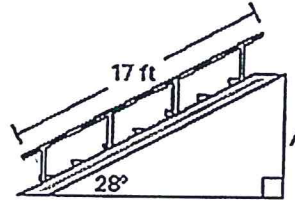


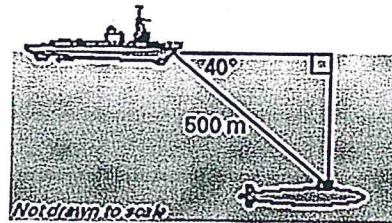
9. **Staircase** A staircase has an angle of elevation of  $28^\circ$  and covers a total distance of 17 feet. To the nearest foot, what is the vertical height  $h$  covered by the staircase?



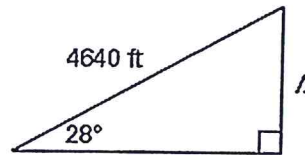
10. **Highway** You are traveling along a stretch of highway that has a slight grade with an angle of inclination of  $5^\circ$ . After traveling for 4 miles, what is the vertical  $v$  and horizontal  $h$  change in feet? (1 mi = 5280 ft) Round your answer to the nearest foot.



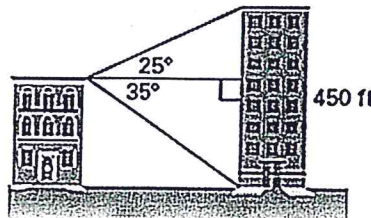
11. **Submarine** A sonar operator on a ship detects a submarine at a distance of 500 meters and an angle of depression of  $40^\circ$ . How deep is the submarine?



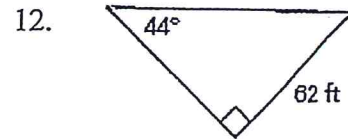
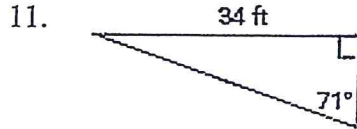
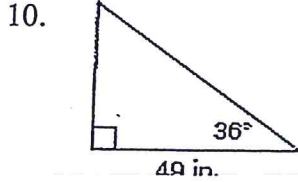
12. **Ski Lift** A chair lift on a ski slope has an angle of elevation of  $28^\circ$  and covers a total distance of 4640 feet. To the nearest foot, what is the vertical height  $h$  covered by the chair lift?



13. **Height of a Building** A 450 foot tall building is near a shorter building. A person on top of the shorter building finds the angle of elevation of the roof of the taller building to be  $25^\circ$  and the angle of depression of its base to be  $35^\circ$ . How far apart are the two buildings to the nearest foot? How tall is the shorter building to the nearest foot?

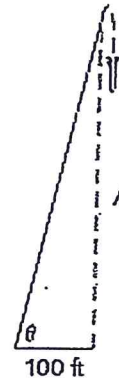


Find the perimeter of the triangle. Round to the nearest tenth.

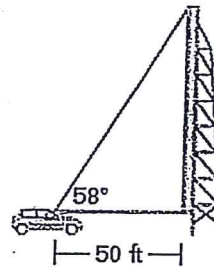


13. **Model Rockets** To calculate the height  $h$  reached by a model rocket, you move 100 feet from the launch point and record the angle of elevation  $\theta$  to the rocket at its highest point. The values of  $\theta$  for three flights are given below. Find the rocket's height to the nearest foot for the given  $\theta$  in each flight.

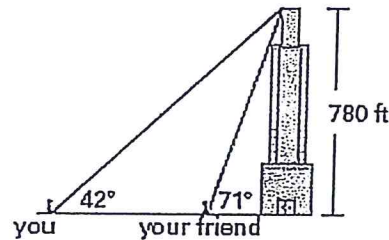
- a.  $\theta = 77^\circ$
- b.  $\theta = 81^\circ$
- c.  $\theta = 83^\circ$



✓ 14. **Drive-in Movie** You are 50 feet from the screen at a drive-in movie. Your eye is on a horizontal line with the bottom of the screen and the angle of elevation to the top of the screen is  $58^\circ$ . How tall is the screen?



15. **Skyscraper** You are a block away from a skyscraper that is 780 feet tall. Your friend is between the skyscraper and yourself. The angle of elevation from your position to the top of the skyscraper is  $42^\circ$ . The angle of elevation from your friend's position to the top of the skyscraper is  $71^\circ$ . To the nearest foot, how far are you from your friend?

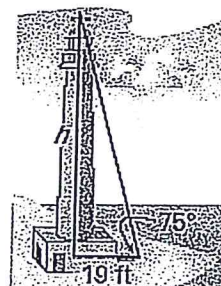


In Exercises 21–23, use the figure of the lighthouse.

✓ 16. At 2 P.M., the shadow of a lighthouse is 19 feet long and the angle of elevation is  $75^\circ$ . Find the height of the lighthouse.

