Content by Levels

Secondary One

NUMBER AND ALGEBRA

N1. Numbers and their operations

1.1. primes and prime factorisation
1.2. finding highest common factor (HCF) and lowest common multiple (LCM), squares, cubes, square roots and cube roots by prime factorisation
1.3. negative numbers, integers, rational numbers, real numbers and their four operations
1.4. calculations with calculator
1.5. representation and ordering of numbers on the number line
1.6. use of <, >, ≤, ≥
1.7. approximation and estimation (including rounding off numbers to a required number of decimal places or significant figures, and estimating the results of computation)

N2. Ratio and proportion

2.1. ratios involving rational numbers
2.2. writing a ratio in its simplest form
2.3. problems involving ratio

N3. Percentage

3.1. expressing one quantity as a percentage of another
3.2. comparing two quantities by percentage
3.3. percentages greater than 100%
3.4. increasing/decreasing a quantity by a given percentage (including concept of percentage point)
3.5. reverse percentages
3.6. problems involving percentages

N4. Rate and Speed

4.1. concepts of average rate, speed, constant speed and average speed
4.2. conversion of units (e.g. km/h to m/s)
4.3. problems involving rate and speed

N5. Algebraic expressions and formulae

5.1. using letters to represent numbers
5.2. interpreting notations:
- ab as $a \times b$
- $\frac{a}{b}$ as $a \div b$ or $a \times \frac{1}{b}$
- a^2 as $a \times a$, a^3 as $a \times a \times a$, a^2b as $a \times a \times b$, ...
- $3y$ as $y + y + y$ or $3 \times y$
- $3(x + y)$ as $3 \times (x + y)$
- $\frac{3+y}{5}$ as $(3 + y) \div 5$ or $\frac{1}{5} \times (3 + y)$

5.3. evaluation of algebraic expressions and formulae
5.4. translation of simple real-world situations into algebraic expressions
5.5. recognising and representing patterns/relationships by finding an algebraic expression for the nth term
5.6. addition and subtraction of linear expressions
5.7. simplification of linear expressions such as
$-2(3x - 5) + 4x$;
$\frac{2x}{3} - \frac{3(x-5)}{2}$
5.8. use brackets and extract common factors

N6. Functions and graphs

6.1. Cartesian coordinates in two dimensions
6.2. graph of a set of ordered pairs as a representation of a relationship between two variables
6.3. linear functions $y = ax + b$
6.4. graphs of linear functions
6.5. the gradient of a linear graph as the ratio of the vertical change to the horizontal change (positive and negative gradients)

N7. Equations and inequalities

7.1. concept of equation
7.2. solving linear equations in one variable
7.3. solving simple fractional equations that can be reduced to linear equations such as

$\frac{x}{3} + \frac{x-2}{4} = 3$;

$\frac{3}{x-2} = 6$

7.4. formulating a linear equation in one variable to solve problems

GEOMETRY AND MEASUREMENT

G1. Angles, triangles and polygons

1.1. right, acute, obtuse and reflex angles
1.2. vertically opposite angles, angles on a straight line, angles at a point
1.3. angles formed by two parallel lines and a transversal: corresponding angles, alternate angles, interior angles
1.4. properties of triangles, special quadrilaterals and regular polygons (pentagon, hexagon, octagon and decagon), including symmetry properties
1.5. classifying special quadrilaterals on the basis of their properties
1.6. angle sum of interior and exterior angles of any convex polygon
1.7. construction of simple geometrical figures from given data using compasses, ruler, set squares and protractors, where appropriate

G5. Mensuration

5.1. area of parallelogram and trapezium
5.2. problems involving perimeter and area of composite plane figures
5.3. volume and surface area of prism and cylinder
5.4. conversion between cm^2 and m^2, and between cm^3 and m^3
5.5. problems involving volume and surface area of composite solids

STATISTICS AND PROBABILITY

S1. Data handling and analysis

1.1. simple concepts in collecting, classifying and tabulating data
1.2. analysis and interpretation of:
- tables
- bar graphs
- pictograms
- line graphs
- pie charts

1.3. purposes and uses, advantages and disadvantages of the different forms of statistical representations
1.4. explaining why a given statistical diagram leads to misinterpretation of data

