Using the Primary Trigonometric Ratios to Find Sides

Warm Up:

Solve for x. Round answers to 2 decimal places where appropriate.

a) $\cos 60° = \dfrac{x}{10}$

$x = 10 \cdot \cos 60°$

$x = 50$

b) $\tan 45° = \dfrac{x}{15}$

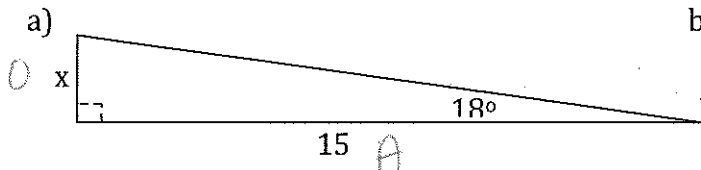$x = 15 \tan 45°$

$x = 15$

c) $\sin 65° = \dfrac{48}{x}$

$x \sin 65° = 48$

$\dfrac{x \sin 65°}{\sin 65°} = \dfrac{48}{\sin 65°}$

$x = \dfrac{48}{\sin 65°}$

$x = 52.96$

Last class we learned how to use the primary trigonometric ratios to solve for a missing angle in a right triangle. We can easily extend that knowledge to solve for a missing in a right triangle.
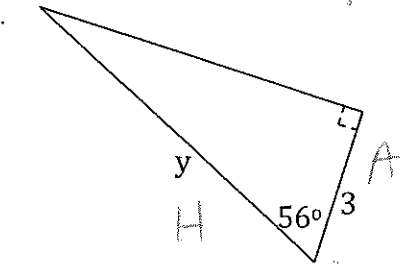
Example: Solve for the missing side. Round answers to 2 decimal places where appropriate.

a)

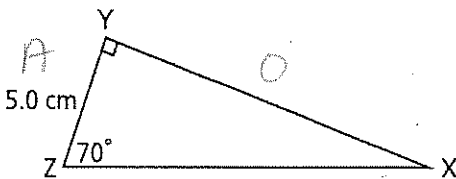$15 \tan 18° = \dfrac{x}{15}$

$x = 15 \tan 18°$

$x = 4.87$

b)

$\cos 56° = \dfrac{3}{y}$

$y \cos 56° = 3$

$\dfrac{y \cos 56°}{\cos 56°} = \dfrac{3}{\cos 56°}$

$y = \dfrac{3}{\cos 56°} = 5.36$

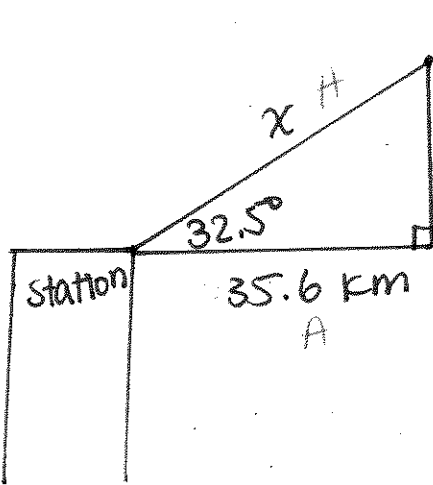Example: Determine the length of XY to the nearest tenth of a centimetre.

$5 \cdot \tan 70° = \dfrac{XY}{5}$

$XY = 5 \tan 70°$

$XY = 13.7 \text{ cm}$

Example: From a radar station, the angle of elevation of an approaching airplane is 32.5°. The horizontal distance between the plane and the radar station is 35.6 km. How far is the plane from the radar station to the nearest tenth of a kilometre?
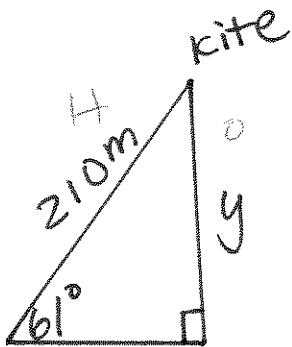

$$x \cos 32.5° = \frac{35.6}{x} \cdot x$$

$$\frac{x \cos 32.5°}{\cos 32.5°} = \frac{35.6}{\cos 32.5°}$$

$$x = \frac{35.6}{\cos 32.5°} = 42.2 \text{ km}$$

Example: A kite is flown with 210 m of string. The angle of elevation of the kite is 61°. How high is the kite to the nearest tenth of a metre?
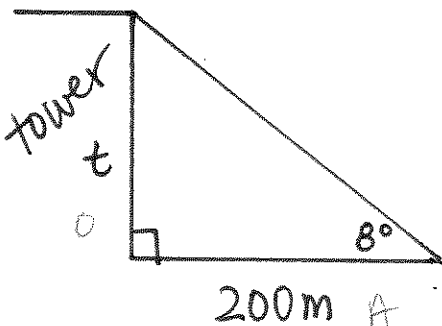

$$210 \sin 61° = \frac{y}{210} \cdot 210$$

$$y = 210 \sin 61°$$

$$y = 183.7 \text{ m}$$

Example: At a horizontal distance of 200 m from the base of an observation tower, the angle between the ground and the line of sight to the top of the tower is 8°. How high is the tower to the nearest metre?

$$200 \tan 8° = \frac{t}{200} \cdot 200$$

$$t = 200 \tan 8°$$

$$t = 28.1 \text{ m}$$