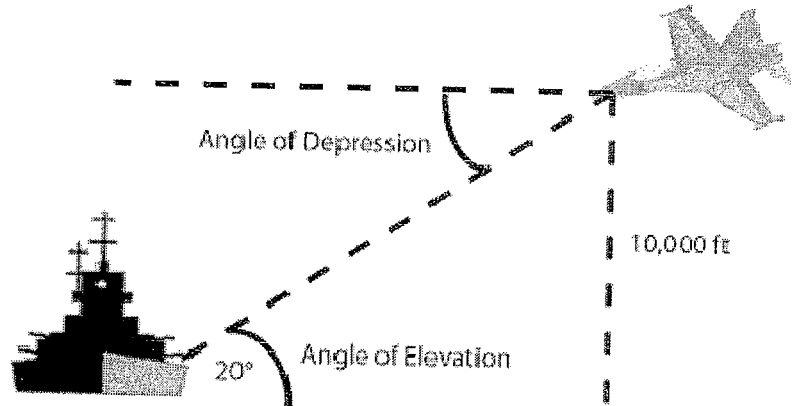
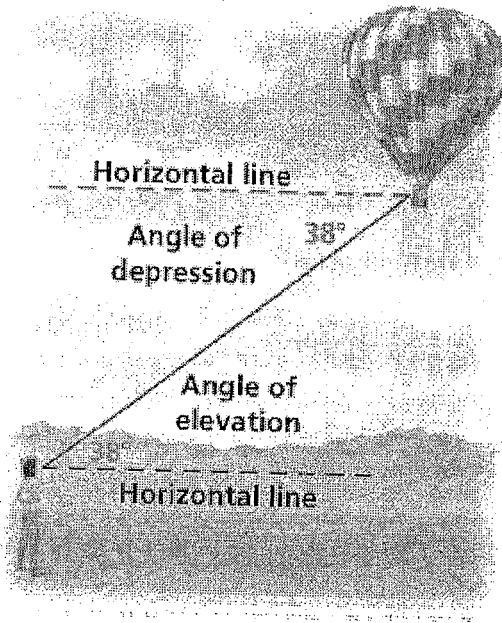
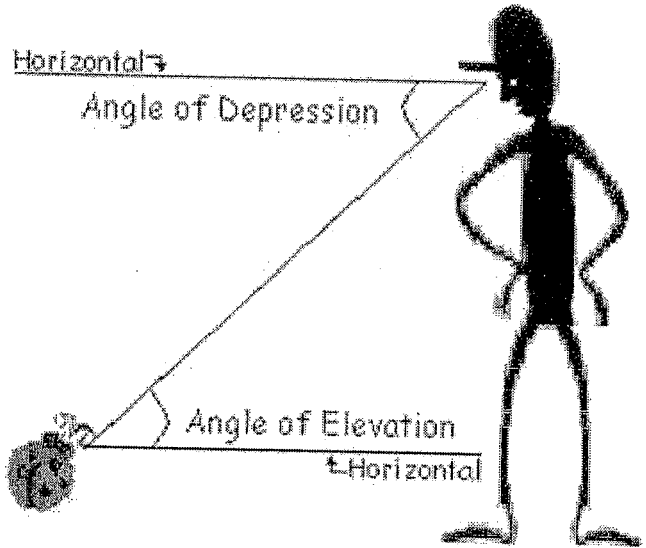
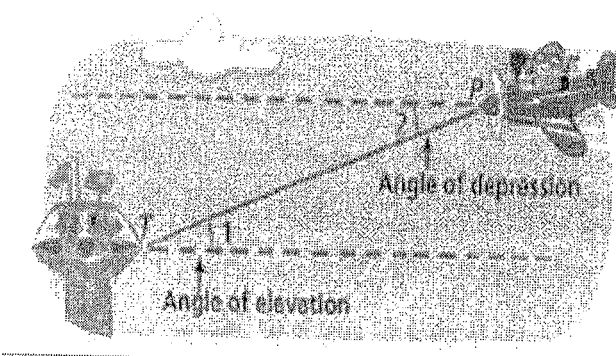


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Right Triangle Trigonometry and Pythagorean Theorem

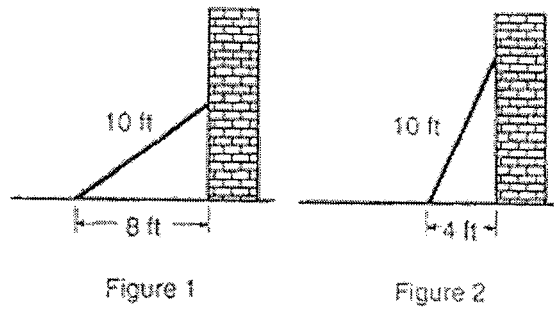


1. A building is 50 feet high. At a distance away from the building, an observer notices that the angle of elevation to the top of the building is 41 degrees. How far away from the base of the building is the observer?

