Year 9

Week	Strand	Topic		Estimated Hours
1	N1, N2, N3, N4, N14, N15	Number 1a-Integers and place value		5-7
2		Number 1a- Integers and place value		
3	N1, N3, A1, A3, A4	Algebra 2a- Expressions		7-9
4		Algebra 2a- Expressions		
5		Algebra 2a- Expressions		
6	G14, S2, S4, S5	Statistics 3a- Tables		6-8
7		Statistics 3a- Tables		
8		**REVIEW/ASSESS/DIRT WEEK 1**		
9	N1, N2, N3, N12, R3, S2	Fractions 4a-Basic Fractions		6-8
10		Fractions 4a-Basic Fractions		
11	N1, A3, A5, A17, A21	Equations 5a- Basic Equations		6-8
12		Equations 5a- Basic Equations		
13	G1, G3, G4, G6, G11	Properties of 6a- Shapes, parallel lines and angle facts		10-12
14		Properties of 6a- Shapes, parallel lines and angle facts		
15		**REVIEW/ASSESS/DIRT WEEK 2** Xmas Activities		
16	S1	Statistics and Sampling 7a – Data and sampling		3-5
17	N14, R1, G11, G14, G16, G17	Perimeter + Area 8a- Scales, perimeters and areas		9-11
18		Perimeter + Area 8a- Scales, perimeters and areas		
19	N13, A7, A8, A9, A10, A14, R1, R11, R14, G11, G14	Real life graphs 9a -	Coordinates, gradients and distance-time graphs	8-10
20		Real life graphs 9a -		
21		**REVIEW/ASSESS/DIRT WEEK 3**		
22	G1, G7, G24	Transformations 10a- Rotations and translations		5-7
23		Transformations 10a- Rotations and translations		
24	N11, N13, R1, R4, R5, R6, R8, R12	Ratio 11a- Basic ratio		5-7
25		Ratio 11a- Basic ratio		
26		**REVIEW/ASSESS/DIRT WEEK 4**		
27	N7, N15, A4, G6, G20, G21	Pythagoras 12		5-7
28	N5, P1, P2, P3, P4, P5, P6, P7, P8	Probability 13		4-6
29		Probability 13		
30	N13, R1, R9, R11, R13, R16, G14	Multiplicative Reasoning 14	%, rates of change and compound measures	6-8
31		Multiplicative Reasoning 14		
32		**REVIEW/ASSESS/DIRT WEEK 5**		
33	G1, G2, G9, G12, G13, G15	Plans + Elevations 15a		5-7
34		Plans + Elevations 15a		
35	N8, N14, G9, G16, G17, G18	Perimeter, Area + Volume 17-	Circles, cylinders, cones and spheres	6-8
36		Perimeter, Area + Volume 17-		
37		**REVIEW/ASSESS/DIRT WEEK 6**		
38	R6, R12, G5, G7, G19	Similarity and Congruence 19a- 2D shapes		6-8
39		Similarity and Congruence 19a- 2D shapes		

Number 1a - Integers and place value. Teaching time: 5-7 hours

OBJECTIVES	**POSSIBLE SUCCESS CRITERIA**
By the end of the sub-unit, students should be able to: • Use and order positive and negative numbers (integers); • Order integers, decimals, use the symbols <, > and understand the ≠ symbol; • Add and subtract positive and negative numbers (integers); • Recall all multiplication facts to 10 × 10, and use them to derive quickly the corresponding division facts; • Multiply or divide any number by powers of 10; • Multiply and divide positive and negative numbers (integers); • Use brackets and the hierarchy of operations (not including powers); • Round numbers to a given power of 10; • Check answers by rounding and using inverse operations.	Given 5 digits, what are the largest or smallest answers when subtracting a two-digit number from a three-digit number? Use inverse operations to justify answers, e.g. 9 x 23 = 207 so 207 ÷ 9 = 23. Check answers by rounding to nearest 10, 100, or 1000 as appropriate, e.g. 29 × 31 ≈ 30 × 30 **COMMON MISCONCEPTIONS** Stress the importance of knowing the multiplication tables to aid fluency. Students may write statements such as 150 – 210 = 60. **NOTES** Particular emphasis should be given to the importance of students presenting their work clearly. Formal written methods of addition, subtraction and multiplication work from right to left, whilst formal division works from left to right. Any correct method of multiplication will still gain full marks, for example, the grid method, the traditional method, Napier's bones. Negative numbers in real life can be modelled by interpreting scales on thermometers using F and C. Encourage the exploration of different calculation methods. Students should be able to write numbers in words and from words as a real-life skill.

