "ten" and "tenth".
- Children may use the incorrect number of placeholders, and so write the incorrect number.
- The phrase "round down" can lead children to round too low, for example rounding 6.923 down to 6.91 rather than 6.92
- Children may not line up digits in the correct place value columns.
- When an exchange is needed in addition, children may forget to add the exchanged number.
- Children may forget to put the decimal point in their answer.
- Children may add a zero when multiplying a decimal number by 10, or two zeros when multiplying by 100, for example 5.13 × 10 = 5.130
- Children may think of the multiplication as moving the decimal point, but it is important to refer to the digits moving instead as they become, for example, 10 times greater.
- Children may try to remove a zero when dividing by 10, two zeros when dividing by 100 and so on.
- Children may move the decimal point as well as the digits. Encourage them to move digits to the right as they become, for example, one-tenth of the size.
- Children may make mistakes with exchanges where decimals are involved, for example thinking that 0.5 × 3 = 0.15
- When using related facts to multiply decimals, children may put the answer as 100 times smaller instead of 10 times smaller, for example 1.2 × 3 = 0.36
- When using related facts, children may make the number being divided one-hundredth the size, but only make the answer one-tenth the size, for example 8 ÷ 2 = 4, so 0.08 ÷ 2 = 0.4
- When using the formal written method for division, children may forget to add the decimal point.

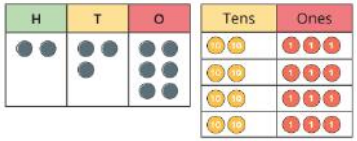
- *Children may be unsure which operation is needed to solve a problem.*
- *When solving questions in context, children may forget the units of measure.*
- *If a unit conversion is needed, for example kilograms to grams, children may multiply or divide by the incorrect amount.*

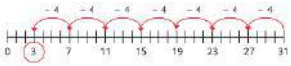
Vocabulary - Fractions/Decimals/Percentages						
Reception	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
	whole	three quarters	tenths	decimal equivalence	fifth	
	half	third		hundredths	thousandths	
	quarter	equivalent fractions		convert	mixed numbers	
	equal parts	unit fractions		proper fractions	per cent %	
		non unit fractions		improper fractions	factors	
		numerator		decimal point	integer	
		denominator			complements	
		one whole				

Area of Study	No of hrs	Suggested Sequence and Key Questions for Assessment	Suggested Concrete and Pictorial Resources	Extension tasks

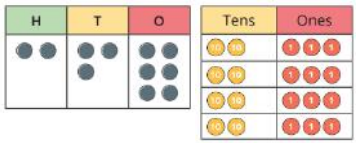
<table>
<tr>
<td rowspan="2">Number

Decimals

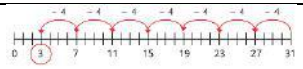
Week 1</td>
<td rowspan="2">5</td>
<td>Suggested sequence of learning:
- Baseline Assessment(s)
- To recognise place value within 1
- To recognise place value of integers and decimals
- To round decimals
- To add and subtract decimals
- To multiply by 10, 100 and 1,000</td>
<td rowspan="2">- Singaporean counters
 
- Place value charts
 

- Number line
  </td>
<td>Suggested grey tasks:
https://nrich.maths.org/10326 Spiralling Decimals</td>
</tr>
<tr>
<td>Key Questions:
What does each digit in a decimal number represent? How do you know? How many tenths/hundredths/thousandths are there in 1 whole? What is the value of the digit in the number ? Which is greater, 0.3 or 0.14? How do you know? What digit is in the column? Which is greater, 1.897 or 3.1? How do you know? What is the next/previous integer/tenth/hundredth? If you are rounding to the nearest , which column do you need to look at to decide where to round to? Which multiple should you round to if the digit is a 5? How can you represent this question using place value counters? Do you have enough to make an exchange? If there are not enough tenths/hundredths/thousandths for the subtraction, what do you need to do? What number is 10 times the size of ? What number is 100 times the size of ? What number is 1,000 times the size of ? How can you multiply decimal numbers using a Gattegno chart? How can you use counters on a place value chart to multiply numbers by 10/100/1,000?</td>
<td>Useful sentence stems:
There are ___ tenths, ___ hundredths and ___ thousandths. The number is ___
There are ___ in ___
___ is 10/100/1,000 times the size of ___
___is one-tenth/hundredth/thousandth the size of ___
To multiply by ___, I move the digits ___ places to the _
The previous/next multiple of ___ is ___ is closer to ___ than ___
_ rounded to the nearest _ is _
___ added to ___ is equal to ___
___ subtract ___ is equal to ___
I do/do not need to make an exchange because …</td>
</tr>
<tr>
<td rowspan="2">Number

Decimals

Week 2</td>
<td rowspan="2">5</td>
<td>Suggested sequence of learning:
- To divide by 10, 100 and 1,000
- To multiply decimals by integers
- To divide decimals by integers
- To multiply and divide decimals in context
- End of Unit Assessment</td>
<td rowspan="2">- Singaporean counters
 
- Place value charts
 

- Number line</td>
<td>Suggested grey tasks:
https://nrich.maths.org/5632 Route Product</td>
</tr>
<tr>
<td>Key Questions:
What is one-tenth the size of ? • What is one-hundredth the size of ? • What is one-thousandth the size of ? What is an integer? How is multiplying decimal numbers similar to/different from multiplying whole numbers? Do you have enough</td>
<td>Useful sentence stems:
___ is 10/100/1,000 times the size of ___
___is one-tenth/hundredth/thousandth the size of ___</td>
</tr>
</table>

		hundredths/tenths/ones to make an exchange? What happens to tenths or hundredths that you cannot group? How can you tell what operation you need to perform to answer this question? How can you draw a bar model to represent this problem?		*To multiply by ___, I move the digits ___ places to the ___* *I need to exchange 10 _ for 1 _* *I know that ___ × ___ = ___, so I also know that ___ × ___ = ___*

Number - Fractions, Decimals and Percentages

Suggested starters (ongoing, throughout the term) with links to relevant resources:

- *Identify multiples and count from (and back to) 0 in multiples of 3, 4, 6, 7, 8, 9, 11,12, 25, 50, 100 and 1000*
- *Count from (and back to) 0 in multiples of 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9 (using known multiples and knowledge of place value)*
- *Recall and use multiplication and division facts for the 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 times tables (up to the 12th multiple)*
- *Find all factor pairs of a given number; find all common factors for a pair of numbers; identify common multiples*
- *Add, subtract, multiply and divide numbers mentally using known facts and a range of strategies* **(See Mental Calculation Strategies, 2017)**
- *Read, write, compare and order numbers within 5,000,000*
- *Read, write, compare and order numbers with up to three decimal places*
- *Multiply numbers by 10, 100 and 1000 and divide corresponding numbers by 10, 100 and 1000 (with up to three decimal places)*
- *Count forwards and backwards with positive and negative whole numbers, including through zero; calculate intervals across zero (in context)*
- *Recognise, describe and extend linear number sequences, including those involving decimals, e.g. 0.9, 1.8, 2.7; find the term to term rule*
- *Compare and order fractions, including those greater than one (consider the use of diagrams and fraction walls)*
- *Find unit and non-unit fractions of numbers and quantities e.g. 1/7 of £56; 3/7 of £56*
- *Know and use the vocabulary of prime numbers and establish whether a number up to 100 is a prime number*
- *Recognise and use square numbers (up to 12 x 12) and the notation e.g. $9^2 = 81$*
- *Convert between different units of measurement (including time), using decimal notation up to three decimal places when appropriate*
- *Consolidate telling the time to the nearest minute on an analogue clock and relate to 12/24 hour digital clocks; interpret timetables*

Relevant Prior learning/previous statutory objectives:

Year 5

- 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 and write mathematical statements > 1 as a mixed number [for example, 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 and compare numbers with up to three decimal places
- solve problems involving number up to three decimal places
- 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
- solve problems which require knowing percentage and decimal equivalents of ½, ¼, 1/5, 2/5, 4/5 and those fractions with a denominator of a multiple of 10 or 25.

Also see NCETM National Curriculum resource tool: https://www.ncetm.org.uk/in-the-classroom/national-curriculum-resource-tool/

Current statutory objectives:

- 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, ¼ × ½ = 1/8]
- divide proper fractions by whole numbers [for example, 1/3 ÷ 2 = 1/6]
- associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [for example, 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.

Also see NCETM National Curriculum resource tool: https://www.ncetm.org.uk/in-the-classroom/national-curriculum-resource-tool/

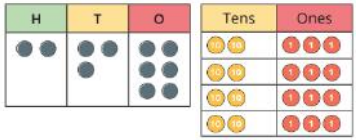
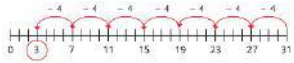
Potential misconceptions:

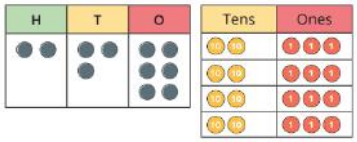
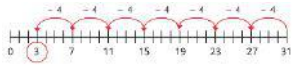
- If children are not confident finding equivalent fractions, they may find converting more complex fractions to decimals difficult.
- Children may be comfortable with the idea of finding a common denominator of 100, but struggle with examples that do not lend themselves to this strategy, for example 1 8
- Children may interpret the division the wrong way around, for example 4 5 as 5 ÷ 4 rather than 4 ÷ 5
- Children may need support to use extra zeros as placeholders when dividing, to avoid errors such as 3 ÷ 4 = 0.7 remainder 2
- Children may think that 1% means 1 unit rather than 1 part out of 100 equal parts.
- If children are not confident with dividing 100 by 10, 5, 4 and 2, they may struggle to use bar models to find common percentages.
- Children need to be able to fluently find equivalent fractions.
- Children may not be confident with factors of 100, including 20 and 25
- Children may not be confident with methods for finding equivalent fractions – both fractions with a denominator of 100 and those that need simplifying.
- Children may decimalise the percentage, for example 0.67%.
- Children may turn numerators into decimals or percentages even if the denominator is not 100, for example 45 50 = 0.45 = 45%.
- Knowing that to find 10% of a number they divide by 10 may confuse some children, leading to misconceptions such as dividing by 20 to find 20%.
- Children may answer every question by dividing the number by 100 to find 1% and then multiplying, rather than solving in one step.
- Children often do not explore subtraction as an efficient strategy, particularly subtracting from the whole, for example 95% = 100% – 5%.
- Children may rely on finding 1% and then multiplying it, rather than considering more efficient methods.
- Children may be confused with two-step solutions, for example saying "30% of a number is 12, so I will multiply 12 by 30"
- Children may use inefficient methods to multiply, for example using the formal method for × 10

Vocabulary - Fractions/Decimals/Percentages

Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
	whole	three quarters	tenths	decimal equivalence	fifth	
	half	third		hundredths	thousandths	

	quarter	equivalent fractions		convert	mixed numbers	
	equal parts	unit fractions		proper fractions	per cent %	
		non unit fractions		improper fractions	factors	
		numerator		decimal point	integer	
		denominator			complements	
		one whole				

Area of Study	No of hrs	Suggested Sequence and Key Questions for Assessment	Suggested Concrete and Pictorial Resources	Extension tasks
Number FDP **Week 1**	5.4	**Suggested sequence of learning:** - Baseline Assessment(s) - To recognise and represent equivalent decimals and fractions - To convert between fractions and decimals using division - To recognise and represent percentages - To convert between fractions and percentages - To find equivalent fractions, decimals and percentages **Key Questions:** *If the whole has been split into 10/100 equal parts, what is each part worth as a fraction/decimal? If you know that is equivalent to , what is as a decimal? How can you convert fractions with a denominator of 100 to decimals? How can you convert fractions with a denominator that is a factor of 100 to decimals? How can you find equivalent fractions? Why might it be helpful to find an equivalent fraction with a denominator of 100/1,000? If the denominator is , how many equal parts are there? What are you dividing by? Can you share 1 one into 4 equal parts? What can you exchange the 1 one for? What can you exchange the remaining tenths for? What do you notice about the decimal parts*	- Singaporean counters  - Place value charts  - Number line 	**Suggested grey tasks:** https://nrich.maths.org/91 Maze 100 https://nrich.maths.org/1130 Reach 100 https://nrich.maths.org/1138 Factor Lines (i or R) **Useful sentence stems:** *The first/second digit after a decimal point represents ___* *Whatever I do to the ___, I need to do to the ___* *The fraction can be expressed as ___ ÷ ___* *I can exchange 1 for ___*