2. An airplane is flying at a height of 2 miles above the ground. The distance along the ground from the airplane to the airport is 5 miles. What is the angle of depression from the airplane to the airport?

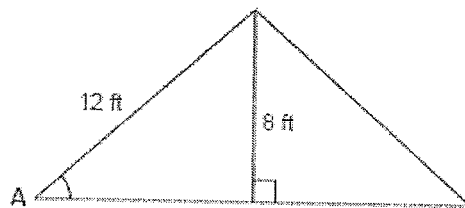
3. A bird sits on top of a lamppost. The angle of depression from the bird to the feet of an observer standing away from the lamppost is 35 degrees. The distance from the bird to the observer is 25 meters. How tall is the lamppost?

4. A 10-foot ladder is placed against the side of a building as shown in figure 1 below. The bottom of the ladder is 8 feet from the base of the building. In order to increase the reach of the ladder against the building, it is moved 4 feet closer to the base of the building as shown in figure 2.



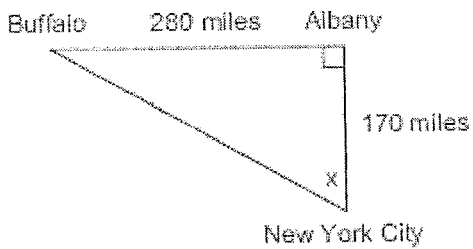
To the *nearest foot*, how much further up the building does the ladder now reach? Show how you arrived at your answer.

5. The center pole of a tent is 8 feet long, and a side of the tent is 12 feet long as shown in the diagram below.



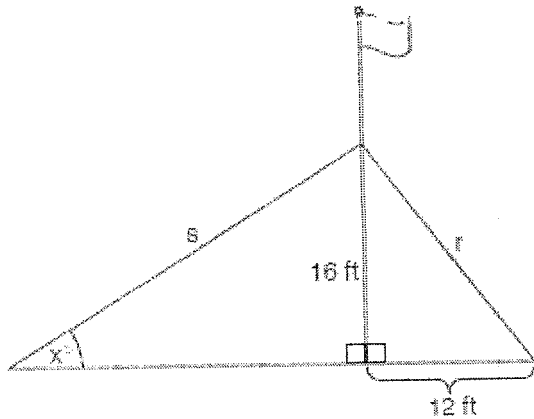
If a right angle is formed where the center pole meets the ground, what is the measure of angle A to the *nearest degree*?

6. As seen in the accompanying diagram, a person can travel from New York City to Buffalo by going north 170 miles to Albany and then west 280 miles to Buffalo.



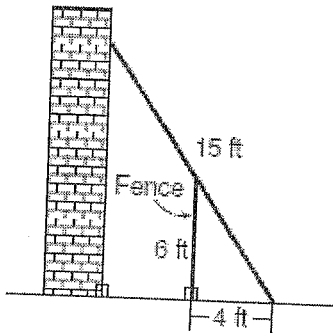
If an engineer wants to design a highway to connect New York City directly to Buffalo, at what angle, x , would she need to build the highway? Find the angle to the *nearest degree*. To the *nearest mile*, how many miles would be saved by traveling directly from New York City to Buffalo rather than by traveling first to Albany and then to Buffalo?

7. The accompanying diagram shows a flagpole that stands on level ground. Two cables, r and s , are attached to the pole at a point 16 feet above the ground. The combined length of the two cables is 50 feet. If cable r is attached to the ground 12 feet from the base of the pole, what is the measure of the angle, x , to the *nearest degree*, that cable s makes with the ground?



