Mathematics Applications Units 1 and 2 Formula Sheet

Measurement

Pythagoras' theorem
$$a^2 + b^2 = c^2$$

Circumference of circle, radius r
$$C = 2\pi r$$

Arc length of circle, central angle θ
$$l = \frac{\theta}{360} 2\pi r$$

Area of circle
$$A = \pi r^2$$

Area of sector
$$A = \frac{\theta}{360} \pi r^2$$

Area of triangle, base b and height h
$$A = \frac{1}{2} bh$$

Area of parallelogram
$$A = bh$$

Area of trapezium, parallel sides a and b
$$A = \frac{1}{2}(a + b)h$$

Volume of prism, base area A
$$V = Ah$$

Volume of pyramid
$$V = \frac{1}{3} Ah$$

Surface area of cylinder
$$S = 2\pi rh + 2\pi r^2$$

Volume of cylinder
$$V = \pi r^2 h$$

Surface area of cone, slant height s
$$S = \pi r^2 + \pi rs$$

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

Surface area of sphere
$$S = 4\pi r^2$$

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

Trigonometry

In a right triangle:

$$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan \theta = \frac{\text{opposite}}{\text{adjacent}}$$

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

Cosine rule

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

Area

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

$$A = \sqrt{s(s - a)(s - b)(s - c)} \text{ where } s = \frac{a+b+c}{2}$$

Linear equations

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

Equation
$$y = mx + c$$

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Consumer arithmetic

P is the principal, A is the final balance, I is the interest, r is the annual rate of interest as a decimal, n is the number of compounding periods and t is the time in years.

Simple interest
$$I = Prt$$

Compound interest
$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

Price-to-earnings ratio
$$PE = \frac{\text{Market value per share}}{\text{Earnings per share}}$$

Univariate data analysis

Standard score, for normally distributed data set with mean $\bar{x}$ and standard deviation s_x
$$z = \frac{x - \bar{x}}{s_x}$$

In a normal distribution, approximately 68% of values lie within one, 95% of values lie within two and 99.7% of values lie within three, standard deviations of the mean.

In a data set with lower quartile Q_1, upper quartile Q_3 and interquartile range IQR, possible outliers lie below $Q_1 - 1.5IQR$ or above $Q_3 + 1.5IQR$.