

Overview: consolidating level 4 and introducing level 5

Unit	Hours	Beyond the Classroom
Integers, powers and roots	6	L5NNS3 and L5CALC4
Sequences, functions and graphs	4	
Geometrical reasoning: lines, angles and shapes	7	L4SSM1
Construction and loci	3	L5SSM4
Probability	5	L5HD3
Ratio and proportion	4	L4NNS6
Equations, formulae, identities and expressions	6	L4ALG1
Measures and mensuration; area	4	
Learning review 1		
Sequences, functions and graphs	6	L4ALG2
Mental calculations and checking	5	L4CALC1 and L4CALC2
Written calculations and checking	5	L4CALC3 and L4CALC5
Transformations and coordinates	7	L4SSM3
Processing and representing data; Interpreting and discussing results	7	L4HD4 and L4HD5
Equations, formulae, identities and expressions	5	
Learning review 2		
Fractions, decimals and percentages	9	L4NNS4 and L5NNS5
Measures and mensuration	4	
Calculations and checking	5	L4NNS5 , L5NNS1 and L4CALC4
Geometrical reasoning and mensuration	7	L4SSM2
Statistical enquiry	7	L4HD2
Learning review 3		

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		11-16 Pathway		
		3 to D+	4 to C+	5 to A+
Stage	1	1	2	3
	2	2	3	4
	3	3	4	5
	4	4	5	6
	5*	5*	6*	7

[More information](#)



Previously...

- Identify pairs of factors of two-digit whole numbers and find common multiples (e.g. for 6 and 9) (Y5)
- Find the difference between a positive and a negative integer, or two negative integers, in context (Y6)
- Recognise that prime numbers have only two factors and identify prime numbers less than 100; find the prime factors of two-digit numbers (Y6)
- Use knowledge of multiplication facts to derive quickly squares of numbers to 12×12 and the corresponding squares of multiples of 10 (Y6)

• Generalise in simple cases by working logically

- Recognise and use multiples, factors, primes (less than 100), common factors, highest common factors and lowest common multiples in simple cases; use simple tests of divisibility
- Understand negative numbers as positions on a number line; order, add and subtract positive and negative integers in context.
- Recognise the first few triangular numbers, squares of numbers to at least 12×12 and the corresponding roots

Next...

- Conjecture and generalise
- Use multiples, factors, common factors, highest common factors, lowest common multiples and primes
- Find the prime factor decomposition of a number (e.g. 8000) using index notation for small positive integer powers
- Add, subtract, multiply and divide integers
- Use squares, positive and negative square roots, cubes and cube roots

Autumn Term 6 hours

Suggested Activities	Criteria for Success
<p>Maths Apprentice</p> <ul style="list-style-type: none"> ▪ Consecutive products ▪ Satisfaction 1, 2, 3, 4 ▪ KPO: Numbers of factors ▪ Abundant, deficient and perfect numbers ▪ Proof, first phase ▪ Divisibility Testing ▪ Squares and roots ▪ Square number puzzle ▪ Eratosthenes sieve is normally presented on a 10x10 square - what if we changed the number of columns on a spreadsheet, and highlighted the primes? ▪ Dominoes – using multiples ▪ History and Culture: Goldbach's Conjectures ▪ History and Culture: Pascal and the Triangle <p>HORN, Cornwall</p> <ul style="list-style-type: none"> ▪ Negative number ladders <p>KS3 Top-up Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Problem Solving: v2 <p>Level 5 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Numbers and the Number System: Ordering negative numbers ▪ Calculating: Working with negative numbers <p>Resources</p> <ul style="list-style-type: none"> ▪ <i>Number line - extend to negative number line; consider negative movement along number line</i> ▪ <i>Powers - HTU chart</i> 	<p>NRICH</p> <ul style="list-style-type: none"> ▪ First Connect Three ▪ How much can we spend? ▪ Dozens ▪ Factors and Multiples Game ▪ Factors and Multiples Puzzle <p>What patterns arise when you multiply consecutive pairs / triples?</p> <p>Can every cube of a number be written as the difference of two squares?</p> <p>Multiply the triangular numbers by 8 and add 1. What numbers do you get? Why?</p> <p>Is there a pattern in the prime numbers?</p> <p>How do you know when you have found all the factors of a number?</p> <p>How many floors do you go up when going from the basement to the 3rd floor?</p> <p>Why are square numbers called square numbers?</p> <p>Why are triangular numbers called triangular numbers?</p> <p>When using the sieve of Eratosthenes, why do we stop at multiples of 7?</p> <p>How many multiples of three are there?</p> <p>Is 3752954 divisible by 2, 3, 5, 6, 9, 10?</p>
	<p>Level Ladders</p> <ul style="list-style-type: none"> ▪ Powers, integers, roots <p>Beyond the Classroom</p> <ul style="list-style-type: none"> ▪ Number patterns and relationships ▪ Negative numbers <p>APP</p> <p><i>Look for learners doing:</i></p> <ul style="list-style-type: none"> ▪ L4NNS2 ▪ L5NNS2 ▪ L5NNS3* ▪ L5CALC4*



Previously...

- Count from any given number in whole-number and decimal steps, extending beyond zero when counting backwards; relate the numbers to their position on a number line (Y5)
- Represent and interpret sequences, patterns and relationships involving numbers and shapes (Y6)

• **Represent problems, making correct use of symbols, words, diagrams, tables and graphs**

- Describe integer sequences; generate terms of a simple sequence, given a rule (e.g. finding a term from the previous term, finding a term given its position in the sequence)
- Generate sequences from patterns or practical contexts and describe the general term in simple cases

Next...

- Try out and compare mathematical representations
- Generate terms of a linear sequence using term-to-term and position-to-term definitions of the sequence, on paper and using a spreadsheet or graphical calculator
- Use linear expressions to describe the n th term of a simple arithmetic sequence, justifying its form by referring to the activity or practical context from which it was generated

Autumn Term 4 hours

Suggested Activities		Criteria for Success	
<p>Maths Apprentice</p> <ul style="list-style-type: none"> ▪ KPO: Handshakes and mark-scheme ▪ Happy and Sad Numbers ▪ History and Culture: Leonardo de Pisa <p>HORN, Cornwall</p> <ul style="list-style-type: none"> ▪ Generating sequences 1 ▪ What's my function? ▪ Which way sequences <p>Y7 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Calculating: v1, v2, v3 <p>KS3 Top-up Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Sequences: v1, v2, v3 <p>Resources Physical equipment - multilink, matchsticks, counters, pattern blocks etc. so that the shape can illustrate the rules generated.</p>	<p>NCETM Departmental Workshops</p> <ul style="list-style-type: none"> ▪ Sequences <p>NRICH</p> <ul style="list-style-type: none"> ▪ Triangle Numbers ▪ Shifting Times Tables ▪ Picturing Square Numbers ▪ Squares in Rectangles 	<p>What is the next term, what is the 10th term? Why?</p>	<p>Level Ladders</p> <ul style="list-style-type: none"> ▪ Sequences, functions and graphs <p>APP Look for learners doing:</p> <ul style="list-style-type: none"> ▪ L5UA4 ▪ L4NNS1



Previously...