		when dividing 1 by 3? What does "recurring" mean? What does "per cent" mean? How many parts are shaded/not shaded? What does 100% mean? How many equal parts is the bar model split into? What percentage is each part worth? How many ways could you make 95% using 50%, 25%, 10%, 5% and 1%? How do you find an equivalent fraction? How many 20s/25s are there in 100?		*If the whole is shared into 100/10/5/4/2 equal parts, each part represents ___%.* *If ___ parts are shaded, the percentage shown is ___%.* *To find ___%, I can halve ___%.* *___ is equivalent to ___*
Number FDP **Week 2**	5	**Suggested sequence of learning:** - To compare and order fractions, decimals and percentages - To find percentages of amounts (one step) - To find percentages of amounts (multi-step) - To solve missing number problems with percentages - End of Unit Assessment **Key Questions:** *If the whole is 100%, what is 1 2/ 1 4/ 1 5? If 1/10 is equal to 10%, what is 3/10 equal to? How many 5s are there in 100? Can the fraction be simplified? How do you know? What fraction/decimal/percentage is equivalent to? Which is the greater amount, or ? How do you know? Which of the amounts are greater than a half? Which of the amounts is closer to 1 whole? Where do these amounts go on a number line? Is it easier to convert the numbers to fractions, decimals or percentages? How can you represent this question with a bar model? How many lots of 10/20/25/50% are there in 100%? How can you find 1%/10%/20%/25%/50% of a number? How can you use 10% to find 30%? How can the percentage 36% be made using 1%, 5%, 10%, 20%, 25%, 50% and 100%? If you know 1% of an amount, how can you work out 37% of that amount? If you know 1% of an amount, how can you work out 99% of that amount? If you know % of a number, how can you work out the whole? How many lots of % are there in 100%?*	- Singaporean counters  - Place value charts  - Number line 	**Suggested grey tasks:** https://nrich.maths.org/7725 (If the World Were a Village) https://nrich.maths.org/6945 Doughnuts Percents **Useful sentence stems:** *If the whole is equal to 100%, then each part is worth ___%* *___ is greater/smaller than one half, and ___ is smaller/ greater than one half, so ___ is greater/smaller than ___* *___ is equivalent to ___, so it is greater/smaller than ___* *There are ___ lots of ___% in 100%* *To find ___% of a number, I need to divide ___ by ___* *The whole amount is worth ___%. To find ___%, I need to divide the whole by ___*

Measurement - Area, Perimeter and Volume

Suggested starters (ongoing, throughout the term) with links to relevant resources:

- Identify multiples and count from (and back to) 0 in multiples of 3, 4, 6, 7, 8, 9, 11,12, 25, 50, 100 and 1000
- Count from (and back to) 0 in multiples of 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9 (using known multiples and knowledge of place value)
- Recall and use multiplication and division facts for the 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 times tables (up to the 12th multiple)

- Find all factor pairs of a given number; find all common factors for a pair of numbers; identify common multiples
- Add, subtract, multiply and divide numbers mentally using known facts and a range of strategies **(See Mental Calculation Strategies, 2017)**
- Read, write, compare and order numbers within 5,000,000
- Read, write, compare and order numbers with up to three decimal places
- Multiply numbers by 10, 100 and 1000 and divide corresponding numbers by 10, 100 and 1000 (with up to three decimal places)
- Count forwards and backwards with positive and negative whole numbers, including through zero; calculate intervals across zero (in context)
- Recognise, describe and extend linear number sequences, including those involving decimals, e.g. 0.9, 1.8, 2.7; find the term to term rule
- Compare and order fractions, including those greater than one (consider the use of diagrams and fraction walls)
- Find unit and non-unit fractions of numbers and quantities e.g. 1/7 of £56; 3/7 of £56
- Know and use the vocabulary of prime numbers and establish whether a number up to 100 is a prime number
- Recognise and use square numbers (up to 12 x 12) and the notation e.g. $9^2 = 81$
- Convert between different units of measurement (including time), using decimal notation up to three decimal places when appropriate
- Consolidate telling the time to the nearest minute on an analogue clock and relate to 12/24 hour digital clocks; interpret timetables

Relevant Prior learning/previous statutory objectives:

Year 5

- convert between different units of metric measure (for example, kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and 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 (cm^2) and square metres (m^2) and estimate the area of irregular shapes
- estimate volume [for example, using 1 cm^3 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.
- 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.

Also see NCETM National Curriculum resource tool: https://www.ncetm.org.uk/in-the-classroom/national-curriculum-resource-tool/

Current statutory objectives:

- 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 the 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]

Also see NCETM National Curriculum resource tool: https://www.ncetm.org.uk/in-the-classroom/national-curriculum-resource-tool/

Potential misconceptions:

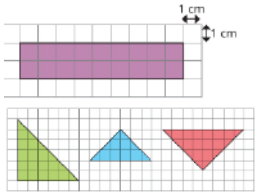
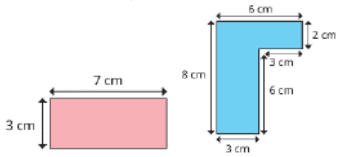
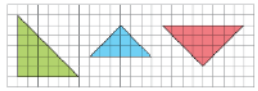
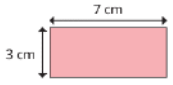
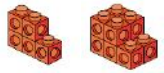
- Children may confuse area and perimeter.
- Children may not use factor pairs to notice shapes that have the same area or to create shapes with the same area.
- When finding the area of a rectilinear shape, children may not split the shape in the most efficient way.
- When calculating the perimeter, children may not use efficient strategies, instead relying on adding lengths in order.
- Children may count half squares as full squares.
- Without an efficient method, children may not count squares accurately.
- If a triangle is not placed on a line, children may believe it is impossible to estimate its area.
- Children may not be able to identify the base and perpendicular height, choosing the incorrect measurements to multiply.
- Children may not associate multiplying by 1/2 with dividing by 2.
- Children may think that the base is always at the bottom of the triangle.
- Children may think that the measurement giving the perpendicular height is always labelled inside the triangle.
- When finding the area of a parallelogram, children may try to use the formula for finding the area of a rectangle or a triangle.
- Children may believe that shapes that look different visually must have different volumes.
- Children may ignore cubes that cannot be "seen" in an image, so it is important to discuss the possibility of hidden cubes and how children might know for certain that more cubes exist even if they cannot see them.
- Children may think that it is impossible to find the volume without cubes.
- Children may think that they must always multiply $l \times w \times h$ in that order, which may not always be the most efficient calculation.

