Mathematics: Units 3A and 3B
Formula Sheet

Number and algebra

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

$a^m b^m = (ab)^m$ $\quad a^m a^n = a^{m+n}$ $\quad (a^m)^n = a^{mn}$

$a^{-m} = \frac{1}{a^m}$ $\quad \frac{a^m}{a^n} = a^{m-n}$ $\quad a^0 = 1$

$a^{\frac{m}{n}} = \sqrt[n]{a^m} = \left(\sqrt[n]{a}\right)^m$ for m an integer and n a positive integer

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

$A = P(1 + \frac{r}{n})^{nt}$ 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 $\frac{dy}{dx} = \frac{du}{dx}v + u\frac{dv}{dx}$

Integration : $\int x^n\, dx = \frac{x^{n+1}}{n+1} + c, \quad n \neq -1$

Antiderivative: Given $\frac{dy}{dx} = x^n$ then $y = \frac{x^{n+1}}{n+1} + c, \quad n \neq -1$

Space and measurement

In any triangle ABC :

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

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

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

Space and measurement

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

$A = \pi r^2$, where A is the area

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

Parallelogram: $A = b h$

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

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

Pyramid: $V = \frac{1}{3} \mathrm{A} h$

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

$V = \pi r^2 h$

Cone: $S = \pi r s + \pi r^2$ 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

$$P(A) + P(\bar{A}) = 1$$

In a normal distribution approximately:
68% of values lie within one (1) standard deviation of the mean
95% of values lie within two (2) standard deviations of the mean
99.7% of values lie within three (3) 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.