- Identify, visualise and describe properties of rectangles, triangles, regular polygons and 3-D solids (Y5)
- Recognise parallel and perpendicular lines in grids and shapes; use a set-square and ruler to draw shapes with perpendicular or parallel sides (Y5)
- Calculate angles in a straight line (Y5)
- Describe, identify and visualise parallel and perpendicular edges or faces; use these properties to classify 2-D shapes and 3-D solids (Y6)
- Calculate angles in a triangle or around a point (Y6)

Classify and visualise properties and patterns

- Use correctly the vocabulary, notation and labelling conventions for lines, angles and shapes
- Identify parallel and perpendicular lines; know the sum of angles at a point, on a straight line and in a triangle; recognise vertically opposite angles
- Identify and use angle, side and symmetry properties of triangles and quadrilaterals; explore geometrical problems involving these properties, explaining reasoning orally, using step-by-step deduction supported by diagrams

Next...

- Visualise and manipulate dynamic images
- Identify alternate angles and corresponding angles; understand a proof that:
 - (i) the sum of the angles of a triangle is 180° and of a quadrilateral is 360° ;
 - (ii) the exterior angle of a triangle is equal to the sum of the two interior opposite angles.
- Solve geometrical problems using side and angle properties of equilateral, isosceles and right-angled triangles and special quadrilaterals, explaining reasoning with diagrams and text; classify quadrilaterals by their geometrical properties

Autumn Term 7 hours

Suggested Activities		Criteria for Success	
<p>Maths Apprentice</p> <ul style="list-style-type: none"> ▪ Angle vocabulary ▪ KPO: Explore Euler's formula ▪ 3x3, 4x4, 5x5 dotty paper activities ▪ Shape work ▪ Use pattern blocks to solve problems - eg make a trapezium out of 4 rhombii and 3 squares ▪ Identify quadrilaterals given only their diagonals; what quadrilaterals can be drawn from diagonals that are perpendicular? ▪ Develop reasoning: drafting written explanations for showing the values of angles in e.g. parallel lines, triangles, given values of some of the angles. <p>HORN, Cornwall</p> <ul style="list-style-type: none"> ▪ Parallel and perpendicular lines <p>Y7 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Lines and Angles: v1, v2, v3 <p>KS3 Top-up Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Lines and Angles: v1 <p>Level 4 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Shape, Space and Measures: Using properties of shapes <p>Resources</p> <ul style="list-style-type: none"> ▪ <i>Spokes OHTs:</i> clock (30°), compass rose (45°), 90° spray ▪ <i>Pattern Blocks</i> ▪ <i>Geostrips</i> ▪ 3X3, 4X4, 5X5 dotty paper 	<p>Standards Unit</p> <ul style="list-style-type: none"> ▪ SS1 Classifying Shapes <p>NCETM Departmental Workshops</p> <ul style="list-style-type: none"> ▪ Angle Properties <p>NRICH</p> <ul style="list-style-type: none"> ▪ Property Chart ▪ Shapely Pairs ▪ Quadrilaterals Game 	<p>Classify these quadrilaterals</p> <p>Which regular polygons tessellate?</p> <p>(Using Geostrip triangles) can you make a different triangle from the same three strips? Repeat for a quadrilateral.</p> <p>Find 2 shapes with an area of ___ but with different perimeters.</p> <p>Can parallel lines be curved?</p> <p>Can you have an obtuse / reflex angle in a triangle?</p>	<p>Level Ladders</p> <ul style="list-style-type: none"> ▪ Geometrical reasoning <p>Beyond the Classroom</p> <ul style="list-style-type: none"> ▪ Properties of shapes <p>APP</p> <p><i>Look for learners doing:</i></p> <ul style="list-style-type: none"> ▪ L4SSM1* ▪ L5SSM1 ▪ L5SSM2



Previously...

- Use knowledge of properties to draw 2-D shapes and identify and draw nets of 3-D shapes (Y5)
- Estimate, draw and measure acute and obtuse angles using an angle measurer or protractor to a suitable degree of accuracy (Y5)
- Make and draw shapes with increasing accuracy and apply knowledge of their properties (Y6)
- Estimate angles, and use a protractor to measure and draw them, on their own and in shapes (Y6)

• Use a ruler and protractor to:

- (i) measure and draw lines to the nearest millimetre and angles, including reflex angles, to the nearest degree;
 - (ii) construct a triangle given two sides and the included angle (SAS) or two angles and the included side (ASA)
- Use ICT to explore constructions

Next...

- Find simple loci, both by reasoning and by using ICT, to produce shapes and paths, e.g. an equilateral triangle
- Use straight edge and compasses to construct;
 - (i) the mid-point and perpendicular bisector of a line segment;
 - (ii) the bisector of an angle;
 - (iii) the perpendicular from a point to a line;
 - (iv) the perpendicular from a point on a line
 - (v) a triangle, given three sides (SSS)
- Use ICT to explore these constructions

Suggested Activities		Criteria for Success	
<p>Maths Apprentice</p> <ul style="list-style-type: none"> ▪ Shape work <p>Level 5 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Shape, Space and Measures: Measuring and drawing 		<p>How can we construct an angle of $45^\circ / 30^\circ / 120^\circ$ etc.</p> <p>How many different triangles can be made with SAS, ASA?</p> <p>Show me i) an acute angle ii) an obtuse angle iii) a reflex angle</p> <p>True/Never/Sometimes:</p> <ul style="list-style-type: none"> • To draw a triangle you need to know the size of all three angles • To draw a triangle you need to know the size of all three sides. <p>Convince me:</p> <ul style="list-style-type: none"> • how to draw a reflex angle with a 180° protractor. • why I should estimate the size of an angle before measuring it. 	<p>Level Ladders</p> <ul style="list-style-type: none"> ▪ Construction, loci <p>Beyond the Classroom</p> <ul style="list-style-type: none"> ▪ Measuring and drawing angles <p>APP Look for learners doing:</p> <ul style="list-style-type: none"> ▪ L5SSM4*



Previously...

- Describe the occurrence of familiar events using the language of chance or likelihood (Y5)
- Describe and predict outcomes from data using the language of chance or likelihood (Y6)

• Draw simple conclusions and explain reasoning

- Use vocabulary and ideas of probability, drawing on experience
- Understand and use the probability scale from 0 to 1; find and justify probabilities based on equally likely outcomes in simple contexts; identify all the possible mutually exclusive outcomes of a single event
- Estimate probabilities by collecting data from a simple experiment and recording it in a frequency table; compare experimental and theoretical probabilities in simple contexts

Next...

- Move between the general and the particular to test the logic of an argument
- Interpret the results of an experiment using the language of probability; appreciate that random processes are unpredictable
- Know that if the probability of an event occurring is p , then the probability of it not occurring is $1-p$; use diagrams and tables to record in a systematic way all possible mutually exclusive outcomes for single events and for two successive events
- Compare estimated experimental probabilities with theoretical probabilities, recognising that:
 - if an experiment is repeated the outcome may, and usually will, be different
 - increasing the number of times an experiment is repeated generally leads to better estimates of probability

Autumn Term 5 hours

Suggested Activities	Criteria for Success
<p>Maths Apprentice</p> <ul style="list-style-type: none"> ▪ Loop cards ▪ KPO: Dice activities (Creative Dice) ▪ Discuss the different outcomes, e.g. tetrahedral dice, dice marked 1,1,2,2,3,4, coin with two heads <p>Y7 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Probability: v1, v2, v3 <p>KS3 Top-up Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Probability: v1 <p>Level 5 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Handling Data: Using the probability scale <p>HORN, Cornwall</p> <ul style="list-style-type: none"> ▪ How many times? <p>Resources</p> <ul style="list-style-type: none"> ▪ Probability scale ▪ Probability recording sheets ▪ Probability pots 	<p>Standards Unit</p> <ul style="list-style-type: none"> ▪ S3 Playing probability computer games <p>NRICH</p> <ul style="list-style-type: none"> ▪ Odds and Evens <p>The probability it will rain tomorrow is $\frac{1}{2}$ - True or False? Why?</p> <p>True / Never / Sometimes: If I flip a coin 100 times I will get 50 heads?</p> <p>If you repeat this experiment, will you always / sometimes / never get the same result?</p> <p>Design an experiment that will give probabilities of $\frac{1}{3}$, $\frac{1}{2}$, $\frac{2}{5}$ etc.</p>
	<p>Level Ladders</p> <ul style="list-style-type: none"> ▪ Probability <p>Beyond the Classroom</p> <ul style="list-style-type: none"> ▪ The probability scale <p>APP</p> <p><i>Look for learners doing:</i></p> <ul style="list-style-type: none"> ▪ L5HD2 ▪ L5HD3* ▪ L5HD5 ▪ L5UAs



Previously...