Algebra 2a – Expressions. Teaching time: 7-9 hours

OBJECTIVES

By the end of the sub-unit, students should be able to:

- Use notation and symbols correctly;
- Write an expression;
- Select an expression/equation/formula/identity from a list;
- Manipulate and simplify algebraic expressions by collecting 'like' terms;
- Multiply together two simple algebraic expressions, e.g. $2a \times 3b$;
- Simplify expressions by cancelling, e.g. $\frac{4x}{2} = 2x$;
- Use index notation when multiplying or dividing algebraic terms;
- Use index laws in algebra;
- Use index notation in algebra.
- Understand the ≠ symbol and introduce the identity ≡ sign;

POSSIBLE SUCCESS CRITERIA

Simplify $4p - 2q + 3p + 5q$.
Simplify $z^4 \times z^3$, $y^3 \div y^2$, $(a^7)^2$.
Simplify $x^{-4} \times x^2$, $w^2 \div w^{-1}$.

COMMON MISCONCEPTIONS

Any poor number skills involving negatives and times tables will become evident.

NOTES

Some of this will be a reminder from Key Stage 3.
Emphasise correct use of symbolic notation, i.e. $3 \times y = 3y$ and not $y3$ and $a \times b = ab$.
Use lots of concrete examples when writing expressions, e.g. 'B' boys + 'G' girls.
Plenty of practice should be given and reinforce the message that making mistakes with negatives and times tables is a different skill to that being developed.

Statistics 3a – Tables. Teaching time: 6-8 hours

OBJECTIVES

By the end of the sub-unit, students should be able to:

- Use suitable data collection techniques (data to be integer and decimal values);
- Design and use data-collection sheets for grouped, discrete and continuous data, use inequalities for grouped data, and introduce ≤ and ≥ signs;
- Interpret and discuss the data;
- Sort, classify and tabulate data, both discrete and continuous quantitative data, and qualitative data;
- Construct tables for time–series data;
- Extract data from lists and tables;
- Use correct notation for time, 12- and 24-hour clock;
- Work out time taken for a journey from a timetable;
- Design and use two-way tables for discrete and grouped data;
- Use information provided to complete a two-way table;
- Calculate the total frequency from a frequency table;
- Read off frequency values from a table;
- Read off frequency values from a frequency table;
- Find greatest and least values from a frequency table;
- Identify the mode from a frequency table;

Identify the modal class from a grouped frequency table.

POSSIBLE SUCCESS CRITERIA

Construct a frequency table for a continuous data set, deciding on appropriate intervals using inequalities
Plan a journey using timetables.

COMMON MISCONCEPTIONS

Students struggle to make the link between what the data in a frequency table represents, so for example may state the 'frequency' rather than the interval when asked for the modal group.

NOTES

Other averages are covered in unit 5, but you may choose to cover them in this unit.
Ensure that students are given the opportunity to draw and complete two-way tables from words.

