



Number - number and place value

Pupils should be taught to:

- 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 0
- solve number and practical problems that involve all of the above

READY TO PROGRESS CRITERIA

NB: MUCH OF THE PV WORK FOR Year 6 IS COVERED IN OTHER AREAS (DECIMALS, STATISTICS, MEASURES)

Year 5 conceptual prerequisite	Year 6 ready-to progress criteria	Key stage 3 applications
Understand the relationship between powers of 10 from 1 hundredth to 1,000 in terms of grouping and exchange (for example, 1 is equal to 10 tenths) and in terms of scaling (for example, 1 is ten times the size of 1 tenth)	6NPV-1 Understand the relationship between powers of 10 from 1 hundredth to 10 million, and use this to make a given number 10, 100, 1,000, 1 tenth, 1 hundredth or 1 thousandth times the size (multiply and divide by 10, 100 and 1,000).	Understand and use place value for decimals, measures, and integers of any size. Interpret and compare numbers in standard form $AX10^n$, where n is a positive or negative integer or zero.
Recognise the place value of each digit in numbers with units from thousands to hundredths and compose and decompose these numbers using standard and nonstandard partitioning.	6NPV-2 Recognise the place value of each digit in numbers up to 10 million, including decimal fractions, and compose and decompose numbers up to 10 million using standard and nonstandard partitioning.	Understand and use place value for decimals, measures, and integers of any size. Order positive and negative integers, decimals, and fractions. Use a calculator and other technologies to calculate results accurately and then interpret them appropriately.
Reason about the location of numbers between 0.01 and 9,999 in the linear number system. Round whole numbers to the nearest multiple of 1,000, 100 or 10, as appropriate. Round decimal fractions to the nearest whole number or nearest multiple of 0.01	6NPV-3 Reason about the location of any number up to 10 million, including decimal fractions, in the linear number system, and round numbers, as appropriate, including in contexts.	Order positive and negative integers, decimals, and fractions; use the number line as a model for ordering of the real numbers; use the symbols =, ≠, <, >, ≤, ≥ Round numbers and measures to an appropriate degree of accuracy (for example, to a number of decimal places or significant figures). Use approximation through rounding to estimate answers and calculate possible resulting errors expressed using inequality notation $a < x \leq b$
Divide 1000, 100 and 1 into 2, 4, 5 and 10 equal parts, and read scales/number lines with 2, 4, 5 and 10 equal parts	6NPV-4 Divide powers of 10, from 1 hundredth to 10 million, into 2, 4, 5 and 10 equal parts, and read scales/number lines with labelled intervals divided into 2, 4, 5 and 10 equal parts.	Use standard units of mass, length, time, money, and other measures, including with decimal quantities. Construct and interpret appropriate tables, charts, and diagrams.

Small Steps

Autumn: place value NPV-2 & NPV-3		
White Rose Maths		NCETM



<p>Numbers to 10000 Numbers to 100000 Numbers to a million numbers to 10 million Compare and order any number Round numbers to 10, 100 and 1000 Round any number Negative numbers</p>	<p>Note: Many children may struggle to work immediately with numbers to 10 million so it is suggested to build up from smaller numbers; recapping Year 4 and Year 5 work. It is vital that children have the understanding of place value to ensure they are going to be successful with later number work.</p>	<p>1.30 composition and calculation numbers up to 10 million 1.31 problems with two unknowns. Nbnctm suggest teaching segment 1.31 at the end of all the number and calculation teaching. This fits in with algebra.</p>
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STEM SENTENCES

One million is one thousand thousands.

