

1. Number

C1.1 Types of number

- ## C1.2 Sets

- ### C1.3 Powers and roots

- ### C1.4 Fractions, decimals and percentages

- ☐☐☐ Recognise equivalence and convert between these forms.

C1.5 Ordering

- Order quantities by magnitude and demonstrate familiarity with the symbols $=, \neq, >, <, \geq$ and $\leq$.

C1.6 The four operations

- ☐☐☐ Use the four operations for calculations with integers, fractions and decimals, including correct ordering of operations and use of brackets.

C1.7 Indices I

- ☐☐☐ Understand and use indices (positive, zero and negative integers).
- ☐☐☐ Understand and use the rules of indices.

C1.8 Standard form ()

- ☐ ☐ ☐ Use the standard form $A \times 10^n$ where n is a positive or negative integer and $1 \leq A < 10$.
- ☐ ☐ ☐ Convert numbers into and out of standard form.
- ☐ ☐ ☐ Calculate with values in standard form.

C1.9 Estimation

- ☐ ☐ ☐ Round values to a specified degree of accuracy.
- ☐ ☐ ☐ Make estimates for calculations involving numbers, quantities and measurements.
- ☐ ☐ ☐ Round answers to a reasonable degree of accuracy in the context of a given problem.

C1.10 Limits of accuracy

- Give upper and lower bounds for data rounded to a specified accuracy.

C1.11 Ratio and proportion

- ☐ ☐ ☐ Understand and use ratio and proportion to:
- ☐ ☐ ☐ • give ratios in their simplest form
 - ☐ ☐ ☐ • divide a quantity in a given ratio
 - ☐ ☐ ☐ • use proportional reasoning and ratios in context.

C1.12 Rates

- ☐☐☐ Use common measures of rate.
- ☐☐☐ Apply other measures of rate.
- ☐☐☐ Solve problems involving average speed.

C1.13 Percentages

- ☐ ☐ ☐ Calculate a given percentage of a quantity.
- ☐ ☐ ☐ Express one quantity as a percentage of another.
- ☐ ☐ ☐ Calculate percentage increase or decrease.
- ☐ ☐ ☐ Calculate with simple and compound interest.

C1.14 Using a calculator

- ☐ ☐ ☐ Use a calculator efficiently.
- ☐ ☐ ☐ Enter values appropriately on a calculator.
- ☐ ☐ ☐ Interpret the calculator display appropriately.

C1.15 Time

- ☐☐☐ Calculate with time: seconds (s), minutes (min), hours (h), days, weeks, months, years, including the relationship between units.
- ☐☐☐ Calculate times in terms of the 24-hour and 12-hour clock.
- ☐☐☐ Read clocks and timetables.

C1.16 Money

- ☐☐☐ Calculate with money.
- ☐☐☐ Convert from one currency to another.

E1.1 Types of number

- Identify and use: • natural numbers • integers (positive, zero and negative) • prime numbers • square numbers • cube numbers • common factors • common multiples • rational and irrational numbers • reciprocals.

E1.2 Sets

- Understand and use set language, notation and Venn diagrams to describe sets and represent relationships between sets.

E1.3 Powers and roots

- ☐☐☐
- Calculate with the following: • squares • square roots • cubes • cube roots • other powers and roots of numbers.

E1.4 Fractions, decimals and percentages

- ☐☐☐
- Use the language and notation of the following in appropriate contexts: • proper fractions • improper fractions • mixed numbers • decimals • percentages.

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E1.5 Ordering

- ☐☐☐
- Order quantities by magnitude and demonstrate familiarity with the symbols =,
- $\neq$
- ,
- $>$
- ,
- $<$
- ,
- $\geq$
- and
- $\leq$
- .

E1.6 The four operations

- ☐☐☐
- Use the four operations for calculations with integers, fractions and decimals, including correct ordering of operations and use of brackets.

E1.7 Indices I

- ☐☐☐
- Understand and use indices (positive, zero, negative, and fractional).

☐☐☐

E1.8 Standard form

- ☐☐☐
- Use the standard form
- $A \times 10^n$
- where
- n
- is a positive or negative integer and
- $1 \leq A < 10$
- .

☐☐☐☐☐☐

E1.9 Estimation

- ☐☐☐
- Round values to a specified degree of accuracy.