Fractions 4a – Basic fractions. Teaching time: 6-8 hours

OBJECTIVES

By the end of the sub-unit, students should be able to:

- Use diagrams to find equivalent fractions or compare fractions;
- Write fractions to describe shaded parts of diagrams;
- Express a given number as a fraction of another, using very simple numbers, some cancelling, and where the fraction is both < 1 and > 1;
- Write a fraction in its simplest form and find equivalent fractions;
- Order fractions, by using a common denominator;
- Compare fractions, use inequality signs, compare unit fractions;
- Convert between mixed numbers and improper fractions;
- Add and subtract fractions;
- Add fractions and write the answer as a mixed number;
- Multiply and divide an integer by a fraction;
- Multiply and divide a fraction by an integer, including finding fractions of quantities or measurements, and apply this by finding the size of each category from a pie chart using fractions;
- Understand and use unit fractions as multiplicative inverses;
- Multiply fractions: simplify calculations by cancelling first;
- Divide a fraction by a whole number;
- Divide fractions by fractions.

POSSIBLE SUCCESS CRITERIA

Express a given number as a fraction of another, including where the fraction > 1.

Simplify $\frac{120}{100}$.

$\frac{3}{5} \times 15$, $20 \times \frac{3}{4}$.

$\frac{1}{2}$ of 36 m, $\frac{1}{4}$ of £20.

Find the size of each category from a pie chart using fractions.

Calculate: $\frac{1}{2} \times \frac{6}{7}$, $\frac{3}{5} \div 3$.

COMMON MISCONCEPTIONS

The larger the denominator the larger the fraction.

NOTES

When expressing a given number as a fraction of another, start with very simple numbers < 1, and include some cancelling before fractions using numbers > 1.

When adding and subtracting fractions, start with same denominator, then where one denominator is a multiple of the other (answers ≤ 1), and finally where both denominators have to be changed (answers ≤ 1).

Regular revision of fractions is essential.

Demonstrate how to the use the fraction button on the calculator.

Use real-life examples where possible.

Use long division to illustrate recurring decimals.

Equations 5a – Basic Equations. Teaching time: 6-8 hours

OBJECTIVES

By the end of the sub-unit, students should be able to:

- Select an expression/equation/formula/identity from a list;
- Write expressions and set up simple equations;
- Use function machines;
- Solve simple equations;
- Solve linear equations, with integer coefficients, in which the unknown appears on either side or on both sides of the equation;
- Solve linear equations which contain brackets, including those that have negative signs occurring anywhere in the equation, and those with a negative solution;
- Solve linear equations in one unknown, with integer or fractional coefficients;
- Rearrange simple equations;
- Substitute into a formula, and solve the resulting equation;
- Find an approximate solution to a linear equation using a graph;
- Solve angle or perimeter problems using algebra.
- Write an equation to solve a word problem.

POSSIBLE SUCCESS CRITERIA

Solve: $x + 5 = 12$

Solve: $x - 6 = 3$

Solve: $\frac{x}{2} = 5$

Solve: $2x - 5 = 19$

Solve: $2x + 5 = 8x - 7$

Given expressions for the angles on a line or in a triangle in terms of a, find the value of a.

Given expressions for the sides of a rectangle and the perimeter, form and solve an equation to find missing values.

COMMON MISCONCEPTIONS

Rules of adding and subtracting negatives.

Inverse operations can be misapplied.

NOTES

Emphasise good use of notation.

Students need to realise that not all linear equations can be solved by observation or trial and improvement, and hence the use of a formal method is important.

Students can leave their answer in fraction form where appropriate.

Properties 6a - Properties of shapes, parallel lines and angle facts. Teaching time: 10-12 hours

OBJECTIVES

By the end of the sub-unit, students should be able to:

- Estimate sizes of angles;
- Measure angles using a protractor;
- Use geometric language appropriately;
- Use letters to identify points, lines and angles;
- Use two-letter notation for a line and three-letter notation for an angle;
- Describe angles as turns and in degrees;
- Understand clockwise and anticlockwise;
- Know that there are 360° in a full turn, 180° in a half turn and 90° in a quarter turn;
- Identify a line perpendicular to a given line;
- Mark perpendicular lines on a diagram and use their properties;
- Identify parallel lines;
- Mark parallel lines on a diagram and use their properties;
- Recall the properties and definitions of special types of quadrilaterals, including symmetry properties;
- List the properties of each special type of quadrilateral, or identify (name) a given shape;
- Draw sketches of shapes;
- Name all quadrilaterals that have a specific property;
- Identify quadrilaterals from everyday usage;
- Given some information about a shape on coordinate axes, complete the shape;
- Classify quadrilaterals by their geometric properties;
- Understand and use the angle properties of quadrilaterals;
- Use the fact that angle sum of a quadrilateral is 360°;
- Use geometrical language appropriately and give reasons for angle calculations;
- Recall and use properties of angles at a point, angles at a point on a straight line, right angles, and vertically opposite angles;
- Distinguish between scalene, equilateral, isosceles and right-angled triangles;
- Derive and use the sum of angles in a triangle;
- Find a missing angle in a triangle, using the angle sum of a triangle is 180°;
- Understand and use the angle properties of triangles, use the symmetry property of isosceles triangle to show that base angles are equal;

- Use the side/angle properties of isosceles and equilateral triangles;
- Show step-by-step deduction when solving problems;
- Understand and use the angle properties of intersecting lines;
- Understand a proof that the exterior angle of a triangle is equal to the sum of the interior angles at the other two vertices;
- Find missing angles using properties of corresponding and alternate angles;
- Understand and use the angle properties of parallel lines.

POSSIBLE SUCCESS CRITERIA

Name all quadrilaterals that have a specific property.
Use geometric reasoning to answer problems giving detailed reasons.
Find the size of missing angles at a point or at a point on a straight line.

COMMON MISCONCEPTIONS

Pupils may believe, incorrectly, that perpendicular lines have to be horizontal/vertical or all triangles have rotational symmetry of order 3.
Some students will think that all trapezia are isosceles, or a square is only square if 'horizontal', or a 'non-horizontal' square is called a diamond.
Some students may think that the equal angles in an isosceles triangle are the 'base angles'.
Incorrectly identifying the 'base angles' (i.e. the equal angles) of an isosceles triangle when not drawn horizontally.

NOTES

Emphasise that diagrams in examinations are seldom drawn accurately.
Make sure drawings are neat, labelled and accurate.
Give students lots of practice.
Angles should be accurate to within 2°.
Investigate Rangoli patterns.
Use tracing paper to assist with symmetry questions.
Ask students to find their own examples of symmetry in real life.
Emphasise that diagrams in examinations are seldom drawn accurately.
Make sure drawings are neat, labelled and accurate.
Students should have plenty of practice drawing examples to illustrate the properties and encourage them to check their drawings.
Emphasise the need to give geometric reasons when required.

Statistics and Sampling 7a – Data and sampling. Teaching time: 3-5 hours

OBJECTIVES

By the end of the sub-unit, students should be able to:

- Specify the problem and:
  - plan an investigation;
  - decide what data to collect and what statistical analysis is needed;
  - consider fairness;
- Recognise types of data: primary secondary, quantitative and qualitative;
- Identify which primary data they need to collect and in what format, including grouped data;
- Collect data from a variety of suitable primary and secondary sources;
- Understand how sources of data may be biased;
- Explain why a sample may not be representative of a whole population;
- Understand sample and population.

POSSIBLE SUCCESS CRITERIA

Explain why a sample may not be representative of a whole population.

Carry out a statistical investigation of their own and justify how sources of bias have been eliminated.

Show me an example of a situation in which biased data would result.

COMMON MISCONCEPTIONS

The concept of an unbiased sample is difficult for some students to understand.

NOTES

Emphasise the difference between primary and secondary sources and remind students about the different between discrete and continuous data.

Discuss sample size and mention that a census is the whole population (the UK census takes place every 10 years in a year ending with a 1 – the next one is due in 2021).

Specify the problem and planning for data collection is not included in the programme of study but is a perquisite to understand the context of the topic.

Writing a questionnaire is not part of the new specification, but is a good topic to demonstrate bias and ways to reduce bias in terms of timing, location and question types that can introduce bias.