17. At 4 P.M., the angle of elevation of the sun is  $40^\circ$ . Find the length of the shadow cast by the lighthouse.

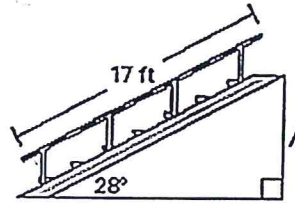
18. At 6 P.M., will the length of the shadow be longer or shorter than it was at 4 P.M.? *Explain.*



9. Staircase A staircase has an angle of elevation of  $28^\circ$  and covers a total distance of 17 feet. To the nearest foot, what is the vertical height  $h$  covered by the staircase?

$$\sin 28^\circ = \frac{h}{17}$$

$$17 \cdot \sin 28^\circ = h$$



10. Highway You are traveling along a stretch of highway that has a slight grade with an angle of inclination of  $5^\circ$ . After traveling for 4 miles, what is the vertical  $v$  and horizontal  $h$  change in feet? (1 mi = 5280 ft) Round your answer to the nearest foot.

$$4 \cdot \cos 5^\circ = \frac{h}{5280} \cdot 4$$

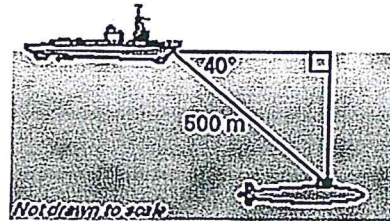
$$4 \cdot \cos 5^\circ = \dots$$



11. Submarine A sonar operator on a ship detects a submarine at a distance of 500 meters and an angle of depression of  $40^\circ$ . How deep is the submarine?

$$\sin 40^\circ = \frac{x}{500}$$

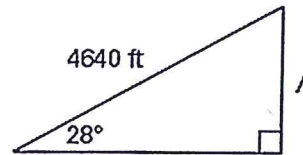
$$500 \cdot \sin 40^\circ = x$$



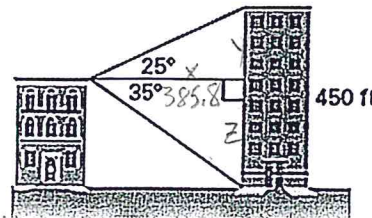
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$$\sin 28^\circ = \frac{h}{4640}$$

$$4640 \cdot \sin 28^\circ =$$



13. Height of a Building A 450 foot tall building is near a shorter building. A person on top of the shorter building finds the angle of elevation of the roof of the taller building to be  $25^\circ$  and the angle of depression of its base to be  $35^\circ$ . How far apart are the two buildings to the nearest foot? How tall is the shorter building to the nearest foot?



$\rightarrow 385.8 \text{ ft}$

$\rightarrow 385.764 \cdot \tan 35^\circ = 270.1 \text{ ft}$

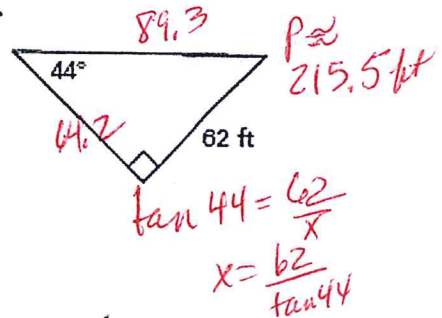
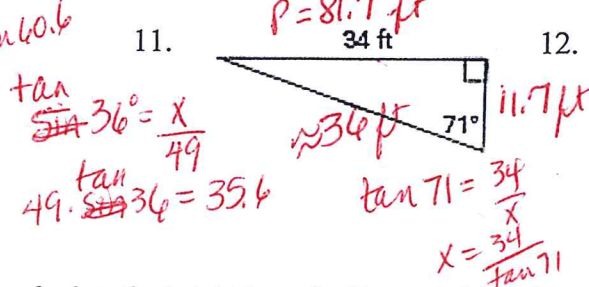
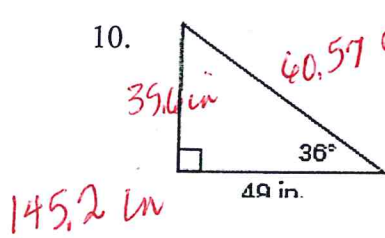
$$\tan 25^\circ = \frac{y}{x} \quad y = x \tan 25^\circ$$

$$\tan 35^\circ = \frac{z}{x} \quad z = x \tan 35^\circ$$

$$x \tan 25^\circ + x \tan 35^\circ = 450$$

$$x(\tan 25^\circ + \tan 35^\circ) = 450$$

Find the perimeter of the triangle. Round to the nearest tenth.



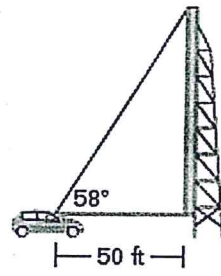
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- a.  $\theta = 77^\circ$   $\tan 77 = \frac{h}{100} \cdot h = 433 \text{ ft}$
- b.  $\theta = 81^\circ$   $h = 631 \text{ ft}$
- c.  $\theta = 83^\circ$   $h = 814 \text{ ft}$

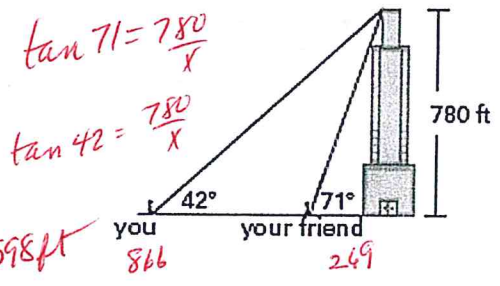


14. **Drive-in Movie** You are 50 feet from the screen at a drive-in movie. Your eye is on a horizontal line with the bottom of the screen and the angle of elevation to the top of the screen is  $58^\circ$ . How tall is the screen?

Handwritten:  $\tan 58 = \frac{x}{50} \quad x \approx 80 \text{ ft}$



15. **Skyscraper** You are a block away from a skyscraper that is 780 feet tall. Your friend is between the skyscraper and yourself. The angle of elevation from your position to the top of the skyscraper is  $42^\circ$ . The angle of elevation from your friend's position to the top of the skyscraper is  $71^\circ$ . To the nearest foot, how far are you from your friend?



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