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E1.10 Limits of accuracy

- ☐☐☐
- Give upper and lower bounds for data rounded to a specified accuracy.

☐☐☐

E1.11 Ratio and proportion

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- Understand and use ratio and proportion to:

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E1.12 Rates

- ☐☐☐
- Use common measures of rate.

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- ☐☐☐
- Solve problems involving average speed.

E1.13 Percentages

- ☐☐☐
- Calculate a given percentage of a quantity.

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E1.14 Using a calculator

- ☐☐☐
- Use a calculator efficiently.

☐☐☐☐☐☐

E1.15 Time

- ☐☐☐
- Calculate with time: seconds (s), minutes (min), hours (h), days, weeks, months, years, including the relationship between units.

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E1.16 Money

- ☐☐☐
- Calculate with money.

☐☐☐

E1.17 Exponential growth and decay

- ☐☐☐
- Use exponential growth and decay.

E1.18 Surds

- ☐☐☐
- Understand and use surds, including simplifying expressions.

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2. Algebra and graphs

C2.1 Introduction to algebra

- ☐☐☐
- Know that letters can be used to represent generalised numbers.

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C2.2 Algebraic manipulation

- ☐☐☐
- Simplify expressions by collecting like terms.

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C2.4 Indices II

- ☐☐☐
- Understand and use indices (positive, zero and negative).

- ☐ ☐ ☐ Understand and use the rules of indices.

C2.5 Equations

- ☐ ☐ ☐ Construct simple expressions, equations and formulas.
- ☐ ☐ ☐ Solve linear equations in one unknown.
- ☐ ☐ ☐ Solve simultaneous linear equations in two unknowns.
- ☐ ☐ ☐ Change the subject of simple formulas.

C2.6 Inequalities

- ☐ ☐ ☐ Represent and interpret inequalities, including on a number line.

C2.7 Sequences

- ☐ ☐ ☐ Continue a given number sequence or pattern.
- ☐ ☐ ☐ Recognise patterns in sequences, including the term-to-term rule, and relationships between different sequences.
- ☐ ☐ ☐ Find and use the n th term of the following sequences: (a) linear (b) simple quadratic (c) simple cubic.

C2.9 Graphs in practical situations

- ☐ ☐ ☐ Use and interpret graphs in practical situations including travel graphs and conversion graphs.
- ☐ ☐ ☐ Draw graphs from given data.

C2.10 Graphs of functions

- ☐ ☐ ☐ Construct tables of values, and draw, recognise and interpret graphs for functions of the following forms: • $ax + b$ • $\pm x^2 + ax + b$ • $\frac{a}{x}$ ($x \neq 0$) where a and b are integer constants.
- ☐ ☐ ☐ Solve associated equations graphically, including finding and interpreting roots by graphical methods.

C2.11 Sketching curves

- ☐ ☐ ☐ Recognise, sketch and interpret graphs of the following functions: (a) linear (b) quadratic.

E2.1 Introduction to algebra

- ☐ ☐ ☐ Know that letters can be used to represent generalised numbers.
- ☐ ☐ ☐ Substitute numbers into expressions and formulas.

E2.2 Algebraic manipulation

- ☐ ☐ ☐ Simplify expressions by collecting like terms.
- ☐ ☐ ☐ Expand products of algebraic expressions.
- ☐ ☐ ☐ Factorise by extracting common factors.
- ☐ ☐ ☐ Factorise expressions of the form: • $ax + bx + kay + kby$ • $a^2x^2 - b^2y^2$ • $a^2 + 2ab + b^2$ • $ax^2 + bx + c$ • $ax^3 + bx^2 + cx$.
- ☐ ☐ ☐ Complete the square for expressions in the form $ax^2 + bx + c$.

E2.3 Algebraic fractions

- ☐ ☐ ☐ Manipulate algebraic fractions.
- ☐ ☐ ☐ Factorise and simplify rational expressions.

E2.4 Indices II II

- ☐ ☐ ☐ Understand and use indices (positive, zero, negative and fractional).
- ☐ ☐ ☐ Understand and use the rules of indices.