Secondary Two

NUMBER AND ALGEBRA

N2. Ratio and proportion

2.4. map scales (distance and area)
2.5. direct and inverse proportion

N5. Algebraic expressions and formulae

5.9. expansion of the product of algebraic expressions
5.10. changing the subject of a formula
5.11. finding the value of an unknown quantity in a given formula
5.12. use of:
- $(a+b)^2 = a^2 + 2ab + b^2$
- $(a-b)^2 = a^2 - 2ab + b^2$
- $a^2 - b^2 = (a+b)(a-b)$

5.13. factorisation of linear expressions of the form $ax + bx + kay + kby$
5.14. factorisation of quadratic expressions $ax^2 + bx + c$
5.15. multiplication and division of simple algebraic fractions such as

$\left(\frac{3a}{4b^2}\right)\left(\frac{5ab}{3}\right)$

$\frac{3a}{4} \div \frac{9a^2}{10}$

5.16. addition and subtraction of algebraic fractions with linear or quadratic denominator such as

$\frac{1}{x-2} + \frac{2}{x-3}$

$\frac{1}{x^2-9} + \frac{2}{x-3}$

$\frac{1}{x-3} + \frac{2}{(x-3)^2}$

N6. Functions and graphs

6.6. quadratic functions $y = ax^2 + bx + c$
6.7. graphs of quadratic functions and their properties:
- positive or negative coefficient of x^2
- maximum and minimum points
- symmetry

N7. Equations and inequalities

7.5. concept of equation and inequality
7.6. solving simple inequalities in the form $ax + b \le c$ and $ax + b < c$ and representing the solutions on the number line
7.7. graphs of linear equations in two variables ($ax + by = c$)
7.8. solving simultaneous linear equations in two variables by:
- substitution and elimination methods
- graphical method

7.9. solving quadratic equations in one variable by factorisation
7.10. formulating a pair of linear equations in two variables to solve problems

GEOMETRY AND MEASUREMENT

G2. Congruence and similarity

2.1. congruent figures 2.2. similar figures 2.3. properties of similar triangles and polygons: • corresponding angles are equal • corresponding sides are proportional 2.4. enlargement and reduction of a plane figure 2.5. solving simple problems involving congruence and similarity
G4. Pythagoras' theorem and trigonometry
4.1. use of Pythagoras' theorem 4.2. determining whether a triangle is right-angled given the lengths of three sides 4.3. use of trigonometric ratios (sine, cosine and tangent) of acute angles to calculate unknown sides and angles in right-angled triangles
G5. Mensuration
5.6. volume and surface area of pyramid, cone and sphere
STATISTICS AND PROBABILITY
S1. Data handling and analysis
1.5. analysis and interpretation of: • dot diagrams • histograms • stem-and-leaf diagrams 1.6. purposes and uses, advantages and disadvantages of the different forms of statistical representations 1.7. explaining why a given statistical diagram leads to misinterpretation of data 1.8. mean, mode and median as measures of central tendency for a set of data 1.9. purposes and use of mean, mode and median 1.10. calculation of the mean for grouped data
S2. Probability
2.1. probability as a measure of chance 2.2. probability of single events (including listing all the possible outcomes in a simple chance situation to calculate the probability)

Secondary Three/Four

NUMBER AND ALGEBRA

N1. Numbers and their operations

1.8. use of standard form $A \times 10^n$, where n is an integer, and $1 \leq A < 10$
1.9. positive, negative, zero and fractional indices
1.10. laws of indices

N6. Functions and graphs

6.8. sketching the graphs of quadratic functions given in the form:
- $y = (x - p)^2 + q$
- $y = -(x - p)^2 + q$
- $y = (x - a)(x - b)$
- $y = -(x - a)(x - b)$

6.9. graphs of power functions $y = ax^n$, where *n* = –2, –1, 0, 1, 2, 3, and simple sums of not more than three of these
6.10. graphs of exponential functions $y = ka^x$, where a is a positive integer, $a > 1$
6.11. estimation of the gradient of a curve by drawing a tangent

