

# Formulae – Higher Tier

## Percentages

Compound interest / Growth + decay:

$$= \left(1 \pm \frac{\%}{100}\right)^n \times \text{original}$$

Original amount =  $\frac{\text{New amount}}{\left(1 \pm \frac{\%}{100}\right)}$

What % increase or decrease? =  $\frac{\text{diff}}{\text{original}} \times 100$

What % did you score? =  $\frac{\text{Your score}}{\text{Total available}} \times 100$

## Angles in Polygons

$$180(n-2) = \text{sum of interior angle}$$

interior + exterior =  $180^\circ$

$$\frac{360^\circ}{n} = \text{exterior angle}$$

$$\frac{360^\circ}{\text{ext.}}$$

## Pythagoras and Trigonometry

Pythagoras (Hypotenuse)  $\sqrt{a^2+b^2} = c$

Pythagoras (non-hypotenuse)  $\sqrt{c^2-b^2} = a$

S O H C A H T O A

$$\sin \theta = \frac{O}{H} \quad \theta = \sin^{-1}\left(\frac{O}{H}\right)$$

$$\cos \theta = \frac{A}{H} \quad \theta = \cos^{-1}\left(\frac{A}{H}\right)$$

$$\tan \theta = \frac{O}{A} \quad \theta = \tan^{-1}\left(\frac{O}{A}\right)$$

Cosine rule missing side  $a^2 = b^2 + c^2 - 2bc \cos A$

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

Sine rule missing side  $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Sine rule missing angle  $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$

Area of a triangle =  $\frac{1}{2} ab \sin C$

## Statistics

$$\frac{360^\circ}{\sum \text{frequency}} = \text{The angle for 1 person/item}$$

Median

odd  $\frac{n+1}{2}$       even  $\frac{n}{2}, \frac{n}{2} + 1$

Histogram: Frequency density =  $\frac{\text{Freq.}}{\text{Class Width}}$

I.Q.R. = U.Q. - L.Q.

## Indices

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

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

$$(a^m)^n = a^{m \times n}$$

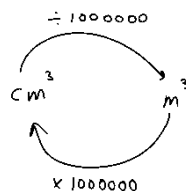
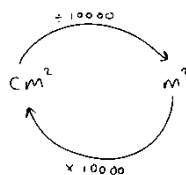
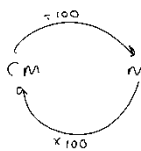
$$a^0 = 1$$

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

$$a^{\frac{1}{n}} = \sqrt[n]{a}$$

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

## Unit Conversion

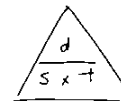


## Compound Measures

pressure =  $\frac{\text{Force}}{\text{Area}}$



Av. speed =  $\frac{\text{distance}}{\text{time}}$



Density =  $\frac{\text{Mass}}{\text{Volume}}$



## Area and Volume

Area of a triangle =  $\frac{b \times h}{2}$

Area of a parallelogram =  $b \times h$

Area of square/rectangle =  $b \times h$

Area of trapezium =  $\frac{a+b}{2} \times h$

Area of a circle =  $\pi r^2$

Circle circumference =  $\pi d$  or  $2\pi r$

Surface area of a cylinder =  $2\pi r^2 + \pi dh$

Surface area of a sphere =  $4\pi r^2$

Surface area of a cone =  $\pi r^2 + \pi rL$

Surface area of a frustum =  $\pi R^2 + \pi r^2 + \pi(R+r)L$

Volume of a cube/cuboid =  $b \times h \times L$

Volume of a cone =  $\frac{\pi r^2 h}{3}$

Volume of a triangular prism =  $\frac{b \times h}{2} \times L$

Volume of a cylinder =  $\pi r^2 h$

Volume of a pyramid =  $\frac{\text{base area} \times \text{height}}{3}$

Volume of a sphere =  $\frac{4\pi r^3}{3}$

Arc length =  $\frac{\theta}{360} \times \pi d$

Sector area =  $\frac{\theta}{360} \times \pi r^2$

Area of segment = Area of a sector - area of a triangle

Enlarged perimeter =  $\frac{\text{original}}{\text{perimeter}} \times \text{S.F.}$

Enlarged area =  $\frac{\text{original}}{\text{area}} \times \text{S.F.}^2$

Enlarged volume =  $\frac{\text{original}}{\text{vol.}} \times \text{S.F.}^3$

## Equations and Graphs

Linear graph:  $y = mx + c$

Grad. =  $\frac{\text{diff. in } y}{\text{diff. in } x}$

Midpoint =  $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

Circle equation:  $x^2 + y^2 = r^2$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

## Sequences

Geometric Sequence  $n^{\text{th}}$  term

$U_n = ar^{n-1}$        $a$ : first term  
 $r$ : common ratio