

E Michaelmas Cosine And Sine Rule

Here we are dealing with a triangle with sides a, b, c and angles A, B, C such that each angle is opposite the same letter side.

- The *cosine rule* states that

$$c^2 = a^2 + b^2 - 2ab \cos C.$$

We use it when

- we have all three sides and want any angle,
- we have two sides and an angle and want the other side.

- The *sine rule* states that

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

We use it when

- we have a side opposite an angle pair and a length and want the angle opposite,
- we have a side opposite an angle pair and an angle and want the side opposite.

- Patrons are reminded that it is worth remembering that $\sin 30^\circ = \cos 60^\circ = \frac{1}{2}$.

Questions

Find the missing angles and lengths (all answers to 3 significant figures):

- Triangle ABC with $AB = 5$, $AC = 7$, $\hat{BAC} = 32^\circ$. Find BC . 3.83
- Triangle DEF with $EF = 8$, $\hat{EDF} = 57^\circ$, $\hat{DFE} = 23^\circ$. Find DE . 3.73
- Triangle XYZ with $XY = 10$, $XZ = 8$, $YZ = 3$. Find $Y\hat{X}Z$. 14.4°
- Triangle PQR with $PQ = 6$, $PR = 8$, $\hat{PQR} = 40^\circ$. Find $P\hat{R}Q$. 28.8°
- Triangle XYZ with $XZ = 10$, $YZ = 3$, $X\hat{Z}Y = 101^\circ$. Find XY . 11.0
- Triangle LMN with $MN = 11$, $M\hat{LN} = 100^\circ$, $L\hat{NM} = 38^\circ$. Find LM . 6.88
- Triangle ABC with $AB = 5.9$, $BC = 4.2$, $AC = 6.2$. Find $A\hat{B}C$. 73.6°
- Triangle ABC with $AC = 8.1$, $BC = 4.3$, $A\hat{B}C = 121^\circ$. Find $B\hat{A}C$. 27.1°
- Triangle PQR with $QR = 6.2$, $PQ = 5.1$, $\hat{PQR} = 57^\circ$. Find PR . 5.48
- Triangle ABC with $AC = 7$, $C\hat{A}B = 120^\circ$, $A\hat{B}C = 40^\circ$. Find BC . 9.43
- Triangle LMN with $LM = 10$, $MN = 6$, $LN = 5$. Find $L\hat{N}M$. 131°
- Triangle XYZ with $XZ = 9$, $XY = 11$, $X\hat{Z}Y = 97^\circ$. Find $X\hat{Y}Z$. 54.3°