- Use sequences to scale numbers up or down; solve problems involving proportions of quantities (e.g. decrease quantities in a recipe designed to feed six people) (Y5)
- Solve simple problems involving direct proportion by scaling quantities up or down (Y6)

• Communicate own findings effectively, orally and in writing, and discuss and compare approaches and results with others

- Understand the relationship between ratio and proportion; use direct proportion in simple contexts; use ratio notation, simplify ratios and divide a quantity into two parts in a given ratio; solve simple problems involving ratio and proportion using informal strategies

Next...

- Refine own findings and approaches on the basis of discussions with others
- Apply understanding of the relationship between ratio and proportion; simplify ratios, including those expressed in different units, recognising links with fraction notation; divide a quantity into two or more parts in a given ratio; use the unitary method to solve simple problems involving ratio and direct proportion

Autumn Term 4 hours

Suggested Activities	Criteria for Success
<p>Maths Apprentice</p> <ul style="list-style-type: none"> ▪ Proportional sets ▪ KPO: Cuisenaire proportions (changing the unit rod) ▪ Eastbourne – map needed, but could be modified ▪ Ratio problems solved with 2-way tables / simple scaling <p>Y7 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Problem Solving: v1, v2, v3 <p>Level 4 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Numbers and the Number System: Getting started with ratio <p>KS3 Top-up Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Ratio and Proportion 1: v1, v2, v3 <p>Resources</p> <ul style="list-style-type: none"> ▪ Fractions images / OHTs ▪ Proportional sets 1 ▪ Proportional sets 2 	<p>NRICH</p> <ul style="list-style-type: none"> ▪ Mixing Lemonade <p>Use the multiplication grid to find other ratios in the family 8:12 and 14:42. What do the ratios have in common?</p> <p>Which is the best buy?</p> <p>Ratios related to age and how they change over time: e.g. if Josh and Beth are 1 and 4, £200 will be split in the ratio 1:4 now. What about next year etc. etc.?</p>
	<p>Level Ladders</p> <ul style="list-style-type: none"> ▪ Fractions ▪ Percentages <p>Beyond the Classroom</p> <ul style="list-style-type: none"> • Simple ratio <p>APP</p> <p><i>Look for learners doing:</i></p> <ul style="list-style-type: none"> ▪ L4UA3 ▪ L4NNS6* ▪ L5NNS6 ▪ L5CALC5



Previously...

- Explore patterns, properties and relationships and propose a general statement involving numbers or shapes (Y5)
- Explain reasoning using diagrams, graphs and text; refine ways of recording using images and symbols (Y5)
- Construct and use simple expressions and formulae in words then symbols (e.g. the cost of c pens at 15 pence each is 15c pence) (Y6)
- Explain reasoning and conclusions, using words, symbols or diagrams as appropriate (Y6)

• **Manipulate numbers, algebraic expressions and equations**

- Use letter symbols to represent unknown numbers or variables; know the meanings of the words *term*, *expression* and *equation*
- Understand that algebraic operations follow the rules of arithmetic
- Simplify linear algebraic expressions by collecting like terms; multiply a single term over a bracket (integer coefficients)
- Substitute positive integers into linear expressions

Next...

- Recognise that letter symbols play different roles in equations, formulae and functions; know the meanings of the words formula and function
- Understand that algebraic operations, including the use of brackets, follow the rules of arithmetic; use index notation for small positive integer powers
- Simplify or transform linear expressions by collecting like terms; multiply a single term over a bracket
- Substitute integers into simple formulae

Autumn Term 6 hours

Suggested Activities	Criteria for Success	
<p>Maths Apprentice</p> <ul style="list-style-type: none"> ▪ Cuisenaire algebra 1, Cuisenaire algebra 2 ▪ KPO: Pairs in Squares ▪ Pick's theorem and mark-scheme ▪ 20g weight 50g plasticene ▪ History and Culture: al-Khwarizmi's Algebra <p>Y7 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Algebra: v1, v2, v3 ▪ Order of Operations: v1, v2, v3 <p>KS3 Top-up Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Algebraic Expressions: v1, v2 <p>Level 4 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Algebra: Using a worded formula <p>HORN, Cornwall</p> <ul style="list-style-type: none"> ▪ Substituting integers ▪ Substitution 1 ▪ Deriving formulae 1 <p>Resources</p> <p>Snakes for substitution. Use spider diagrams for building up expressions.</p>	<p>NCETM Departmental Workshops</p> <ul style="list-style-type: none"> ▪ Constructing Equations <p>NRICH</p> <ul style="list-style-type: none"> ▪ More Number Pyramids ▪ Crossed Ends ▪ Number Pyramids 	<p>The answer is $2x+5y$. What is the question?</p> <p>The answer is $4n-12$. What is the question?</p> <p>True / Never / Sometimes: $n^2 = 2n$</p> <p>Show me an example of a formula expressed in words</p> <p>What is the same/different about '£5 standing charge plus 5p for every minute' and 'Cost of phone bill = £5 standing charge plus 5p for every minute'</p> <p>How can you change 'Plumber's bill = £40 per hour' to include a £20 call-out fee</p> <p>True/Never/Sometimes: A formula should have an equals sign in it</p> <p>Convince me that there is only one solution to 'I think of a number and add 12. The answer is 17.'</p> <p>Level Ladders</p> <ul style="list-style-type: none"> ▪ Equations, formulae, identities <p>Beyond the Classroom</p> <ul style="list-style-type: none"> ▪ Simple formulae in words <p>APP</p> <p>Look for learners doing:</p> <ul style="list-style-type: none"> ▪ L4ALG1* ▪ L5ALG1



Previously...

- Measure and calculate the perimeter of regular and irregular polygons (Y5)
- Use the formula for the area of a rectangle to calculate the rectangle's area (Y5)
- Calculate the perimeter and area of rectilinear shapes; estimate the area of an irregular shape by counting squares (Y6)

- **Make accurate mathematical diagrams and constructions on paper**
- **Check the accuracy of the solution**

- Choose and use units of measurement to measure, estimate, calculate and solve problems in everyday contexts
- Know and use the formula for the area of a rectangle; calculate the perimeter and area of shapes made from rectangles
- Calculate the surface area of cubes and cuboids

Next...

