

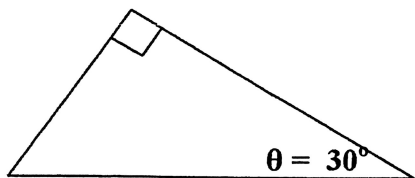
More Practice with the Tangent Function

Recall:

$$\tan \theta = \frac{\text{opposite}}{\text{adjacent}}$$

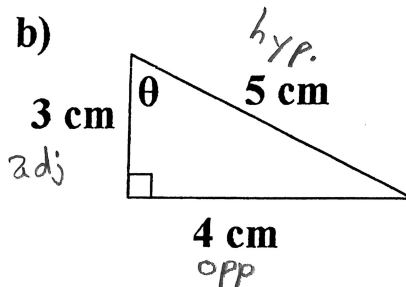
1. Determine the 'tan' of the angle θ (to 4 digits).

a)



$$\begin{aligned} \tan \theta &= \tan(30^\circ) \\ &\approx 0.5774 \end{aligned}$$

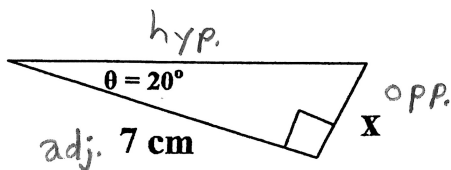
b)



$$\begin{aligned} \tan \theta &= \frac{\text{opp}}{\text{adj}} \\ &= \frac{4}{3} \\ &\approx 1.333 \end{aligned}$$

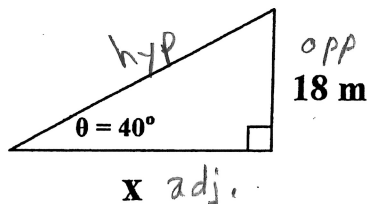
2. Use the tangent function to determine the length of side 'x'.

a)



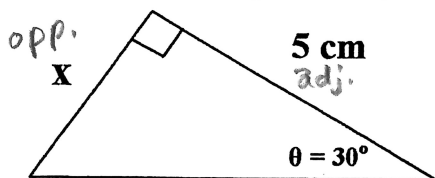
$$\begin{aligned} \tan \theta &= \frac{\text{opp}}{\text{adj}} \\ \frac{\tan(20^\circ)}{1} &= \frac{x}{7} \\ x &= 7 \tan 20^\circ \\ x &\approx 2.5 \text{ cm} \end{aligned}$$

b)



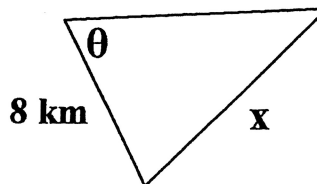
$$\begin{aligned} \tan \theta &= \frac{\text{opp}}{\text{adj}} \\ \frac{\tan(40^\circ)}{1} &= \frac{18}{x} \\ x \tan(40^\circ) &= 18 \\ \frac{x \tan(40^\circ)}{\tan(40^\circ)} &= \frac{18}{\tan(40^\circ)} \\ x &\approx 21.5 \text{ m} \end{aligned}$$

c)



$$\begin{aligned} \tan \theta &= \frac{\text{opp}}{\text{adj}} \\ \frac{\tan(30^\circ)}{1} &= \frac{x}{5} \\ x &= 5 \tan(30^\circ) \\ x &\approx 2.9 \text{ cm} \end{aligned}$$

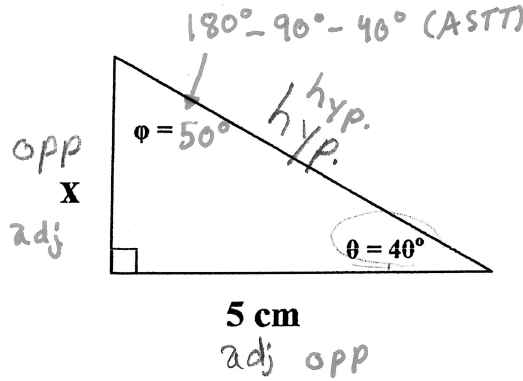
d)



No right angle.
Cannot solve
for x.

Regardless of the angle that is chosen in a right triangle (other than the right angle), you should be able to solve for a side.

Solve for 'x' in the diagram below using both θ and ϕ .



