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

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

Heron's Rule:

$A = \sqrt{s(s-a)(s-b)(s-c)}$ 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 $Q_3 + 1.5IQR$.