

1. Numbers

- 1 Arithmetic number operations, ordering, and comparison
- 2 BIDMAS
- □ 3 Conversion between fractions, decimals and percentages
- ☐ 4 Laws of indices
- □ 5 Prime factor decomposition of positive integers (Including index notation)
- ☐ 6 The LCM and HCF (using : listing, Venn diagrams and prime factors)
- □ 7 The total number of choices when m & n are the number of choices of two options

2. <u>Algebra – Basics</u>

- □ 1 Formation of algebraic expressions and equations
- **2** Simplification of the algebraic expressions
- □ 3 Substitution into algebraic expressions
- ☐ 4 Multiplication and division of algebraic terms (using index notation and index laws)

3. <u>Geometry – Basics</u>

- □ 1 Angles in parallel lines (corresponding, alternate and co-interior angles)
- □ 2 The angle properties of quadrilaterals and triangles
- □ 3 Angles at a point, angles at a point on a straight line, right angles, and vertically opposite angles
- ☐ 4 The perimeters of: rectangles, squares, triangles, parallelograms, trapezia and compound shapes
- 5 The areas of : rectangles, squares, triangles, parallelograms, rhombuses, kites, trapezia and compound shapes
- \Box 6 Nets of cuboids and prisms

4. Statistics – Basics

- □ 1 Two-way and grouped data
- Pictograms, bar charts, composite bar charts, line charts, line graphs, pie charts, stem and leaf diagrams (including back-to-back)
- □ 3 The total frequency, max and min values, range, median, mode or modal class

5. Percentages

- 1 A given number as a percentage of another number
- \Box 2 The percentage of a quantity
- □ 3 Percentage increase / decrease
- □ 4 VAT, profit or loss, simple interest, compound interest, income tax calculations
- □ 5 Increasing or decreasing a quantity by a percentage (using a multiplier)
- □ 6 Repeated percentages
- □ 7 Reverse percentages
- **8** Growth and decay

6. Indices and Roots

- 1 Integer powers, fractional powers, negative powers
- 2 Standard form : addition, subtraction, multiplication and division.
- 3 Estimation: powers and roots of a positive number
- 4 Surds : simplification, addition, subtraction, (bracket notation) multiplication, division
- **5** Surds: Rationalisation of the denominators

7. <u>Algebraic manipulation</u>

- 1 Multiplications involving a single bracket or double brackets
- 2 Factorisation of algebraic expressions by taking out common factors
- 3 Simplification, multiplication and division of algebraic terms

8. <u>Straight-line graphs</u>

- 1 The coordinates of the midpoint of a line segment
- Straight-line graphs for real-life situations: ready reckoner graphs, conversion graphs, fuel bills graphs, fixed charge and cost per unit
- □ 3 Distance–time graphs and velocity–time graphs
- □ 4 The gradient of a straight line (rate of change)
- □ 5 Graphs of straight lines of the form y = mx + c using a table of values
- 6 A graph of a linear function, using the gradient and y-intercept
- □ 7 Gradient calculations from the equations in the form y = mx + c or ax + by = c
- □ 8 The equation of a straight line from a graph
- 9 The equation of a line: using given point on the line and gradient or through two given points
- 10 An approximate solution to a linear equation from a graph
- 11 Lines parallel and perpendicular to the given line

9. <u>Polygons</u>

- □ 1 Regular and irregular polygons
- □ 2 For any polygon of n sides:
 - » the sum of the interior angles = [180°(n-2)]
 - » sum of the exterior angles = 360°
 - » sum of the interior angle and the exterior angle = 180°
- □ 3 For a regular polygon of n sides:
 - » exterior angle = $\frac{360^{\circ}}{2}$

10. <u>Congruence and Similarity</u>

- 1 The congruence criteria for triangles (SSS, SAS, ASA and RHS)
- □ 2 Missing angles and lengths in similar shapes



- 3 The lengths, areas in similar 2D shapes
- □ 4 The lengths, areas and volumes in similar 3D solids
- 5 The relationships between linear, area and volume scale factors of mathematically similar shapes and solids

11. Accuracy

- □ 1 Degree of accuracy
- 2 Error intervals
- □ 3 The upper and lowers bounds of numbers
- ☐ 4 The upper and lower bounds of an expression involving the four operations
- □ 5 The upper and lower bounds of perimeters, areas and volumes of 2D and 3D shapes

12. Circles

- 1 Parts of a circle: radius, diameter, tangent, chord, arc, segment and sector
- 2 The circumference and the area of a circle (Including in terms of π)
- □ 3 The perimeters and areas of semicircles, quarter-circles and composite shapes
- □ 4 The arc lengths, angles and areas of sectors

13. Circle theorems

- □ 1 Circle theorem 1: The angle in a semicircle is a right angle (90°).
- 2 Circle theorem 2: The tangent at any point on a circle is perpendicular to the radius at that point.
- □ 3 Circle theorem 3: The tangents to a circle from an external point are equal in length..
- ☐ 4 Circle theorem 4: The opposite angles of a cyclic quadrilateral sum to 180°.
- ☐ 5 Circle theorem 5: The angle subtended by an arc at the centre of a circle is twice the angle subtended by the same arc at any point on the circle.
- ☐ 6 Circle theorem 6: The angles in the same segment are equal.
- 7 Circle theorem 7: The alternate segment theorem.
 The angle between a tangent and a chord

is equal to the angle subtended by the same chord in the alternate segment.