N7. Equations and inequalities

7.11. solving quadratic equations in one variable by:
- use of formula
- completing the square for $y = x^2 + px + q$
- graphical method

7.12. solving fractional equations that can be reduced to quadratic equations such as
$\frac{6}{x+4} = x + 3$; $\frac{1}{x-2} + \frac{2}{x-3} = 5$
7.13. solving linear inequalities in one variable (including simultaneous inequalities) and representing the solution on the number line
7.14. formulating a quadratic equation in one variable to solve problems

N8. Set language and notation

8.1. use of set language and the following notation:

Union of *A* and *B*	$A \cup B$
Intersection of *A* and *B*	$A \cap B$
Number of elements in set *A*	$n(A)$
"… is an element of …"	$\in$
"… is not an element of …"	$\notin$
Complement of set *A*	A'
The empty set	$\emptyset$
Universal set	ξ
A is a subset of *B*	$A \subseteq B$
A is a not a subset of *B*	$A \nsubseteq B$
A is a (proper) subset of *B*	$A \subset B$
A is a not a (proper) subset of *B*	$A \not\subset B$

8.2. union and intersection of two sets
8.3. Venn diagrams

N9. Matrices

9.1. display of information in the form of a matrix of any order
9.2. interpreting the data in a given matrix
9.3. product of a scalar quantity and a matrix
9.4. problems involving addition, subtraction and multiplication of matrices

GEOMETRY AND MEASUREMENT

G2. Congruence and similarity

2.6. scale drawings
2.7. properties and construction of perpendicular bisectors of line segments and angle bisectors
2.8. determining whether two triangles are:
- congruent
- similar

2.9. ratio of areas of similar plane figures
2.10. ratio of volumes of similar solids

G3. Properties of circles

3.1. 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
- the line joining an external point to the centre of the circle bisects the angle between the tangents

3.2. angle properties of circles:
- angle in a semicircle is a right angle
- angle between tangent and radius of a circle is a right angle
- angle at the centre is twice the angle at the circumference
- angles in the same segment are equal
- angles in opposite segments are supplementary

G4. Pythagoras' theorem and trigonometry

4.4. extending sine and cosine to obtuse angles
4.5. use of the formula $\frac{1}{2}ab\sin C$ for the area of a triangle
4.6. use of sine rule and cosine rule for any triangle
4.7. problems in two and three dimensions including those involving angles of elevation and depression and bearings

G5. Mensuration

5.7. arc length, sector area and area of a segment of a circle
5.8. use of radian measure of angle (including conversion between radians and degrees)

G6. Coordinate geometry

6.1. finding the gradient of a straight line given the coordinates of two points on it
6.2. finding the length of a line segment given the coordinates of its end points
6.3. interpreting and finding the equation of a straight line graph in the form $y = mx + c$
6.4. geometric problems involving the use of coordinates

G7. Vectors in two dimensions

7.1. use of notations: $\begin{pmatrix} x \\ y \end{pmatrix}$, $\overrightarrow{AB}$, $\boldsymbol{a}$, $|\overrightarrow{AB}|$, and $|\boldsymbol{a}|$
7.2. representing a vector as a directed line segment
7.3. translation by a vector
7.4. position vectors
7.5. magnitude of a vector $\begin{pmatrix} x \\ y \end{pmatrix}$ as $\sqrt{x^2 + y^2}$
7.6. use of sum and difference of two vectors to express given vectors in terms of two coplanar vectors
7.7. multiplication of a vector by a scalar

7.8. geometric problems involving the use of vectors
STATISTICS AND PROBABILITY
S1. Data handling and analysis
1.11. quartiles and percentiles 1.12. range, interquartile range and standard deviation as measures of spread for a set of data 1.13. analysis and interpretation of: • cumulative frequency diagrams • box-and-whisker plots 1.14. purposes and uses, advantages and disadvantages of the different forms of statistical representations 1.15. calculation of the standard deviation for a set of data (grouped and ungrouped) 1.16. using the mean and standard deviation to compare two sets of data
S2. Probability
2.3. probability of simple combined events (including using possibility diagrams and tree diagrams, where appropriate) 2.4. addition and multiplication of probabilities (mutually exclusive events and independent events)