- Choose and use units of measurement to measure, estimate, calculate and solve problems in a range of contexts
- Derive and use formulae for the area of a triangle, parallelogram and trapezium; calculate areas of compound shapes

Autumn Term 4 hours

Suggested Activities		Criteria for Success	
<p>Maths Apprentice</p> <ul style="list-style-type: none"> ▪ Equivalent perimeters ▪ 3x3, 4x4, 5x5 dotty paper activities - area and perimeter ▪ KPO: Shape work (Squares) ▪ Dotty activities - 4x4 Find the squares, triangles etc... then find the areas of the shapes you have drawn. <p>Y7 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Metric Units: v1, v2, v3 <p>Resources</p> <ul style="list-style-type: none"> ▪ <i>Arrays of counters to link with area</i> ▪ <i>HTU Chart</i> ▪ 3x3, 4x4, 5x5 dotty paper 	<p>NRICH</p> <ul style="list-style-type: none"> ▪ Estimating Angles ▪ On the Edge ▪ Fence It ▪ Hidden Dimensions ▪ Warmslug Double ▪ Glazing 	<p>How do you know which is the base and height?</p> <p>Find shapes with a perimeter of 11cm</p> <p>Find another measurement that is the same as 3m</p> <p>How we decide what each division on the scale represents?</p> <p>Draw two different rectangles with an area of 8 squares? How about 7 squares? Why not?</p> <p>Why is the area of a rectangle given by length times width?</p> <p>A shape made from two rectangles has area 10cm². Draw the shape.</p> <p>Given a set of balances, some plasticene and only a 20g weight, can you measure 50g of plasticene?</p>	<p>Level Ladders</p> <ul style="list-style-type: none"> ▪ Measures <p>APP</p> <p><i>Look for learners doing:</i></p> <ul style="list-style-type: none"> ▪ L5UA2 ▪ L4SSM4 ▪ L4SSM6 ▪ L5SSM7

LEARNING REVIEW 1



Previously...

- Read and plot coordinates in the first quadrant (Y5)
- Use coordinates in the first quadrant to draw, locate and complete shapes that meet given properties (Y6)

• **Make accurate mathematical graphs on paper and on screen**

- Express simple functions in words, then using symbols; represent them in mappings
- Generate coordinate pairs that satisfy a simple linear rule; plot the graphs of simple linear functions, where y is given explicitly in terms of x , on paper and using ICT; recognise straight-line graphs parallel to the x -axis or y -axis
- Plot and interpret the graphs of simple linear functions arising from real-life situations, e.g. conversion graphs

Next...

- Express simple functions algebraically and represent them in mappings or on a spreadsheet
- Generate points in all four quadrants and plot the graphs of linear functions, where y is given explicitly in terms of x , on paper and using ICT; recognise that equations of the form $y = mx + c$ correspond to straight-line graphs
- Construct linear functions arising from real-life problems and plot their corresponding graphs; discuss and interpret graphs arising from real situations, e.g. distance–time graphs

Spring Term 6 hours

Suggested Activities		Criteria for Success	
<p>Maths Apprentice</p> <ul style="list-style-type: none"> ▪ Lines ▪ Fascinating food <p>Y7 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Plotting Graphs: v1, v2, v3 <p>Level 4 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Algebra: Coordinates in the first quadrant <p>HORN, Cornwall</p> <ul style="list-style-type: none"> ▪ KPO: Plotting linear graphs <p>Resources</p> <p>Axes</p>		<p>Coordinates: 'x is a cross, wise up'. What does this mean?! Does it help you?</p> <p>I want to plot the graph of $y=2x$. What shall I do?</p> <p>Give me the co-ordinates of some points which can be joined to form a straight line</p> <p>Find three lines that pass through 1 on the y-axis</p> <p>Is the point (2, 4) on the line $y=x+1$? Explain your answer</p>	<p>Level Ladders</p> <ul style="list-style-type: none"> ▪ Sequences, functions, graphs <p>Beyond the Classroom</p> <ul style="list-style-type: none"> ▪ Coordinates in the first quadrant <p>APP</p> <p><i>Look for learners doing:</i></p> <ul style="list-style-type: none"> ▪ L4ALG2*



Previously...

- Extend mental methods for whole-number calculations, for example to multiply a two-digit by a one-digit number (e.g. 12×9), to multiply by 25 (e.g. 16×25), to subtract one near multiple of 1000 from another (e.g. $6070 - 4097$) (Y5)
- Use knowledge of place value and multiplication facts to 10×10 to derive related multiplication and division facts involving decimals (e.g. 0.8×7 , $4.8 \div 6$) (Y6)
- Calculate mentally with integers and decimals: $U.t \pm U.t$, $TU \times U$, $TU \div U$, $U.t \times U$, $U.t \div U$ (Y6)
- Use approximations, inverse operations and tests of divisibility to estimate and check results (Y6)

Understand the significance of a counter-example

Calculate accurately, selecting mental methods or calculating devices as appropriate

- Understand and use the rules of arithmetic and inverse operations in the context of positive integers and decimals
- Use the order of operations, including brackets
- Strengthen and extend mental methods of calculation to include decimals, fractions and percentages, accompanied where appropriate by suitable jottings; solve simple problems mentally
- Recall number facts, including positive integer complements to 100 and multiplication facts to 10×10 , and quickly derive associated division facts
- Check results by considering whether they are of the right order of magnitude and by working problems backwards

Next...

- Identify exceptional cases or counter-examples
- Understand and use the rules of arithmetic and inverse operations in the context of integers and fractions
- Use the order of operations, including brackets, with more complex calculations
- Strengthen and extend mental methods of calculation, working with decimals, fractions, percentages, squares and square roots, and cubes and cube roots; solve problems mentally
- Recall equivalent fractions, decimals and percentages; use known facts to derive unknown facts, including products involving numbers such as 0.7 and 6, and 0.03 and 8
- Make and justify estimates and approximations of calculations
- Select from a range of checking methods, including estimating in context and using inverse operations

Spring Term 5 hours

Suggested Activities	Standards Unit	Criteria for Success	
<p><i>This unit, with the next one, is designed to take pupils through the structure of mental - jottings - written, and using calculators as and when necessary. Children should use mental approaches as a first resort to solving number calculations; then mental approaches with informal jottings, then finally written methods. See 'Approaches to calculation, some principles'</i></p> <p>Y7 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Mental Maths: v1, v2, v3 <p>KS3 Top-up Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Place Value: v1, v2, v3 ▪ Fractions, Decimals and Percentages 1: v1, v2 ▪ Using a Calculator: v1 <p>Level 4 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Calculating: Mental methods, Using tables I, Using tables II <p>Resources</p> <ul style="list-style-type: none"> ▪ Place value chart ▪ Number lines ▪ Place value grids - cut up 100 square/ missing numbers ▪ Diene's blocks ▪ Cuisenaire Rods ▪ 100 squares ▪ Counting stick – decimals 	<p>KPO: N2 Evaluating statements about number operations</p> <p>NRICH</p> <ul style="list-style-type: none"> ▪ The Remainders Game ▪ Countdown ▪ Remainders ▪ Number Daisy ▪ Got It 	<p>How many numbers are there between 1 and 2?</p> <p>Give me some numbers between 7.1 and 7.2</p> <p>$1/8 = 0.125$. What is $3/8$?</p> <p>80 pupils go on a trip. 25% are girls, how can you work out the number of boys?</p>	<p>Level Ladders</p> <ul style="list-style-type: none"> ▪ Mental calculations ▪ Place value, rounding <p>Beyond the Classroom</p> <ul style="list-style-type: none"> ▪ Mental methods ▪ Multiplication facts <p>APP</p> <p><i>Look for learners doing:</i></p> <ul style="list-style-type: none"> ▪ L4CALC1* ▪ L4CALC2* ▪ L4NNS3 ▪ L5UA2



Previously...

