

| UNIT | NNS LINK | KS3 | GCSE | AS/A2 |
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| Substitution Ciphers | <p>Y7 KO</p> <ul style="list-style-type: none"> - Solve word problems and investigate in a range of contexts, explaining and justifying methods and conclusions(Number 1) - Use letter symbols to represent unknown numbers or variables.(Algebra 1/2) - Compare two simple distributions using the range and one of the mode, median or mean (Handling Data 3) <p>Y7 Handling Data 2/3</p> <p>Y8 KO</p> <ul style="list-style-type: none"> - Construct, on paper and using ICT, a range of graphs and charts; identify which are most useful in the context of a problem. (Handling Data 3) - Identify the necessary information to solve a problem; represent problems and interpret solutions in algebraic, geometric or graphical form (Solving Problems) - Use logical argument to establish the truth of a statement (Solving problems) <p>Y9 KO</p> <ul style="list-style-type: none"> - Design a survey or experiment to capture the necessary data from one or more sources; <u>determine the sample size and degree of accuracy needed</u>; design, trial and if necessary refine data collection sheets(Handling Data 1) Communicate interpretations and results of a statistical enquiry using selected tables, graphs and diagrams in support (Handling Data 1) - Present a concise, reasoned argument, using symbols, diagrams, graphs and related explanatory text (Handling Data 3) | <p>Level 4 – Collect data and record them using a frequency table</p> | <p>Foundation Tier - Design and use data collection sheets (Tally charts)</p> | <p>C2 – Notation n!</p> |

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| Braille | <p>Y7 Number 5</p> <p>Y8 KO</p> <ul style="list-style-type: none"> - Identify the necessary information to solve a problem; represent problems and interpret solutions in algebraic, geometric or graphical form (Solving Problems) <p>Y8 Number/algebra 1</p> <p>Y9 KO</p> <ul style="list-style-type: none"> - Solve substantial problems by breaking them into simpler tasks, using a range of efficient techniques, methods and resources, including ICT; give solutions to an appropriate degree of accuracy (Number 2) | <p>Level 4</p> <ul style="list-style-type: none"> -Recall multiplication facts up to 10x10 - Recognise and describe number patterns. | <p>Intermediate/Foundation Tier</p> <ul style="list-style-type: none"> - Evaluating indices | <p>C2 – Notation $n!$ and ${}^n C_r$</p> |
| EAN Bar Codes | <p>Y5 KO</p> <ul style="list-style-type: none"> – Know by heart all multiplication facts up to 10x10 <p>Y6 KO</p> <ul style="list-style-type: none"> - Carry out short multiplication and division <p>Y7 KO</p> <ul style="list-style-type: none"> - Extend mental methods of calculation to include decimals, fractions and percentages (Number 2) <p>Y7 Number 5</p> <p>Y8 Number/algebra 1</p> | <p>Level 4</p> <ul style="list-style-type: none"> – Use a range of mental methods of computation with the four operations, including mental recall of multiplication facts up to 10x10. - Recognise and describe number patterns, and relationships including multiple, factor and square. | <p>Intermediate/Foundation Tier</p> <ul style="list-style-type: none"> – Use the concepts and vocabulary of factor, multiple and common factor. – Recall all multiplication facts to 10x10 | |
| ISBN Numbers | <p>Y6 KO</p> <ul style="list-style-type: none"> - Carry out short multiplication and division <p>Y7 KO</p> <ul style="list-style-type: none"> - Extend mental methods of calculation to include decimals, fractions and percentages (Number 2) - Multiply and divide three-digit by two- | <p>Level 4 - Use a range of mental methods of computation with the four operations, including mental recall of multiplication facts up to 10x10 and quick derivation of corresponding division facts.</p> <p>Level 5 - Appropriate non-calculator method for solving problems that involve</p> | <p>Intermediate/Foundation</p> <ul style="list-style-type: none"> – Recall all multiplication facts up to 10x10 – Multiply and divide numbers with no more than one decimal digit. | |