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

$$\frac{\tan(40^\circ)}{1} = \frac{x}{5}$$

$$x = 5 \tan(40^\circ)$$

$$x \approx 4.2 \text{ cm}$$

phi

$$\tan \phi = \frac{\text{opp}}{\text{adj}}$$

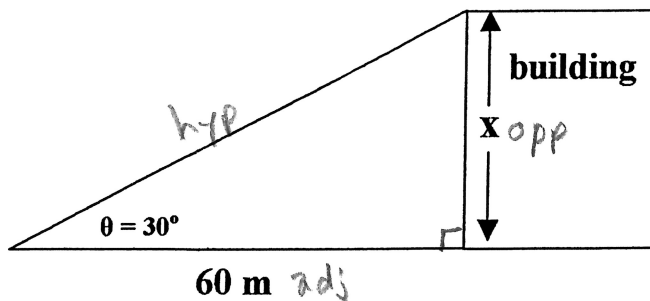
$$\frac{\tan(50^\circ)}{1} = \frac{5}{x}$$

$$\frac{x \tan(50^\circ)}{\tan(50^\circ)} = \frac{5}{\tan(50^\circ)}$$

$$x \approx 4.2 \text{ cm}$$

Applications of the Tangent Function

1. The top of a building has an elevation of 30° above the ground when standing 60 m away from it. How tall is the building?



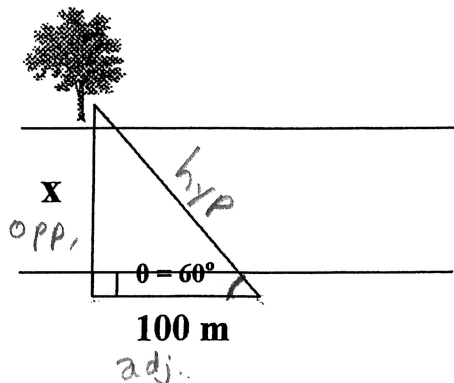
$$\tan \theta = \frac{\text{opp}}{\text{adj}}$$

$$\frac{\tan(30^\circ)}{1} = \frac{x}{60}$$

$$x = 60 \tan(30^\circ)$$

$$x \approx 34.6 \text{ m}$$

2. An observer notices a tree on the opposite side of a river. He walks 100 m perpendicular to his initial line of sight and then realizes that the tree is now located at an angle of 60° with his walking path. How far is the distance across the river?



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

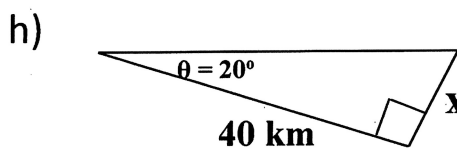
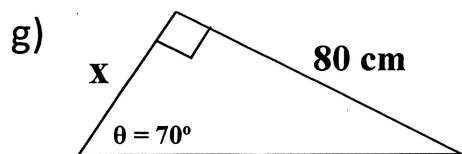
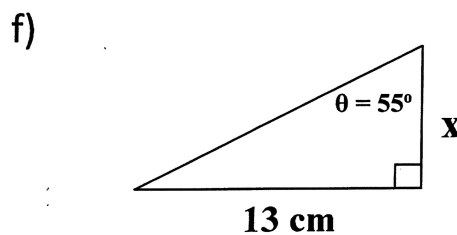
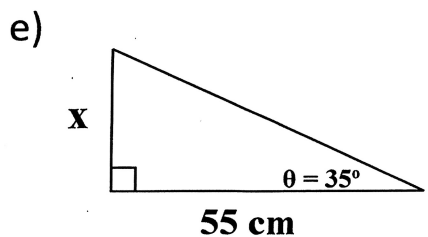
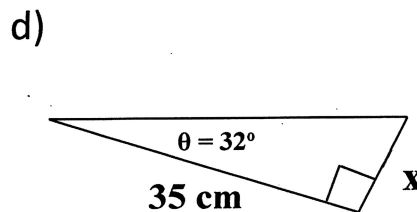
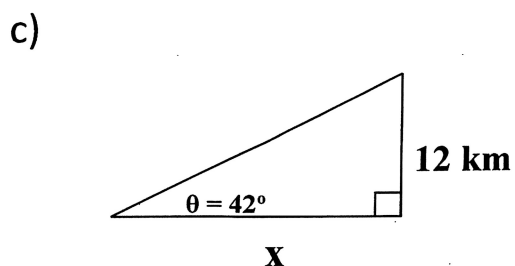
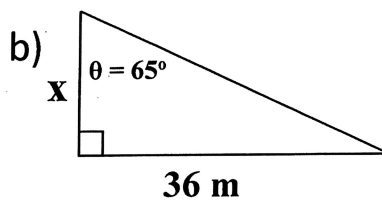
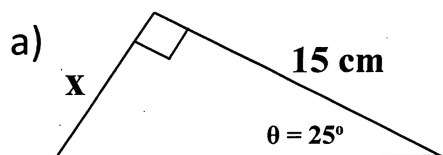
$$\frac{\tan(60^\circ)}{1} = \frac{x}{100}$$

$$x = 100 \tan(60^\circ)$$

$$x \approx 173.2 \text{ m}$$

Solving Sides Using the Tangent Ratio – Practice

For each triangle below, use the tangent ratio to determine the length of the side marked x.



Answers: a) 7.0 cm b) 16.8 m c) 13.3 km d) 21.9 cm e) 38.5 cm f) 9.1 cm g) 29.1 cm h) 14.6 km