 □ 8 Circle theorem 8: The perpendicular drawn from the centre of a circle to a chord bisects the chord.

14. Equations and Inequalities

- □ 1 Linear equation with x on either side or on both sides of the equation
- Change the subject of a formula (Re-arrange the formula)
- 3 Linear inequalities in one variable, the solution set on a number line (with inclusive and exclusive values)
- ☐ 4 Two inequalities in x, and choosing the values of x which satisfy both the inequalities

- 5 Forming the inequalities to represent a set shown on a number line
- ☐ 6 The solution set for inequalities using set notations
- 7 Inequalities region: Graphical representation of the solution set for inequalities on a graph

15. Probability

- 1 Systematic listing of all outcomes for a single event
- □ 2 The frequency tables and frequency trees
- □ 3 Mutually exclusive outcomes
- 4 Probability from a list or a table (algebraic expressions)
- 5 The probability of an event when relative frequency is given
- 6 Estimation of the number of times an event will occur, given the probability and the number of trials

16. Sequences

- 1 Sequences of odd and even numbers, Fibonacci sequences
- 2 Expression for the nth term in the sequence using position-to-term
- Arithmetic sequences of numbers, triangular numbers, square and cube integers and sequences derived from diagrams
- \Box 4 The next term in a sequence, (n + 1)th term
- **5** The nth term for a pattern sequence
- G Using the nth term formula, check if a given number is a term in the sequence, find the first term greater/less than a given number
- ☐ 7 Geometric progression: nth term, term to term rule (Including surds)
- **8** The nth term for a quadratic sequence

17. Constructions

- 1 The front and side elevations and plans of simple solids
- Given the front and side elevations and the plan of a 3D solid, draw a sketch of the solid
- 3 The constructions listed below using a ruler and a pair of compasses
 - » perpendicular bisector of a given line,
 - » perpendicular from a point to a line,
 - » bisector of a given angle,
 - » angles of 30°, 45°, 60°, 90°, 120°
 - » hexagon of given length
 - » a triangle when the lengths of all sides are given
- 🛛 4 Loci
 - » A region bounded by a circle and an intersecting line
 - » A given distance from a point and a given distance from a line
 - » Equal distances from two points or two line segments
 - » Regions 'nearer to' or 'greater than'



- □ 5 Maps and scale drawings, estimation of lengths
- □ 6 An accurate scale drawing from given info
- □ 7 Three-figure bearings
- □ 8 The position of point B when its bearing from point A is given on a diagram
- 9 The bearing between the points on a map or on a scaled plan
- 10 The bearing of a point A from point B when the bearing of B from A is given

18. Quadratics

- 1 Multiplication of two algebraic expressions with brackets
- □ 2 Factorisation of quadratic expressions of the form $x^2 + bx + c$, $ax^2 + bx + c$ and $x^2 a^2$
- □ 3 Quadratic equations by factorising
- □ 4 The roots of a quadratic function algebraically
- **5** Quadratic equations by completing the square
- ☐ 6 Quadratic equations by using the quadratic formula
- 7 Iterations to find approximate solutions to equations (including quadratic and cubic equations)
- □ 8 Algebraic fractions: addition, subtraction, multiplication, division and simplification

19. Quadratic graphs

- □ 1 Graphs of quadratic functions (using a table of values)
- □ 2 The line of symmetry of a quadratic graph
- □ 3 The approximate solutions to quadratic equations using a graph
- 4 The roots, intercepts and turning points of quadratic graphs.
- □ 5 The turning points by completing the square
- ☐ 6 Quadratic inequalities (sketching quadratic curves)

20. Ratios and Compound measures

- □ 1 Ratios in their simplest form
- 2 A quantity shared in a given ratio (including three-part ratios)
- □ 3 Ratios in form 1 : n or n : 1
- ☐ 4 Compound measures: density, pressure and speed
- ☐ 5 Conversion between the units for density, pressure and speed

21. <u>Proportion</u>

- □ 1 A multiplicative relationship between two quantities as a ratio or a fraction
- 2 Best buys
- □ 3 Repeated proportional change and its multiplier
- □ 4 Direct and inverse proportion

- ☐ 5 Graphs of direct proportion (y = kx) and inverse proportion (y = $\frac{k}{x}$)
- □ 6 Direct and inverse proportion word problems

22. Simultaneous equations

- □ 1 Two simultaneous equations linear and linear algebraically & graphically
- □ 2 Real life situation word problems
- 3 Two simultaneous equations linear and quadratic – algebraically & graphically

