

## Formulae

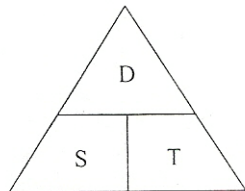
**Rectangle** area = length  $\times$  width perimeter =  $2 \times$  length +  $2 \times$  width = (distance around shape)

**Triangle** area =  $\frac{1}{2}$  base  $\times$  height perimeter = add up all the sides

**Parallelogram** area = base  $\times$  height

**Trapezium** area =  $\frac{\text{sum of parallel sides}}{2} \times$  height

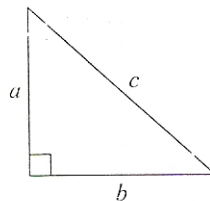
**Circle** area =  $\pi r^2$  circumference =  $2\pi r$  where  $r$  is the radius



**Distance** = speed  $\times$  time

**Speed** = distance  $\div$  time

**Time** = distance  $\div$  speed



$$c = \sqrt{a^2 + b^2}$$

$$a = \sqrt{c^2 - b^2}$$

$$b = \sqrt{c^2 - a^2}$$

**Gradient of a graph** =  $\frac{\text{change in } y}{\text{change in } x}$

**Mean** = total of values  $\div$  sum of values

**Mode** = most frequent number

**Median** = middle value when numbers in order of size

**% increase/decrease** =  $\frac{\text{actual change} \times 100}{\text{original}}$

**Total degrees in polygon** =  $(n - 2) \times 180^\circ$

**Interior angle** = Total degrees  $\div n$  where  $n$  = number of sides

**Number of sides** =  $\frac{360^\circ}{\text{exterior angle}}$

**Sin**  $\theta$  =  $\frac{\text{opposite}}{\text{hypotenuse}}$     **Cos**  $\theta$  =  $\frac{\text{adjacent}}{\text{hypotenuse}}$     **Tan**  $\theta$  =  $\frac{\text{opposite}}{\text{adjacent}}$

**Volume of any shape** = cross-sectional area  $\times$  length (or height)

**Sine rule:**  $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$     **Cosine rule:**  $a^2 = b^2 + c^2 - 2bc \cos A$

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

**Area of triangle** =  $\frac{1}{2}ab \sin C$     **Arc length** =  $\frac{\theta}{360} \times 2\pi r$     **Sector area** =  $\frac{\theta}{360} \times \pi r^2$

**Venn diagram formula:**  $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

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

**Equation of linear graph:**  $y = mx + c$  where  $m$  = gradient  $c$  = intercept of  $y$ -axis

**Matrices:**  $X = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$     **Determinant**  $|X| = ad - bc$     **Inverse**  $X^{-1} = \frac{1}{|X|} \begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$

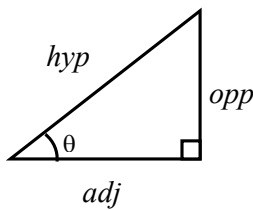
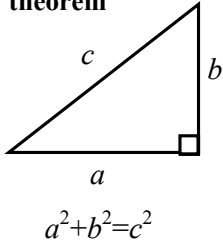
**Acceleration/deceleration** =  $\frac{\text{change in speed}}{\text{time taken}}$     **Distance travelled** = area under speed-time graph

**Simple interest,**  $I = \frac{PTR}{100}$  where  $P$  is the principal amount,  $T$  the time and  $R$  the rate.

**Compound interest,**  $A = P(1 + i)^n$

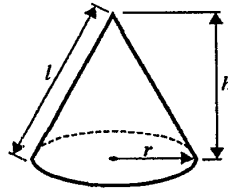
## Mensuration

**Pythagoras' theorem**



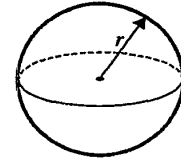
**Volume of cone** =  $\frac{1}{3}\pi r^2 h$

**Curved surface area of cone** =  $\pi r l$



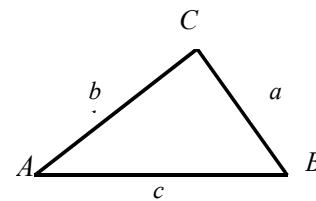
**Volume of sphere** =  $\frac{4}{3}\pi r^3$