Perimeter + Area 8a – Scales, perimeters and areas. Teaching time: 9-11 hours

OBJECTIVES

By the end of the sub-unit, students should be able to:

- Indicate given values on a scale, including decimal value;
- Know that measurements using real numbers depend upon the choice of unit;
- Convert between units of measure within one system, including time;
- Convert metric units to metric units;
- Make sensible estimates of a range of measures in everyday settings;
- Measure shapes to find perimeters and areas using a range of scales;
- Find the perimeter of rectangles and triangles;
- Find the perimeter of parallelograms and trapezia;
- Find the perimeter of compound shapes;
- Recall and use the formulae for the area of a triangle and rectangle;
- Find the area of a rectangle and triangle;
- Find the area of a trapezium and recall the formula;
- Find the area of a parallelogram;
- Calculate areas and perimeters of compound shapes made from triangles and rectangles;
- Estimate surface areas by rounding measurements to 1 significant figure;
- Find the surface area of a prism;
- Find surface area using rectangles and triangles;
- Convert between metric area measures.
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POSSIBLE SUCCESS CRITERIA

Find the area/perimeter of a given shape, stating the correct units.

COMMON MISCONCEPTIONS

Shapes involving missing lengths of sides often result in incorrect answers.
Students often confuse perimeter and area.

NOTES

Use questions that involve different metric measures that need converting.
Measurement is essentially a practical activity: use a range of everyday shapes to bring reality to lessons.
Ensure that students are clear about the difference between perimeter and area.
Practical examples help to clarify the concepts, i.e. floor tiles, skirting board, etc.

Real Life Graphs 9a – Coordinates, gradients and distance-time graphs. Teaching time: 8-10 hours

OBJECTIVES

By the end of the sub-unit, students should be able to:

- Use input/output diagrams;
- Use axes and coordinates to specify points in all four quadrants in 2D;
- Identify points with given coordinates and coordinates of a given point in all four quadrants;
- Find the coordinates of points identified by geometrical information in 2D (all four quadrants);
- Find the coordinates of the midpoint of a line segment;
- Draw, label and scale axes;
- Read values from straight-line graphs for real-life situations;
- Draw straight line graphs for real-life situations, including ready reckoner graphs, conversion graphs, fuel bills graphs, fixed charge and cost per unit;
- Draw distance–time graphs and velocity–time graphs;
- Work out time intervals for graph scales;
- Interpret distance–time graphs, and calculate: the speed of individual sections, total distance and total time;
- Interpret information presented in a range of linear and non-linear graphs;
- Interpret graphs with negative values on axes;
- Interpret gradient as the rate of change in distance–time and speed–time graphs, graphs of containers filling and emptying, and unit price graphs.

POSSIBLE SUCCESS CRITERIA

Interpret a description of a journey into a distance–time or speed–time graph.

COMMON MISCONCEPTIONS

With distance–time graphs, students struggle to understand that the perpendicular distance from the x-axis represents distance.

NOTES

Clear presentation of axes is important.

Ensure that you include questions that include axes with negative values to represent, for example, time before present time, temperature or depth below sea level.

Careful annotation should be encouraged: it is good practice to get the students to check that they understand the increments on the axes.

Use standard units of measurement to draw conversion graphs.

Use various measures in distance–time and velocity–time graphs, including miles, kilometres, seconds, and hours.

Transformations 10a – Rotations and translations. Teaching time: 5-7 hours

OBJECTIVES

By the end of the sub-unit, students should be able to:

- Identify congruent shapes by eye;
- Understand clockwise and anticlockwise;
- Understand that rotations are specified by a centre, an angle and a direction of rotation;
- Find the centre of rotation, angle and direction of rotation and describe rotations;
- Describe a rotation fully using the angle, direction of turn, and centre;
- Rotate a shape about the origin or any other point on a coordinate grid;
- Draw the position of a shape after rotation about a centre (not on a coordinate grid);
- Identify correct rotations from a choice of diagrams;
- Understand that translations are specified by a distance and direction using a vector;
- Translate a given shape by a vector;
- Describe and transform 2D shapes using single translations on a coordinate grid;
- Use column vectors to describe translations;
- Understand that distances and angles are preserved under rotations and translations, so that any figure is congruent under either of these transformations.