E2.5 Equations

- ☐ ☐ ☐ Construct expressions, equations and formulas.
- ☐ ☐ ☐ Solve linear equations in one unknown.
- ☐ ☐ ☐ Solve fractional equations with numerical and linear algebraic denominators.
- ☐ ☐ ☐ Solve simultaneous linear equations in two unknowns.
- ☐ ☐ ☐ Solve simultaneous equations, involving one linear and one non-linear.
- ☐ ☐ ☐ Solve quadratic equations by factorisation, completing the square and by use of the quadratic formula.
- ☐ ☐ ☐ Change the subject of formulas.

E2.6 Inequalities

- ☐ ☐ ☐ Represent and interpret inequalities, including on a number line.
- ☐ ☐ ☐ Construct, solve and interpret linear inequalities.
- ☐ ☐ ☐ Represent and interpret linear inequalities in two variables graphically.
- ☐ ☐ ☐ List inequalities that define a given region.

E2.7 Sequences

- ☐ ☐ ☐ Continue a given number sequence or pattern.
- ☐ ☐ ☐ Recognise patterns in sequences, including the term-to-term rule, and relationships between different sequences.
- ☐ ☐ ☐ Find and use the n th term of sequences.

E2.8 Proportion

- ☐ ☐ ☐ Express direct and inverse proportion in algebraic terms and use this form of expression to find unknown quantities.

E2.9 Graphs in practical situations

- ☐ ☐ ☐ Use and interpret graphs in practical situations including travel graphs and conversion graphs.
- ☐ ☐ ☐ Draw graphs from given data.
- ☐ ☐ ☐ Apply the idea of rate of change to simple kinematics involving distance–time and speed–time graphs, acceleration and deceleration.
- ☐ ☐ ☐ Calculate distance travelled as area under a speed–time graph.

E2.10 Graphs of functions

- ☐ ☐ ☐ Construct tables of values, and draw, recognise and interpret graphs for functions of the following forms: • ax^n (includes sums of no more than three of these) • $ab^x + c$ where $n = -2, -1, -\frac{1}{2}, 0, \frac{1}{2}, 1, 2, 3$; a and c are rational numbers; and b is a positive integer.

- ☐☐☐ Solve associated equations graphically, including finding and interpreting roots by graphical methods.
- ☐☐☐ Draw and interpret graphs representing exponential growth and decay problems.

E2.11 Sketching curves

- ☐☐☐ Recognise, sketch and interpret graphs of the following functions: (a) linear (b) quadratic (c) cubic (d) reciprocal (e) exponential.

E2.12 Differentiation

- ☐☐☐ Estimate gradients of curves by drawing tangents.
- ☐☐☐ Use the derivatives of functions of the form ax^n , where a is a rational constant and n is a positive integer or zero, and simple sums of not more than three of these.
- ☐☐☐ Apply differentiation to gradients and stationary points (turning points).
- ☐☐☐ Discriminate between maxima and minima by any method.

E2.13 Functions

- ☐☐☐ Understand functions, domain and range and use function notation.
- ☐☐☐ Understand and find inverse functions $f^{-1}(x)$.
- ☐☐☐ Form composite functions as defined by $gf(x) = g(f(x))$.

3. Coordinate geometry

C3.1 Coordinates

- ☐☐☐ Use and interpret Cartesian coordinates in two dimensions.

C3.2 Drawing linear graphs

- ☐☐☐ Draw straight-line graphs for linear equations.

C3.3 Gradient of linear graphs

- ☐☐☐ Find the gradient of a straight line.

C3.5 Equations of linear graphs

- ☐☐☐ Interpret and obtain the equation of a straight-line graph in the form $y = mx + c$.

C3.6 Parallel lines

- ☐☐☐ Find the gradient and equation of a straight line parallel to a given line.

E3.1 Coordinates

- ☐☐☐ Use and interpret Cartesian coordinates in two dimensions.

E3.2 Drawing linear graphs

- ☐☐☐ Draw straight-line graphs for linear equations.

E3.3 Gradient of linear graphs

- ☐☐☐ Find the gradient of a straight line.
- ☐☐☐ Calculate the gradient of a straight line from the coordinates of two points on it.

E3.4 Length and midpoint

- ☐☐☐ Calculate the length of a line segment.
- ☐☐☐ Find the coordinates of the midpoint of a line segment.

E3.5 Equations of linear graphs

- ☐☐☐ Interpret and obtain the equation of a straight-line graph.