<p>STEM SENTENCES and IMAGES - Rounding</p>	<p>Rounding to the nearest 1,000,000:</p> <table style="width: 100%; text-align: center;"> <tr> <td style="width: 30%;">previous multiple of 1,000,000</td> <td style="width: 40%;"></td> <td style="width: 30%;">next multiple of 1,000,000</td> </tr> <tr> <td>2,000,000</td> <td>< 2,783,450 <</td> <td>3,000,000</td> </tr> <tr> <td>5,000,000</td> <td>< 5,192,012 <</td> <td>6,000,000</td> </tr> <tr> <td>5,000,000</td> <td>< 5,811,159 <</td> <td>6,000,000</td> </tr> <tr> <td>7,000,000</td> <td>< 7,683,102 <</td> <td>8,000,000</td> </tr> </table>	previous multiple of 1,000,000		next multiple of 1,000,000	2,000,000	< 2,783,450 <	3,000,000	5,000,000	< 5,192,012 <	6,000,000	5,000,000	< 5,811,159 <	6,000,000	7,000,000	< 7,683,102 <	8,000,000
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<ul style="list-style-type: none"> • 'a is between ___ and ___.' • 'The previous multiple of one million is ___. The next multiple of one million is ___.' • 'a is nearest to ___.' • 'a is ___ when rounded to the nearest million.' 																
<p>Rounding to the nearest 1,000,000:</p> <table style="width: 100%; text-align: center;"> <tr> <td style="width: 30%;">previous multiple of 1,000,000</td> <td style="width: 40%;"></td> <td style="width: 30%;">next multiple of 1,000,000</td> </tr> <tr> <td>2,000,000</td> <td>< a <</td> <td>3,000,000</td> </tr> </table> <ul style="list-style-type: none"> • 'a is between two million and three million.' • 'The previous multiple of one million is two million. The next multiple of one million is three million.' • 'a is nearest to three million.' • 'a is three million when rounded to the nearest million.' 	previous multiple of 1,000,000		next multiple of 1,000,000	2,000,000	< a <	3,000,000										
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2,000,000	< a <	3,000,000														
<p>In previous segments, the children learnt that, for example, to round to the nearest 100,000 it is the 10,000s digit that they must consider. Now introduce the following generalisation: 'When rounding to the nearest million, the hundred thousands digit is the digit to consider. If it is four or less we round down. If it is five or more we round up.'</p>																
<ul style="list-style-type: none"> • '___ is between ___ and ___.' • 'The previous multiple of one hundred thousand is ___. The next multiple of one hundred thousand is ___.' • '___ is nearest to ___.' • '___ is ___ when rounded to the nearest one hundred thousand.' 																
<p>Once children are confident rounding seven-digit numbers to the nearest 100,000, repeat the generalised statement they met in segment 1.26: 'When rounding to the nearest one hundred thousand, the ten thousands digit is the digit to consider. If it is four or less we round down. If it is five or more we round up.'</p>																
<p>At this stage, it can be valuable to make a wider generalisation about rounding: 'When rounding to a particular degree of accuracy, the digit to the right of the place value you are rounding to is the one that determines whether to round up or down.'</p>																



Number - addition, subtraction, multiplication and division

Pupils should be taught to:

- 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 4 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

READY TO PROGRESS CRITERIA

Year 5 conceptual prerequisite	Year 6 ready-to progress criteria	Key stage 3 applications
Be fluent in all key stage 2 additive and multiplicative number facts (see Appendix: number facts fluency overview) and calculation. Manipulate additive equations, including applying understanding of the inverse relationship between addition and subtraction, and the commutative property of addition. Manipulate multiplicative equations, including applying understanding of the inverse relationship between multiplication and division, and the commutative property of multiplication.	6AS/MD-1 Understand that 2 numbers can be related additively or multiplicatively, and quantify additive and multiplicative relationships (multiplicative relationships restricted to multiplication by a whole number).	Understand that a multiplicative relationship between 2 quantities can be expressed as a ratio or a fraction. Express 1 quantity as a fraction of another, where the fraction is less than 1 and greater than 1. Interpret mathematical relationships both algebraically and geometrically. Interpret when the structure of a numerical problem requires additive, multiplicative or proportional reasoning.
Make a given number (up to 9,999, including decimal fractions) 10, 100, 1 tenth or 1 hundredth times the size (multiply and divide by 10 and 100). Apply place-value knowledge to known additive and multiplicative number facts (scaling facts by 10, 100, 1 tenth or 1 hundredth). Manipulate additive equations. Manipulate multiplicative equations.	6AS/MD-2 Use a given additive or multiplicative calculation to derive or complete a related calculation, using arithmetic properties, inverse relationships, and place-value understanding.	Recognise and use relationships between operations including inverse operations. Use algebra to generalise the structure of arithmetic, including to formulate mathematical relationships. Understand and use standard mathematical formulae; rearrange formulae to change the subject.
Recall multiplication and division facts up to 12 X 12. Apply place-value knowledge to known additive and multiplicative number facts.	6AS/MD-3 Solve problems involving ratio relationships.	Use ratio notation, including reduction to simplest form. Divide a given quantity into 2 parts in a given part:part or part:whole ratio; express the division of a quantity into 2 parts as a ratio.
Be fluent in all key stage 2 additive and	6AS/MD-4 Solve problems with 2	Reduce a given linear equation in two



<p>multiplicative number facts and calculation. Manipulate additive equations. Manipulate multiplicative equations. Find a fraction of a quantity</p>	<p>unknowns.</p>	<p>variables to the standard form $y = mx + c$; calculate and interpret gradients and intercepts of graphs of such linear equations numerically, graphically and algebraically. Use linear and quadratic graphs to estimate values of y for given values of x and vice versa and to find approximate solutions of simultaneous linear equations.</p>
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SMALL STEPS