POSSIBLE SUCCESS CRITERIA

Understand that translations are specified by a distance and direction (using a vector).
Describe and transform a given shape by either a rotation or a translation.

COMMON MISCONCEPTIONS

The directions on a column vector often get mixed up.
Student need to understand that the 'units of movement' are those on the axes, and care needs to be taken to check the scale.
Correct language must be used: students often use 'turn' rather than 'rotate'.

NOTES

Emphasise the need to describe the transformations fully, and if asked to describe a 'single' transformation they should not include two types.
Include rotations with the centre of rotation inside the shape.
Use trial and error with tracing paper to find the centre of rotation.
It is essential that the students check the increments on the coordinate grid when translating shapes.

Ratio 11a – Basic ratio. Teaching time: 5-7 hours

OBJECTIVES

By the end of the sub-unit, students should be able to:

- Understand and express the division of a quantity into a of number parts as a ratio;
- Write ratios in their simplest form;
- Write/interpret a ratio to describe a situation;
- Share a quantity in a given ratio including three-part ratios;
- Solve a ratio problem in context:
  - use a ratio to find one quantity when the other is known;
  - use a ratio to compare a scale model to a real-life object;
  - use a ratio to convert between measures and currencies;
  - problems involving mixing, e.g. paint colours, cement and drawn conclusions;
- Compare ratios;
- Write ratios in form $1 : m$ or $m : 1$;
- Write a ratio as a fraction;
- Write a ratio as a linear function;
- Write lengths, areas and volumes of two shapes as ratios in simplest form;
- Express a multiplicative relationship between two quantities as a ratio or a fraction.

POSSIBLE SUCCESS CRITERIA

Write a ratio to describe a situation such as 1 blue for every 2 red, or 3 adults for every 10 children.

Recognise that two paints mixed red to yellow 5 : 4 and 20 : 16 are the same colour.

Express the statement 'There are twice as many girls as boys' as the ratio 2 : 1 or the linear function $y = 2x$, where x is the number of boys and y is the number of girls.

COMMON MISCONCEPTIONS

Students find three-part ratios difficult.

Using a ratio to find one quantity when the other is known often results in students 'sharing' the known amount.

NOTES

Emphasise the importance of reading the question carefully.

Include ratios with decimals 0.2 : 1.

Converting imperial units to imperial units aren't specifically in the programme of study, but still useful and provide a good context for multiplicative reasoning.

It is also useful generally for students to know rough metric equivalents of commonly used imperial measures, such as pounds, feet, miles and pints.

Right-Angled Triangles 12 – Pythagoras and trigonometry. Teaching time: 5-7 hours

OBJECTIVES

By the end of the unit, students should be able to:

- Understand, recall and use Pythagoras' Theorem in 2D, including leaving answers in surd form;
- Given 3 sides of a triangle, justify if it is right-angled or not;
- Calculate the length of the hypotenuse in a right-angled triangle, including decimal lengths and a range of units;
- Find the length of a shorter side in a right-angled triangle;
- Apply Pythagoras' Theorem with a triangle drawn on a coordinate grid;
- Calculate the length of a line segment AB given pairs of points;

POSSIBLE SUCCESS CRITERIA

Does 2, 3, 6 give a right angled triangle?
Justify when to use Pythagoras' Theorem

COMMON MISCONCEPTIONS

Answers may be displayed on a calculator in surd form.
Students forget to square root their final answer or round their answer prematurely.

NOTES

Students may need reminding about surds.
Drawing the squares on the 3 sides will help to illustrate the theorem.
Include examples with triangles drawn in all four quadrants.
Scale drawings are not acceptable.