8. In right triangle ABC , $m\angle C = 90$, $AC = 7$, and $AB = 13$. What is the length of \overline{BC} ?

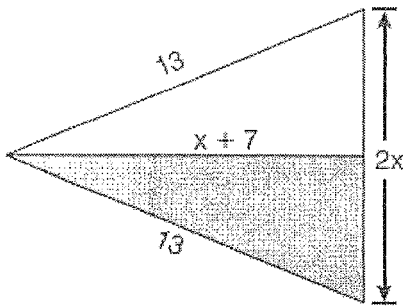
9. In the accompanying diagram, the base of a 15-foot ladder rests on the ground 4 feet from a 6-foot fence.



A. If the ladder touches the top of the fence and the side of a building, what angle, to the nearest degree, does the ladder make with the ground?

B. Using the angle found in part A, determine how far the top of the ladder reaches up the side of the building, to the nearest foot.

10. The diagram below shows a pennant in the shape of an isosceles triangle. The equal sides each measure 13, the altitude is $x + 7$, and the base is $2x$. What is the length of the base?

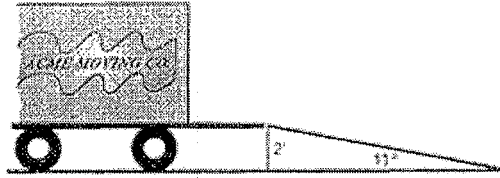


11. If a tree 28 meters tall casts a shadow 32 meters long, what is the angle of elevation of the Sun to the nearest degree?

12. A 28-foot ladder is leaning against a house. The bottom of the ladder is 6 feet from the base of the house. Find the measure of the angle formed by the ladder and the ground, to the *nearest degree*.

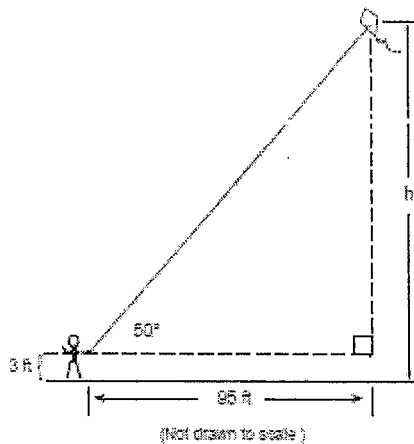
13. A man standing on level ground is 1000 feet away from the base of a 350-foot-tall building. Find, to the *nearest degree*, the measure of the angle of elevation to the top of the building from the point on the ground where the man is standing.

14. The tailgate of a truck is 2 feet above the ground. The incline of a ramp used for loading the truck is 11° , as shown below.

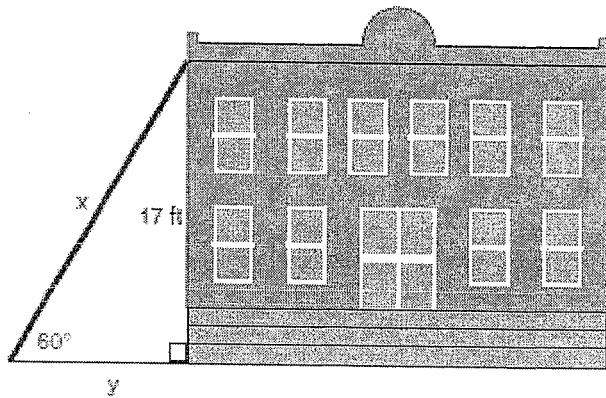


Find, to the *nearest tenth of a foot*, the length of the ramp.

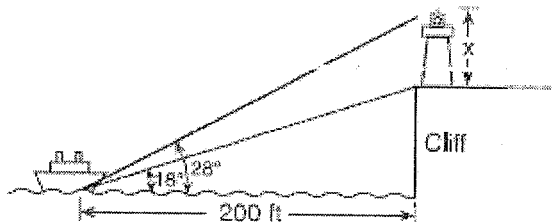
15. Joe is holding his kite string 3 feet above the ground, as shown in the accompanying diagram. The distance between his hand and a point directly under the kite is 95 feet. If the angle of elevation to the kite is 50° , find the height, h , of his kite, to the *nearest foot*.



16. In the accompanying diagram, x represents the length of a ladder that is leaning against a wall of a building, and y represents the distance from the foot of the ladder to the base of the wall. The ladder makes a 60° angle with the ground and reaches a point on the wall 17 feet above the ground. Find the number of feet in x and y .

