

Formulae

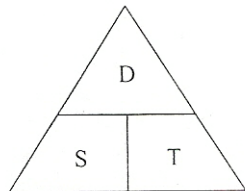
Rectangle area = length \times width perimeter = $2 \times$ length + $2 \times$ width = (distance around shape)

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

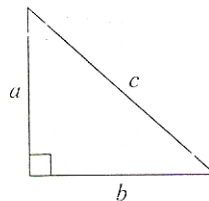
Circle area = πr^2 circumference = $2\pi r$ where r is the radius



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

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** $X^{-1} = \frac{1}{|X|} \begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$

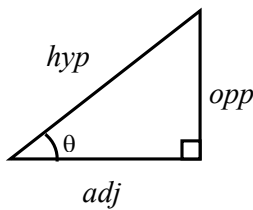
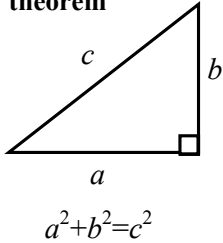
Acceleration/deceleration = $\frac{\text{change in speed}}{\text{time taken}}$ **Distance travelled** = area under speed-time graph

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

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

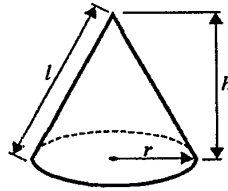
Mensuration

Pythagoras' theorem



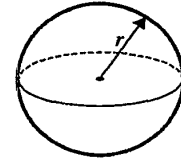
Volume of cone = $\frac{1}{3}\pi r^2 h$

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



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

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

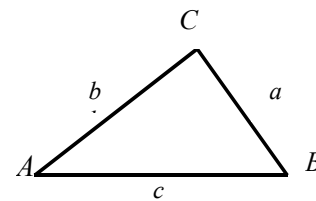


$\sin \theta = \frac{\text{opp}}{\text{hyp}}$

$\cos \theta = \frac{\text{adj}}{\text{hyp}}$

$\tan \theta = \frac{\text{opp}}{\text{adj}}$

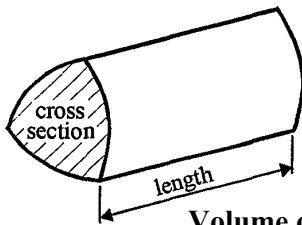
In any triangle ABC



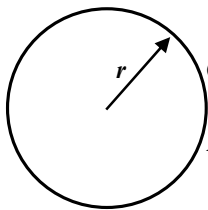
Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

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



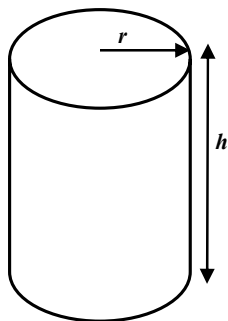
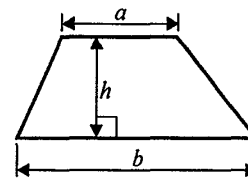
Volume of prism = area of cross section \times length



Circumference of circle = $2\pi r$

Area of circle = πr^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

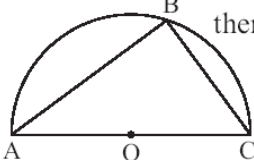
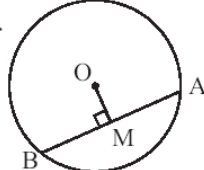
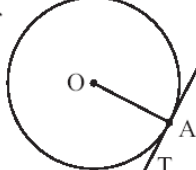
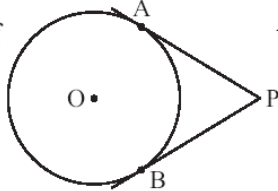
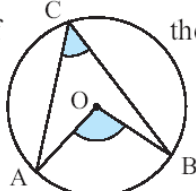
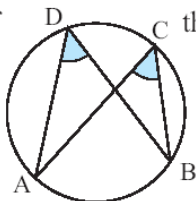
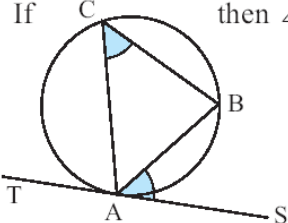
where, x is the midpoint in case of grouped data and is calculated by taking an average of the lower and upper limits of the class interval.

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