- Use efficient written methods to add and subtract whole numbers and decimals with up to two places (Y5)
- Refine and use efficient written methods to multiply and divide HTU × U, TU × TU, U.t × U and HTU ÷ U (Y5)
- Use a calculator to solve problems, including those involving decimals or fractions (e.g. to find $\frac{3}{4}$ of 150 g); interpret the display correctly in the context of measurement (Y5)
- Use efficient written methods to add and subtract integers and decimals, to multiply and divide integers and decimals by a one-digit integer, and to multiply two-digit and three-digit integers by a two-digit integer (Y6)
- Use a calculator to solve problems involving multi-step calculations (Y6)

- **Apply routine algorithms**
- **Estimate, approximate and check working**

- Understand and use the rules of arithmetic and inverse operations in the context of positive integers and decimals
- Use the order of operations, including brackets
- Use efficient written methods to add and subtract whole numbers and decimals with up to two places
- Multiply and divide three-digit by two-digit whole numbers; extend to multiplying and dividing decimals with one or two places by single-digit whole numbers
- Carry out calculations with more than one step using brackets and the memory; use the square root and sign change keys
- Enter numbers and interpret the display in different contexts (decimals, percentages, money, metric measures)
- Check results by considering whether they are of the right order of magnitude and by working problems backwards

Next...

- Understand and use the rules of arithmetic and inverse operations in the context of integers and fractions
- Use the order of operations, including brackets, with more complex calculations
- Use efficient written methods to add and subtract integers and decimals of any size, including numbers with differing numbers of decimal places
- Use efficient written methods for multiplication & division of integers & decimals, including by decimals such as 0.6 or 0.06; understand where to position the decimal point by considering equivalent calculations
- Carry out more difficult calculations effectively and efficiently using the function keys for sign change, powers, roots and fractions; use brackets and the memory
- Enter numbers and interpret the display in different contexts (extend to negative numbers, fractions, time)
- Make and justify estimates and approximations of calculations
- Select from a range of checking methods, including estimating in context and using inverse operations

Spring Term 5 hours

Suggested Activities	Criteria for Success
<p><i>This unit, with the previous one, is designed to take pupils through the structure of mental - jottings - written, and using calculators as and when necessary. Children should use mental approaches as a first resort to solving number calculations; then mental approaches with informal jottings, then finally written methods. See 'Approaches to calculation, some principles'</i></p> <p>Maths Apprentice</p> <ul style="list-style-type: none"> ▪ Multiplying problems ▪ Divide by 7, 11, 13 trick ▪ Proof 1st phase: Reverse and add ▪ KPO: Maximum quotient ▪ Explore number problems ▪ What does BIDMAS mean – does it help? <p>Y7 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Multiplying & Dividing: v1, v2, v3, v4, v5, v6 ▪ Estimating: v1, v2, v3 <p>Level 4 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Calculating: Written methods, Using a calculator 	<p>NRICH</p> <ul style="list-style-type: none"> ▪ Two and Two ▪ Multiplying with Lines ▪ Make 37 ▪ Consecutive Numbers ▪ Where Can We Visit? ▪ Consecutive Sums ▪ Consecutive Seven
<p>Can division ever make a number larger?</p> <p>Can multiplication ever make a number smaller?</p> <p>In which order would you calculate $4 \times 7 \times 5$? Why?</p> <p>How would you work out 537×24? What would be the answer to 53.7×24?</p> <p>How can you check if your answer makes sense? [Last digits / estimating]</p> <p>This division calculation is incorrect $219.3 \div 8 = 274.125$ How can you tell?</p> <p>How do you choose an estimate to use?</p>	<p>Level Ladders</p> <ul style="list-style-type: none"> ▪ Written calculations <p>Beyond the Classroom</p> <ul style="list-style-type: none"> ▪ Written methods ▪ Solving problems <p>APP</p> <p><i>Look for learners doing:</i></p> <ul style="list-style-type: none"> ▪ L4CALC3* ▪ L4CALC5* ▪ L5CALC3 ▪ L5CALC6



Previously...

- Complete patterns with up to two lines of symmetry; draw the position of a shape after a reflection or translation (Y5)
- Visualise and draw on grids of different types where a shape will be after reflection, after translations, or after rotation through 90° or 180° about its centre or one of its vertices (Y6)

- **Compare and evaluate approaches; recognise equivalent approaches**
- **Take account of feedback and learn from mistakes**

- Understand and use the language and notation associated with reflections, translations and rotations
- Recognise and visualise the symmetries of a 2-D shape
- Transform 2-D shapes by:
 - reflecting in given mirror lines;
 - rotating about a given point;
 - translating.
- Explore these transformations and symmetries using ICT

Next...

- Evaluate the efficiency of alternative strategies and approaches; recognise efficiency in an approach
- Identify all the symmetries of 2-D shapes
- Transform 2-D shapes by rotation, reflection and translation, on paper and using ICT
- Try out mathematical representations of simple combinations of these transformations
- Understand and use the language and notation associated with enlargement; enlarge 2-D shapes, given a centre of enlargement and a positive integer scale factor; explore enlargement using ICT
- Know that if two 2-D shapes are congruent, corresponding sides and angles are equal

Spring Term 7 hours

Suggested Activities	Criteria for Success
<p>Maths Apprentice</p> <ul style="list-style-type: none"> ▪ Galloping Horse and teacher's version ▪ Rangoli Patterns ▪ Lines of symmetry in polygons and mark-scheme ▪ Go to a car park and look at hubcaps ▪ Use pattern blocks to make shapes with 'x' lines of symmetry and order 'y' of rotational symmetry <p>Level 4 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Shape, Space and Measures: Transformations <p>HORN, Cornwall</p> <ul style="list-style-type: none"> ▪ Reflections ▪ Geometrical visualisations <p>Resources</p> <ul style="list-style-type: none"> ▪ 3x3, 4x4, 5x5 <i>dotty paper</i> 	<p>Standards Unit</p> <ul style="list-style-type: none"> ▪ KPO: SS7 Transforming shapes <p>NRICH</p> <ul style="list-style-type: none"> ▪ Reflecting Squarely ▪ Isometrically ▪ Mirror, Mirror... ▪ ...on the Wall
<p>Level Ladders</p> <ul style="list-style-type: none"> ▪ Transformations ▪ Geometrical reasoning <p>Beyond the Classroom</p> <ul style="list-style-type: none"> ▪ Simple transformations <p>APP</p> <p><i>Look for learners doing:</i></p> <ul style="list-style-type: none"> ▪ L4SSM3* ▪ L5SSM3 	<p>Coordinates: 'x is a cross, wise up'. What does this mean?! Does it help you?</p> <p>Find a pair of points with a mid-point of (1,4): and another... and another</p> <p>Find a point which is a three units from (1,4): and another... and another</p> <p>A square has sides parallel to the x and y axes. What relationships exist between the coordinates of the four corners?</p> <p>Is it always possible to find the coordinates of the third and fourth corners of a square if you know the first and second? Is there a unique answer?</p> <p>Make a polygon which is symmetrical but not regular</p> <p>Draw a hexagon with 6 / 3 / 2 / 1 / 0 lines of symmetry. Why can't you draw one with 4 / 5 lines of symmetry?</p> <p>How many lines of symmetry can a quadrilateral have?</p> <p>When reflecting / rotating on a coordinate grid: What connections are there between the coordinates of corresponding vertices?</p>



Previously...

- Construct frequency tables, pictograms and bar and line graphs to represent the frequencies of events and changes over time (Y5)
- Construct and interpret frequency tables, bar charts with grouped discrete data, and line graphs; interpret pie charts (Y6)
- Describe & interpret results & solutions to problems using the mode, range, median & mean (Y6)

• Identify the necessary information to understand or simplify a context or problem

- Calculate statistics for small sets of discrete data:
 - (i) find the mode, median and range, and the modal class for grouped data
 - (ii) calculate the mean, including from a simple frequency table, using a calculator for a larger number of items
- Construct, on paper and using ICT, graphs and diagrams to represent data, including:
 - (i) bar-line graphs
 - (ii) frequency diagrams for grouped discrete data
 - (iii) simple pie charts
- Interpret diagrams and graphs (including pie charts), and draw simple conclusions based on the shape of graphs and simple statistics for a single distribution

Next...