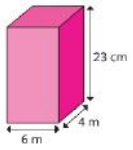
- *When finding the volumes of cubes, children may think that they need more than one measurement.*

Vocabulary - Measurement (Measure and Length)						
Reception	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
measure	compare	standard units	millimetre mm	kilometres km	decimal notation	conversion
wide(er)		estimate	perimeter	rectilinear figure	scaling	miles
narrow(er)		order		area	metric units	formulae
compare		record results			imperial units	parallelograms
long(er)(est)		centimetre cm			inches	triangles
short(er)(est)		metre m			compound shape	feet
length					irregular shapes	
					square centimetres	
					square metres	

Vocabulary - Measurement (Height, Weight and Capacity)

Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
height	mass	kilogram kg			cubic centimetre	cubic metre
long(er)/short(er)	volume	gram g			pounds	cubic millimetre
tall(er)/short(er)		quarter full			pints	cubic kilometre
weight		three quarters full				gallons
capacity		litres l				stones
heavy/light		millilitres ml				ounces
heavier than		temperature				
lighter than		Celsius				
big/bigger/biggest						
full/empty						
more than						
less than						
half/half full						

Area of Study	No of hrs	Suggested Sequence and Key Questions for Assessment	Suggested Concrete and Pictorial Resources	Extension tasks
Number Area, Perimeter and Volume **Week 1**	5	**Suggested sequence of learning:** - Baseline Assessment(s) - To identify shapes with the same area - To calculate the perimeter and area of rectilinear shapes - To calculate the area of a triangle by counting squares - To calculate the area of a right-angled triangle **Key Questions:** *How can you find the area of this shape? Is there more than one way? Do shapes that have the same area have to look the same? How can you use factor pairs to find shapes that would have the same area? How would you draw more than one rectangle that has an area of __cm2? What is perimeter? What is area? How can you find the perimeter of the rectangle? What is the formula to find the area of a rectangle? How can you split the rectilinear shape into rectangles? Is there more than one way? How is finding the area/perimeter of a __ different to finding the area/perimeter of a rectangle? How is it similar? How can you work out the other side lengths? How will you count the squares accurately? Is more or less than half the square shaded? Can you see any parts of squares that combine to make approximately one full square? What do you notice about finding the area of a rectangle and finding the area of a right-angled triangle? What is the formula to find the area of a right-angled triangle? What does "perpendicular" mean? How do you know which measurement is the base/ perpendicular height?*	- Shapes on cm grid  - Shapes with dimensions  	**Suggested grey tasks:** https://nrich.maths.org/4963 Torn Shapes https://nrich.maths.org/10344 Through the Window (connected with above) https://nrich.maths.org/10333 Dicey Perimeter/Area **Useful sentence stems:** *The total number of squares in the rectangle is __. The area of the rectangle is __ cm2* *The length of the rectangle is __cm. The width of the rectangle is __ cm. The area of the rectangle is __ cm2.* *The formula to find the area of a rectangle is …* *To find the perimeter of a rectangle, I …* *The triangle has __ full squares. The triangle has __ half squares. The area of the triangle is __ cm2/The approximate area of the triangle is __cm2.* *The formula for the area of a triangle is …*
Number Area, Perimeter and Volume **Week 2**	5	**Suggested sequence of learning:** - To calculate the area of triangles - To calculate the area of a parallelogram - To calculate volume by counting cubes - To calculate the volume of cuboids - End of unit Assessment **Key Questions:**	- Shapes on cm grid  - Shapes with dimensions  - Link cubes  - Cuboids	**Suggested grey tasks:** https://nrich.maths.org/4963 Torn Shapes https://nrich.maths.org/10344 Through the Window (connected with above) https://nrich.maths.org/10333 Dicey Perimeter/Area **Useful sentence stems:** *The formula for the area of a triangle is …*

		How could you change the parallelogram into a rectangle? How will this help you to find the area? How can you count the squares accurately to find the area? How do you know you have found the base/ perpendicular height? What is the formula for finding the area of a parallelogram? When you have different units, what is your first step? What is volume? How is volume different from area? How can you count the number of cubes efficiently? If each cube has a volume of 1 cubic centimetre (cm3), what is the volume of the shape? How many cubes are there in this layer? How many equal layers are there? So how can you find the volume? What is the length/width/depth of this cuboid?		*The base is ___ cm. The perpendicular height is ___ cm. The base of the parallelogram is ___ cm. The perpendicular height of the parallelogram is ___cm. The area of the parallelogram is …* *The volume of the shape is ___ cubes/cm³* *There are ___ cubes in each layer and ___ equal layers, so the volume is ___ cubes.*

Statistics

Suggested starters (ongoing, throughout the term) with links to relevant resources:

- *Identify multiples and count from (and back to) 0 in multiples of 3, 4, 6, 7, 8, 9, 11,12, 25, 50, 100 and 1000*
- *Count from (and back to) 0 in multiples of 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9 (using known multiples and knowledge of place value)*
- *Recall and use multiplication and division facts for the 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 times tables (up to the 12th multiple)*
- *Find all factor pairs of a given number; find all common factors for a pair of numbers; identify common multiples*
- *Add, subtract, multiply and divide numbers mentally using known facts and a range of strategies* **(See Mental Calculation Strategies, 2017)**
- *Read, write, compare and order numbers within 5,000,000*
- *Read, write, compare and order numbers with up to three decimal places*
- *Multiply numbers by 10, 100 and 1000 and divide corresponding numbers by 10, 100 and 1000 (with up to three decimal places)*
- *Count forwards and backwards with positive and negative whole numbers, including through zero; calculate intervals across zero (in context)*
- *Recognise, describe and extend linear number sequences, including those involving decimals, e.g. 0.9, 1.8, 2.7; find the term to term rule*
- *Compare and order fractions, including those greater than one (consider the use of diagrams and fraction walls)*
- *Find unit and non-unit fractions of numbers and quantities e.g. 1/7 of £56; 3/7 of £56*
- *Know and use the vocabulary of prime numbers and establish whether a number up to 100 is a prime number*
- *Recognise and use square numbers (up to 12 x 12) and the notation e.g. $9^2 = 81$*
- *Convert between different units of measurement (including time), using decimal notation up to three decimal places when appropriate*
- *Consolidate telling the time to the nearest minute on an analogue clock and relate to 12/24 hour digital clocks; interpret timetables*

Relevant Prior learning/previous statutory objectives:

Year 5

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

Also see NCETM National Curriculum resource tool: https://www.ncetm.org.uk/in-the-classroom/national-curriculum-resource-tool/

Current statutory objectives:

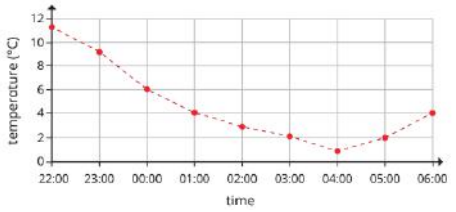
- *interpret and construct pie charts and line graphs and use these to solve problems*
- *calculate and interpret the mean as an average*

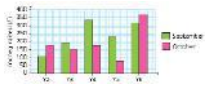
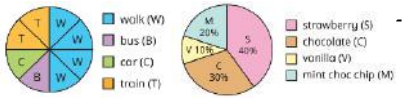
Also see NCETM National Curriculum resource tool: https://www.ncetm.org.uk/in-the-classroom/national-curriculum-resource-tool/

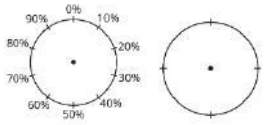
Potential misconceptions:

Vocabulary Statistics						
Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
		pictograms	table	time graph	timetable	pie chart

		tally chart	bar chart	discrete data	two-way tables	mean
		block diagram	one-step problem	continuous data		
		category	two-step problem	line graph		
		sorting		comparison problem		
		totalling		sum problem		
		comparing		difference problem		
		horizontal		calculate		
		vertical		interpret		

Area of Study	No of hrs	Suggested Sequence and Key Questions for Assessment	Suggested Concrete and Pictorial Resources	Extension tasks
Number Area, Perimeter and Volume	5	**Suggested sequence of learning:** - Baseline Assessment(s) - To read and interpret line graphs - To read and interpret dual bar charts - To read and interpret pie charts - To read and interpret pie charts with percentages	- Line graphs 	**Suggested grey tasks:** https://nrich.maths.org/6288 Treasure Hunt (interactive) https://nrich.maths.org/6280 Eight Hidden Squares

<table>
<tr>
<td>Week 1</td>
<td></td>
<td>Key Questions:
How do you read information from a line graph? What does each axis represent? What is the smallest value in the data? What is the greatest? What intervals would be appropriate for this line graph? What does this line graph tell you? What does the direction of the line tell you about what happened? How can two sets of data be recorded on the same line graph? How is a dual bar chart different from a single bar chart? What information does this dual bar chart give? What is different about what the two bars show? How do you know which bar shows which information? What is the difference between ___ and ___? How much is ___ and ___ in total? What does the pie chart show? What does each section of the pie chart show? Which of the choices was the most popular? How do you know? If you know the total, how can you work out the value of one part? If you know the value of one part, how can you work out the total number? How is a pie chart different from a bar chart? What percentage does the whole pie chart represent? What percentage does half/quarter of the pie chart represent? What percentages of an amount can you work out easily? How do you work out 10% of an amount? How does this help you to work out other percentages? If you know 10%/20%/25%, how can you work out the total?</td>
<td>- Double Bar charts
 
- Pie Charts (inc. %)
 

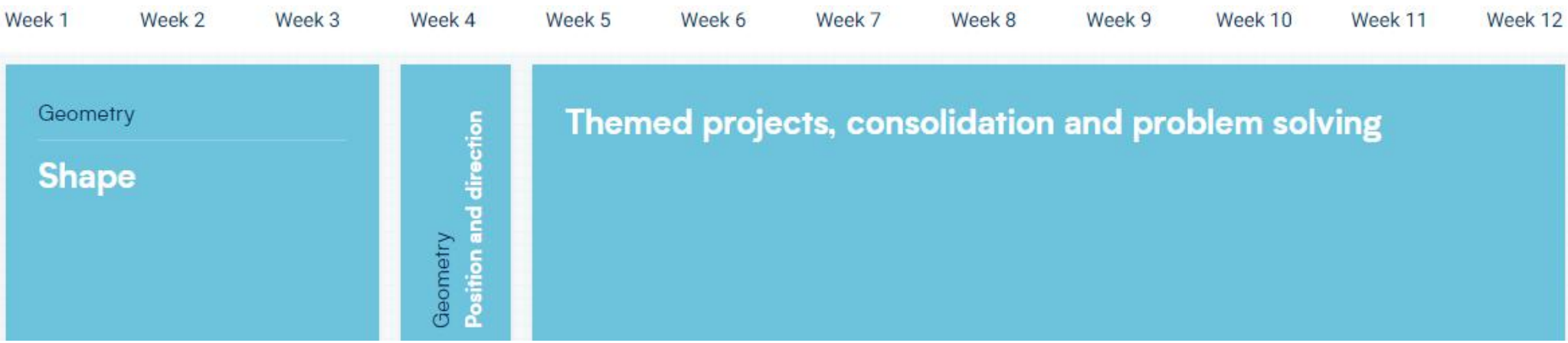
- Blank Pie Charts (inc. %)
  </td>
<td>Useful sentence stems:
The horizontal axis shows ___. The vertical axis shows ___
The difference between ___ and ___ is ___
The first bar represents ___. The second bar represents ___.
The bar is closer to ___ than ___, so I estimate that the value is _
There are ___ equal parts altogether. The total is ___, so each part is equal to ___.
There are ___ equal parts altogether, so the total is equal to ___
If ___% is worth ___, then I can multiply/divide it by to find ___%.
If the total is ___, then the part representing ___% is worth ___
If the part representing ___% is worth ___, then the total is ___</td>
</tr>
<tr>
<td rowspan="2">Number

Area, Perimeter and Volume

Week 2</td>
<td rowspan="2">5</td>
<td>Suggested sequence of learning:
- To draw pie charts
- To calculate the mean
- End of Unit Assessment</td>
<td rowspan="2"></td>
<td>Suggested grey tasks:
https://nrich.maths.org/6288 Treasure Hunt (interactive)

https://nrich.maths.org/6280 Eight Hidden Squares</td>
</tr>
<tr>
<td>Key Questions:
What percentage does the whole pie chart represent? How can I show ___% of a pie chart? How many degrees are there in a full turn? If there are in total and a part is ___, what fraction is the part of the whole? How can you work out the percentage/angle that represents each sector? How do you use a protractor? How do you know which scale to use? How can you calculate the total number of ___? What operation do you use to share equally? How can you use the total to calculate the mean? Why would you want to find the mean of a set of data? For what sets of data would it be useful to calculate the mean? How can you use the mean to work out missing information?</td>
<td>Useful sentence stems:
The fraction/percentage of ___is ___
The whole pie chart is ___°
This represents ___items of data.
Each item of data is represented by ___ ÷ ___ = ___°
The mean is the size of each part when the whole is shared ___
The total is ___. There are ___ numbers. Mean = ___ ÷ ___</td>
</tr>
</table>

Summer Term Overview



Notes for guidance

- Weeks 1-4 adapted to accommodate coverage prior to SATs assessments
- Timescales may vary depending upon the emergent needs of the children/class. However, teachers are encouraged to ensure that coverage is achieved prior to the end of the year.
- In each sequence, time has been blocked for the completion of a baseline assessment at the beginning of each new block of learning. Teachers should use this assessment to inform planning – e.g. groups for pre-teaching, intervention and differentiation.
- Likewise, in each sequence, time has been blocked for the completion of an 'end of unit' assessment, to ensure that children are ready for progression and to plan any necessary interventions.
- Included in these medium-term-plans are references to prior learning objectives, teachers are encouraged to use these to help inform assessments, the planning for their inputs and potential interventions. Teachers may wish to make use of starters that revisit these areas of learning prior to the commencement of that block of learning (e.g. completing addition and subtraction questions related to learning from the previous year/term prior to beginning a new block of addition and subtraction) – examples are included in the 'starters' box for each unit.
- At the beginning of each block of learning, there is a table showing the progression of vocabulary in this area of Mathematics across all year groups.