23. Pythagoras' theorem

- □ 1 Pythagoras' theorem in 2D
- 2 The length of a line segment AB given the coordinates of points A and B
- □ 3 Pythagoras' theorem in 3D

24. Statistical graphs and measures

- 1 The median, mean, mode and range of a data set
- 2 Stem and leaf diagrams (including back-to-back diagrams)
- 3 Comparison of two distributions from stem and leaf diagrams (mode, median, range)
- 4 The mean, mode, median and range from a frequency table (discrete data)
- 5 For grouped data: finding the class which contains the median and finding the modal class
- ☐ 6 The estimated mean of a grouped data
- □ 7 Cumulative frequency tables and graphs
- □ 8 The cumulative frequency graph: estimation of frequency greater/less than a certain value
- 9 The cumulative frequency graph: the median, lower and upper quartiles, interquartile range
- □ 10 Box plots: median, upper and lower quartiles, interquartile range, outliers
- 11 Histograms: class intervals with equal and unequal widths
- □ 12 A grouped frequency table from a histogram
- 13 Estimated mean, median from a histogram

25. Transformations

- 1 Rotation: the centre of rotation, angle and direction of rotation
- 2 Translation: Transformation of 2D shape, column vector
- 3 Reflection: Transformation of 2D shapes using single reflections with vertical, horizontal and diagonal mirror lines
- 4 Enlargement: The centre of enlargement, positive scale factor, negative scale factor, fractional scale factor
- 5 Transformation of 2D shapes by a combination of two transformations
- 6 The changes and invariance achieved by combinations of transformations



26. <u>Vectors</u>

- □ 1 Column vectors
- 2 Parallel vectors
- Galculation and graphical representation of: the sum of two vectors, the difference of two vectors and the product of a vector and a scalar

27. Bivariate data

- □ 1 Scatter graphs: drawing, interpretation and outliers
- 2 The line of best fit on a scatter graph and predictions based on it.
- □ 3 Interpolations and extrapolations, reliability
- ☐ 4 Correlation: positive, negative and no correlation
- □ 5 Correlation and causality

28. Sampling

- □ 1 Types of data: primary, secondary, quantitative and qualitative
- Identification and collection of data from a variety of suitable primary and secondary sources
- □ 3 'sample' and 'population'
- 4 Biased data

29. Probability of combined events

- □ 1 Systematic listing of all outcomes for combined events
- □ 2 Sample space diagrams
- □ 3 The probabilities from Venn diagrams
- 4 Union, intersection and complement notations in set theory
- □ 5 The probability of successive events
- ☐ 6 Tree diagrams to calculate the probability of independent events
- □ 7 Conditional probabilities using
 - » tree diagrams
 - » Venn diagrams
 - » two-way tables

30. Volume and Surface area

- The volume of : cubes, cuboids, prisms, cylinders, spheres, cones, pyramids & composite 3D shapes
- 2 The surface area of: cubes, cuboids, prisms, cylinders, spheres, pyramids, cones and composite 3D shapes

31. <u>Trigonometry</u>

- ☐ 1 SOH CAH TOA
- □ 2 The trigonometric ratios to find angles and lengths in right-angled triangles in 2D figures
- □ 3 Angles of elevation and depression
- □ 4 Knowledge of the exact values of sin θ and cos θ for $\theta = 0^{\circ}$, 30°, 45°, 60° and 90°
- **5** Knowledge of the exact values of tan θ for $\theta = 0^\circ$, 30°, 45° and 60°
- \Box 6 Area = $\frac{1}{2}$ ab sin C
- □ 7 The sine and cosine rules

32. Further graphs

- □ 1 Graphs of simple cubic functions: sketching and interpretation
- □ 2 Graphs of the reciprocal function $y = \frac{1}{x} (x \neq 0)$: sketching and interpretation
- Graphs of exponential functions y = k^x for positive values of k and integer values of x
- ☐ 4 Graphs of the trigonometric functions (in degrees) y = sin x, y = cos x and y = tan x
- □ 5 The transformation of y = f(x) to y = -f(x) and to y = f(-x)
- □ 6 The transformation of y = f(x) to y = f(x) + aand to y = f(x + a)
- 7 The area under a quadratic or other graph by dividing it into trapezia
- 8 Estimation of the gradient of a quadratic or non-linear graph at a given point
- 9 the equation of a tangent to a circle at a given point
- 10 The graph of a circle using x² + y² = r² for radius r centred at the origin

33. Mathematical arguments

- 1 'Show that' questions using consecutive integers (n, n + 1), squares (a², b²), even numbers (2n), and odd numbers (2n + 1)
- 2 Function notation
- □ 3 Calculations such as f(x) + g(x), f(x) g(x), 2f(x), f(3x), algebraically
- \square 4 The inverse function : $f^{-1}(x)$
- **5** Composite functions : gf(x), fg(x)
- 6 Vectors: vector notation, column vectors, parallel vectors
- □ 7 Geometric proofs using vectors