<p>Autumn: Number: addition, subtraction, multiplication and division</p>		
<p>White Rose Maths</p>	<p>Notes:</p>	<p>NCETM</p>
<p>Add whole numbers with more than four digits Subtract numbers with more than four digits Operations (addition and subtraction) Multi step addition and subtraction problems Add and subtract integers Multiply 4 digits by 1-digit Multiply 2 digits (area model) Multiply 2-digits by 2-digits Multiply 3 digits by 2 two digits Multiply up to a 4-digit number by 2-digit number Divide 4 digits by 1-digit Divide with remainders Short division Division using factors Long division Factors Common factors Common multiples Primes to 100 Squares and cubes Order of operations Mental calculation and estimation Reason from known facts</p>	<p>Year 6 assumes a lot of prior understanding of four operations. A deep understanding of these concepts are essential to help children prepare for Secondary Education and beyond.</p> <p>Some children may not have had much practice in the last few months so extended blocks and plenty of recap are included.</p>	<p>2.23 Multiplication strategies for larger numbers and long multiplication 2.24 Division: dividing by two-digit divisors 2.25 Using compensation to calculate 2.26 Mean average and equal shares 2.27 Scale factors, ratio and proportional reasoning 2.28 Combining division with addition and subtraction 2.29 Decimal place-value knowledge, multiplication and division 2.30 Multiplicative contexts: area and perimeter 2</p> <p>Some of these are not actually the topic but this is the order in which NCETM suggests following the multiplication and division objectives. Nb they also break between 2.25 and 2.26 for the two fraction segments.</p>

STEM SENTENCES

[Enigma-Stem-Sentence-bank-Number-Addition-Subtraction.pdf](#)

[Enigma-Stem-Sentence-bank-multiplication-and-division-with-links.pdf](#)

MULTIPLICATION AND DIVISION

<p>___ is a factor of ___ because ___ is in the ___ times table.</p>	<p>Structure / language</p>	
<p>Numbers that have more than two factors are composite numbers.</p>	<p>Generalisation</p>	



Numbers that have exactly two factors are prime numbers.	Generalisation	
The common factors of ___ and ___ are _____	Language / structure	Common factors
___ and ___ are prime factors of _____		Prime Factors 2 and 3 are prime factors of 12.
Combining calculations		
When there are no brackets, multiplication is completed before addition and subtraction.	Generalisation	
When there are no brackets, division is completed before addition and subtraction.	Generalisation	
$a \times c - c \times c = (a - b) \times c$	Structure / generalisation	
When two dividends are divided by the same divisor, we can <u>add</u> the dividends first then divide.	Generalisation	
When two dividends are divided by the same divisor, we can <u>subtract</u> the dividends first then divide.	Generalisation	
Long multiplication		



<p>To multiply by a multiple of 10, use short multiplication by a single digit number then multiply by 10.</p>	<p>Generalisation</p>	
<p>To multiply two two digit numbers, first multiply by the ones, then multiply by the tens, and then add them together.</p>	<p>Generalisation</p>	<p>42 x 28</p>
<p>Multiply by the units. Add the place value holder to show it is ten times the size. Multiply by the tens. Add the partial products.</p>	<p>Generalisation</p>	
<p>When multiplying, you can write a composite number as factor x factor and use the associative law to make the calculation more efficient.</p>	<p>Generalisation</p>	<p>To</p>
<p>Division – 2 digit divisors</p>		
<p>If I divide the dividend by ten, I must divide the divisor by ten for the quotient to stay the same.</p>	<p>Generalisation</p>	
<p>There are roughly ____ ‘ ____’ in ____.</p>	<p>Structure</p>	



Partition ___ into __ and ____	Structure	Partitioning
___ hundreds divided by ___ is equal to ___ hundreds with a remainder of ____ Exchange the remainder: ___ hundreds is equal to ___ tens.	Structure	Short division method
___ tens divided by ___ is equal to ___ tens with a remainder of ____ Exchange the remainder: ___ tens is equal to ___ ones.		
	Structure	Long division
Compensation to calculate.		
If I double one factor, I must double the product.	Generalisation	
If I multiply one factor by __ , I must multiply the product by ____.	Structure/ language	If I multiply one factor by 3 , I must multiply the product by 3.



