Math Rules

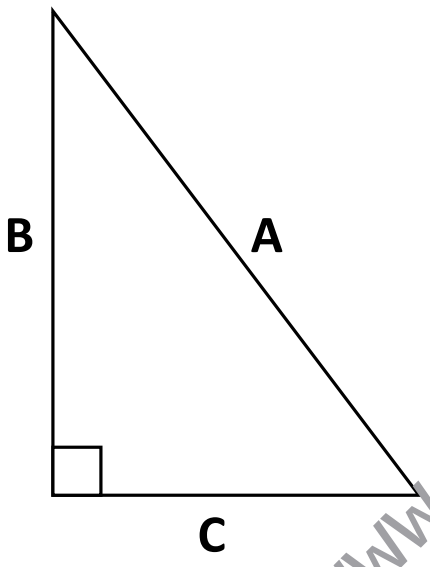
Factorisation:

For factorising a Quadratic Equation by Formula:

$$X = \frac{-(b) \pm \sqrt{(b)^2 - 4(a)(c)}}{2(a)}$$

Trignometry:

Pythagoras Theorem:



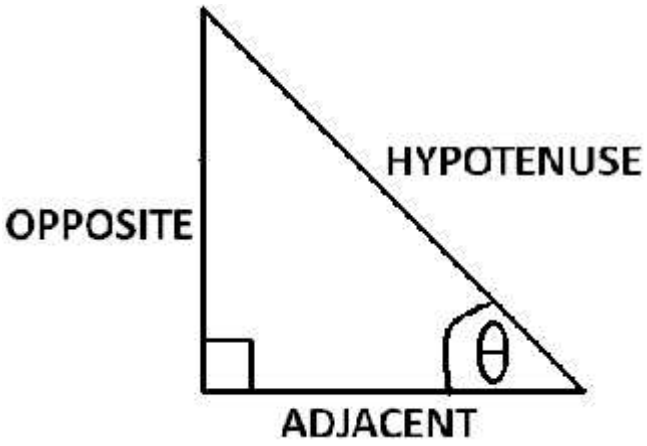
$$A^2 = B^2 + C^2$$
$$B^2 = A^2 - C^2$$
$$C^2 = A^2 - B^2$$

Trignometry of a right angled Triangle:

$$S\theta \quad :S \quad = \frac{O}{H}$$

$$C\theta \quad :C \quad = \frac{A}{H}$$

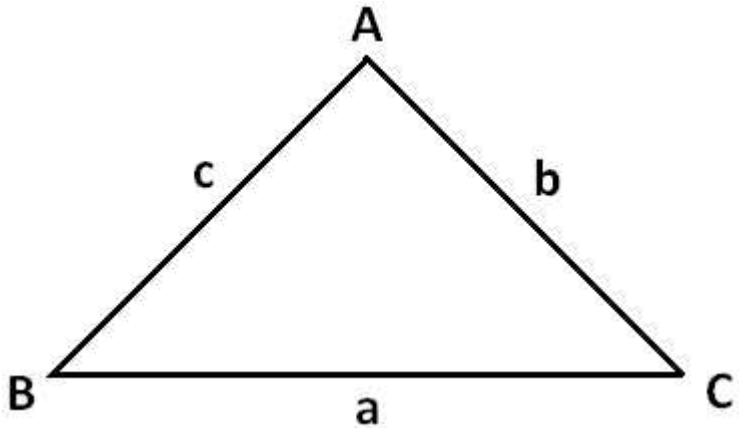
$$T\theta \quad :T \quad = \frac{O}{A}$$



The Sine rule:

A,B & C are angles

A,b & c are sides



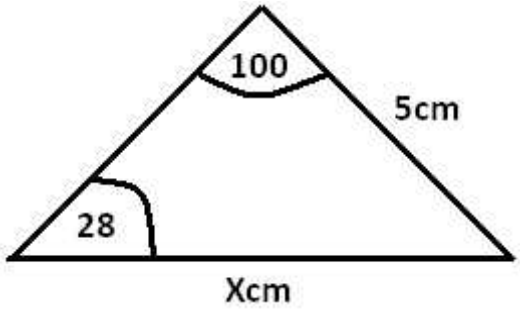
The Sine Rule is used when:

- **You are given ONE SIDE and TWO ANGLES, to find the missing side**
- **You are given TWO SIDES and ONE ANGLE which is <u>not between the two sides,</u> to find the missing angle.**

$$\frac{a}{S} = \frac{b}{S} = \frac{c}{S}$$

Examples on Sine rule:

1) Find X:

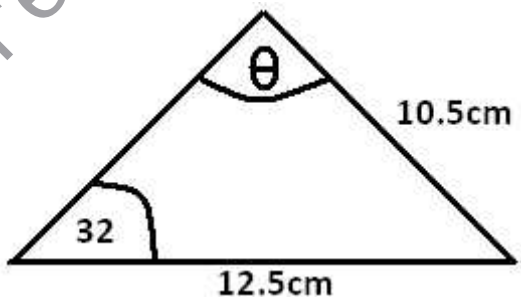


$$\frac{5}{S\ (2\ )} = \frac{X}{S\ (1\ \ )}$$

$$X = \frac{5 \times S\ \ (1\ \ )}{S\ \ (2\ )}$$

$$X = 1\ \ .5c$$

2) Find θ:



$$\frac{1\ \ .5}{S} = \frac{1\ \ .5}{S\ \ (3\ )}$$

$$S\ \ \ \ = \frac{S\ \ (3\ ) \times 1\ \ .5}{1\ \ .5}$$

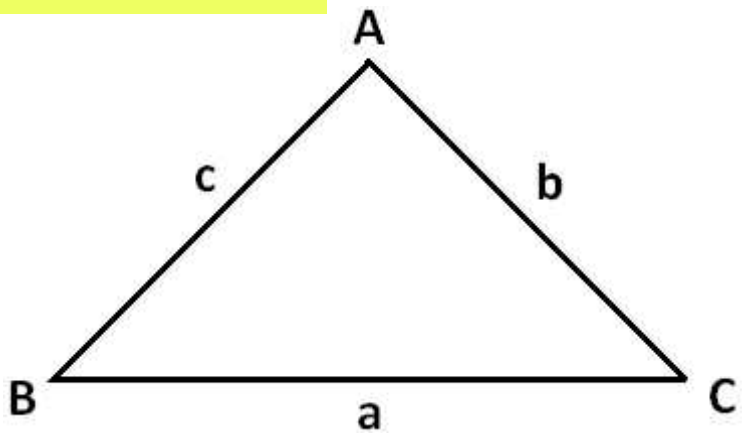
$$\theta = S\ n^{-1}\left(\frac{S\ \ (3\ ) \times 1\ \ .5}{1\ \ .5}\right)$$

$$\theta = 3\ \ .1°$$

The Cosine Rule:

A,B & C are angles

A,b & c are sides



The Cosine Rule is used when:

- **You are given TWO SIDES and ONE ANGLE <u>which is between the two sides</u>, to get the side opposite to the angle.**
- **You are given THREE SIDES, to find any angle.**

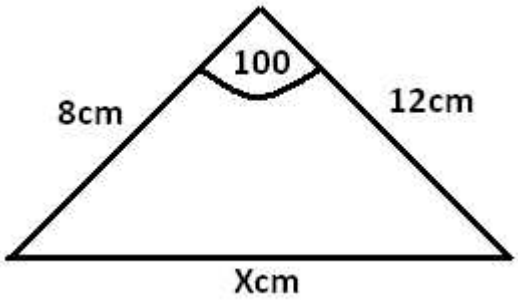
$$a^2 = b^2 + c^2 - 2(b)(c)(C \quad)$$

$$b = a^2 + c^2 - 2(a)(c)(C \quad)$$

$$c^2 = b^2 + a^2 - 2(b)(a)(C \quad)$$

Examples on the Cosine Rule:

1) Find X:

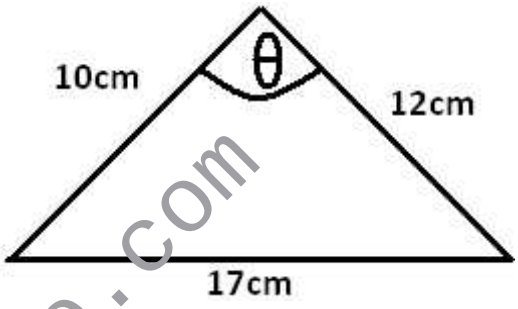


$$X^2 = 8^2 + 1\ ^2 - 2(8)(1\ )(C\ \ \ \ \ )$$

$$X = 2\ \ .2$$

$$X = 1\ .5$$

2) Find θ:

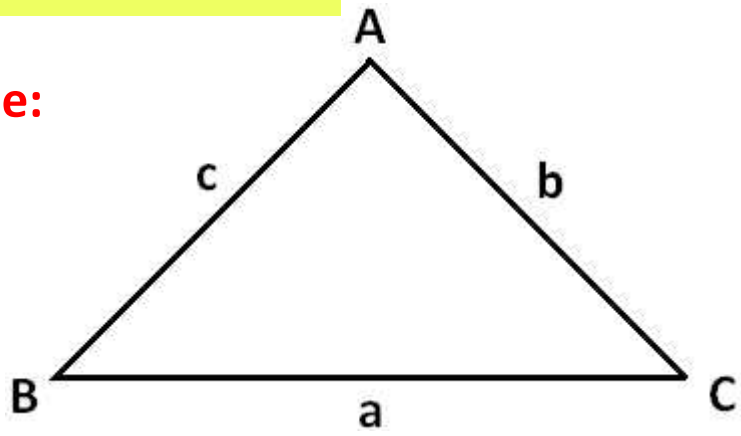


$$1\ ^2 = 1\ ^2 + 1\ ^2 - 2(1\ )(1\ )(C\ \ \theta)$$
$$2\ \ = 2\ \ - 2\ \ (C\ \ \ )$$
$$2\ \ + 2\ \ (C\ \ \ ) = 2$$
$$2\ \ (C\ \ \ ) = 2\ \ - 2$$
$$2\ \ (C\ \ \ ) = -4$$
$$C\ \ \ = \frac{-4}{2}$$
$$\theta = C\ \ ^{-1}\left(\frac{-4}{2}\right)$$
$$\theta = 1\ \ .8°$$

Sine Rule of the Area of a triangle:

A,B & C are angles

A,b & c are sides



This Rule is used when:

- **You are given TWO SIDES and ONE ANGLE <u>which is between the two sides</u>.**

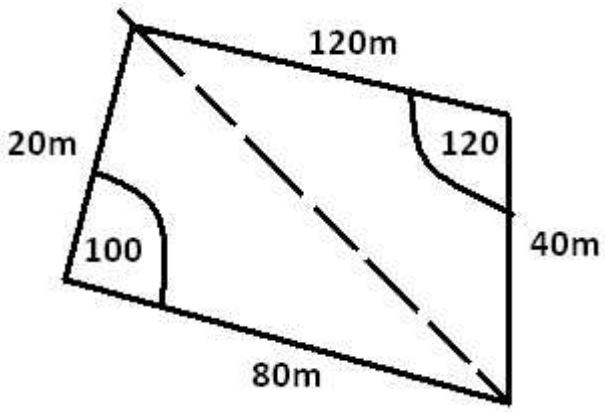
$$A = \frac{1}{2} \times b \times c \times S$$

$$A = \frac{1}{2} \times b \times a \times S$$

$$A = \frac{1}{2} \times a \times c \times S$$

Examples on the Sine Rule of Area:

Find the area of this shape:



$$A = \left(\frac{1}{2} \times 1 \times 4 \times S(1)\right) + \left(\frac{1}{2} \times 2 \times 8 \times S(1)\right)$$

$$A = 2.3\ m^2$$

Sine Curve Rule:

$$S \quad = S \quad (1 \quad - \theta)$$

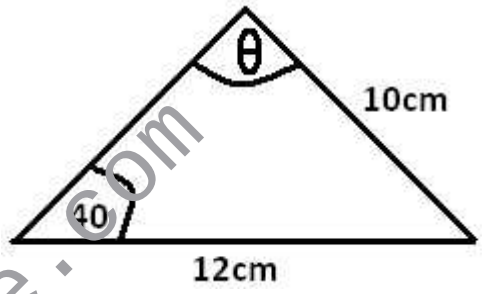
Examples:

$$S \quad = S$$
$$S \quad = S$$

And so on…

Example on Sine Curve rule:

Calculate angle θ given that it is obtuse.



$$\frac{1}{S} = \frac{1}{S}$$

$$S \quad = \frac{1 \quad \times s}{1}$$

$$\theta = S \quad ^{-1}\left(\frac{1 \quad \times s}{1}\right)$$

$\theta = 5 \quad .4 \quad \ldots°$ **which is obtuse. We have to find the other angle which has the same sine.**

$$1 \quad - 5 \quad .4 \quad \ldots = 1 \quad .5$$

Back Bearing:

If the bearing of B from A is θ, then the bearing of A from B {Back Bearing} is:

$$\theta + 1 \quad °(i \;\; \theta \; i: \; l \quad t \quad 1 \quad)$$
$$\theta - 1 \quad °(i \;\; \theta \; i: \; m \quad t \quad 1 \quad)$$

Co-ordinate Geometry and straight lines:

To calculate the distance between two given points:

$$D = \sqrt{(X_2 - X_1)^2 + (Y_2 - Y_1)^2}$$

To calculate the Co-ordinates of the mid-point between two given points:

$$\left(\frac{X_1 + X_2}{2}, \frac{Y_1 + Y_2}{2}\right)$$

To calculate the gradient of a straight line:

we must have two points on the line (X_1,Y_1) and (X_2,Y_2)

the gradient (m) is:

$$m = \frac{Y_2 - Y_1}{X_2 - X_1}$$

Matrices:

Multiplication of two Matrices $|M|$:

$$\begin{pmatrix} A & B \\ C & D \end{pmatrix}\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} = \begin{pmatrix} A & +B & A & +B \\ C & +D & C & +D \end{pmatrix}$$

Determinant of a Matrix:

$$M = \begin{pmatrix} A & B \\ C & D \end{pmatrix} \rightarrow |M| = A \quad -B$$

Multiplicative Inverse of a Matrix (M^{-1}):

$$M = \begin{pmatrix} A & B \\ C & D \end{pmatrix} \rightarrow |M| = A \quad -B \quad \rightarrow M^{-1} = \frac{1}{|M|} \times \begin{pmatrix} D & -B \\ -C & A \end{pmatrix}$$

NOTE: M x M^{-1} = Identity Martix

Any matrix multiplied by its multiplicative inverse will give you the identity matrix which is: $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

Variations:

Direct proportion equation:

$$Y = K(X)$$

Y and X are the two variables and K is the constant of variation which you will be given information to find.

Indirect proportion equation:

$$Y = \frac{K}{X}$$

Polygons:

To calculate the sum of interior angles of a regular polygon:

$$(n-2) \times 1$$

Where n is the number of sides in the polygon.

To calculate one interior angle of a regular polygon:

$$\frac{(n-2)1}{n}$$

To calculate the one exterior angle of a regular polygon:

$$\frac{3}{n}$$

Note: the sum of exterior angles of any polygon is always 360.