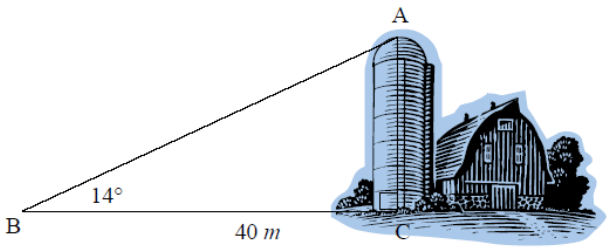
MORE WORD PROBLEMS

Learning Goal

- apply primary trigonometric ratios

While walking to school you pass a barn with a silo. Looking up to the top of the silo you estimate the angle of elevation to the top of the silo to be about 14°. You continue walking and find that you were around 40 m from the silo. Using this information and your knowledge of trigonometric ratios calculate the height of the silo.

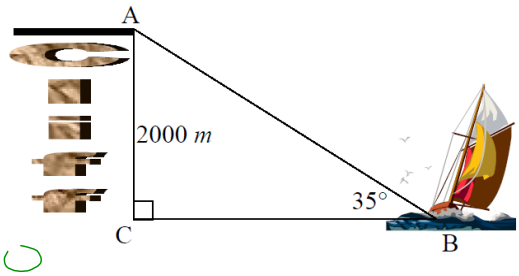


$$\tan 14^\circ = \frac{h}{40}$$

$$40 \cdot \tan 14^\circ = h$$

$$9.97 = h$$

A sailboat is approaching a cliff. The angle of elevation from the sailboat to the top of the cliff is 35°. The height of the cliff is known to be about 2000 m. How far is the sailboat away from the base of the cliff?



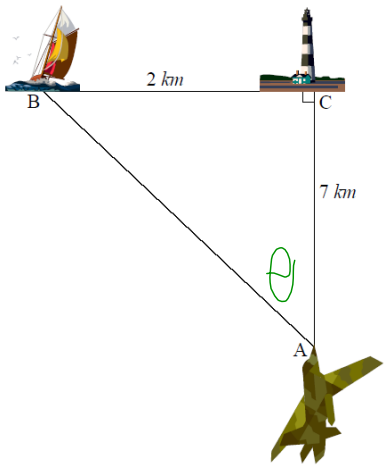
$\tan 35^\circ = \frac{2000}{x}$

$x \cdot \tan 35^\circ = 2000$

$x = \frac{2000}{\tan 35^\circ}$

$x = 2856.3$

A sailboat that is 2 km due west of a lighthouse sends a signal to the lighthouse that it is in distress. The lighthouse quickly signals a rescue plane that is 7 km due south of the lighthouse. What heading from due north should the plane take in order to intercept the troubled sailboat?

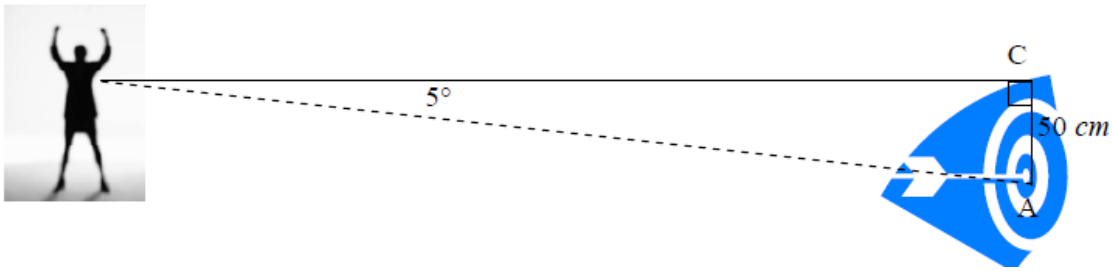


$\tan\theta = \frac{2}{7}$

$\tan\theta = 0.2857$

$\theta = 16^\circ$

An archer shoots and gets a bulls-eye on the target. From the archer's eye level the angle of depression to the bulls-eye is 5°. The arrow is in the target 50 cm below the archer's eye level. Calculate the distance the arrow flew to hit the target (*the dotted line*).



