

# 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,

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

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

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

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

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

$$a^0 = 1$$

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

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

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

$A = P\left(1 + \frac{r}{n}\right)^{nt}$  compounded  $n$  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  $y' = f'(x) g(x) + f(x) g'(x)$

then  $\frac{dy}{dx} = \frac{du}{dx} v + u \frac{dv}{dx}$

See next page

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:

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

Parallelogram:

$$A = bh$$

Trapezium:

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

Prism:

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

Pyramid:

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

Cylinder:

$$S = 2\pi rh + 2\pi r^2, \text{ where } S \text{ is the total surface area}$$

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

Cone:

$$S = \pi rs + \pi r^2, \text{ where } s \text{ is the slant height}$$

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

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.