<p>If I divide one factor by ____, I must divide the product by ____.</p>	<p>Structure/ language</p>	<p>If I divide one factor by 5 , I must divide the product by 5.</p>
<p>If I multiply the dividend by ____ and keep the divisor the same, I must multiply the quotient by ____.</p>	<p>Structure/ language</p>	<p>If I multiply the dividend by 4 and keep the divisor the same, I must multiply the quotient by 4.</p>
<p>If I double the divisor and keep the dividend the same, I must halve the quotient.</p>	<p>Generalisation</p>	
<p>If I <u>multiply</u> the divisor by ____ and keep the dividend the same, I must <u>divide</u> the quotient by ____.</p>	<p>Structure.</p>	
<p>If I <u>divide</u> the divisor by ____ and keep the dividend the same, I must <u>multiply</u> the quotient by ____.</p>	<p>Structure.</p>	

<p style="text-align: center;">Mean Average</p>		
<p>The mean is the size of each part when a quantity is shared equally.</p> <p>The mean is the total of the numbers divided by how many numbers there are.</p>	<p>Generalisation</p>	
<p>The dividend is _____ The divisor is ____ because _____ The mean is ____ ÷ _____ = _____</p>	<p>Language / structure.</p>	



<p>If the number of values in the set stays the same and the total increases, the mean also increases.</p> <p>If the number of values in the set stays the same and the total decreases, the mean also decreases.</p>	<p>Generalisation</p>	
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Number - Fractions (including decimals and percentages)

Pupils should be taught to:

- 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, $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$]
- divide proper fractions by whole numbers [for example, $\frac{1}{3} \div 2 = \frac{1}{6}$]
- associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [for example, $\frac{3}{8}$]
- identify the value of each digit in numbers given to 3 decimal places and multiply and divide numbers by 10, 100 and 1,000 giving answers up to 3 decimal places
- multiply one-digit numbers with up to 2 decimal places by whole numbers
- use written division methods in cases where the answer has up to 2 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

READY TO PROGRESS CRITERIA

Year 5 conceptual prerequisite	Year 6 ready-to progress criteria	Key stage 3 applications
	NPV-1 & NPV-2 as above	
Recall multiplication and division facts up to 12×12 . Find factors and multiples of positive whole numbers, including common factors and common multiples. Find equivalent fractions and understand that they have the same value and the same position in the linear number system.	6F-1 Recognise when fractions can be simplified, and use common factors to simplify fractions.	Use the concepts and vocabulary of prime numbers, factors (or divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation property. Simplify and manipulate algebraic expressions by taking out common factors.
Recall multiplication and division facts up to . Find factors and multiples of positive whole numbers. Find equivalent fractions. Reason about the location of fractions and mixed numbers in the linear number system.	6F-2 Express fractions in a common denomination and use this to compare fractions that are similar in value.	Order positive and negative integers, decimals and fractions. Use the 4 operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative. Use and interpret algebraic notation, including: a/b in place of $a \div b$ coefficients written as fractions rather than as decimals.
Reason about the location of fractions and mixed numbers in the linear number system. Find equivalent fractions.	6F-3 Compare fractions with different denominators, including fractions greater than 1, using reasoning, and choose between reasoning and common denomination as a comparison	Order positive and negative integers, decimals, and fractions; use the number line as a model for ordering of the real



	strategy.	numbers; use the symbols =, ≠, <, >, ≤, ≥
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SMALL STEPS

Autumn FRACTIONS		
White Rose Maths		NCETM
Equivalent fractions • Simplify fractions Improper fractions to mixed numbers Mixed numbers to improper fractions • Fractions on a number line • Compare and order (denominator) Compare and order (numerator) Four rules with Fractions • Add fractions • Subtract fractions • Mixed numbers addition Mixed numbers subtraction Multiply fractions by integers Multiply fractions by fractions Divide fractions by integers Fraction of an amount Fraction of an amount find the whole		3.9 multiplying fraction and dividing fraction by a whole number


STEM SENTENCES


[Enigma-Stem-Sentence-bank-Fractions-with-links.pdf](#)

Multiplying whole numbers and fractions			
Year 6: 3.9 1:2	There were ___ equal parts in the whole. Each of the three parts was halved so we now have ___ equal parts in the whole.	Language / structure	<p>There were 3 equal parts in the whole. Each of the three parts was halved so we now have six equal parts in the whole.</p>
Year 6: 3.9 1:4	When multiplying unit fractions, multiply the denominators.	Generalisation	$\frac{1}{2} \times \frac{1}{6} = \frac{1}{12}$ $\frac{1}{6} \times \frac{1}{2} = \frac{1}{12}$ $\frac{1}{3} \times \frac{1}{5} = \frac{1}{15}$ $\frac{1}{5} \times \frac{1}{3} = \frac{1}{15}$




Year 6: 3.9 1:4	When multiplying unit fractions, the product is smaller than the fractions being multiplied. .	Generalisation	
Year 6: 3.9 1:10	To multiply fractions, we can multiply the numerators and multiply the denominators.	Generalisation	$\frac{4}{5} \times \frac{2}{3} = \frac{8}{15}$

