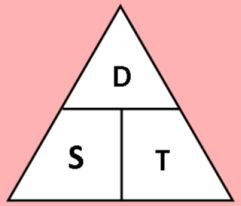
Year 11 – Higher Knowledge Organiser HT1

Speed Distance Time

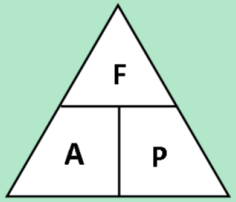


$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\text{Distance} = \text{Speed} \times \text{Time}$$

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

Force Area Pressure

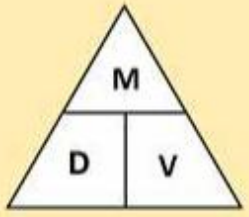


$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

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

$$\text{Force} = \text{Area} \times \text{Pressure}$$

Mass Density Volume

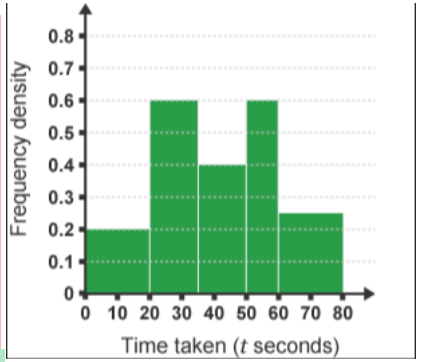


$$\text{Volume} = \frac{\text{Mass}}{\text{Density}}$$

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

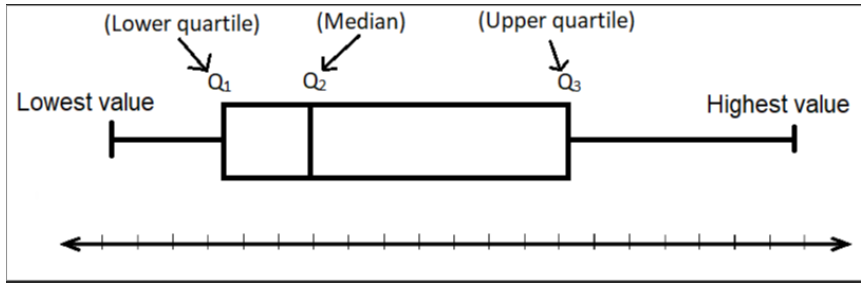
$$\text{Mass} = \text{Density} \times \text{Volume}$$

Histograms:



$$\text{frequency density} = \frac{\text{frequency}}{\text{class width}}$$

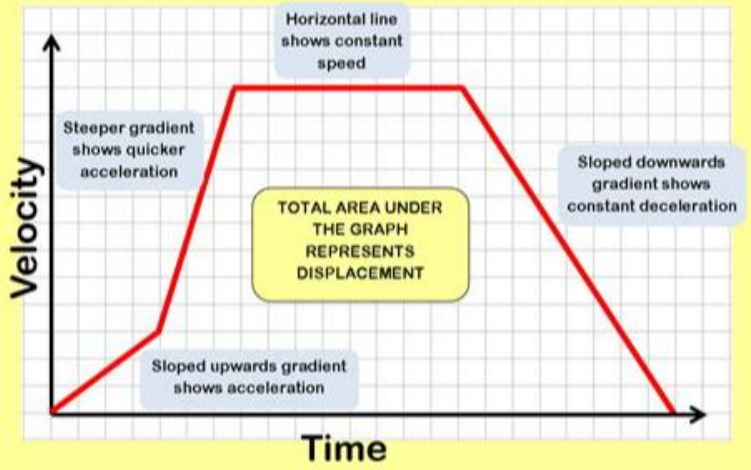
Boxplots:



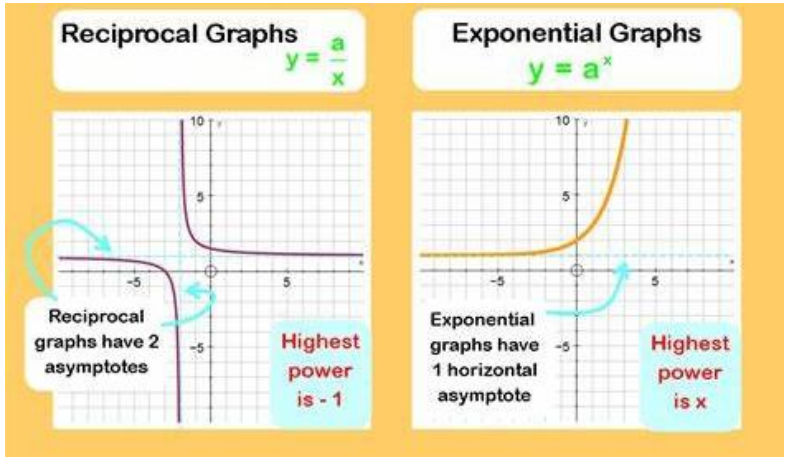
Lower quartile= 25% of the data
Upper quartile = 75% of the data
Interquartile range= upper quartile- lower quartile

Velocity Time Graphs

www.cazoommaths.com

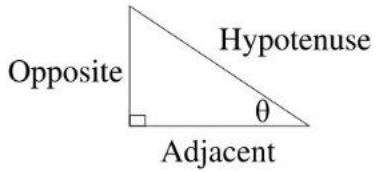


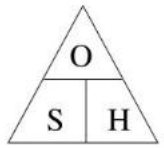
$f(x) \pm d$	**Shifts the graph up/down d units**
$f(x \pm d)$	Shifts the graph right/left d units
$-f(x)$	Reflects in the x axis
$f(-x)$	Reflects in the y axis



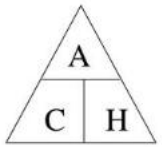
Year 11 – Higher Knowledge Organiser HT2

Trigonometry:

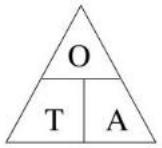




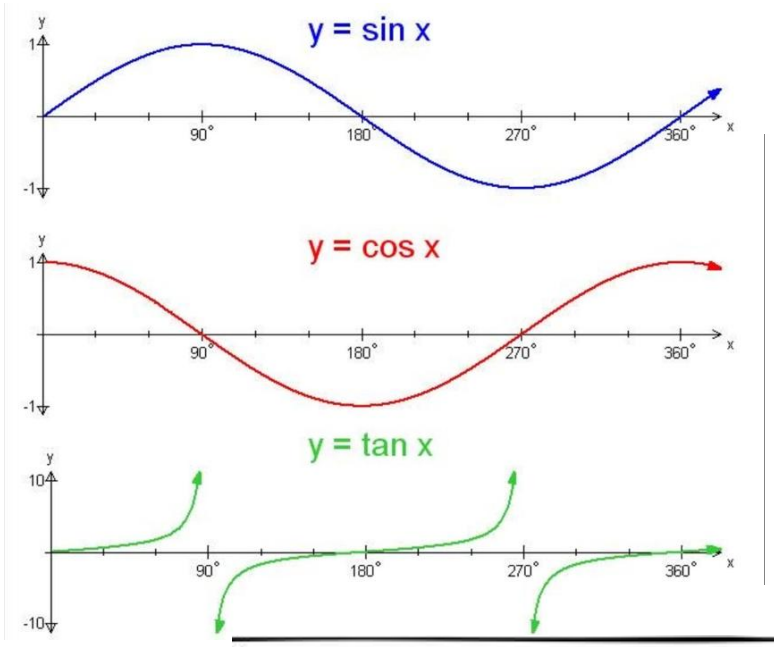
$$Sin\theta = \frac{Opp}{Hyp}$$



$$Cos\theta = \frac{Adj}{Hyp}$$



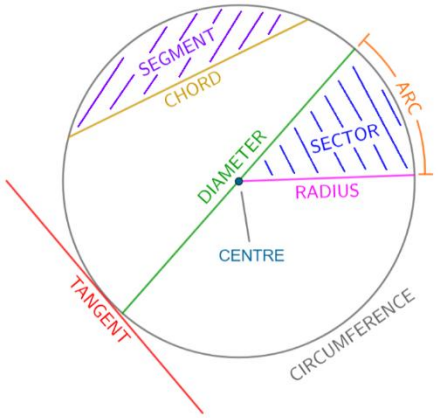
$$Tan\theta = \frac{Opp}{Adj}$$



Exact Trig:

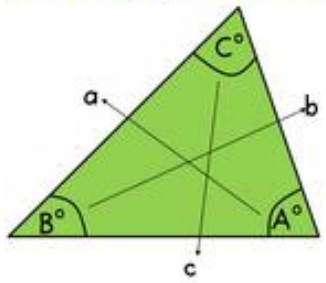
	0°	30°	45°	60°	90°
sin	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
cos	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
tan	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	Undefined

Circles:



Trigonometry – Non Right-Angled Triangles

Labelling your triangle



Cosine rule

Finding Sides

$a^2 = b^2 + c^2 - 2bc\,CosA$

To find sides you need:
2 sides and 1 angle

Finding Angles

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

To find angles you need:
3 sides

Sine rule

$\frac{a}{sinA} = \frac{b}{sinB} = \frac{c}{sinC}$

To find sides you need
1 side and 2 angle

$\frac{sinA}{a} = \frac{sinB}{b} = \frac{sinC}{c}$

To find angles you need
2 sides and 1 angle

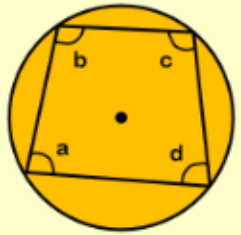
Area of a triangle

$\frac{1}{2} \times a \times b \times sinC°$

CIRCLE THEOREMS

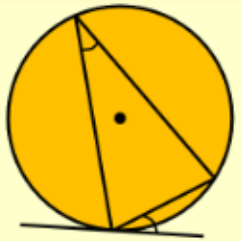
The angle at the centre of the circle is twice the angle at the circumference.

Angles in the same segment that are subtended from the same chord are equal.

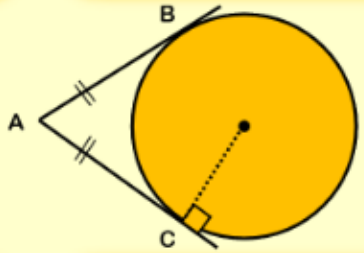


Opposite angles in a cyclic quadrilateral add up to 180°. a + b + c + d = 180°.

The angle in a semi-circle is always 90°.



The alternate segment theorem states that the angle between the tangent and triangle is equal.



The angle between the tangent and the radius is 90°. AB = AC.

Year 11 – Higher Knowledge Organiser Formula and Facts

You are given this in the exam

Higher Tier Formulae Sheet

Perimeter, Area and Volume

Where a and b are the lengths of the parallel sides and h is their perpendicular separation:

Area of a trapezium $= \frac{1}{2}(a+b)h$

Volume of a prism = area of cross section × length

Where r is the radius and d is the diameter:

Circumference of a circle $= 2\pi r = \pi d$

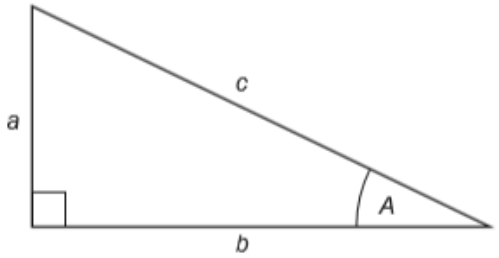
Area of a circle $= \pi r^2$

The Quadratic Formula

The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$

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

Pythagoras' Theorem and Trigonometry

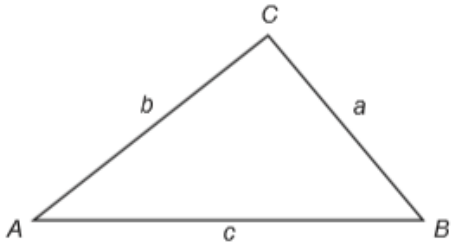


In any right-angled triangle where a, b and c are the length of the sides and c is the hypotenuse:

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

In any right-angled triangle ABC where a, b and c are the length of the sides and c is the hypotenuse:

$\sin A = \frac{a}{c}$ $\cos A = \frac{b}{c}$ $\tan A = \frac{a}{b}$



In any triangle ABC where a, b and c are the length of the sides:

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

Compound Interest

Where P is the principal amount, r is the interest rate over a given period and n is the number of times that the interest is compounded:

Total accrued $= P\left(1 + \frac{r}{100}\right)^n$

Probability

Where $P(A)$ is the probability of outcome A and $P(B)$ is the probability of outcome B:

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

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

You need to learn these

Laws of indices

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

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

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

$a^0 = 1$

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

$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$

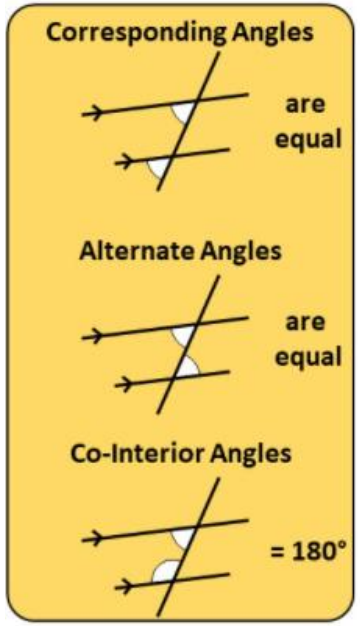
$a^{\frac{m}{n}} = \left(a^{\frac{1}{n}}\right)^m$

The power $\frac{1}{2}$ means square root

The power $\frac{1}{3}$ means cube root

The power $\frac{1}{4}$ means Fourth root etc.

Angle Facts



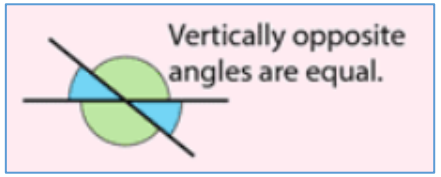
Polygons

e = exterior angle
i = interior angle
n = number of sides

$e = \frac{360}{n}$ $n = \frac{360}{e}$

i + e = 180

sum of interior = 180(n-2)

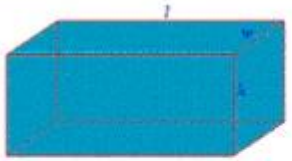


Sectors of Circles

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

$$\text{area of sector} = \frac{\theta}{360} \times \pi r^2$$

Rectangular Cuboid & Formulas



$Volume = Length * Width * Height$

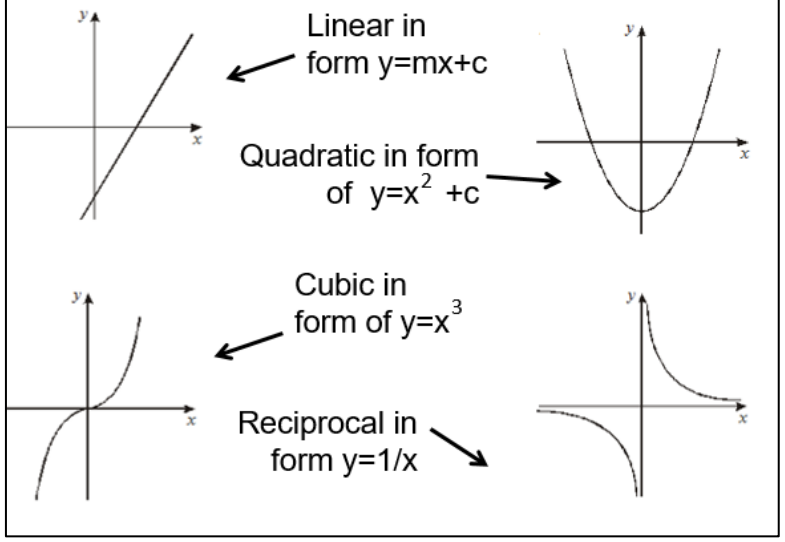
$Surface\ Area = 2(lw) + 2(hl) + 2(hw)$

$Diagonal = \sqrt{(l^2 + w^2 + h^2)}$

$Perimeter = 2l + 2w$

	0°	30°	45°	60°	90°
$\sin\theta$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
$\cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
$\tan\theta$	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	$\pm\infty$