$$\sin 5^\circ = \frac{50}{x}$$

$$x \cdot \sin 5^\circ = 50$$

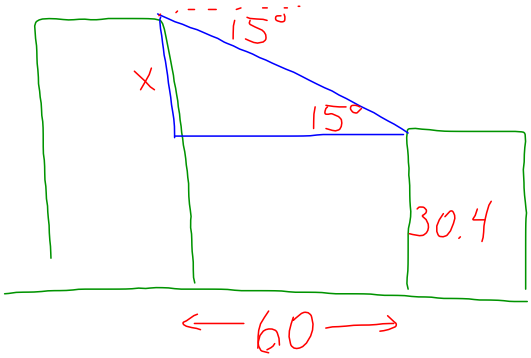
$$x = \frac{50}{\sin 5^\circ}$$

$$x = 573.69$$

Homework

Handout

5) Two buildings are 60 m apart. The angle of depression from the top of the taller building to the top of the shorter building is 15°. The height of the shorter building is 30.4 m. What is the height of taller building? Express your answer to the nearest tenth of a metre.



$\tan 15^\circ = \frac{x}{60}$

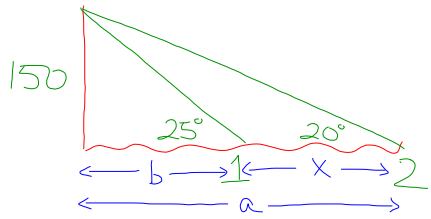
$60 \cdot \tan 15^\circ = x$

$16.08 = x$

Total Height $30.4 + 16.08$

$= 46.48$ $\therefore 46.48$ m

6) From the top of a 150 m high cliff, the angles of depression of two boats on the water are 20° and 25°. How far apart are the boats?



Boat 1

$\tan 25^\circ = \frac{150}{b}$

$b \cdot \tan 25^\circ = 150$

$b = \frac{150}{\tan 25^\circ}$

$b = 321.68$

Boat 2

$\tan 20^\circ = \frac{150}{a}$

$a = \frac{150}{\tan 20^\circ}$

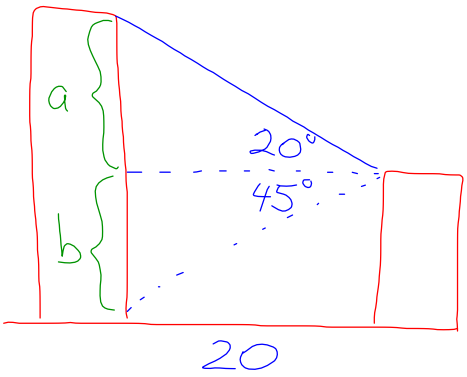
$a = 412.1$

Find x

$412.1 - 321.68$

$= 90.42$ $\therefore 90.42$ m

7) Two buildings are 20 m apart. The angle from the top of the shorter building to the top of the taller building is 20°. The angle from the top of the shorter building to the base of the taller building is 45°. What is the height of the taller building?



a

$\tan 20° = \frac{a}{20}$

$7.28 = a$

b

$\tan 45° = \frac{b}{20}$

$20 = b$

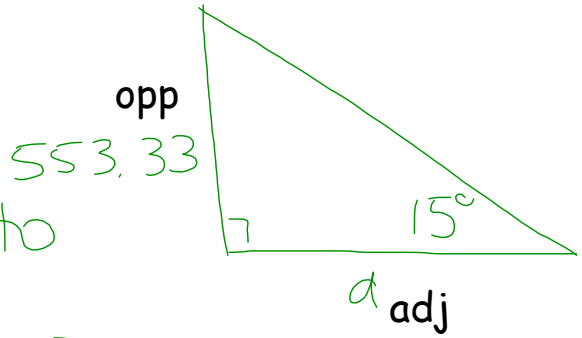
Total $= 7.28 + 20 = 27.28$

8) The CN Tower is 553.33 m high. Lina looks up at the top of the tower at a 15° angle of elevation. She calculates the distance, d, from the base of the tower as follows:

adj / opp

$$\frac{d}{553.33} = \tan 15°$$
$$d = 553.33 \times \tan 15°$$
$$d \doteq 149$$

Explain why Lina's solution is incorrect.
Write a correct solution



∴ we want to use

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

the formula is backwards