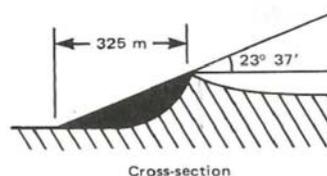
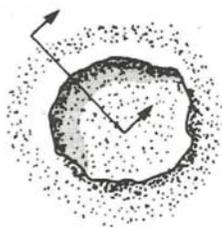
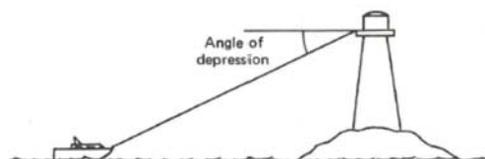


Right Triangle and Law of Triangles Word Problems

- You lean a ladder 6.7 meters long against the wall. It makes an angle of 63° with the level ground. How high up is the top of the ladder?
- One of the tallest freestanding structure in the world is the 553-meter tall CN Tower in Toronto, Ontario. Suppose that at a certain time of day it casts a shadow 1100 meters long on the ground. What is the angle of elevation of the sun at that time of day?
- Scientists estimate the heights of features on the moon by measuring the lengths of the shadows they cast on the moon's surface. From a photograph, you find that the shadow cast on the inside of a crater by its rim is 325 meters long. At the time the photograph was taken, the sun's angle of elevation from this place on the moon's surface was $23^\circ 37'$. How high does the rim rise above the inside of the crater?

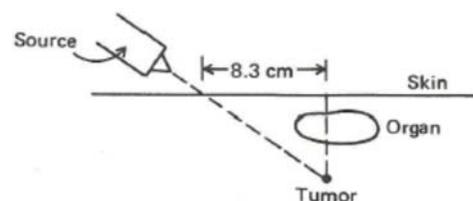


- An observer 80 feet above the surface of the water measures an angle of depression of $0^\circ 42'$ to a distant ship. How many miles is the ship from the base of the lighthouse? (A mile is 5280 feet.)



- Commercial airliners fly at an altitude of about 10 kilometers. They start descending toward the airport when they are far away, so that they will not have to dive at a steep angle.
 - If the pilot wants the plane's path to make an angle of 3° with the ground, at what horizontal distance from the airport must he start descending?
 - If he starts descending a ground distance of 300 kilometers from the airport, what angle will the plane's path make with the horizontal?

- A beam of gamma rays is to be used to treat a tumor known to be 5.7 centimeters beneath the patient's skin. To avoid damaging a vital organ, the radiologist moves the source over 8.3 centimeters.
 - At what angle to the patient's skin must the radiologist aim the gamma ray source to hit the tumor?
 - How far will the beam have to travel through the patient's body before reaching the tumor?

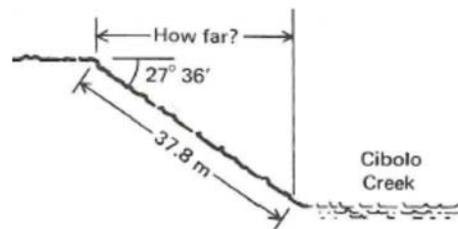


- A block bordering Market Street is a right triangle. You start walking around the block, taking 125 paces on Market Street and 102 paces on Pine Street.
 - At what angle do Pine and Market Streets intersect?
 - How many paces must you take on Front Street to complete the trip?



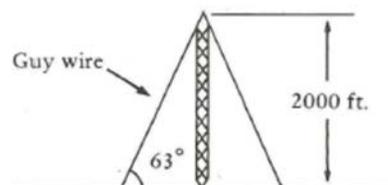
1. 5.970 m	3. 142.102 m	5. a. 190.811 km b. 1.909°	7. a. 35.313°
2. 26.68°	4. 6547.763 ft or 1.24 miles	6. a. 34.479° b. 10.068 cm	b. 72.256 paces

8. When surveyors measure land that slopes significantly, the distance which is measured will be *longer* than the *horizontal* distance which must be drawn on the map. Suppose that the distance from the top edge of the Cibolo Creek bed to the edge of the water is 37.8 meters. The land slopes downward at $27^{\circ}36'$ to the horizontal.



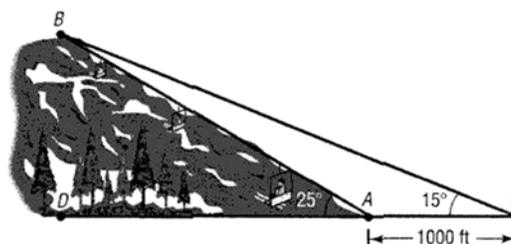
- What is the horizontal distance from the top of the bank to the edge of the creek?
- How far is the surface of the creek below the level of the surrounding land?

