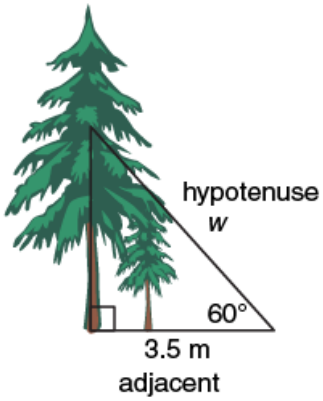
Lesson 3

Sketching Diagrams

1. A guy wire is used to secure a tree. The wire is attached to the ground 3.5 m from the base of the tree, at a 60° angle with the ground. Determine the length of the wire, to the nearest tenth of a metre.

Step 1: Identify and label the sides as being adjacent to, opposite, or the hypotenuse, in relation to the angle indicated.



Step 2: State the appropriate ratio.

$$cosine\ of\ \ angle\ \theta = \frac{length\ adjacent\ \ to\ \theta}{hypotenuse}$$

Step 3: Substitute known values, and calculate the unknown value.

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

$$\cos\ 60° = \frac{3.5\ m}{w}$$

$$w\ \times\ \cos 60° = \frac{3.5\ m}{\cancel{w}}\ \times\ \cancel{w}$$

$$w\ \times\ \cos 60° = 3.5\ m$$

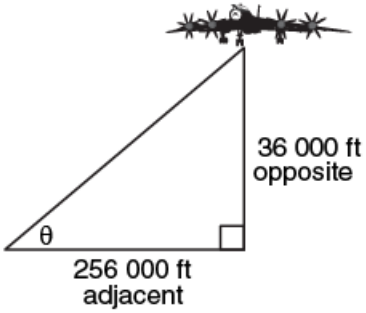
$$\frac{w\ \times\ \cancel{\cos 60°}}{\cancel{\cos 60°}} = \frac{3.5\ m}{\cos 60°}$$

$$w = 7.0\ m$$

The length of the wire is 7.0 m.

2. An aircraft travels a horizontal distance of 256 000 feet, from its take off point, to reach its cruising altitude of 36 000 feet. At what angle did the plane leave the ground, to the nearest degree?

Step 1: Identify and label the sides as being adjacent to, opposite, or the hypotenuse, in relation to the angle indicated.



Step 2: State the appropriate ratio.

$$tan\ gent\ of\ \ angle\ \theta = \frac{length\ opposite\ \theta}{length\ adjacent\ to\ \theta}$$

Step 3: Substitute known values, and calculate the unknown value.

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

$$tan\,\theta = \frac{36\ 000\ \cancel{ft}}{256\ 000\ \cancel{ft}}$$

$$tan\,\theta = \frac{36\ 000}{256\ 000}$$

$$\theta = tan^{-1}\left(\frac{36\ 000}{256\ 000}\right)$$

$$\theta = 8°$$

The plane left the ground at an angle of 8°.