Probability 13a – Probability I. Teaching time: 4-6 hours

OBJECTIVES

By the end of the sub-unit, students should be able to:

- Distinguish between events which are impossible, unlikely, even chance, likely, and certain to occur;
- Mark events and/or probabilities on a probability scale of 0 to 1;
- Write probabilities in words or fractions, decimals and percentages;
- Find the probability of an event happening using theoretical probability;
- Use theoretical models to include outcomes using dice, spinners, coins;
- List all outcomes for single events systematically;
- Work out probabilities from frequency tables;
- Work out probabilities from two-way tables;
- Record outcomes of probability experiments in tables;
- Add simple probabilities;
- Identify different mutually exclusive outcomes and know that the sum of the probabilities of all outcomes is 1;
- Using $1 - p$ as the probability of an event not occurring where p is the probability of the event occurring;
- Find a missing probability from a list or table including algebraic terms.

POSSIBLE SUCCESS CRITERIA

Mark events on a probability scale and use the language of probability.

If the probability of outcomes are x, $2x$, $4x$, $3x$ calculate x.

Calculate the probability of an event from a two-way table or frequency table.

Decide if a coin, spinner or game is fair.

NOTES

Use this as an opportunity for practical work.

Probabilities written in fraction form should be cancelled to their simplest form.

Multiplicative Reasoning 14 - Percentages, rates of change and compound measures. Teaching time: 6-8 hours

OBJECTIVES

By the end of the unit, students should be able to:

- Understand and use compound measures:
  - density;
  - pressure;
  - speed:
    - convert between metric speed measures;
    - read values in km/h and mph from a speedometer;
    - calculate average speed, distance, time – in miles per hour as well as metric measures;
    - use kinematics formulae from the formulae sheet to calculate speed, acceleration (with variables defined in the question);
    - change d/t in m/s to a formula in km/h, i.e. d/t × (60 × 60)/1000 – with support;
- Express a given number as a percentage of another number in more complex situations;
- Calculate percentage profit or loss;
- Make calculations involving repeated percentage change, not using the formula;
- Find the original amount given the final amount after a percentage increase or decrease;
- Use compound interest;
- Use a variety of measures in ratio and proportion problems:
  - currency conversion;
  - rates of pay;
  - best value;
- Set up, solve and interpret the answers in growth and decay problems;
- Understand that X is inversely proportional to Y is equivalent to X is proportional to $\frac{1}{Y}$;
- Interpret equations that describe direct and inverse proportion.

POSSIBLE SUCCESS CRITERIA

Know that measurements using real numbers depend upon the choice of unit, with speedometers and rates of change. Change m/s to km/h.

Understand direct proportion as: as x increase, y increases.

Understand inverse proportion as: as x increases, y decreases.

COMMON MISCONCEPTIONS

Some students may think that compound interest and simple interest are the same method of calculating interest.

Incomplete methods when using multipliers, i.e. reduce £80 by 15% = 80 × 0.15.

NOTES

Encourage students to use a single multiplier.

Include simple fractional percentages of amounts with compound interest and encourage use of single multipliers.

Amounts of money should be rounded to the nearest penny, but emphasise the importance of not rounding until the end of the calculation if doing in stages.

Use a formula triangle to help students see the relationship for compound measures – this will help them evaluate which inverse operations to use.

Help students to recognise the problem they are trying to solve by the unit measurement given, e.g. km/h is a unit of speed as it is speed divided by a time.

Plans and Elevations 15a. Teaching time: 5-7 hours

OBJECTIVES

By the end of the sub-unit, students should be able to:

- Understand clockwise and anticlockwise;
- Draw circles and arcs to a given radius or given the diameter;
- Measure and draw lines, to the nearest mm;
- Measure and draw angles, to the nearest degree;
- Know and use compass directions;
- Draw sketches of 3D solids;
- Know the terms face, edge and vertex;
- Identify and sketch planes of symmetry of 3D solids;
- Use isometric grids to draw 2D representations of 3D solids;
- Make accurate drawings of triangles and other 2D shapes using a ruler and a protractor;
- Construct diagrams of everyday 2D situations involving rectangles, triangles, perpendicular and parallel lines;
- Understand and draw front and side elevations and plans of shapes made from simple solids;
- Given the front and side elevations and the plan of a solid, draw a sketch of the 3D solid.

