



Topic 1: Number and algebra

1.2 n th term of an arithmetic sequence

$$u_n = u_1 + (n - 1)d$$

Sum of n terms of an arithmetic sequence

$$S_n = \frac{n}{2}(2u_1 + (n - 1)d) = \frac{n}{2}(u_1 + u_n)$$

1.3 n th term of a geometric sequence

$$u_n = u_1 r^{n-1}$$

Sum of n terms of a finite geometric sequence

$$S_n = \frac{u_1(r^n - 1)}{r - 1} = \frac{u_1(1 - r^n)}{1 - r}, \quad r \neq 1$$

1.4 Compound interest

$$FV = PV \times \left(1 + \frac{r}{100k}\right)^{kn}$$

1.5 Exponents and logarithms ($a, b > 0$, $a \neq 1$)

$$a^x = b \iff x = \log_a b$$

1.6 Percentage error

$$\varepsilon = \left| \frac{v_A - v_E}{v_E} \right| \times 100\%$$

Topic 2: Functions

2.1 Equations of a straight line

$$y = mx + c$$

$$ax + by + d = 0$$

$$y - y_1 = m(x - x_1)$$

Gradient formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

2.5 Axis of symmetry of a quadratic

$$f(x) = ax^2 + bx + c \Rightarrow x = -\frac{b}{2a}$$

Topic 3: Geometry and trigonometry – prior learning

Area of a parallelogram

$$A = bh \quad (b \text{ base, } h \text{ height})$$

Area of a triangle

$$A = \frac{1}{2}bh$$

Area of a trapezoid

$$A = \frac{1}{2}(a + b)h \quad (a, b \text{ parallel sides})$$

Area of a circle

$$A = \pi r^2$$

Circumference of a circle

$$C = 2\pi r$$

Volume of a cuboid

$$V = lwh$$

Volume of a cylinder

$$V = \pi r^2 h$$

Volume of a prism

$$V = Ah \quad (A \text{ cross-section})$$

Curved surface area of a cylinder

$$A = 2\pi rh$$

Distance between (x_1, y_1) and (x_2, y_2)

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

Midpoint of (x_1, y_1) and (x_2, y_2)

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Topic 3: Geometry and trigonometry

3.1 Distance between (x_1, y_1, z_1) and (x_2, y_2, z_2)

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$$

Midpoint of (x_1, y_1, z_1) and (x_2, y_2, z_2)

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}, \frac{z_1 + z_2}{2} \right)$$

Volume of a right pyramid

$$V = \frac{1}{3}Ah \quad (A \text{ base area})$$

Volume of a right cone

$$V = \frac{1}{3}\pi r^2 h$$

Curved surface area of a cone

$$A = \pi rl \quad (l \text{ slant height})$$

Volume of a sphere

$$V = \frac{4}{3}\pi r^3$$

Surface area of a sphere

$$A = 4\pi r^2$$

3.2 Sine rule

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Cosine rule

$$c^2 = a^2 + b^2 - 2ab \cos C$$

$$\cos C = \frac{a^2 + b^2 - c^2}{2ab}$$

Area of a triangle

$$A = \frac{1}{2}ab \sin C$$

3.4 Length of an arc (θ in degrees)

$$l = \frac{\theta}{360} \times 2\pi r$$

Area of a sector (θ in degrees)

$$A = \frac{\theta}{360} \times \pi r^2$$

Topic 4: Statistics and probability

4.2 Interquartile range

$$\text{IQR} = Q_3 - Q_1$$

4.3 Mean of a data set

$$\bar{x} = \frac{\sum_{i=1}^k f_i x_i}{n}, \quad n = \sum_{i=1}^k f_i$$

4.5 Probability of an event A

$$P(A) = \frac{n(A)}{n(U)}$$

Complementary events

$$P(A) + P(A') = 1$$

4.6 Combined events

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

Mutually exclusive events

$$P(A \cup B) = P(A) + P(B)$$

Conditional probability

$$P(A | B) = \frac{P(A \cap B)}{P(B)}$$

Independent events

$$P(A \cap B) = P(A)P(B)$$

4.7 Expected value of a discrete random variable X

$$E(X) = \sum_{i=1}^k x_i P(X = x_i)$$

4.8 Binomial distribution

$$X \sim B(n, p)$$

Mean and variance

$$E(X) = np, \quad \text{Var}(X) = np(1 - p)$$

Topic 5: Calculus

5.3 Derivative of x^n

$$f(x) = x^n \Rightarrow f'(x) = nx^{n-1}$$

5.5 Integral of x^n

$$\int x^n dx = \frac{x^{n+1}}{n+1} + C, \quad n \neq -1$$

Area between $y = f(x)$ and the x -axis, $f(x) > 0$

$$A = \int_a^b y dx$$

5.8 The trapezoidal rule

$$\int_a^b y dx \approx \frac{1}{2}h((y_0 + y_n) + 2(y_1 + \dots + y_{n-1}))$$

$$h = \frac{b - a}{n}$$