- Identify the mathematical features of a context or problem
- Calculate statistics for sets of discrete and continuous data, including with a calculator and spreadsheet; recognise when it is appropriate to use the range, mean, median and mode and, for grouped data, the modal class
- Construct graphical representations, on paper and using ICT, and identify which are most useful in the context of the problem. Include:
 - (i) pie charts for categorical data
 - (ii) bar charts and frequency diagrams for discrete and continuous data
 - (iii) simple line graphs for time series
 - (iv) simple scatter graphs
 - (v) stem-and-leaf diagrams
- Interpret tables, graphs and diagrams for discrete and continuous data, relating summary statistics and findings to the questions being explored

Spring Term 7 hours

Suggested Activities		Criteria for Success	
<p>Maths Apprentice</p> <ul style="list-style-type: none"> ▪ Graph Match and answers ▪ KPO: Averages <p>Y7 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Comparing Statistics: v1, v2, v3 <p>KS3 Top-up Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Handling Data: v1 <p>Level 4 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Handling Data: Interpreting frequency diagrams and line graphs, Understanding mode and range <p>Resources</p> <ul style="list-style-type: none"> ▪ <i>Cuisenaire rods (averaging physical / visual resources to demonstrate even distribution of values for the mean)</i> ▪ <i>Mini-whiteboards (with numbers on, pupils are arranged for median, mode etc.)</i> 	<p>NCETM Departmental Workshops</p> <ul style="list-style-type: none"> ▪ Statistical Data <p>NRICH</p> <ul style="list-style-type: none"> ▪ Searching for (Mean)ing ▪ Litov's Mean Value Theorem ▪ M, M and M 	<p>What does average mean?</p> <p>Why do we have more than one way of working out an average?</p> <p>Can the average be bigger than the largest number?</p> <p>Can an average be the same as the largest number?</p> <p>How can we represent a group of numbers, with a single number?</p> <p>Any possibilities using Averages</p>	<p>Level Ladders</p> <ul style="list-style-type: none"> ▪ Processing, representing and interpreting data <p>Beyond the Classroom</p> <ul style="list-style-type: none"> ▪ Frequency diagrams and line graphs ▪ Mode and range <p>APP</p> <p><i>Look for learners doing:</i></p> <ul style="list-style-type: none"> ▪ L5UA1 ▪ L4,HD4* ▪ L4,HD5* ▪ L5HD4 ▪ L5HD6 ▪ L5HD7



Spring Term 5 hours

Previously...

- Solve one-step and two-step problems involving whole numbers and decimals and all four operations, choosing and using appropriate calculation strategies, including calculator use (Y5)
- Represent a puzzle or problem by identifying and recording the information or calculations needed to solve it; find possible solutions and confirm them in the context of the problem (Y5)
- Tabulate systematically the information in a problem or puzzle; identify and record the steps or calculations needed to solve it, using symbols where appropriate; interpret solutions in the original context and check their accuracy (Y6)

• Interpret information from a mathematical representation or context

- Know the meanings of the words *term*, *expression* and *equation*
- Construct and solve simple linear equations with integer coefficients (unknown on one side only) using an appropriate method (e.g. inverse operations)

Next...

- Use logical argument to interpret the mathematics in a given context or to establish the truth of a statement
- Recognise that letter symbols play different roles in equations, formulae and functions
- Construct and solve linear equations with integer coefficients (unknown on either or both sides, without and with brackets) using appropriate methods (e.g. inverse operations, transforming both sides in same way)
- Use graphs and set up equations to solve simple problems involving direct proportion
- Substitute integers into simple formulae, including examples that lead to an equation to solve

Suggested Activities		Criteria for Success	
<p>Maths Apprentice</p> <ul style="list-style-type: none"> ▪ KPO: The domino trick and the card trick <p>Y7 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Algebra: v1, v2, v3 ▪ Order of Operations: v1, v2 <p>KS3 Top-up Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Algebraic Equations: v1, v2 <p>Resources</p> <ul style="list-style-type: none"> ▪ <i>Flowcharts for equations</i> ▪ <i>Pack of cards (for think of a number problems)</i> 	<p>NCETM Departmental Workshops</p> <ul style="list-style-type: none"> ▪ Constructing Equations 	<p>What is different about the two statements here: $x + 7 = 12$ and $x + y = 15$?</p>	<p>Level Ladders</p> <ul style="list-style-type: none"> ▪ Equations, formulae, identities <p>APP Look for learners doing:</p> <ul style="list-style-type: none"> ▪ L4ALG1 ▪ L5ALG1

LEARNING REVIEW 2



Previously...

- Relate fractions to multiplication and division (e.g. $6 \div 2 = 1 \frac{1}{2}$ of $6 = 6 \times 1 \frac{1}{2}$); express a quotient as a fraction or decimal (e.g. $67 \div 5 = 13.4$ or $13 \frac{2}{5}$); find fractions and percentages of whole-number quantities (e.g. $\frac{5}{8}$ of 96, 65% of £260) (Y6)
- Express a larger whole number as a fraction of a smaller one (e.g. recognise that 8 slices of a 5-slice pizza represents $\frac{8}{5}$, or $1 \frac{3}{5}$ pizzas); simplify fractions by cancelling common factors; order a set of fractions by converting them to fractions with a common denominator (Y6)
- Express one quantity as a percentage of another (e.g. express £400 as a percentage of £1000); find equivalent percentages, decimals and fractions (Y6)

• Use accurate notation, including correct syntax when using ICT

- Express a smaller whole number as a fraction of a larger one; simplify fractions by cancelling all common factors and identify equivalent fractions; convert terminating decimals to fractions, e.g. $0.23 = \frac{23}{100}$; use diagrams to compare two or more simple fractions
- Add & subtract simple fractions and those with common denominators; calculate simple fractions of quantities & measurements (whole-number answers); multiply a fraction by an integer
- Understand percentage as the 'number of parts per 100'; calculate simple percentages and use percentages to compare simple proportions
- Recognise the equivalence of percentages, fractions and decimals

Next...

- Recognise that a recurring decimal is a fraction; use division to convert a fraction to a decimal; order fractions by writing them with a common denominator or by converting them to decimals
- Add and subtract fractions by writing them with a common denominator; calculate fractions of quantities (fraction answers); multiply and divide an integer by a fraction
- Interpret percentage as the operator 'so many hundredths of' and express one given number as a percentage of another; calculate percentages and find the outcome of a given percentage increase or decrease
- Use the equivalence of fractions, decimals and percentages to compare proportions