Dividing fractions			
Year 6: 3.9 2:5	To divide a fraction by a whole number, we can change it to an equivalent multiplication. To divide by ____, we can multiply by ____.	Structure	 $\frac{1}{3} \div 5 = \frac{1}{15} \rightarrow \frac{1}{3} \times \frac{1}{5} = \frac{1}{15}$ <p><i>To divide a fraction by a whole number, we can change it to an equivalent multiplication. To divide by five, we can multiply by $\frac{1}{5}$.</i></p>
Year 6: 3.9 3:1	To divide a fraction by a whole number, we can change it to an equivalent multiplication.	Generalisation	

Year 6: 3.9 3:1	To divide by ____ we can multiply by ____	Structure	$\frac{1}{3} \div 4 = \frac{1}{12}$ $\frac{1}{3} \times \frac{1}{4} = \frac{1}{12}$
Year 6: 3.9 3:3	If we divide into __ equal groups, then each of the groups is because ____ \div ____ = ____	Structure	 $\frac{6}{7} \div 3 = \frac{2}{7}$ <p>2/7 If we divide six 1/7 into 3 equal groups, then each of the groups is 2/7 because $6 \div 3 = 2$</p>



Year 6: 3.9 3:1	If the divisor is a factor of the numerator, just divide the numerator by the denominator and keep the denominator the same.	Generalisation	$\frac{8}{10} \div 4 = \frac{2}{10}$ 
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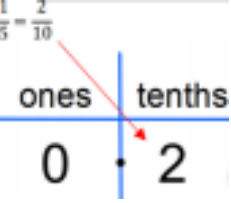
SMALL STEPS

Spring: Decimals		
White Rose Maths		NCETM
Decimals up to 2 decimal places Understand thousandths Three decimal places Multiply by 10, 100 and 1,000 Divide by 10, 100 and 1,000 Multiply decimals by integers Divide decimals by integers Division to solve problems Decimals as fractions Fractions to decimals	Notes: The recap steps are at the beginning of this block to ensure children have a good understanding of numbers up to three decimal places before moving on to multiplication and division. This should build on place value work in the autumn term and make use of place value grids and counters to build on previous learning	3.10 Linking fractions, decimals and percentages

SMALL STEPS

Spring: Percentages		
White Rose Maths		NCETM
Understand percentages Fractions to percentages Equivalent FDP Order FDP Percentage of an amount (1) Percentage of an amount (2) Percentages – missing values	Notes: Children should have been introduced to percentages briefly in Y5 but this work may have been missed. Time spent exploring 100 as a denominator, making the link to decimals and hundredths is important. Bar models and hundred squares should be used to support understanding.	As above 3.10 Linking fractions, decimals and percentages

STEM SENTENCES

Linking fractions, decimals and percentages			
Year 6: 3.10	In order to use a place value chart to help convert a fraction to a decimal, the fraction must be expressed as a tenth, hundredth or thousandth.	Generalisation	$\frac{1}{5} = \frac{2}{10}$ 



<p>Year 6: 3.10</p>	<p>A fraction can be converted into a decimal by dividing the numerator by the denominator.</p>	<p>Generalisation .</p>	$\frac{1}{5} = 5 \overline{) 1.0}$
<p>Year 6: 3.10 1:9</p>	<p>• '___ is equivalent to $\frac{\square}{\square}$' • 'We know that $\frac{\square}{\square} < \frac{\square}{\square}$, so ___ < $\frac{\square}{\square}$' or • '___ is equivalent to ___' • 'We know that ___ < ___' so ___ < $\frac{\square}{\square}$'</p>	<p>Structure</p>	<p>'0.6 is equivalent to $\frac{3}{5}$.'</p> <p>'We know that $\frac{3}{5} < \frac{4}{5}$, so $0.6 < \frac{4}{5}$.'</p> $0.6 < \frac{4}{5}$ $0.6 = \frac{3}{5}$ $\frac{3}{5} < \frac{4}{5}$
<p>Year 6: 3.10 5:7 5:8</p>	<p>In order to convert a percentages to a fraction, first convert it to a fraction with a denominator of 100 then simplify.</p>	<p>Generalisation</p>	$45\% = \frac{\square}{100} = \frac{\square}{20}$ $12\% = \frac{12}{100} = \frac{3}{25}$
<p>Year 6: 3.10 6:1</p>	<p>To find 50% of a number, halve it.</p>	<p>Generalisation</p>	<p>'Zara is doing a 420 km charity bike ride. So far, she has completed 50% of the route. How far has she cycled?'</p> <ul style="list-style-type: none"> • '100% of 420 km is 420 km.' • '50% of 420 km is $\frac{1}{2}$ of 420 km.' • 'Zara has cycled 210 km.'
<p>Year 6: 3.10 6:2</p>	<p>To find 10% of a number, divide it by ten.</p>	<p>Generalisation</p>	<p>'Rishi has completed 10% of the same bike ride. How far has he cycled?'</p> <ul style="list-style-type: none"> • '100% of 420 km is 420 km.' • '10% of 420 km is $\frac{1}{10}$ of 420 km.' • 'Rishi has cycled 42 km.'
<p>Year 6: 3.10 6:3</p>	<p>To find 1% of a number, divide it by hundred.</p>	<p>Generalisation .</p>	<p>'100% of 420 km is 420 km.'</p> <p>'1% of 420 km is $\frac{1}{100}$ of 420 km.'</p> <p>'James has cycled 4.2 km.'</p>



