

**MATHEMATICS**

**UNITS 3A AND 3B**

**FORMULA SHEET**

**2015**

Numbers and algebra

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

**Space and measurement**

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In any triangle  $ABC$ :

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

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

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

$$\text{Area} = \frac{1}{2} ab \sin C$$

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**

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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.*