9. A 2000 foot high television transmitting tower is to be supported by guy wires running from the ground to the top. The wires must make an angle of 63° with the ground.

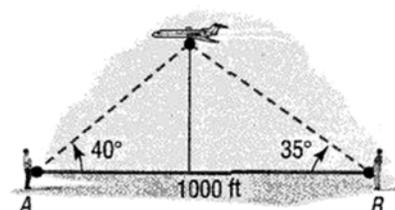


- How long will each wire be?
- How far from the base of the tower must the wires be anchored in the ground?

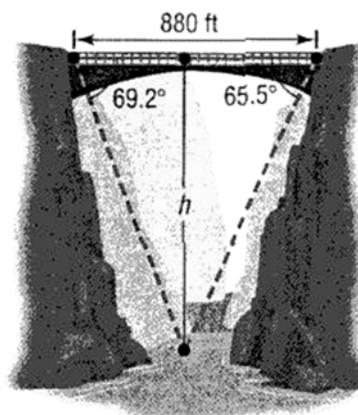
10. Consult the figure. To find the length of the span of a proposed ski lift from A to B, a surveyor measures the angle DAB to be 25° and then walks off a distance of 1000 feet to C and measures the angle ACB to be 15° . What is the distance from A to B?



11. An aircraft is spotted by two observers who are 1000 feet apart. As the airplane passes over the line joining them, each observer takes a sighting of the angle of elevation to the plane, as indicated in the figure. How high is the airplane?



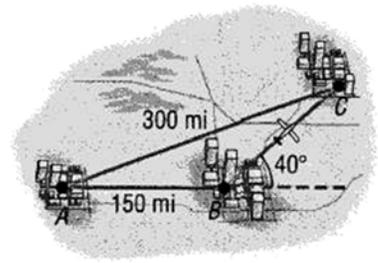
12. The highest bridge in the world is the bridge over the Royal Gorge of the Arkansas River in Colorado. Sightings to the same point at water level directly under the bridge are taken from each side of the 880-foot-long bridge, as indicated in the figure. How high is the bridge?



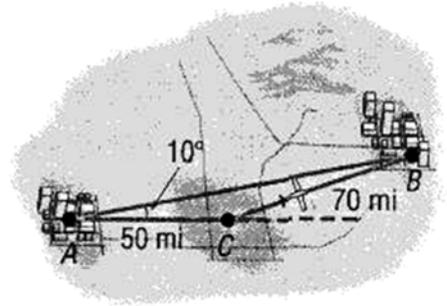
8.	a. 33.498 m	b. 17.512 m	10.	1490.48 ft	11.	381.69 ft
9.	a. 2244.652 ft	b. 1019.051 ft			12.	1053.15 ft

13. An airplane flies from city A to city B, a distance of 150 miles, and then turns through an angle of 40° and heads toward city C, as shown in the figure.

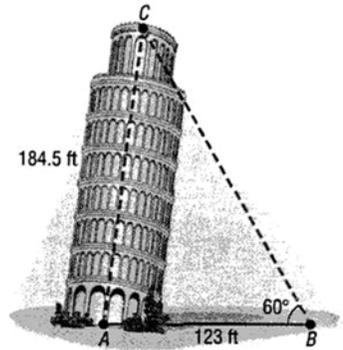
- (a) If the distance between cities A and C is 300 miles, how far is it from city B to city C?
 (b) Through what angle should the pilot turn at city C to return to city A?



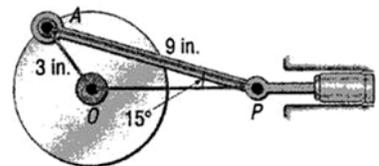
14. In attempting to fly from city A to city B, an aircraft followed a course that was 10° in error, as indicated in the figure. After flying a distance of 50 miles, the pilot corrected the course by turning at point C and flying 70 miles farther. If the constant speed of the aircraft was 250 miles per hour, how much time was lost due to the error?