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| | <p>digit whole numbers; extend to multiplying and dividing decimals with one or two places by single-digit whole numbers (Number 3)</p> <p>Y7 Number 5</p> <p>Y8 Number/algebra 1</p> | <p>multiplying and dividing any three digit by any two digit</p> | | |
| Binary Codes | <p>Y8 KO</p> <ul style="list-style-type: none"> - Use logical argument to establish the truth of a statement (Solving Problems) <p>Y9 KO</p> <ul style="list-style-type: none"> - Solve substantial problems by breaking them into simpler tasks, using a range of efficient techniques, methods and resources, including ICT; give solutions to an appropriate degree of accuracy (Number 2) | | | |
| Genetic Fingerprinting | <p>Y9 KO</p> <ul style="list-style-type: none"> - Add, subtract, multiply and divide fractions (Number 1) | <p>Level 7 – Understand the effect of multiplying and dividing by numbers between 0 and 1</p> | <p>Intermediate/Higher – Multiply and divide a given fraction by a general fraction</p> | <p>C2 – Solutions of equations of the form $a^x=b$</p> <p>Laws of logarithms</p> <p>S1 – Probability</p> |
| Postcodes | <p>Y7 KO</p> <ul style="list-style-type: none"> - Break a complex calculation into simpler steps, choosing and using appropriate and efficient operations and methods (Number 2) - Solve word problems and investigate in a range of contexts, explaining and justifying methods and conclusions (Number 1) <p>Y9 KO</p> <ul style="list-style-type: none"> - Solve substantial problems by breaking them into simpler tasks, using a range of efficient techniques, methods and resources, including ICT; give solutions to an appropriate degree of accuracy (Number 2) | <p>Level 6 – Carry through substantial tasks and solve quite complex problems by independently breaking them down into smaller, more manageable tasks.</p> | | |
| ITF Symbols | | | | |
| Code 3 of 9 | | | | |

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| Public Key Cryptography | <p><u>Setting the key</u> Y7 Number 5 Y8 Number/Algebra 1</p> | <p><u>Setting the key</u> Level 4 - Recognise and describe number patterns, and relationships including multiple, factor and square. - Use a range of mental methods of computation with the four operations, including mental recall of multiplication facts up to 10x10. <u>Ciphering</u> Level 7 – Solve numerical problems involving multiplication and division with numbers of any size Level 8 – Solve problems involving calculating with powers.</p> | <p><u>Setting the key</u> Intermediate/Foundation Tier - Use the concepts and vocabulary of factor, multiple and common factor. - Recall all multiplication facts to 10x10 - Intermediate/Foundation Tier – Evaluating indices <u>Ciphering</u> Intermediate/Higher – Solve numerical problems involving multiplication and division with numbers of any size - Solve problems involving calculating with powers.</p> | |
| Transposition | <p>Y5 KO - Know by heart multiplication facts up to 10x10 - Understand and use the formula for the area of a rectangle Y7 KO - Solve word problems and investigate in a range of contexts, explaining and justifying methods and conclusions (Number 1)</p> | <p>Level 4 - Use a range of mental methods of computation with the four operations, including mental recall of multiplication facts up to 10x10 and quick derivation of corresponding division facts. Level 5 – Understand and use the formula for the area of a rectangle</p> | <p>Intermediate/Foundation - Recall all multiplication facts up to 10x10 - Multiply and divide numbers with no more than one decimal digit. - Find areas of rectangles</p> | |
| One-Time Pads | <p>Y7 KO - 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 numbers (Number 3)</p> | <p>Level 5 - Appropriate non-calculator method for solving problems that involve multiplying and dividing any three digit by any two digit <i>(in the context of modulo arithmetic)</i></p> | <p>Intermediate/Foundation - Recall all multiplication facts up to 10x10 - Multiply and divide numbers with no more than one decimal digit. <i>(in the context of modulo arithmetic)</i></p> | |
| Semaphore | <p>Y7 KO - Identify parallel and perpendicular lines; know the sum of angles at a point, on a</p> | <p>Level 5 – Know the angle sum of angles at a point</p> | <p>Intermediate/Foundation - Recall and use properties of angles at a point</p> | |

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| | straight line and in a triangle (SSM 2) | | | |
| Morse Code | | Level 8 – Understand how to calculate the probability of a compound event | Intermediate/Higher - Use tree diagrams to represent outcomes events, recognising when events are independent | |
| Vehicle Registration Marks | Y7 KO - Break a complex calculation into simpler steps, choosing and using appropriate and efficient operations and methods (Number 2) - Solve word problems and investigate in a range of contexts, explaining and justifying methods and conclusions (Number 1) Y9 KO - Solve substantial problems by breaking them into simpler tasks, using a range of efficient techniques, methods and resources, including ICT; give solutions to an appropriate degree of accuracy (Number 2) | Level 6 – Carry through substantial tasks and solve quite complex problems by independently breaking them down into smaller, more manageable tasks. | | |
| Modern Encryption | | | | |
| Huffman Codes | | | Level 8 – Understand how to calculate the probability of a compound event | Intermediate/Higher - Use tree diagrams to represent outcomes events, recognising when events are independent |
| Arithmetic Coding | | | | |
| Lorenz Cipher | | | | |
| Enigma Cipher | | | | |

Using and Applying Level Descriptors

Level 1

Pupils use mathematics as an integral part of classroom activities. They represent their work with objects or pictures and discuss it. They recognise and use a simple pattern or relationship.

Level 2

Pupils select the mathematics they use in some classroom activities. They discuss their work using mathematical language and are beginning to represent it using symbols and simple diagrams. They explain why an answer is correct.

Level 3

Pupils try different approaches and find ways of overcoming difficulties that arise when they are solving problems. They are beginning to organise their work and check results. Pupils discuss their mathematical work and are beginning to explain their thinking. They use and interpret mathematical symbols and diagrams. Pupils show that they understand a general statement by finding particular examples to match it.