Summer Term 9 hours

Suggested Activities		Criteria for Success	
<p>Maths Apprentice</p> <ul style="list-style-type: none"> ▪ Fraction Action, FDP carpets, Fraction OHTs, Fractions poem ▪ Operations, using brackets ▪ 6ocm number line; Parallel lines ▪ The Heinz Matrix (using fractions): try this second version, and PowerPoint. ▪ KPO: Create fractions using a spreadsheet (dividing 'x' by 'y'); colour cells that are equivalent ▪ Egyptian fractions ▪ Evaluate $\frac{1}{2} + \frac{1}{4}$ - what do you notice? Continue by halving each successive term; e.g. $\frac{1}{2} + \frac{1}{4} + \frac{1}{8}$ ▪ Find $\frac{2}{5}$ of 45 (etc) using the multiplication grid ▪ Use fraction walls / Cuisenaire to compare fractions; Extend to comparing those with common denominators – e.g. $\frac{3}{4}$ or $\frac{4}{5}$? <p>Y7 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Simplifying Fractions: v1, v2, v3 ▪ Fractions, Decimals & Percentages: v1, v2, v3 <p>KS3 Top-up Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Fractions, Decimals and Percentages 1: v1, v2, v3 <p>Level 4 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Numbers and the number system: Fractions and percentages <p>Level 5 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Numbers and the number system: Equivalence between fractions <p>Resources</p> <p>Spider diagram – e.g. fractions of 40 or 60, Fractions images, Multiplication squares, Division using the number line, Counting stick</p>	<p>NCETM Departmental Workshops</p> <ul style="list-style-type: none"> ▪ Fractions <p>NRICH</p> <ul style="list-style-type: none"> ▪ Fractions Jigsaw ▪ Peaches Today, Peaches Tomorrow... ▪ Matching Fractions, Decimals, Percentages 	<p>Show this fraction as part of a square / rectangle / number line</p> <p>Explain mental methods for finding common percentages of a quantity – e.g. $33\frac{1}{3}\%$, $17\frac{1}{2}\%$, 20%</p> <p>How many different ways can you shade a 2×3 rectangle of squares to show $\frac{1}{3}$?</p> <p>Use multilink cubes to make some cuboids that show $\frac{1}{3}$. Can this be done with all cuboids?</p> <p>Find six fractions \equiv to ____</p> <p>Which percentages/ decimals / fractions are easiest to convert? Why?</p> <p>To find 10% you divide by 10. Why don't you divide by 20 to find 20%?</p> <p>2 badgers plus 3 badgers equals 5 badgers. What is 2 sevenths plus 3 sevenths?</p> <p>80 pupils go on a school trip. 25% are girls. How can you work out the number of boys?</p>	<p>Level Ladders</p> <ul style="list-style-type: none"> ▪ Fractions ▪ Mental calculations ▪ Percentages <p>Beyond the Classroom</p> <ul style="list-style-type: none"> ▪ Proportions of a whole ▪ Simplifying fractions <p>APP</p> <p>Look for learners doing:</p> <ul style="list-style-type: none"> ▪ L4NNS4* ▪ L5NNS4 ▪ L5NNS5*



Previously...

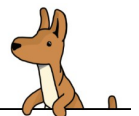
- Read, choose, use and record standard metric units to estimate and measure length, weight and capacity to a suitable degree of accuracy (e.g. the nearest centimetre); convert larger to smaller units using decimals to one place (e.g. change 2.6 kg to 2600 g) (Y5)
- Interpret a reading that lies between two unnumbered divisions on a scale (Y5)
- Select and use standard metric units of measure and convert between units using decimals to two places (e.g. change 2.75 litres to 2750 ml, or vice versa) (Y6)
- Read and interpret scales on a range of measuring instruments, recognising that the measurement made is approximate and recording results to a required degree of accuracy; compare readings on different scales, for example when using different instruments (Y6)

- Convert one metric unit to another, e.g. grams to kilograms; read and interpret scales on a range of measuring instruments
- Distinguish between and estimate the size of acute, obtuse and reflex angles

Next...

- Choose and use units of measurement to measure, estimate, calculate and solve problems in a range of contexts; know rough metric equivalents of imperial measures in common use, such as miles, pounds (lb) and pints
- Use bearings to specify direction

Suggested Activities		Criteria for Success	
<p>Maths Apprentice</p> <ul style="list-style-type: none"> ▪ Research a brief history of length from Roman times ▪ Walk 1000 metres. Compare 1000 paces with 1000 metres. <p>Y7 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Metric Units: v1, v2, v3 <p>Resources</p> <ul style="list-style-type: none"> ▪ <i>Sets of scales</i> ▪ <i>Measuring jugs</i> ▪ <i>Spokes OHTs: clock (30°); compass rose (45°)</i> 	<p>NCETM Departmental Workshops</p> <ul style="list-style-type: none"> ▪ Converting Units <p>NRICH</p> <ul style="list-style-type: none"> ▪ Estimating Angles 	<p>What unit would you use to measure_____?</p> <p>Show me pairs of metric units that can complete the statements below:</p> <p>i) 1 _____ = 1000 _____</p> <p>ii) 1 _____ = 100 _____</p> <p>iii) 1 _____ = 10 _____</p> <p>What is the same/different about:</p> <ul style="list-style-type: none"> • mm, cm ,m,km • mg, g, kg, • km, kg, l <p>Convince me how to read a scale on measuring equipment.</p>	<p>Level Ladders</p> <ul style="list-style-type: none"> ▪ Measures <p>APP</p> <p><i>Look for learners doing:</i></p> <ul style="list-style-type: none"> ▪ L4SSM5 ▪ L5SSM5 ▪ L5SSM6



Previously...

- Use understanding of place value to multiply and divide whole numbers and decimals by 10, 100 or 1000 (Y5)
- Explain what each digit represents in whole numbers and decimals with up to two places, and partition, round and order these numbers (Y5)
- Use decimal notation for tenths, hundredths and thousandths; partition, round and order decimals with up to three places, and position them on the number line (Y6)
- Solve multi-step problems, and problems involving fractions, decimals and percentages; choose and use appropriate calculation strategies at each stage, including calculator use (Y6)

• **Record methods, solutions and conclusions**

- Understand and use decimal notation and place value; multiply and divide integers and decimals by 10, 100, 1000, and explain the effect
- Compare and order decimals in different contexts; know that when comparing measurements the units must be the same
- Round positive whole numbers to the nearest 10, 100 or 1000, and decimals to the nearest whole number or one decimal place
- Use the order of operations, including brackets
- Strengthen and extend mental methods of calculation to include decimals, fractions and percentages, accompanied where appropriate by suitable jottings; solve simple problems mentally
- Multiply and divide three-digit by two-digit whole numbers; extend to multiplying and dividing decimals with one or two places by single-digit whole numbers
- Check results by considering whether they are of the right order of magnitude and by working problems backwards

Next...

- Read and write positive integer powers of 10; multiply and divide integers and decimals by 0.1, 0.01
- Order decimals
- Round positive numbers to any given power of 10; round decimals to the nearest whole number or to one or two decimal places
- Use the order of operations, including brackets, with more complex calculations
- Make and justify estimates and approximations of calculations
- Strengthen and extend mental methods of calculation, working with decimals, fractions, percentages, squares and square roots, and cubes and cube roots; solve problems mentally
- Use efficient written methods for multiplication and division of integers and decimals, including by decimals such as 0.6 or 0.06; understand where to position the decimal point by considering equivalent calculations
- Select from a range of checking methods, including estimating in context and using inverse operations