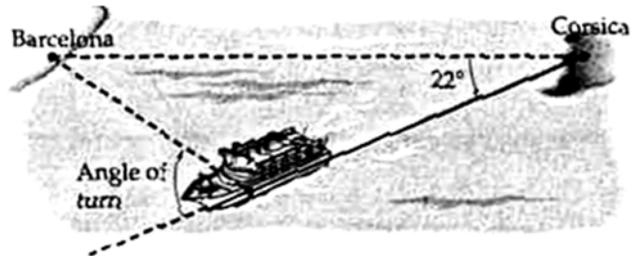
15. The famous Leaning Tower of Pisa was originally 184.5 feet high. At a distance of 123 feet from the base of the tower, the angle of elevation to the top of the tower is found to be 60° . Find the angle CAB indicated in the figure. Also, find the perpendicular distance from C to AB.



16. On a certain automobile, the crankshaft is 3 inches long and the connecting rod is 9 inches long (see the figure). At the time when the angle OPA is 15° , how far is the piston (P) from the center (O) of the crankshaft?

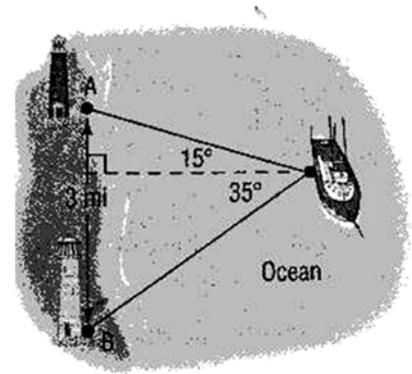


17. A ship is traveling at 18 miles per hour from Corsica to Barcelona, a distance of 350 miles. To avoid bad weather, the ship leaves Corsica on a route 22° south of the direct route (see the figure below). After 7 hours the bad weather has been bypassed. Through what angle should the ship now turn to head directly to Barcelona?

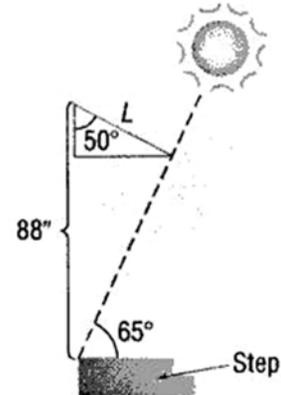


13. a. 169.18 mi 14. 18.7 sec	b. 161.3°	15. $84.7^\circ, 183.72$ ft	16. 6.8 or 10.58 in 17. 33.4°
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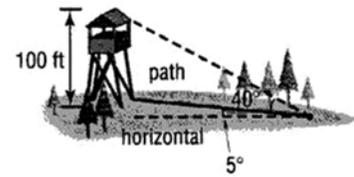
18. The navigator of a ship at sea spots two lighthouses that she knows to be 3 miles apart along a straight seashore. She determines that the angles formed between two line-of-sight observations of the lighthouses and the line from the ship directly to shore are 15° and 35° . See the illustration.
- (a) How far is the ship from lighthouse A?
 (b) How far is the ship from lighthouse B?
 (c) How far is the ship from shore?



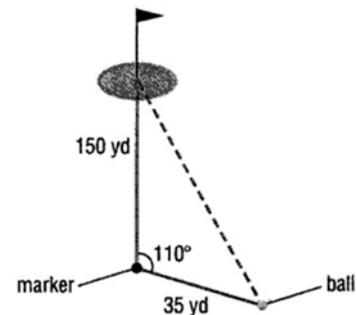
19. An awning that covers a sliding glass door that is 88 inches tall forms an angle of 50° with the wall. The purpose of the awning is to prevent sunlight from entering the house when the angle of elevation of the sun is more than 65° . See the figure. Find the length L of the awning.



20. A forest ranger is walking on a path inclined at 5° to the horizontal directly toward a 100-foot-tall fire observation tower. The angle of elevation from the path to the top of the tower is 40° . How far is the ranger from the tower at this time?



21. A straight tunnel is to be dug through a hill. Two people stand on opposite sides of the hill where the tunnel entrances are to be located. Both can see a stake located 530 meters from the first person and 755 meters from the second. The angle determined by the two people and the stake (the vertex) is 77° . How long must the tunnel be?
22. A golfer hits an errant tee shot that lands in the rough. A marker in the center of the fairway is 150 yards from the center of the green. While standing on the marker and facing the green, the golfer turns 110° toward his ball. He then paces off 35 yards to his ball. How far is the ball from the center of the green?



18. a. 3.21 mi b. 3.78 mi c. 3.10 mi	19. 38.5 in 20. 110.01 ft	21. 819.08 m 22. 165 yd
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