POSSIBLE SUCCESS CRITERIA

Be able to estimate the size of given angles.
Convert fluently between metric units of length.
Use bearings in a real-life context to describe the bearing between two towns on a map.

COMMON MISCONCEPTIONS

Some pupils may use the wrong scale of a protractor. For example, they measure an obtuse angle as 60° rather than as 120°.
Often 5 sides only are drawn for a cuboid.

NOTES

This is a very practical topic, and provides opportunities for some hands-on activities.
Whilst not an explicit objective, it is useful for students to draw and construct nets and show how they fold to make 3D solids, allowing students to make the link between 3D shapes and their nets. This will enable students to understand that there is often more than one net that can form a 3D shape.

Return to Overview

Perimeter, area and volume - Circles, cylinders, cones and spheres. Teaching time: 6-8 hours

OBJECTIVES

By the end of the unit, students should be able to:

- Recall the definition of a circle;
- Identify, name and draw parts of a circle including tangent, chord and segment;
- Recall and use formulae for the circumference of a circle and the area enclosed by a circle circumference of a circle = $2\pi r = \pi d$, area of a circle = πr^2;
- Find circumferences and areas enclosed by circles;
- Use $\pi \approx 3.142$ or use the π button on a calculator;
- Give an answer to a question involving the circumference or area of a circle in terms of π;
- Find radius or diameter, given area or perimeter of a circles;
- Find the perimeters and areas of semicircles and quarter-circles;
- Calculate perimeters and areas of composite shapes made from circles and parts of circles;
- Calculate arc lengths, angles and areas of sectors of circles;
- Find the surface area of a cylinder;
- Find the volume of a cylinder;
- Find the surface area and volume of spheres, pyramids, cones and composite solids;
- Round answers to a given degree of accuracy.

POSSIBLE SUCCESS CRITERIA

Recall terms related to a circle.
Understand that answers in terms of pi are more accurate.

COMMON MISCONCEPTIONS

Diameter and radius are often confused and recollection which formula to use for area and circumference of circles is often poor.

NOTES

Emphasise the need to learn the circle formula: 'Cherry Pie's Delicious' and 'Apple Pies are too' are good ways to remember them.
Formulae for curved surface area and volume of a sphere, and surface area and volume of a cone, will be given on the formulae sheet in the examination.
Ensure that students know it is more accurate to leave answers in terms of π but only when asked to do so.

Similarity and Congruence 19a – 2D shapes. Teaching time: 6-8 hours

OBJECTIVES

By the end of the sub-unit, students should be able to:

- Use the basic congruence criteria for triangles (SSS, SAS, ASA and RHS);
- Solve angle problems involving congruence;
- Identify shapes which are similar; including all circles or all regular polygons with equal number of sides;
- Understand similarity of triangles and of other plane shapes, use this to make geometric inferences, and solve angle problems using similarity;
- Identify the scale factor of an enlargement of a shape as the ratio of the lengths of two corresponding sides;
- Understand the effect of enlargement on perimeter of shapes;
- Solve problems to find missing lengths in similar shapes;
- Know that scale diagrams, including bearings and maps are 'similar' to the real-life examples.

POSSIBLE SUCCESS CRITERIA

Understand similarity as one shape being an enlargement of the other.

Recognise that all corresponding angles in similar shapes are equal in size when the corresponding lengths of sides are not equal in size.

Use AB notation for describing lengths and $\angle ABC$ notation for describing angles.

COMMON MISCONCEPTIONS

Students may incorrectly believe that all polygons are regular or that all triangles have a rotational symmetry of order 3.

Often students think that when a shape is enlarged the angles also get bigger.

NOTES

Use simple scale factors that are easily calculated mentally to introduce similar shapes.

Reinforce the fact that the sizes of angles are maintained when a shape is enlarged.

Make links between similarity and trigonometric ratios.