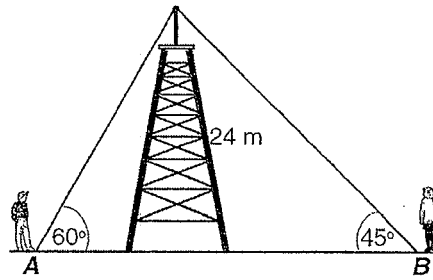


17. A lighthouse is built on the edge of a cliff near the ocean, as shown in the accompanying diagram. From a boat located 200 feet from the base of the cliff, the angle of elevation to the top of the cliff is 18° and the angle of elevation to the top of the lighthouse is 28° . What is the height of the lighthouse, x , to the nearest tenth of a foot?



18.

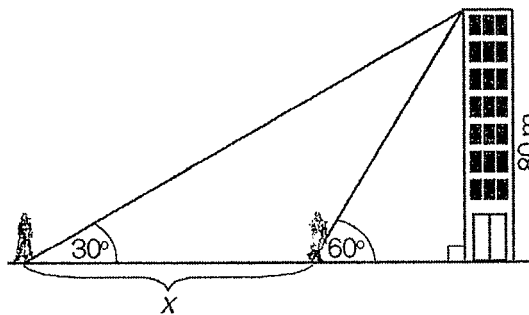
Amos and Ben stand on opposite sides of a radio tower 24 m tall. The angle of elevation from Amos to the top of the tower is 60° , and from Ben it is 45° .



What is the distance between Amos and Ben to the nearest tenth of a meter?

19.

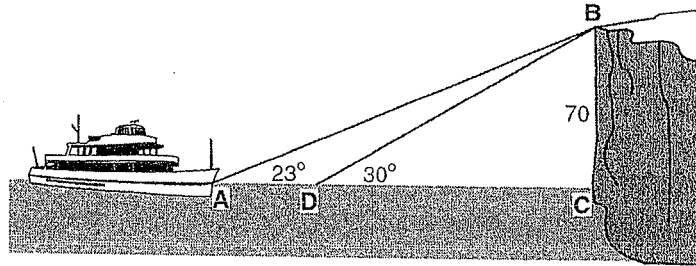
Jiang and Karl are standing some distance apart on the same side of a building 80 m tall. From where Jiang stands, the angle of elevation of the top of the building is 30° . From where Karl stands, the angle is 60° .



What is the distance x between Jiang and Karl to the nearest tenth of a meter?

20.

As shown in the accompanying diagram, a ship is headed directly toward a coastline formed by a vertical cliff \overline{BC} , 70 meters high. At point A , the angle of elevation from the ship to B , the top of the cliff, is 23° . A few minutes later at point D , the angle of elevation increased to 30° .



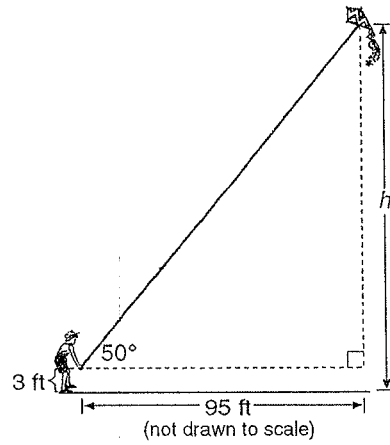
(a) To the nearest meter, find:

- (1) DC
- (2) AC
- (3) AB

(b) To the nearest meter, what is the distance between the ship's positions at the two sightings?

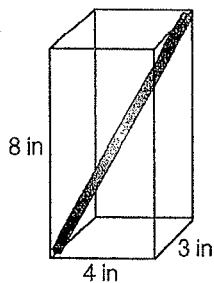
21.

Joe is holding his kite string 3 feet above the ground, as shown in the accompanying diagram. The distance between his hand and a point directly under the kite is 95 feet.



If the angle of elevation to the kite is 50° , find the height, h , of his kite above the ground, to the nearest foot.

A straw is placed into a rectangular box that is 3 inches by 4 inches by 8 inches, as shown in the accompanying diagram.



If the straw fits exactly into the box diagonally from the bottom left front corner to the top right back corner, how long is the straw, to the nearest tenth of an inch? [*Show all work.*]

28. You are building a model sailboat. The mast, see diagram below, will have two inches of height below the base of the main sail. You want the base of the sail to have a length of 12 inches. If you require the angle S in the sail to be 46 degrees, what will be the height of the mast to the nearest tenth inch?