Ratio and proportion

Pupils should be taught to:

- solve problems involving the relative sizes of 2 quantities where missing values can be found by using integer multiplication and division facts
- solve problems involving the calculation of percentages [for example, of measures and such as 15% of 360] and the use of percentages for comparison
- solve problems involving similar shapes where the scale factor is known or can be found
- solve problems involving unequal sharing and grouping using knowledge of fractions and multiples

Year 5 conceptual prerequisite	Year 6 ready-to progress criteria	Key stage 3 applications
	6AS/MD-3 Solve problems involving ratio relationships.	


SMALL STEPS

Spring: Ratio		
White Rose Maths		NCETM
Using ratio language <ul style="list-style-type: none"> • Ratio and fractions • Introducing the ratio symbol • Calculating ratio • Using scale factors • Calculating scale factors • Ratio and proportion problems 	Notes: Bar models are a key representation in this topic. Children may need some extra input here if they have not used bar models throughout KS2.	2.27 Scale factors, ratio and proportional reasoning

STEM SENTENCES



COLLECTION OF STEM SENTENCES FROM ENIGMA MATHS HUB BASED ON THE NCETM PD MATERIALS

Ratio and Proportion										
For every ___ there are _____	Language / structure.	 <p>For every one vase there are 5 flowers.</p> <table border="1" data-bbox="753 1659 1029 1798"> <thead> <tr> <th>Number of grapes that Lily eats</th> <th>Number of grapes that Ralph eats</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>10</td> </tr> <tr> <td>?</td> <td>20</td> </tr> <tr> <td>3</td> <td>?</td> </tr> </tbody> </table> <p><i>'If Ralph eats twenty grapes, how many does Lily eat?'</i> <i>'If Lily eats three grapes, how many does Ralph eat?'</i></p>	Number of grapes that Lily eats	Number of grapes that Ralph eats	1	10	?	20	3	?
Number of grapes that Lily eats	Number of grapes that Ralph eats									
1	10									
?	20									
3	?									

<p>The length of one of the sides of the square is ___ times the length of one of the sides of square ____.</p> <p>The side length of square ___ is ___ times the side-length of square ____.</p>	<p>Structure.</p>	<p>Example comparison:</p> <ul style="list-style-type: none"> • 'The length of one of the sides of square B is <u>two times</u> the length of one of the sides of square A.' side-length of B = side-length of A \times 2 • 'The length of one of the sides of square A is <u>one-half</u> (0.5) the length of one of the sides of square B.' side-length of A = side-length of B \times $\frac{1}{2}$
<p>To change shape ___ into shape ___, scale the side-lengths by a scale factor of ____.</p>		<ul style="list-style-type: none"> • 'To change shape A into shape C, scale the side-lengths by a scale factor of <u>three</u>' side-length of C = side-length of A \times 3 • 'To change shape C into shape A, scale the side-lengths by a scale factor of <u>one-third</u>' side-length of A = side-length of C \times $\frac{1}{3}$
<p>If the scale factor is greater than one, the shape is made larger. We can say the shape is enlarged.</p> <p>If the scale factor is equal to one, the shape is the same size.</p> <p>If the scale factor is less than one, the shape is made smaller. We can say the shape has been reduced.</p>	<p>Generalisation</p>	
<p>The ratio of the dimensions of shape ___ to the dimensions of shape ___ is equal to ___ to ____.</p>	<p>Structure/ language</p>	<ul style="list-style-type: none"> • 'To change shape A into shape C, scale the side-lengths by a scale factor of <u>three</u>'. • 'The ratio of the dimensions of shape A to the dimensions of shape C is equal to <u>one-to-three</u>'. • 'We can write this as:' dimensions of A : dimensions of C = 1 : 3



<p>To change shape ___ into shape ___, scale the dimensions by a scale factor of ___</p> <p>The ratio of dimensions of shape ___ to the dimensions of shape ___ is equal to ___ to ___</p>	<p>Structure / language.</p>	<div data-bbox="756 232 1091 367" data-label="Image"> </div> <p>To change shape A into shape B, scale the dimensions by a scale factor of 3</p> <p>The ratio of dimensions of shape A to the dimensions of shape B is equal to 1 to 3</p>
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Algebra

Pupils should be taught to:

- use simple formulae
- generate and describe linear number sequences
- express missing number problems algebraically
- find pairs of numbers that satisfy an equation with 2 unknowns
- enumerate possibilities of combinations of 2 variables

READY TO PROGRESS CRITERIA

Year 5 conceptual prerequisite	Year 6 ready-to progress criteria	Key stage 3 applications
	6AS/MD-4 Solve problems with 2 unknowns..	