E3.6 Parallel lines

- ☐☐☐ Find the gradient and equation of a straight line parallel to a given line.

E3.7 Perpendicular lines

- ☐☐☐ Find the gradient and equation of a straight line perpendicular to a given line.

4. Geometry

C4.1 Geometrical terms

- ☐☐☐ Use and interpret the following geometrical terms: • point • vertex • line • parallel • perpendicular • bearing • right angle • acute, obtuse and reflex angles • interior and exterior angles • similar • congruent • scale factor.
- ☐☐☐ Use and interpret the vocabulary of: • triangles • special quadrilaterals • polygons • nets • simple solids.
- ☐☐☐ Use and interpret the vocabulary of a circle.

C4.2 Geometrical constructions

- ☐☐☐ Measure and draw lines and angles.
- ☐☐☐ Construct a triangle, given the lengths of all sides, using a ruler and pair of compasses only.
- ☐☐☐ Draw, use and interpret nets.

C4.3 Scale drawings

- ☐☐☐ Draw and interpret scale drawings.
- ☐☐☐ Use and interpret three-figure bearings.

C4.4 Similarity

- ☐☐☐ Calculate lengths of similar shapes.

C4.5 Symmetry

- ☐☐☐ Recognise line symmetry and order of rotational symmetry in two dimensions.

C4.6 Angles

- ☐☐☐ Calculate unknown angles and give simple explanations using the following geometrical properties: • sum of angles at a point = 360° • sum of angles at a point on a straight line =

180° • vertically opposite angles are equal • angle sum of a triangle = 180° and angle sum of a quadrilateral = 360°.

- ☐☐☐ Calculate unknown angles and give geometric explanations for angles formed within parallel lines:
- corresponding angles are equal
 - alternate angles are equal
 - co-interior angles sum to 180° (supplementary).

- ☐☐☐ Know and use angle properties of regular polygons.

C4.7 Circle theorems

- ☐☐☐ Calculate unknown angles and give explanations using the following geometrical properties of circles:
- angle in a semicircle = 90°
 - angle between tangent and radius = 90°.

E4.1 Geometrical terms

- ☐☐☐ Use and interpret the following geometrical terms:
- point
 - vertex
 - line
 - plane
 - parallel
 - perpendicular
 - perpendicular bisector
 - bearing
 - right angle
 - acute, obtuse and reflex angles
 - interior and exterior angles
 - similar
 - congruent
 - scale factor.
- ☐☐☐ Use and interpret the vocabulary of:
- triangles
 - special quadrilaterals
 - polygons
 - nets
 - solids.
- ☐☐☐ Use and interpret the vocabulary of a circle.

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- ☐☐☐ Draw and interpret scale drawings.
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E4.4 Similarity

- ☐☐☐ Calculate lengths of similar shapes.
- ☐☐☐ Use the relationships between lengths and areas of similar shapes and lengths, surface areas and volumes of similar solids.
- ☐☐☐ Solve problems and give simple explanations involving similarity.

E4.5 Symmetry

- ☐☐☐ Recognise line symmetry and order of rotational symmetry in two dimensions.
- ☐☐☐ Recognise symmetry properties of prisms, cylinders, pyramids and cones.

E4.6 Angles

- ☐☐☐ Calculate unknown angles and give simple explanations using the following geometrical properties:
- sum of angles at a point = 360°
 - sum of angles at a point on a straight line = 180°
 - vertically opposite angles are equal
 - angle sum of a triangle = 180° and angle sum of a quadrilateral = 360°.
- ☐☐☐ Calculate unknown angles and give geometric explanations for angles formed within parallel lines:
- corresponding angles are equal
 - alternate angles are equal
 - co-interior angles sum to 180° (supplementary).

- ☐☐☐ Know and use angle properties of regular and irregular polygons.

E4.7 Circle theorems I

I

- ☐☐☐ Calculate unknown angles and give explanations using the following geometrical properties of circles:
- angle in a semicircle = 90°
 - angle between tangent and radius = 90°
 - angle at the centre is twice the angle at the circumference
 - angles in the same segment are equal
 - opposite angles of a cyclic quadrilateral sum to 180° (supplementary)
 - alternate segment theorem.

