

# GCSE Maths Formulae



Higher Tier

H

# Area, Volume and Circles

Name of Formula	
Area of a Rectangle	length $\times$ width
Area of a Triangle	$\frac{1}{2} \times$ base $\times$ height
Area of a Parallelogram	base $\times$ height
Area of a Trapezium	$\frac{1}{2} \times (a + b) \times$ height
Area of a Circle	$\pi \times$ (radius) <sup>2</sup> or $\pi r^2$
Circumference of a Circle	$\pi \times$ diameter or $\pi d$
Volume of a Cuboid	length $\times$ width $\times$ height
Volume of a Prism	area of cross section $\times$ length
Volume of a Cylinder	$\pi \times$ (radius) <sup>2</sup> $\times$ height or $\pi r^2 h$
Volume of a Sphere	$\frac{3}{4} \pi r^3$
Volume of a Cone	$\frac{1}{3} \pi r^2 h$
Volume of a Rectangular Based Pyramid	$\frac{1}{3} lwh$
Surface Area of a Sphere	$4\pi r^2$
Curved Surface Area of a Cone	$\pi r l$

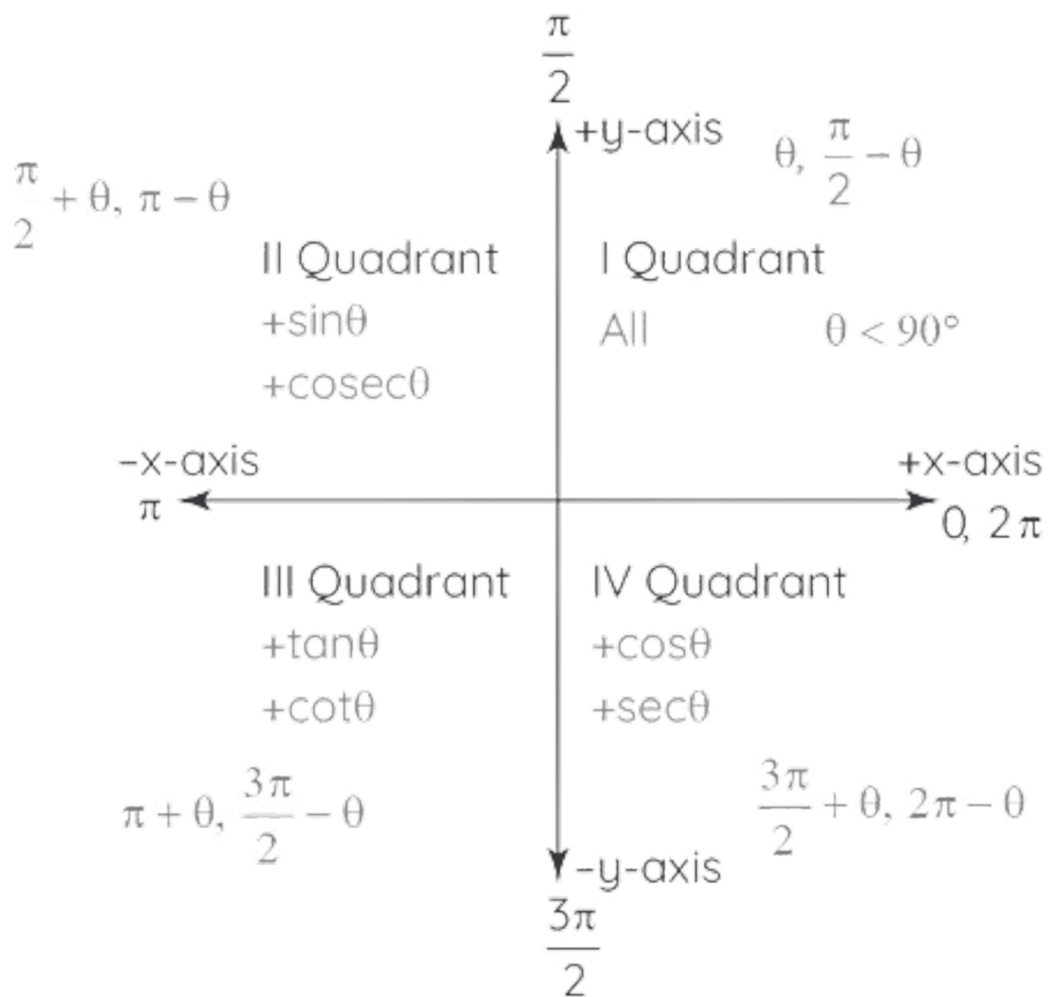
# Trigonometric Functions

Name of Formula	
$\sin \theta$	Perpendicular/ Hypotenuse
$\cos \theta$	Base / Hypotenuse
$\tan \theta$	Perpendicular/ Base
$\sec \theta$	Hypotenuse / Base
$\operatorname{cosec} \theta$	Hypotenuse/Perpendicular
$\cot \theta$	Base/Perpendicular

