

Geometry CC - Unit 8  
Lesson 9: Unknown Angles  
M2 L34

1) Dan was walking through a forest when he came upon a sizable tree. Dan estimated he was about 40 meters away from the tree when he measured the angle of elevation between the horizontal and the top of the tree to be 35 degrees. If Dan is about 2 meters tall, about how tall is the tree?

$$\tan 35 = \frac{X}{40}$$

$$40 \tan 35 = X$$

$$X = 28.0083015 + 2$$

$$X \approx 30.0 \text{ m}$$

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2) Dan was pretty impressed with this tree ... until he turned around and saw a bigger one, also 40 meters away but in the other direction. "Wow," he said. "I bet that tree is at least 50 meters tall!" Then, he thought a moment. "Hmm ... if it is 50 meters tall, I wonder what angle of elevation I would measure from my eye level to the top of the tree?" What angle will Dan find if the tree is 50 meters tall? Explain your reasoning.

$$\tan X = \frac{46}{40}$$

$$\tan^{-1}\left(\frac{46}{40}\right) \approx 50^\circ$$

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3) Shelves are being built in a classroom to hold textbooks and other supplies. The shelves will extend 10 in. from the wall. Support braces will need to be installed to secure the shelves. The braces will be attached to the end of the shelf and secured 6 in. below the shelf on the wall. What angle measure will the brace and the shelf make?

$$\tan X = \frac{6}{10}$$

$$\tan^{-1}\left(\frac{6}{10}\right) \approx 31^\circ$$

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4) A 16 ft. ladder leans against a wall. The foot of the ladder is 7 ft. from the wall.

a) Find the vertical distance from the ground to the point where the top of the ladder touches the wall.

$$X^2 + 7^2 = 16^2$$

$$X^2 + 49 = 256$$

$$\sqrt{X^2} = \sqrt{207}$$

$$X = \sqrt{207}$$

b) Determine the measure of the angle formed by the ladder and the ground.

$$\cos y = \frac{7}{16}$$

$$\cos^{-1}\left(\frac{7}{16}\right) \approx 64^\circ$$

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5) A group of friends have hiked to the top of the Mile High Mountain. When they look down, they can see their campsite, which they know is approximately 3 miles from the base of the mountain.

a. Sketch a drawing of the situation.

b. What is the angle of depression?

$$\tan X = \frac{1}{3}$$

$$\tan^{-1}\left(\frac{1}{3}\right) \approx 18^\circ$$

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6) A roller coaster travels 80 ft. of track from the loading zone before reaching its peak. The horizontal distance between the loading zone and the base of the peak is 50 ft.

a. Model the situation using a right triangle.

b. At what angle is the roller coaster rising according to the model?

$$\cos X = \frac{50}{80}$$

$$\cos^{-1}\left(\frac{50}{80}\right) \approx 51^\circ$$

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