



MATHEMATICS

UNITS 3A AND 3B

FORMULA SHEET

2013

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Numbers and algebra

Index laws: For $a, b > 0$ and m, n real,

$$a^m b^m = (a b)^m$$

$$a^m a^n = a^{m+n}$$

$$(a^m)^n = a^{mn}$$

$$\frac{1}{a^m} = a^{-m}$$

$$\frac{a^m}{a^n} = a^{m-n}$$

$$a^0 = 1$$

For $a > 0$ and m an integer and n a positive integer,

$$a^{\frac{m}{n}} = \sqrt[n]{a^m} = (\sqrt[n]{a})^m$$

Simple interest: $I = Prt$, where P is the principal, r is the rate per year and t is the time in years

Compound interest: $A = P(1 + r)^t$ compounded annually

$$A = P\left(1 + \frac{r}{n}\right)^{nt} \text{ compounded } n \text{ times a year}$$

Differentiation: If $f(x) = y$ then $f'(x) = \frac{dy}{dx}$

Powers: If $f(x) = x^n$ then $f'(x) = nx^{n-1}$ or If $y = x^n$ then $\frac{dy}{dx} = nx^{n-1}$

Product rule: If $y = f(x) g(x)$ or If $y = uv$
then $y' = f'(x) g(x) + f(x) g'(x)$ or then $\frac{dy}{dx} = \frac{du}{dx} v + u \frac{dv}{dx}$

Space and measurement

In any triangle ABC :

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

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

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

$$A = \frac{1}{2} ab \sin C, \text{ where } A \text{ is the area}$$

Circle: $C = 2\pi r = \pi D$, where C is the circumference, r is the radius and D is the diameter

$$A = \pi r^2$$

Triangle: $A = \frac{1}{2}bh$, where b is the base and h is the perpendicular height

Parallelogram: $A = bh$

Trapezium: $A = \frac{1}{2}(a + b)h$, where a and b are the lengths of the parallel sides

Prism: $V = Ah$, where V is the volume and A is the area of the base

Pyramid: $V = \frac{1}{3}Ah$

Cylinder: $S = 2\pi rh + 2\pi r^2$, where S is the total surface area
 $V = \pi r^2 h$

Cone: $S = \pi rs + \pi r^2$, where s is the slant height
 $V = \frac{1}{3}\pi r^2 h$

Sphere: $S = 4\pi r^2$
 $V = \frac{4}{3}\pi r^3$

Chance and data

Probability: For any event A and its complement \bar{A}
 $P(A) + P(\bar{A}) = 1$

In a normal distribution approximately:

68% of values lie within one standard deviation of the mean

95% of values lie within two standard deviations of the mean

99.7% of values lie within three standard deviations of the mean.

Note: Any additional formulas identified by the examination panel as necessary will be included in the body of the particular question.

