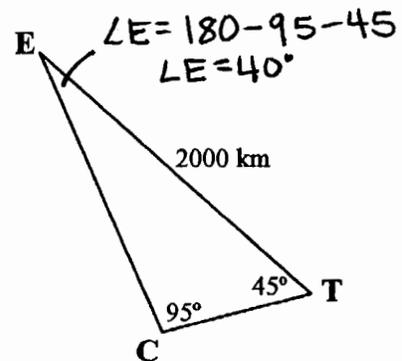


Solving Real-World Problems with Trigonometry

Eg. 1:

David wants to go to Toronto from Edmonton, but he took the wrong road and ended up in Chicago instead. Upon realizing his directional mistake, David drove from Chicago to Toronto. If the angle at Toronto is 45° , the angle at Chicago is 95° , and the distance from Edmonton to Toronto is 2000 km, how much further did David drive than necessary?



Using sine law:

$$\frac{EC}{\sin 45^\circ} = \frac{2000}{\sin 95^\circ}$$

$$\frac{CT}{\sin 40^\circ} = \frac{2000}{\sin 95^\circ}$$

$$EC = \frac{2000}{\sin 95^\circ} \times \sin 45^\circ$$

$$CT = \frac{2000}{\sin 95^\circ} \times \sin 40^\circ$$

$$EC \approx 1419.6$$

$$CT \approx 1290.5$$

\therefore He drove
710 km further
than necessary.

$$\text{Total distance driven} = 1290.5 + 1419.6$$

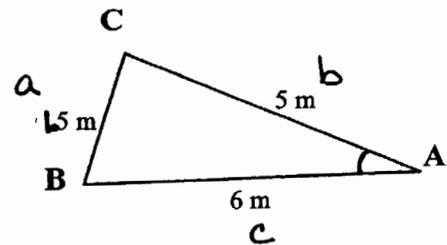
$$\approx 2710$$

$$\text{Difference} = 2710 - 2000$$

$$= 710$$

Eg. 2:

Jeff and his friends built an outdoor hockey rink. Their hockey goal line is 1.5 m wide. Jeff shoots a puck from a point where the puck is 5 metres from one goal post and 6 metres from the other goal post. Within what angle must he make his shot to hit the net?



Using cosine law: (find $\angle A$)

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

$$= \frac{5^2 + 6^2 - 1.5^2}{2(5)(6)}$$

$$\cos A = \frac{58.75}{60}$$

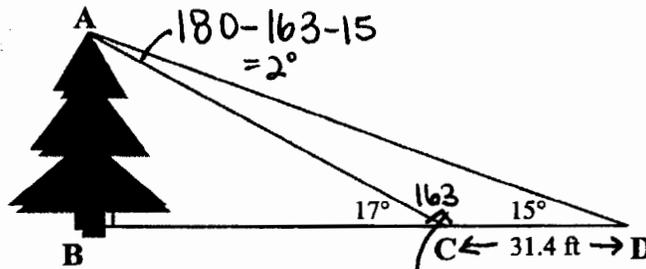
$$A = \cos^{-1}\left(\frac{58.75}{60}\right)$$

$$A \approx 11.7^\circ$$

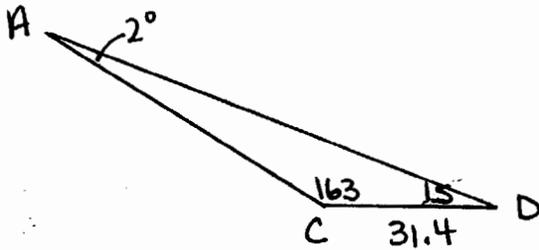
\therefore He must make the
shot within an angle
of 11.7°

Eg. 3:

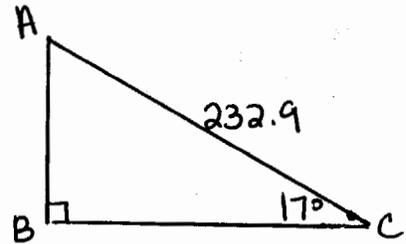
Jillian stood at a distance admiring a magnificent Douglas Fir. Jillian measured the **angle of elevation** to the top of the tree and found it to be 15° . Jillian then walked 31.4 feet closer to the tree. This time the **angle of elevation** to the top of the tree was 17° . Calculate the height of the tree to the nearest tenth of a metre.



In $\triangle ACD$,



In $\triangle ABC$



Using sine law:

$$\frac{AC}{\sin 15^\circ} = \frac{31.4}{\sin 2^\circ}$$

$$AC = \frac{31.4}{\sin 2^\circ} \times \sin 15^\circ$$

$$AC \doteq 232.9 \text{ ft}$$

$$\sin 17^\circ = \frac{AB}{232.9}$$

$$232.9 (\sin 17^\circ) = AB$$

$$AB \doteq 68.1$$

\therefore The tree is 68.1 ft tall.