E4.8 Circle theorems II

II

- ☐☐☐ Use the following symmetry properties of circles:
- equal chords are equidistant from the centre
 - the perpendicular bisector of a chord passes through the centre
 - tangents from an external point are equal in length.

5. Mensuration

C5.1 Units of measure

- ☐☐☐ Use metric units of mass, length, area, volume and capacity in practical situations and convert quantities into larger or smaller units.

C5.2 Area and perimeter

- ☐☐☐ Carry out calculations involving the perimeter and area of a rectangle, triangle, parallelogram and trapezium.

C5.3 Circles, arcs and sectors

- ☐☐☐ Carry out calculations involving the circumference and area of a circle.
- ☐☐☐ Carry out calculations involving arc length and sector area as fractions of the circumference and area of a circle, where the sector angle is a factor of 360°.

C5.4 Surface area and volume

- ☐☐☐ Carry out calculations and solve problems involving the surface area and volume of a:
- cuboid
 - prism
 - cylinder
 - sphere
 - pyramid
 - cone.

C5.5 Compound shapes and parts of shapes

- ☐☐☐ Carry out calculations and solve problems involving perimeters and areas of:
- compound shapes
 - parts of shapes.
- ☐☐☐ Carry out calculations and solve problems involving surface areas and volumes of:
- compound solids
 - parts of solids.

E5.1 Units of measure

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- ☐☐☐ Carry out calculations involving the perimeter and area of a rectangle, triangle, parallelogram and trapezium.

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 - parts of shapes.
- ☐☐☐ Carry out calculations and solve problems involving surface areas and volumes of:
 - compound solids
 - parts of solids.

6. Trigonometry

C6.1 Pythagoras' theorem

- ☐☐☐ Know and use Pythagoras' theorem.

C6.2 Right-angled triangles

- ☐☐☐ Know and use the sine, cosine and tangent ratios for acute angles in calculations involving sides and angles of a right-angled triangle.
- ☐☐☐ Solve problems in two dimensions using Pythagoras' theorem and trigonometry.

E6.1 Pythagoras' theorem

- ☐☐☐ Know and use Pythagoras' theorem.

E6.2 Right-angled triangles

- ☐☐☐ Know and use the sine, cosine and tangent ratios for acute angles in calculations involving sides and angles of a right-angled triangle.
- ☐☐☐ Solve problems in two dimensions using Pythagoras' theorem and trigonometry.
- ☐☐☐ Know that the perpendicular distance from a point to a line is the shortest distance to the line.
- ☐☐☐ Carry out calculations involving angles of elevation and depression.

E6.3 Exact trigonometric values

- ☐☐☐ Know the exact values of: $1 \sin x$ and $\cos x$ for $x = 0^\circ, 30^\circ, 45^\circ, 60^\circ$ and 90° . $2 \tan x$ for $x = 0^\circ, 30^\circ, 45^\circ$ and 60° .

E6.4 Trigonometric functions

- ☐☐☐ Recognise, sketch and interpret the following graphs for $0^\circ \leq x \leq 360^\circ$:
 - $y = \sin x$
 - $y = \cos x$
 - $y = \tan x$.
- ☐☐☐ Solve trigonometric equations involving $\sin x$, $\cos x$ or $\tan x$, for $0^\circ \leq x \leq 360^\circ$.

E6.5 Non-right-angled triangles

- ☐☐☐ Use the sine and cosine rules in calculations involving lengths and angles for any triangle.

- ☐☐☐ Use the formula area of triangle $= \frac{1}{2}ab \sin C$.

E6.6 Pythagoras' theorem and trigonometry in 3D

- ☐☐☐ Carry out calculations and solve problems in three dimensions using Pythagoras' theorem and trigonometry, including calculating the angle between a line and a plane.

7. Transformations and vectors

C7.1 Transformations

- ☐☐☐ Recognise, describe and draw the following transformations:
 - ☐☐☐ Reflection of a shape in a vertical or horizontal line.
 - ☐☐☐ Rotation of a shape about the origin, vertices or midpoints of edges of the shape, through multiples of 90° .
 - ☐☐☐ Enlargement of a shape from a centre by a scale factor.
 - ☐☐☐ Translation of a shape by a vector $\begin{pmatrix} x \\ y \end{pmatrix}$.