Level 4

Pupils are developing their own strategies for solving problems and are using these strategies both in working within mathematics and in applying mathematics to practical contexts. They present information and results in a clear and organised way. They search for a solution by trying out ideas of their own.

Level 5

In order to carry through tasks and solve mathematical problems, pupils identify and obtain necessary information. They check their results, considering whether these are sensible. Pupils show understanding of situations by describing them mathematically using symbols, words and diagrams. They draw simple conclusions of their own and give an explanation of their reasoning.

Level 6

Pupils carry through substantial tasks and solve quite complex problems by independently breaking them down into smaller, more manageable tasks. They interpret, discuss and synthesise information presented in a variety of mathematical forms. Pupil's writing explains and informs their use of diagrams. Pupils are beginning to give mathematical justifications.

| Key Stage 3 National Strategy Year 7 Key objectives | Key Stage 3 National Strategy Year 8 Key objectives | Key Stage 3 National Strategy Year 9 Key objectives |
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| Simplify fractions by cancelling all common factors; identify equivalent fractions. | Add, subtract, multiply and divide integers. | Add, subtract, multiply and divide fractions. |
| Recognise the equivalence of percentages, fractions and decimals. | Use the equivalence of fractions, decimals and percentages to compare proportions; calculate percentages and find the outcome of a given percentage increase or decrease. | Use proportional reasoning to solve a problem, choosing the correct numbers to take as 100%, or as a whole. |
| Extend mental methods of calculation to include decimals, fractions and percentages. | Divide a quantity into two or more parts in a given ratio; use the unitary method to solve simple word problems involving ratio and direct proportion. | Make and justify estimates and approximations of calculations. |
| 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. | Use standard column procedures 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. | Construct and solve linear equations with integer coefficients, using an appropriate method. |
| Break a complex calculation into simpler steps, choosing and using appropriate and efficient operations and methods. | Simplify or transform linear expressions by collecting like terms; multiply a single term over a bracket. | Generate terms of a sequence using term-to-term and position-to-term definitions of the sequence, on paper and using ICT; write an expression to describe the nth term of an arithmetic sequence. |
| Check a result by considering whether it is of the right magnitude. | Substitute integers into simple formulae. | Given values for m and c, find the gradient of lines given by equations of the form $y = mx + c$. |
| Use letter symbols to represent unknown numbers or variables. | Plot the graphs of linear functions, where y is given explicitly in terms of x; recognise that equations of the form $y = mx + c$ correspond to straight-line graphs. | Construct functions arising from real-life problems and plot their corresponding graphs; interpret graphs arising from real situations. |
| Know and use the order of operations and understand that algebraic operations follow the same conventions and order as arithmetic operations. | Identify alternate and corresponding angles; understand a proof that the sum of the angles of a triangle is 180° and of a quadrilateral is 360° . | Solve geometrical problems using properties of angles, of parallel and intersecting lines, and of triangles and other polygons. |
| Plot the graphs of simple linear functions. | Enlarge 2-D shapes, given a centre of enlargement and a positive whole-number scale factor. | Know that translations, rotations and reflections preserve length and angle and map objects on to congruent images. |
| Identify parallel and perpendicular lines; know the sum of angles at a point , on a straight line and in a triangle. | Use straight edge and compasses to do standard constructions. | Know and use the formulae for the circumference and area of a circle. |
| Convert one metric unit to another (e.g. grams to kilograms); read and interpret scales on a range of measuring instruments. | Deduce and use formulae for the area of a triangle and parallelogram, and the volume of a cuboid; calculate volumes and surface areas of cuboids. | Design a survey or experiment to capture the necessary data from one or more sources; determine the sample size and degree of accuracy needed; design, trial and if necessary refine data collection sheets. |
| Compare two simple distributions using the range and one of the mode , median or mean. | Construct, on paper and using ICT, a range of graphs and charts; identify which are most useful in the context of a problem. | Communicate interpretations and results of a statistical enquiry using selected tables, graphs and diagrams in support. |
| Understand and use the probability scale from 0 to 1; find and justify probabilities based on equally likely outcomes in simple contexts. | Find and record all possible mutually exclusive outcomes for single events and two successive events in a systematic way. | Know that the sum of probabilities of all mutually exclusive outcomes is 1 and use this when solving problems. |
| Solve word problems and investigate in a range of contexts, explaining and justifying methods and conclusions. | Identify the necessary information to solve a problem; represent problems and interpret solutions in algebraic, geometric or graphical form. | Solve substantial problems by breaking them into simpler tasks, using a range of efficient techniques, methods and resources, including ICT; give solutions to an appropriate degree of accuracy. |
| | Use logical argument to establish the truth of a statement. | Present a concise, reasoned argument, using symbols, diagrams, graphs and related explanatory text. |