# Trigonometric Functions Values

$\theta$	$0^\circ$	$30^\circ$	$45^\circ$	$60^\circ$	$90^\circ$	$180^\circ$	$270^\circ$	$360^\circ$
$\sin \theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1	0	-1	0
$\cos \theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0	-1	0	1
$\tan \theta$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	Not Defined	0	Not Defined	0
$\operatorname{cosec} \theta$	Not Defined	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1	Not Defined	-1	Not Defined
$\sec \theta$	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	Not Defined	-1	Not Defined	1
$\cot \theta$	Not Defined	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0	Not Defined	0	Not Defined

# Trigonometric Functions in Four Quadrants



$$\sin(90^\circ - \theta) = \cos \theta$$

$$\cot(90^\circ - \theta) = \tan \theta$$

$$\cos(90^\circ - \theta) = \sin \theta$$

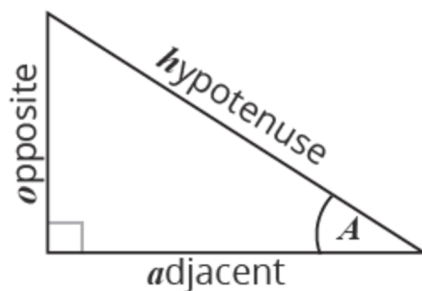
$$\sec(90^\circ - \theta) = \operatorname{cosec} \theta$$

$$\tan(90^\circ - \theta) = \cot \theta$$

$$\operatorname{cosec}(90^\circ - \theta) = \sec \theta$$

# Trigonometric Functions and Pythagoras' Theorem

## Trigonometry Formulae



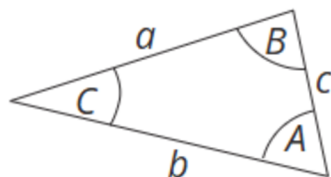
$$\sin A = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos A = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan A = \frac{\text{opposite}}{\text{adjacent}}$$

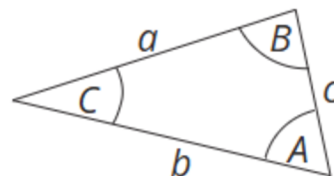
$$\sin A = \frac{o}{h}, \cos A = \frac{a}{h}, \tan A = \frac{o}{a}$$

## Sine Rule



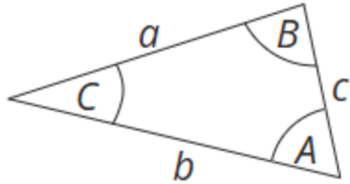
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

## Cosine Rule



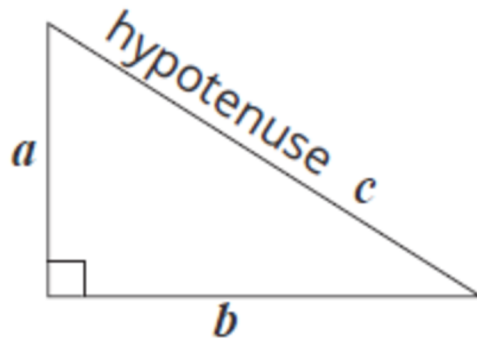
$$a^2 = b^2 + c^2 - 2bc \cos A$$

## Area of ANY Triangle



$$\frac{1}{2}ab\sin C$$

## Pythagoras' Theorem



$$a^2 + b^2 = c^2$$

# Quadratic Formula

For:  $ax^2 + bx + c = 0$

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

# Probability

P(A) is Probability of outcome A

P(B) is Probability of outcome B

$$P(\mathbf{A \text{ or } B}) = P(\mathbf{A}) + P(\mathbf{B}) - P(\mathbf{A \text{ and } B})$$

$$P(\mathbf{A \text{ and } B}) = P(\mathbf{A \text{ given } B})P(\mathbf{B})$$

# Compound Interest

Principle amount

interest rate

number of times the interest is compounded

$$\text{Value of Investment} = P\left(1 + \frac{r}{100}\right)^n$$



# Compound Measures

Name of Formula	
Speed	$\text{distance} \div \text{time}$
Distance	$\text{speed} \times \text{time}$
Time	$\text{distance} \div \text{speed}$
Density	$\text{mass} \div \text{volume}$
Mass	$\text{density} \times \text{volume}$
Volume	$\text{mass} \div \text{density}$
Pressure	$\text{force} \div \text{area}$
Force	$\text{pressure} \times \text{area}$
Area	$\text{force} \div \text{pressure}$