SMALL STEPS

Spring: Algebra		
White Rose Maths		NCETM
Find a rule – one step Find a rule – two step Forming expressions Substitution Formulae Forming equations Solve simple one-step equations Solve two-step equations Find pairs of values Enumerate possibilities	<p>Note: Children first look at forming expressions before moving on to solving more complex equations.</p> <p>This should be introduced using concrete and pictorial methods alongside the abstract notation.</p>	1.31 finding problems with two unknowns

STEM SENTENCES



Measurement

Pupils should be taught to:

- solve problems involving the calculation and conversion of units of measure, using decimal notation up to 3 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 3 decimal places
- convert between miles and kilometres
- recognise that shapes with the same areas can have different perimeters and vice versa
- recognise when it is possible to use formulae for area and volume of shapes
- calculate the area of parallelograms and triangles
- calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm³) and cubic metres (m³), and extending to other units [for example, mm³ and km³]

READY TO PROGRESS CRITERIA

Year 5 conceptual prerequisite	Year 6 ready-to progress criteria	Key stage 3 applications
	6NPV-1 Understand the relationship between powers of 10 from 1 hundredth to 10 million, and use this to make a given number 10, 100, 1,000, 1 tenth, 1 hundredth or 1 thousandth times the size (multiply and divide by 10, 100 and 1,000).	
Find the perimeter of regular and irregular polygons. Compare angles, estimate and measure angles in degrees (°) and draw angles of a given size. Compare areas and calculate the area of rectangles (including squares) using standard units.	6G-1 Draw, compose, and decompose shapes according to given properties, including dimensions, angles and area, and solve related problems.	Draw shapes and solve more complex geometry problems (see Mathematics programmes of study: key stage 3 - Geometry and measures

SMALL STEPS

Spring: Measurement CONVERTING/EQUIVALENCE	
White Rose Maths	
Metric measures Convert metric measures Calculate with metric measures Miles and kilometres Imperial measures	Notes: some of this may have been covered in Year 5. But as it is not a priority target it all needs to be consolidated or indeed taught as a new topic in Year 6

SMALL STEPS

Spring: Measurement: Perimeter / Area / Volume	
White Rose Maths	
Shapes – same area Area and perimeter Area of a triangle Area of parallelogram What is volume?	



Volume – counting cubes Volume of a cuboid	
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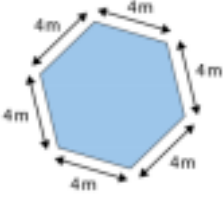
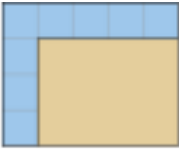
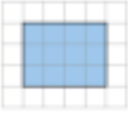

STEM SENTENCES



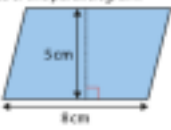
A COLLECTION OF STEM SENTENCES FROM ENIGMA MATHS HUB BASED ON THE NCETM PD MATERIALS

Area and Perimeter		
Perimeter is equal to two times ____ plus two times ____.	Language / structure.	<p>$P = 2 \times 20\text{m} + 2 \times 10\text{m}$ $= 40\text{m} + 20\text{m}$ $= 60\text{m}$</p>
The perimeter of a rectangle is equal to two times the length of the long side plus two times the length of the short side.	Generalisation	
Perimeter of the square is ____ + ____ + ____ + ____ Or Perimeter of the square is 4 x ____	Structure	<p>$P = 12\text{m} + 12\text{m} + 12\text{m} + 12\text{m}$ $= 12\text{m} \times 4$ $= 48\text{m}$</p>
The perimeter of a square is four times the length of one of the sides.	Generalisation	
Perimeter of the equilateral triangle is ____ + ____ + ____ Or Perimeter of the equilateral triangle is 3 x ____	Structure	<p>$P = 15\text{m} + 15\text{m} + 15\text{m}$ $= 3 \times 15\text{m}$ $= 45\text{m}$</p>
The perimeter of an equilateral triangle is three times the length of one of the sides.	Generalisation	