Summer Term 5 hours

Suggested Activities		Criteria for Success	
<p>Maths Apprentice</p> <ul style="list-style-type: none"> ▪ Operations, using brackets ▪ 1, 2, 3, 4 – (and cards) extend to as many numbers between 1 and 100 as can be found ▪ KPO: Four fours – as above ▪ Compare calculators: i.e. a basic calculator that does not use the order of operations correctly, and a 'proper' scientific calculator <p>Y7 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Mental Maths: v1, v2, v3 ▪ Order of Operations: v3 <p>KS3 Top-up Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Problem Solving: v1 <p>Level 4 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Numbers and the number system: Transformations ▪ Calculating: Multiplying decimals <p>Level 5 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Numbers and the number system: Multiplying and dividing by 10, 100 and 1000 <p>Resources</p> <p>Place value chart, Number lines, Decimal ordering cards, HTU chart, Gattegno charts, Diene's blocks, Multiplication squares, Division using the number line</p>	<p>Standards Unit</p> <ul style="list-style-type: none"> • N1 Ordering fractions and decimals <p>NCETM Departmental Workshops</p> <ul style="list-style-type: none"> • Place Value <p>NRICH</p> <ul style="list-style-type: none"> ▪ Going Round in Circles ▪ Rule of Three ▪ Make 100 	<p>What is the quick way to multiply and divide by 4, 8, 16, 32?</p> <p>Complete this equation $35/a = b/20 = 3.5$</p> <p>Does $8-4-1 = 8-(4-1)$?</p> <p>Does $8+4+1$ and $8+(4+1)$?</p> <p>Does $11 \times 4 \times 3 = 11 \times (4 \times 3)$?</p> <p>Does $12 \div 6 \div 2 = 12 \div (6 \div 2)$?</p> <p>Why do some calculators give us a different answer to this calculation: $2 + 5 \times 4$?</p> <p>How many different numbers can you make from the following calculation by inserting brackets at different points: $2 + 3 \times 4 - 1$?</p>	<p>Level Ladders</p> <ul style="list-style-type: none"> ▪ Place value, rounding ▪ Mental calculations ▪ Written calculations <p>Beyond the Classroom</p> <ul style="list-style-type: none"> ▪ Ordering decimals ▪ Place value ▪ Multiplying a decimal <p>APP</p> <p><i>Look for learners doing:</i></p> <ul style="list-style-type: none"> ▪ L4NNS5* ▪ L5NNS1* ▪ L4CALC4* ▪ L5CALC1



Previously...

- Use knowledge of properties to draw 2-D shapes and identify and draw nets of 3-D shapes (Y5)
- Read and plot coordinates in the first quadrant (Y5)
- Use coordinates in the first quadrant to draw, locate and complete shapes that meet given properties (Y6)

• **Explain and justify methods and conclusions**

- Use 2-D representations to visualise 3-D shapes and deduce some of their properties
- Use conventions and notation for 2-D coordinates in all four quadrants; find coordinates of points determined by geometric information
- Calculate the surface area of cubes and cuboids

Next...

- Give accurate solutions appropriate to the context or problem
- Visualise 3-D shapes from their nets; use geometric properties of cuboids and shapes made from cuboids; use simple plans and elevations
- Make scale drawings
- Find the midpoint of the line segment AB, given the coordinates of points A and B
- Know and use the formula for the volume of a cuboid; calculate volumes and surface areas of cuboids and shapes made from cuboids

Suggested Activities		Criteria for Success	
<p>Maths Apprentice</p> <ul style="list-style-type: none"> ▪ Complete the net ▪ Unraveling dice (nets) ▪ Shape work: Dice, Opposite numbers ▪ A 3D World ▪ KPO: The painted cube and mark-scheme ▪ Given 24 multilink cubes what are the different possible surface areas. Draw on isometric paper / make nets ▪ How many different cuboids can you make with a surface area of 40 squares? <p>Level 4 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Shape, Space and Measures: Making shapes 	<p>NCETM Departmental Workshops</p> <ul style="list-style-type: none"> ▪ 2D Shapes <p>NRICH</p> <ul style="list-style-type: none"> ▪ Cops and Robbers ▪ Coordinate Patterns ▪ Route to Infinity ▪ Cuboids 	<p>Show me a net of a i) cube ii) cuboid iii) prism iv) pyramid</p> <p>True/Never/Sometimes: 3-D shapes have more than one net</p> <p>Convince me that:</p> <ul style="list-style-type: none"> • a cube has at least five different nets • a cuboid has at least five different nets • a triangular prism has at least two different nets 	<p>Level Ladders</p> <ul style="list-style-type: none"> ▪ Construction, loci ▪ Transformations ▪ Geometric reasoning <p>Beyond the Classroom</p> <ul style="list-style-type: none"> ▪ Making models and drawing shapes <p>APP</p> <p>Look for learners doing:</p> <ul style="list-style-type: none"> ▪ L4SSM2* ▪ L5UA5 ▪ L5ALG2



Previously...

- Answer a set of related questions by collecting, selecting and organising relevant data; draw conclusions, using ICT to present features, and identify further questions to ask (Y5)
- Suggest and test hypotheses (Y6)
- Solve problems by collecting, selecting, processing, presenting and interpreting data, using ICT where appropriate; draw conclusions and identify further questions to ask (Y6)
- Suggest, plan and develop lines of enquiry; collect, organise and represent information, interpret results and review methods; identify and answer related questions (Y6)

- **Use appropriate procedures and tools, including ICT**
- **Relate findings to the original context**

- Suggest possible answers, given a question that can be addressed by statistical methods
- Decide which data would be relevant to an enquiry and possible sources
- Plan how to collect and organise small sets of data from surveys and experiments:
 - (i) design data collection sheets or questionnaires to use in a simple survey
 - (ii) construct frequency tables for gathering discrete data, grouped where appropriate in equal class intervals
- Collect small sets of data from surveys and experiments, as planned
- Compare two simple distributions using the range and one of the mode, median or mean
- Write a short report of a statistical enquiry, including appropriate diagrams, graphs and charts, using ICT as appropriate; justify the choice of presentation

Next...

- Select appropriate procedures and tools, including ICT
- Discuss a problem that can be addressed by statistical methods and identify related questions to explore
- Decide which data to collect to answer a question, and the degree of accuracy needed; identify possible sources; consider appropriate sample size
- Plan how to collect the data; construct frequency tables with equal class intervals for gathering continuous data and two-way tables for recording discrete data
- Collect data using a suitable method (e.g. observation, controlled experiment, data logging using ICT)
- Compare two distributions using the range and one or more of the mode, median and mean
- Write about and discuss the results of a statistical enquiry using ICT as appropriate; justify the methods used

Summer Term 7 hours

Suggested Activities	NCETM Departmental Workshops	Criteria for Success	Level Ladders
<p><i>The aim of the project is: Write a short report of a statistical enquiry and illustrate with appropriate diagrams, graphs and charts, using ICT as appropriate; justify the choice of what is presented. Refer to the previous handling data unit for guidance on appropriate techniques.</i></p> <p>Maths Apprentice</p> <ul style="list-style-type: none"> ▪ Interpreting pie charts (Framework) ▪ KPO: This data handling project should involve pupils making hypotheses, collecting data, representing their collected information and interpreting it with reference to the hypotheses stated <p>Y7 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Comparing Statistics: v1, v2, v3 <p>KS3 Top-up Bring on the Maths</p> <p>Handling Data: v1</p> <p>Level 4 Bring on the Maths</p> <ul style="list-style-type: none"> ▪ Handling Data: Grouping data 	<ul style="list-style-type: none"> ▪ Data Collection 	<p>Concentrate on <i>interpretation</i> as a key element of the project; relating outcomes directly with the hypothesis being tested.</p> <p>Dinner Lady 1 serving three pupils gives 70, 40, 40 chips in the three portions she serves. Dinner Lady 2 gives 50, 50, 50 in her three portions. Who would you go to and why?</p> <p>If we want to find the median of an even number of numbers, what do we do?</p>	<ul style="list-style-type: none"> ▪ Processing, representing and interpreting data <p>Beyond the Classroom</p> <ul style="list-style-type: none"> • Grouping data <p>APP</p> <p><i>Look for learners doing:</i></p> <ul style="list-style-type: none"> ▪ L4HD1 ▪ L4HD2* ▪ L5HD1

LEARNING REVIEW 3