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



$\sin \theta = \frac{\text{opp}}{\text{hyp}}$   
 $\cos \theta = \frac{\text{adj}}{\text{hyp}}$   
 $\tan \theta = \frac{\text{opp}}{\text{adj}}$

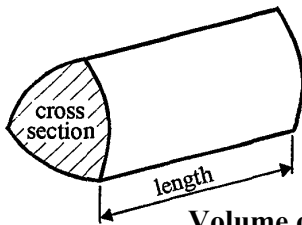
In any triangle ABC



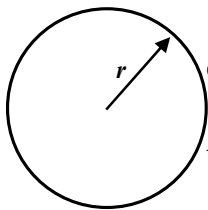
**Sine Rule**  $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

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



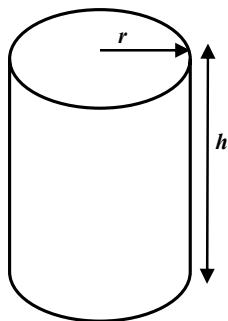
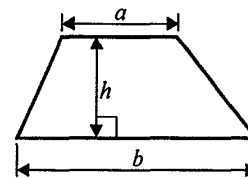
**Volume of prism** = area of cross section  $\times$  length



**Circumference of circle** =  $2\pi r$

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

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



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

**Curved surface area of cylinder** =  $2\pi r h$

**The quadratic equation**

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

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

**Mean:**  $\bar{x} = \frac{\sum x}{n}$  for ungrouped data and  $\bar{x} = \frac{\sum fx}{\sum f}$  for grouped data

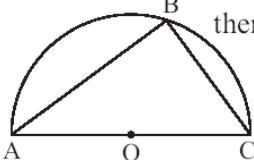
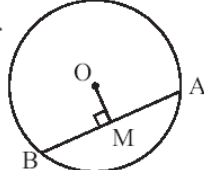
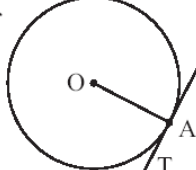
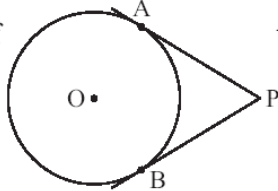
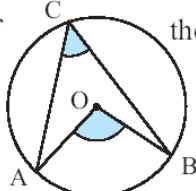
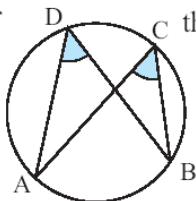
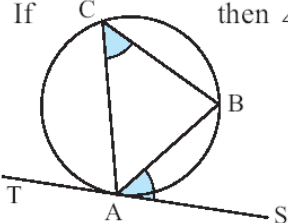
where,  $x$  is the midpoint in case of grouped data and is calculated by taking an average of the lower and upper limits of the class interval.

**Median:** is the middle most value where as **Mode:** is the value which occurs most often in a data set.

**Frequency density (fd):**  $fd = \frac{\text{Frequency}}{\text{Width}(w)}$

where,  $w$  is the difference between the upper and lower limits of the class interval.

## Circle Theorem

Name of theorem	Statement	Diagram
<b>Angle in a semi-circle</b>	The angle in a semi-circle is a right angle.	If  then $\angle ABC = 90^\circ$ .
<b>Chords of a circle</b>	The perpendicular from the centre of a circle to a chord bisects the chord.	If  then $AM = BM$ .
<b>Radius-tangent</b>	The tangent to a circle is perpendicular to the radius at the point of contact.	If  then $\angle OAT = 90^\circ$ .
<b>Tangents from an external point</b>	Tangents from an external point are equal in length.	If  then $AP = BP$ .
<b>Angle at the centre</b>	The angle at the centre of a circle is twice the angle on the circle subtended by the same arc.	If  then $\angle AOB = 2\angle ACB$ .
<b>Angles subtended by the same arc</b>	Angles subtended by an arc on the circle are equal in size.	If  then $\angle ADB = \angle ACB$ .
<b>Angle between a tangent and a chord</b>	The angle between a tangent and a chord at the point of contact is equal to the angle subtended by the chord in the alternate segment.	If  then $\angle BAS = \angle BCA$ .