E7.1 Transformations

- ☐☐☐ Transformations

E7.2 Vectors in two dimensions

- ☐☐☐ Vectors in two dimensions

E7.3 Magnitude of a vector

- ☐☐☐ Magnitude of a vector

E7.4 Vector geometry

- ☐☐☐ Vector geometry

8. Probability

C8.1 Introduction to probability

- ☐☐☐ Understand and use the probability scale from 0 to 1.
- ☐☐☐ Calculate the probability of a single event.
- ☐☐☐ Understand that the probability of an event not occurring $= 1 -$ the probability of the event occurring.

C8.2 Relative and expected frequencies

- ☐☐☐ Understand relative frequency as an estimate of probability.
- ☐☐☐ Calculate expected frequencies.

C8.3 Probability of combined events

- ☐☐☐ Calculate the probability of combined events using, where appropriate:
 - sample space diagrams
 - Venn diagrams
 - tree diagrams.

E8.1 Introduction to probability

- ☐☐☐ Understand and use the probability scale from 0 to 1.
- ☐☐☐ Understand and use probability notation.
- ☐☐☐ Calculate the probability of a single event.
- ☐☐☐ Understand that the probability of an event not occurring = $1 -$ the probability of the event occurring.

E8.2 Relative and expected frequencies

- ☐☐☐ Understand relative frequency as an estimate of probability.
- ☐☐☐ Calculate expected frequencies.

E8.3 Probability of combined events

- ☐☐☐ Calculate the probability of combined events using, where appropriate:
 - sample space diagrams
 - Venn diagrams
- ☐☐☐ • tree diagrams.

E8.4 Conditional probability

- ☐☐☐ Calculate conditional probability using Venn diagrams, tree diagrams and tables.

9. Statistics

C9.1 Classifying statistical data

- ☐☐☐ Classify and tabulate statistical data.

C9.2 Interpreting statistical data

- ☐☐☐ Read, interpret and draw inferences from tables and statistical diagrams.
- ☐☐☐ Compare sets of data using tables, graphs and statistical measures.
- ☐☐☐ Appreciate restrictions on drawing conclusions from given data.

C9.3 Averages and range

- ☐☐☐ Calculate the mean, median, mode and range for individual data and distinguish between the purposes for which these are used.

C9.4 Statistical charts and diagrams

- ☐☐☐ Draw and interpret: (a) bar charts (b) pie charts (c) pictograms (d) stem-and-leaf diagrams (e) simple frequency distributions.

C9.5 Scatter diagrams

- ☐☐☐ Draw and interpret scatter diagrams.
- ☐☐☐ Understand what is meant by positive, negative and zero correlation.
- ☐☐☐ Draw by eye, interpret and use a straight line of best fit.

E9.1 Classifying statistical data

- ☐☐☐ Classify and tabulate statistical data.

E9.2 Interpreting statistical data

- ☐☐☐ Read, interpret and draw inferences from tables and statistical diagrams.
- ☐☐☐ Compare sets of data using tables, graphs and statistical measures.
- ☐☐☐ Appreciate restrictions on drawing conclusions from given data.

E9.3 Averages and measures of spread

- ☐☐☐ Calculate the mean, median, mode, quartiles, range and interquartile range for individual data and distinguish between the purposes for which these are used.
- ☐☐☐ Calculate an estimate of the mean for grouped discrete or grouped continuous data.
- ☐☐☐ Identify the modal class from a grouped frequency distribution.

E9.4 Statistical charts and diagrams

- ☐☐☐ Draw and interpret: (a) bar charts (b) pie charts (c) pictograms (d) stem-and-leaf diagrams (e) simple frequency distributions.

E9.5 Scatter diagrams

- ☐☐☐ Draw and interpret scatter diagrams.
- ☐☐☐ Understand what is meant by positive, negative and zero correlation.
- ☐☐☐ Draw by eye, interpret and use a straight line of best fit.

E9.6 Cumulative frequency diagrams

- ☐☐☐ Draw and interpret cumulative frequency tables and diagrams.
- ☐☐☐ Estimate and interpret the median, percentiles, quartiles and interquartile range from cumulative frequency diagrams.

E9.7 Histograms

- ☐☐☐ Draw and interpret histograms.
- ☐☐☐ Calculate with frequency density.