<p>Perimeter of the regular hexagon is _____ + _____ + _____ + _____ + _____ + _____</p> <p>Or</p> <p>Perimeter of the regular hexagon is 6 x _____</p>		 <p>$P = 4m + 4m + 4m + 4m + 4m + 4m$ $= 6 \times 4m$ $= 24m$</p>
<p>To find the perimeter of a regular polygon, you multiply the length one of the sides by the number of sides.</p>	<p>Generalisation</p>	
<p>If you know the perimeter of a regular polygon you divide it by the number of sides to find the length of one of its sides.</p>	<p>Generalisation</p>	
<p>This shape has an area of _____ square units.</p>		<p>This shape has an area of 8 square units.</p>
<p>We can measure area in square centimetres. We write this as cm^2</p>	<p>Generalisation</p>	
<p>The _____ represents the _____</p>	<p>Structure</p>	 <p>$5\text{ cm} \times 4\text{ cm} = 20\text{ cm}^2$ $4\text{ cm} \times 5\text{ cm} = 20\text{ cm}^2$ $A = 20\text{ cm}^2$</p> <p><i>'The "5 cm" represents the width.'</i> <i>'The "4 cm" represents the length.'</i> <i>'The "20 cm²" represents the area.'</i></p>
<p>To find the area of a rectangle multiply the length by the width.</p>	<p>Generalisation</p>	 <p>$4 \times 3 = 12\text{cm}^2$</p>
<p>A parallelogram can be made into a rectangle that has the same area.</p>	<p>Generalisation</p>	



<p>The base is ____ The perpendicular height is ____ The area is ____</p>	<p>Structure/ language</p>	<p>Find the area of this parallelogram.</p>  <ul style="list-style-type: none"> • 'The base is 8 cm.' • 'The perpendicular height is 5 cm.' • 'The area is $8 \times 5 = 40 \text{ cm}^2$.'
<p>To find the area of a parallelogram multiply the base by the perpendicular height.</p>	<p>Generalisation</p>	
<p>Two right-angled triangles that are the same can be joined to make a rectangle.</p> <p>A rectangle can be divided into two right-angled triangles.</p>	<p>Generalisation</p>	
<p>Two triangles that are the same can be joined to make a parallelogram.</p> <p>A parallelogram can be divided into two triangles.</p>	<p>Generalisation</p>	
<p>To find the area of a triangle multiply the base by the perpendicular height and then divide by two.</p>	<p>Generalisation</p>	
<p>Shapes can have the same perimeter but different areas.</p> <p>Shapes can have the same area but different perimeters.</p>	<p>Generalisation</p>	
<p>When a shape has been transformed by a scale factor, the perimeter is also transformed by the same scale factor.</p>	<p>Generalisation</p>	





Geometry - properties of shapes

Pupils should be taught to:

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

Geometry - position and direction

Pupils should be taught to:

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

READY TO PROGRESS CRITERIA

Year 5 conceptual prerequisite	Year 6 ready-to progress criteria	Key stage 3 applications
Find the perimeter of regular and irregular polygons. Compare angles, estimate and measure angles in degrees (°) and draw angles of a given size. Compare areas and calculate the area of rectangles (including squares) using standard units.	6G-1 Draw, compose, and decompose shapes according to given properties, including dimensions, angles and area, and solve related problems.	Draw shapes and solve more complex geometry problems (see Mathematics programmes of study: key stage 3 - Geometry and measures)

SMALL STEPS

Autumn: Geometry position and direction	
White Rose Maths	
The first quadrant Four Quadrants Translations Reflections	Note: this is likely to have been missed in Year 5 - particularly 2020/21. Treat as new learning.

SMALL STEPS

Summer: Geometry	
White Rose Maths	
Measure with a protractor Draw lines and angles accurately Introduce angles Angles on a straight line Angles around a point Calculate angles Vertically opposite angles Angles in a triangle Angles in a triangle – special cases	Notes: In this block children will build on learning from Year 5 to look at properties of shape in detail, specifically angles. Consider recapping the drawing of pie charts from STATISTICS when working with protractors.



Angles in a triangle – missing angles Angles in special quadrilaterals Angles in regular polygons Draw shapes accurately Draw nets of 3-D shapes	
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Statistics

Pupils should be taught to:

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

There is no RTPC

SMALL STEPS

Spring or Summer: Statistics	
White Rose Maths	
Read and interpret line graphs Draw line graphs Use line graphs to solve problems Circles Read and interpret pie charts Pie charts with percentages Draw pie charts The mean	<p>Note: Depending on SATs and number and calculation coverage this topic could be at the end of spring term or beginning of summer.</p> <p>More pie chart work is possible in geometry following this block/unit.</p>