Geometry - Shape

Suggested starters (ongoing, throughout the term) with links to relevant resources:

- Whiterose Flashback 4 - WHOLE CLASS
- Daily 10 - Level 4 or 5 - https://www.topmarks.co.uk/maths-games/daily10 - WHOLE CLASS
- Times tables dice game - children roll dice; first to multiply together gets a point; keep score on mini whiteboard - PAIRS
- Rocket rounding - https://www.topmarks.co.uk/maths-games/rocket-rounding - WHOLE CLASS
- Tug Harder - https://nrich.maths.org/5898 - PAIRS
- Roman numeral matching pairs - PAIRS
- Column addition and subtraction with 4 and 3 digit numbers -- see Google Sheet - WHOLE CLASS
- Dicey Addition - https://nrich.maths.org/11863 - PAIRS
- Identify multiples and count from (and back to) 0 in multiples of 3, 4, 6, 7, 8, 9, 11,12, 25, 50, 100 and 1000
- Count from (and back to) 0 in multiples of 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9 (using known multiples and knowledge of place value)
- Recall and use multiplication and division facts for the 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 times tables (up to the 12th multiple)
- Find all factor pairs of a given number; find all common factors for a pair of numbers; identify common multiples
- Add, subtract, multiply and divide numbers mentally using known facts and a range of strategies **(See Mental Calculation Strategies, 2017)**
- Read, write, compare and order numbers within 5,000,000
- Read, write, compare and order numbers with up to three decimal places
- Multiply numbers by 10, 100 and 1000 and divide corresponding numbers by 10, 100 and 1000 (with up to three decimal places)
- Count forwards and backwards with positive and negative whole numbers, including through zero; calculate intervals across zero (in context)
- Recognise, describe and extend linear number sequences, including those involving decimals, e.g. 0.9, 1.8, 2.7; find the term to term rule
- Compare and order fractions, including those greater than one (consider the use of diagrams and fraction walls)
- Find unit and non-unit fractions of numbers and quantities e.g. 1/7 of £56; 3/7 of £56
- Know and use the vocabulary of prime numbers and establish whether a number up to 100 is a prime number
- Recognise and use square numbers (up to 12 x 12) and the notation e.g. $9^2 = 81$
- Convert between different units of measurement (including time), using decimal notation up to three decimal places when appropriate
- Consolidate telling the time to the nearest minute on an analogue clock and relate to 12/24 hour digital clocks; interpret timetables

Relevant learning/previous statutory objectives:

Year 5

- 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 and ½ a turn (total 180°) 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.

Also see NCETM National Curriculum resource tool: https://www.ncetm.org.uk/in-the-classroom/national-curriculum-resource-tool/

Place Value Current statutory objectives:

- 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 circle, 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.

Also see NCETM National Curriculum resource tool: https://www.ncetm.org.uk/in-the-classroom/national-curriculum-resource-tool/

Potential misconceptions:

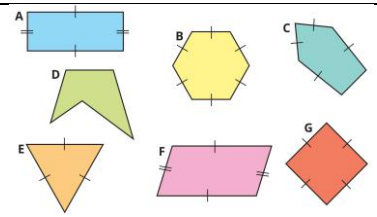
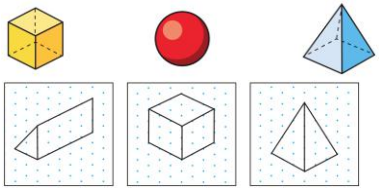
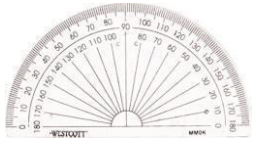
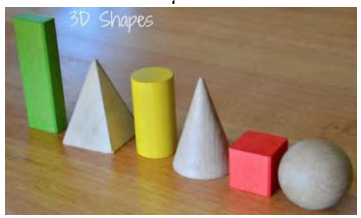
- Children may read the scale on the protractor from the wrong end.
- Children may require support when measuring reflex angles with a 180° protractor.
- Children may try to find missing angles by measuring with a protractor, rather than working them out using given facts.
- Children may make errors when using mental strategies of subtraction, for example 90 – 75 = 25
- Children may think that vertically opposite angles must be vertical in relation to each other, rather than sharing a common vertex.
- Children may think that all opposite angles are equal, rather than only those formed by intersecting straight lines.
- Children may try to use a protractor to measure missing angles, rather than working them out based on given facts.
- Children may use 360° (from angles around a point) instead of 180°.
- Children may use a protractor to measure unknown angles, rather than working them out from given facts.
- Children may wrongly identify which two angles are equal to each other in an isosceles triangle.
- Children may measure missing angles with a protractor, rather than working them out based on given facts.
- Children may need support to work out intermediate angles when the required angle cannot be found in one step.
- Children may incorrectly identify equal sides and/or angles.
- Children may try to use 180° instead of 360° as the sum of the angles in a quadrilateral.
- Children may use a protractor instead of calculating a missing angle.
- Children may multiply the number of sides by 180° to find the sum of the interior angles.
- When looking for the number of triangles, children may draw too many triangles by drawing lines from more than one vertex of the polygon.
- Children may confuse the terms "radius" and "diameter".
- Children may think that a diameter is any line across a circle, even if it does not go through the centre.
- Children may need support to decide which part of the shape to draw first.
- Children may start from the wrong end of the scale on a protractor.

- *Children may have the correct number of 2-D shapes in a net, but not in an arrangement that will create the correct shape.*
- *Children may need a reminder of vocabulary such as "prism" when naming 3-D shapes.*

Vocabulary - Geometry – Properties of Shape						
Reception	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
2-d shapes	sides	pentagon	right-angle triangle	isosceles	regular polygon	radius
rectangle	corners	hexagon	heptagon	equilateral	irregular polygon	diameter
square	properties	line of symmetry	octagon	scalene	**reflex angles**	circumference
circle	pyramids	properties	polygon	trapezium	**degrees**	dimensions
triangle	faces	cylinder	properties	rhombus	**one whole turn**	
characteristics		edges	prism	parallelogram	**angles on straight line**	
3-d shapes		vertices	**orientations**	kite	**angles around a point**	
cuboids		vertex	**angles**	geometric shapes	**vertically opposite**	
cubes			**acute angle**	quadrilaterals	**missing angles**	
cone			**obtuse angle**			
spheres			**turn**			

curved			right angles			
straight			half turn			
flat			three quarters of a turn			
			greater than right angle			
			less than right angle			
			horizontal lines			
			vertical lines			
			perpendicular lines			
			parallel lines			