Types of Graphs

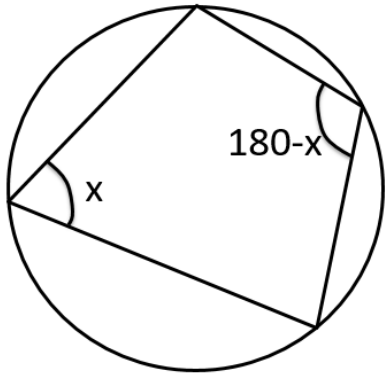


Proportionality

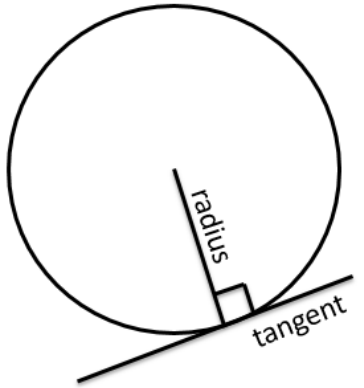
Recognise that if $y = kx$, where k is a constant, then y is proportional to x.

Recognise that if $y = \frac{k}{x}$, where k is a constant, then y is inversely proportional to x.

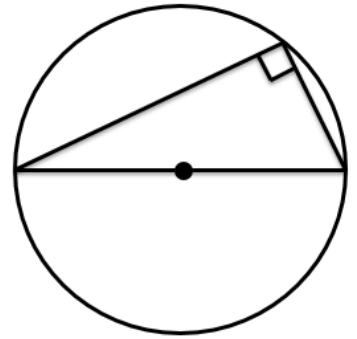
Circle Theorems



Opposite angles of **cyclic quadrilateral** add up to 180.

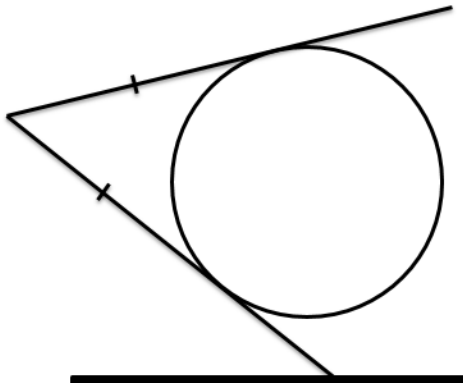


The radius and tangent meet at 90°

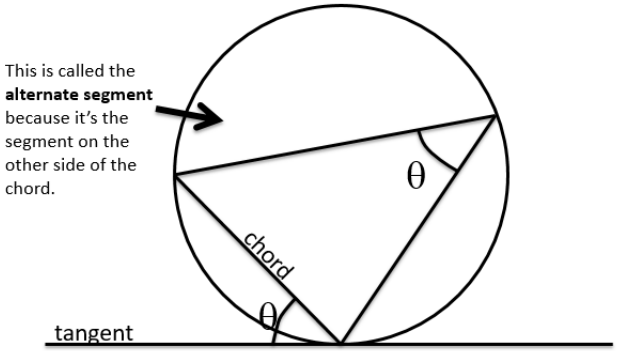


"Angle in semicircle is 90°."

Note that the hypotenuse of the triangle MUST be the diameter.



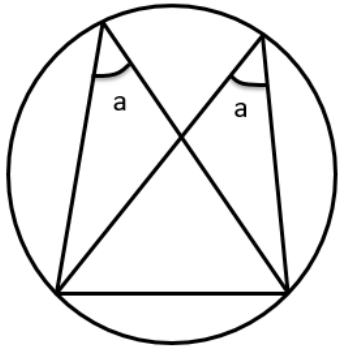
Tangents meeting at a point are equal in length



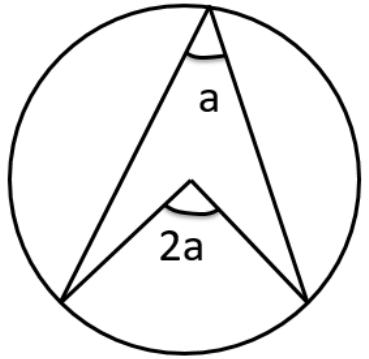
This is called the **alternate segment** because it's the segment on the other side of the chord.

The angle between the tangent and a chord...

...is equal to the angle in the **alternate segment**



"Angles in same segment are equal."



"Angle at centre is twice the angle at the circumference."