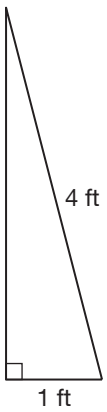
Chapter Review

Hint
For Question 1 Part a), the maximum safe angle cannot be greater or less than the result of the calculation.

1. Brynn installs soffit, fascia, and eavestrough. Safety regulations state that the base of a ladder must be at least 1 ft away from the wall for every 4 ft of ladder length.



a) What is the maximum safe angle of elevation for a ladder, without rounding?

e.g., $\cos x^\circ = \frac{1}{4}$

$x^\circ = \cos^{-1}\left(\frac{1}{4}\right)$, or $x^\circ = 75.522...^\circ$

The maximum angle of elevation is $75.522...^\circ$.

Hint
The maximum safe angle of elevation for any ladder is the same as it is for a 4 ft ladder.

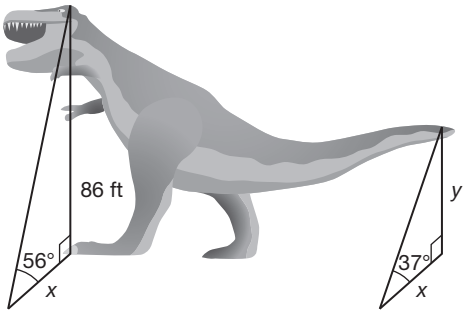
b) Brynn's ladder is 24 ft long. How high can a 24 ft ladder reach, without rounding?

e.g., $\sin 75.522...^\circ = \frac{h}{24}$

$24 \times \sin 75.522...^\circ = h$ The ladder can reach a height

$23.237... = h$ of 23.237... ft safely.

2. The world's largest dinosaur, in Drumheller, is 86 ft tall. Anita measured the angles of elevation to its head and its tail from points on the ground. Each point was the same horizontal distance from the dinosaur, x ft. How high is the tail, y to the nearest foot?



e.g., Horizontal from Anita to dinosaur:

$\tan 56^\circ = \frac{86}{x}$

$x \times \tan 56^\circ = 8.6$

$x = \frac{86}{\tan 56^\circ}$

$x = 58.007...$, or $58.007...$ ft

Tail height:

$\tan 37^\circ = \frac{y}{58.007...}$

$58.007... \times \tan 37^\circ = y$

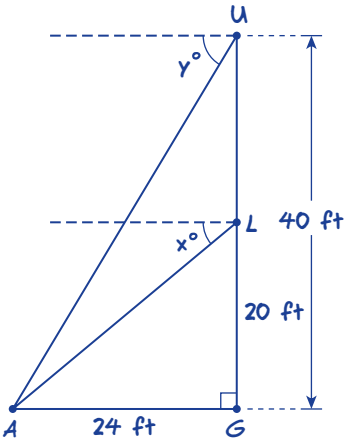
$43.711... = y$, or 43.711... ft

The tail is 44 ft high, to the nearest foot.

3. Alexis installs wind turbines on the Prairies. For installations on rocky ground, she uses guy wires to secure the pole.

- The wires are anchored at a point 24 ft from the pole base.
- The wires meet the pole at 20 ft and 40 ft above the ground.

Draw a diagram to show the angle of depression of each wire. Label the lengths and angles you know. What is the angle of depression of each wire, to the nearest degree?



e.g., Lower wire:

$x^\circ = \tan^{-1}\left(\frac{20}{24}\right)$

$x^\circ = 39.805...^\circ$

$x^\circ \doteq 40^\circ$

Upper wire:

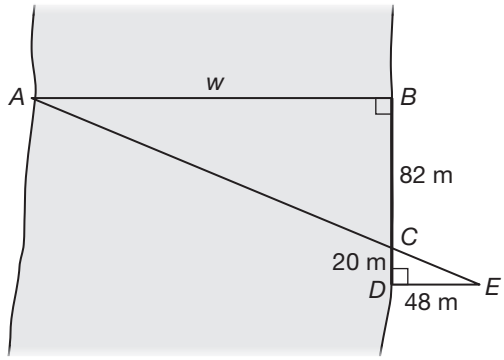
$y^\circ = \tan^{-1}\left(\frac{40}{24}\right)$

$y^\circ = 59.036...^\circ$

$y^\circ \doteq 59^\circ$

4. To construct the Esplanade Riel Pedestrian Bridge in Winnipeg, surveyors needed to determine the width across the river.

The diagram shows $\triangle CDE$ measured out on shore BD. How wide is the river, w, to the nearest metre?



e.g., $\tan \angle DCE = \frac{48}{20}$

$\angle DCE = \tan^{-1}\left(\frac{48}{20}\right)$

$\angle DCE = 67.380...^\circ$

$\angle ACB = 67.380...^\circ$

$\tan \angle ACB = \frac{w}{82}$

$82 \times \tan 67.380...^\circ = w$

$196.798... = w$

The river is 197 m wide, to the nearest metre.

5. How are the angles of elevation and angles of depression similar? How are they different?

e.g., They are similar, because their measures are equal for a situation. They are different, because they are in different places on a diagram that represents a situation. Also, the angle of elevation is when you look up and the angle of depression is when you look down.