Area of Study	No of hrs	Suggested Sequence and Key Questions for Assessment	Suggested Concrete and Pictorial Resources	Extension Tasks and Sentence Stems
Number Week 1	6	Suggested sequence of learning: - Baseline Assessment - To measure and classify angles - To calculate angles - To recognise and calculate vertically opposite angles - To calculate missing angles in a triangle - To calculate missing angles in equilateral and isosceles triangles - To solve missing angle problems involving triangles	- Representations of regular and irregular polygons (NB – avoid representations with third dimension)	Suggested grey tasks:

		Key Questions: ***L1:*** *What are the four types of angles? How many degrees are there in a right angle? How can you describe an acute/obtuse/reflex angle? How can you use a protractor to measure an angle? Where on the angle do you place the protractor? Does it matter which end of the protractor you start from? How can you use a protractor to measure a reflex angle?* ***L2:*** *How can you calculate angles without using a protractor? What sort of angle is shown by a square marker? What do angles within a right angle add up to? What do angles on a straight line add up to? What do angles around a point add up to? Which angles are already given? How can you use these to calculate the missing angle? Is there more than one way to work out the answer?* ***L3:*** *What are vertically opposite angles? How do you know that the angles are vertically opposite? Which angles are the same size? How do you know? What number sentences can you write about vertically opposite angles? How can you find the size of the missing angle? Is there more than one way? What is the difference between vertically opposite angles and two angles around a point that are opposite each other?* ***L4:*** *What does "interior" mean? How many interior angles does a triangle have? How can you measure the angles in a triangle? What do the interior angles of a triangle sum to? If you know the size of two interior angles in a triangle, how can you work out the third angle? Could you work out the missing angle a different way?* ***L5:*** *What do the interior angles in a triangle add up to? If a triangle is equilateral, what do you know about its sides/ angles? How can you work out the size of one of the angles? What are the properties of an isosceles triangle? Which of the angles in the triangle are equal? How do you know? If you know one angle in an isosceles triangle, how can you calculate the sizes of the other two angles?* ***L6:*** *Why can you not always find the size of the missing angle by measuring? What type of triangle is this? How will knowing that help you to find the value of the missing angle? Do you need to work out a different angle before you can work out the missing angle? Which angles can you work out straight away? How will that help you to work out other angles? What do angles in a right angle/on a straight line/around a point add up to?*	 - 2D representations of 3D shapes (inc. isometric paper)  - Protractors (and angle measurers)  - Rulers  - 3D shapes 	***Useful sentence stems:***
Number	6	***Suggested sequence of learning:*** - To calculate missing angles inside quadrilaterals - To calculate the interior angles of polygons - To recognise and label the parts of a circle - To draw shapes accurately	- Representations of regular and irregular polygons (**NB** – avoid representations with third dimension)	***Suggested grey tasks:***

<table>
<tr>
<td rowspan="2">Week 2</td>
<td rowspan="2"></td>
<td>- To recognise nets of 3D shapes
- End of Unit Assessment</td>
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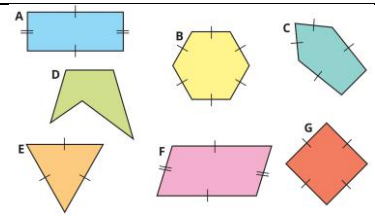
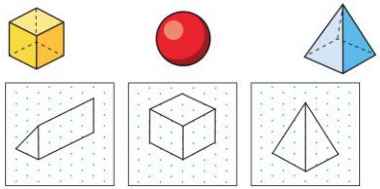
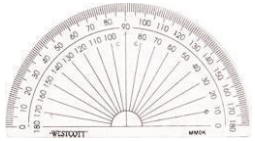
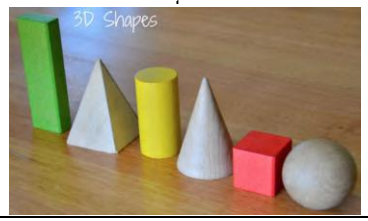


- 2D representations of 3D shapes (inc. isometric paper)

- Protractors (and angle measurers)

- Rulers

- 3D shapes


</td>
<td></td>
</tr>
<tr>
<td>Key Questions:
L7: What is a quadrilateral? In what ways can quadrilaterals be different from one another? What is the sum of the interior angles in a quadrilateral? What is the same/different about a rhombus and a square? If you know one angle in a parallelogram, how can you work out the sizes of the missing angles?
L8: What is a polygon? What is the difference between a regular and an irregular polygon? How many triangles can you make in this polygon? Why is it important to draw the triangles from a single vertex? If the sum of interior angles in each triangle adds up to 180°, how can you work out the sum of the interior angles in the polygon? If you know the sum of the interior angles in a polygon, how can you use this information to find a missing angle?
L9: What does the term "radius"/"diameter"/"circumference" mean? What is the relationship between the radius and the diameter of a circle? What point must the diameter of a circle go through? If you know the diameter of a circle, how can you calculate its radius? If you know the radius of a circle, how can you calculate its diameter? How can you tell if a line across a circle is a diameter or not?
L10: How can you use squared paper to draw a shape with right angles? What tools can you use to help you draw a shape accurately? What do you know about the shape that will help you to draw it accurately? Which part of the shape can you draw first? Then what can you draw? How can you check if your shape is drawn accurately? What labels can you add to your drawing? Which scale on the protractor do you need to use?
L11: How many faces does a have? What shapes are they? What is the difference between a 2-D and a 3-D shape? What 2-D shapes are needed to create the net of a ___? What 3-D shape will this net create? Which two faces of the 3-D shape made from this net will be opposite each other? How many different ways can you arrange the faces of the net so that it still folds up to make the ___?</td>
<td>Useful sentence stems:</td>
</tr>
</table>

Geometry - Position and Direction

Suggested starters (ongoing, throughout the term) with links to relevant resources:

- Whiterose Flashback 4 - WHOLE CLASS
- Daily 10 - Level 4 or 5 - https://www.topmarks.co.uk/maths-games/daily10 - WHOLE CLASS
- Times tables dice game - children roll dice; first to multiply together gets a point; keep score on mini whiteboard - PAIRS
- Rocket rounding - https://www.topmarks.co.uk/maths-games/rocket-rounding - WHOLE CLASS
- Tug Harder - https://nrich.maths.org/5898 - PAIRS
- Roman numeral matching pairs - PAIRS
- Column addition and subtraction with 4 and 3 digit numbers -- see Google Sheet - WHOLE CLASS
- Dicey Addition - https://nrich.maths.org/11863 - PAIRS
- Identify multiples and count from (and back to) 0 in multiples of 3, 4, 6, 7, 8, 9, 11,12, 25, 50, 100 and 1000
- Count from (and back to) 0 in multiples of 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9 (using known multiples and knowledge of place value)
- Recall and use multiplication and division facts for the 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 times tables (up to the 12th multiple)
- Find all factor pairs of a given number; find all common factors for a pair of numbers; identify common multiples
- Add, subtract, multiply and divide numbers mentally using known facts and a range of strategies **(See Mental Calculation Strategies, 2017)**
- Read, write, compare and order numbers within 5,000,000
- Read, write, compare and order numbers with up to three decimal places
- Multiply numbers by 10, 100 and 1000 and divide corresponding numbers by 10, 100 and 1000 (with up to three decimal places)
- Count forwards and backwards with positive and negative whole numbers, including through zero; calculate intervals across zero (in context)
- Recognise, describe and extend linear number sequences, including those involving decimals, e.g. 0.9, 1.8, 2.7; find the term to term rule
- Compare and order fractions, including those greater than one (consider the use of diagrams and fraction walls)
- Find unit and non-unit fractions of numbers and quantities e.g. 1/7 of £56; 3/7 of £56
- Know and use the vocabulary of prime numbers and establish whether a number up to 100 is a prime number
- Recognise and use square numbers (up to 12 x 12) and the notation e.g. $9^2 = 81$
- Convert between different units of measurement (including time), using decimal notation up to three decimal places when appropriate
- Consolidate telling the time to the nearest minute on an analogue clock and relate to 12/24 hour digital clocks; interpret timetables

Relevant learning/previous statutory objectives:

Year 5

- 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.

Also see NCETM National Curriculum resource tool: https://www.ncetm.org.uk/in-the-classroom/national-curriculum-resource-tool/

Place Value Current statutory objectives:

- 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.

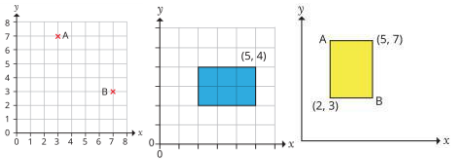
Also see NCETM National Curriculum resource tool: https://www.ncetm.org.uk/in-the-classroom/national-curriculum-resource-tool/

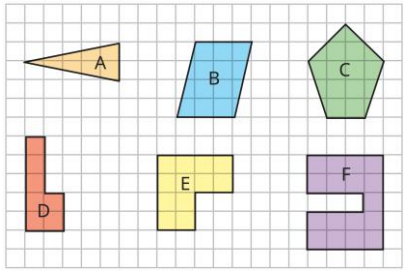
Potential misconceptions:

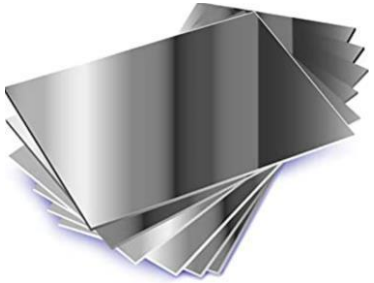
- Children may confuse the x- and y-values of the coordinates and read or plot them in the wrong order.
- Children may think a coordinate refers to a square on the grid rather than a single point.
- Children may confuse the x- and y-values of the coordinates and read or plot them in the wrong order.
- Children may ignore or omit the negative sign.
- Some children may need the support of gridlines to work out the coordinates of a point.
- If children confuse the x- and y-values of the coordinates of a point, then coordinates derived from this point will also be incorrect.
- Children may look at the gap between shapes, instead of how far a specific vertex has been translated.
- Children may not give the direction of the translation and/or confuse left and right.
- Children may confuse translation and reflection.
- Children may confuse translation and reflection.
- Children may draw the reflection of a shape in the same orientation as the original shape.
- Children may miscount the distances to/from the mirror line.

Vocabulary - Geometry – Position and direction						
Reception	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
over	position	clockwise/anti-clockwise		co-ordinates	reflection	four quadrants
under	direction	straight line		first quadrant		co-ordinate plane
between	movement	rotation		grid		
around	whole turn	arrange		translation		

through	quarter turn	sequences		plot		
on	half turn			polygon		
into	three-quarter turn			axis		
next to						
behind						
beneath						
order						
repeat						
patterns						
on top of						

Area of Study	No of hrs	Suggested Sequence and Key Questions for Assessment	Suggested Concrete and Pictorial Resources	Extension Tasks and Sentence Stems
Number	5	**Suggested sequence of learning:** - Baseline Assessment - To read and plot coordinates in the first quadrant - To read and plot coordinates in four quadrants - To solve problems with coordinates - To translate shapes - To reflect shapes	- Coordinate grids (axes)  (NB – See Geogebra Classic for interactive version)	**Suggested grey tasks:**

<table>
<tr>
<td rowspan="2">Week 1</td>
<td rowspan="2"></td>
<td>- End of Unit Assessment</td>
<td rowspan="2">- Table
<table>
<tr><th>Coordinates</th><th>Translation</th><th>New coordinates</th></tr>
<tr><td>(1, 3)</td><td>2 right and 1 down</td><td>(3, 2)</td></tr>
<tr><td>(5, 2)</td><td>3 left and 2 up</td><td></td></tr>
<tr><td>(6, 7)</td><td></td><td>(2, 5)</td></tr>
<tr><td></td><td>1 left and 1 down</td><td>(5, 5)</td></tr>
</table>
- Representations of 2D shapes (NB – Do not use representations of 2D shapes with 3rd dimension)
 

- Plastic mirrors
  </td>
<td></td>
</tr>
<tr>
<td>Key Questions:
L1: What is a coordinate grid? What is the name of the horizontal/vertical axis? What are the coordinates of this point? Which axis do you look at first when finding the coordinates of a point? Where does the point go on the grid? What do you notice about all the points that are on a horizontal/vertical line? How can you work out the missing coordinate(s)?
L2: Which axis do you look at first when finding the coordinates of a point? What are the coordinates of the point? What are the coordinates of the vertices of the shape? Where does the point go on the grid? How do you know if the x-value/y-value is positive or negative? What do you notice about the coordinates in the first/second/ third/fourth quadrant?
L3: Which axis do you look at first when finding the coordinates of a point? What do you know about the coordinates of all points on the x-axis/y-axis? If you know the coordinates of a point, what do you know about the coordinates of a point that lies on the vertical/ horizontal line that passes through the point? How can you use the coordinates of these two vertices to work out the coordinates of the other vertices?
L4: What does "translation" mean? How can you translate a point? What will the shape look like when it has been translated? Which point on the shape will you translate first? Will each vertex on a shape be translated in the same way? How can you describe the translation?
L5: How is reflecting similar to translating? How is it different? How does reflecting one vertex at a time make it easier to reflect the whole shape? How far away is the vertex from the mirror line? How far away does the corresponding vertex need to be from the mirror line? How can you check if the reflected shape looks like it is in the correct place? Does the reflection of a shape always, sometimes or never face the same way as the original shape?</td>
<td>Useful sentence stems:</td>
</tr>
</table>