

Name \_\_\_\_\_ Date \_\_\_\_\_ Period \_\_\_\_\_

**Worksheet 5.8—Problem Solving With Trig**

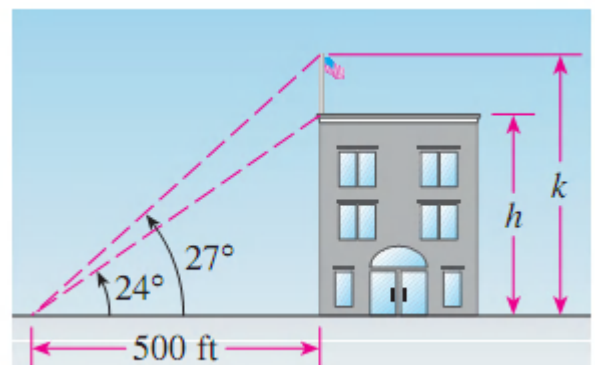
Show all work on a separate sheet of paper. Calculator permitted. Report three decimals and units in all final answers.

**Multiple Choice**

1. To get a rough idea of the height of a building, Bartholomew paces off 50 feet from the base of a building, then measures the angle of elevation from the ground to the top of the building at that point to be  $58^\circ$ . About how tall is the building, in feet?  
(A) 31      (B) 42      (C) 59      (D) 80      (E) 417
2. A boat leaves harbor and travels at 20 knots heading due east. After two hours, it changes course to a bearing of  $150^\circ$  and continues at the same speed for another hour. After the entire 3-hour trip, how far, in nautical miles, is the boat from the harbor?  
(A) 50      (B) 53      (C) 57      (D) 60      (E) 67
3. A 20-foot ladder makes an angle of  $62^\circ$  with the ground as it leans against a wall. How far up the wall does the ladder reach (in feet)?  
(A) 22.65      (B) 17.66      (C) 9.39      (D) 37.67      (E) 14.45
4. At a distance of 34 feet from the base of a flag pole, the angle of elevation to the top of a flag that is 5.1 feet tall is  $48.6^\circ$ . The angle of elevation to the bottom of the flag is  $44.6^\circ$ . The pole extends 1 foot above the flag. Find the height of the pole, in feet.  
(A) 38.6      (B) 33.9      (C) 34.9      (D) 36.9      (E) 39.6
5. An airplane is flying east at a constant altitude of 30,500 meters. When first seen to the east of an ambitious precal student with a homemade sextant, the angle of elevation to the airplane is  $63.6^\circ$ . After 33 seconds, the angle of elevation is  $56.1^\circ$ . Find the approximate speed of the airplane, in meters per second.  
(A) 162      (B) 158      (C) 379      (D) 392      (E) 247

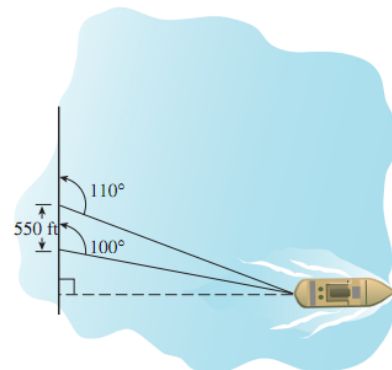
**Short Answer**

6. A hot-air balloon is floating above a straight road. To estimate their height above the ground, the balloonists simultaneously measure the angle of depression to two consecutive mileposts on the road on the same side of the balloon. The angles of depression are found to be  $20^\circ$  and  $22^\circ$ . How high is the balloon?
7. From a point on the ground 500 feet from the base of a building, an observer finds that the angle of elevation to the top of the building is  $24^\circ$  and that the angle of elevation to the top of the flagpole atop the building is  $27^\circ$  (as shown in the picture). Find the height of the building and the length of the flagpole.

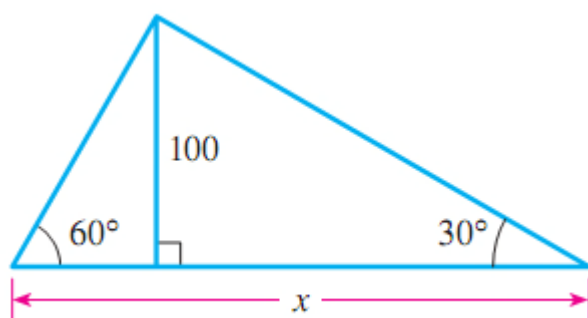


8. The angle of elevation to the top of an antenna mounted on top of the Eiffel Tower in Paris is measured to be  $80^{\circ}1'12''$  at a point 185 feet from the base of the tower. How tall is the tower plus the antenna?
9. The Coast Guard cutter ship *Precalculus* travels at 30 knots from its home port at Camp Comal on a course of  $95^{\circ}$  for 2 hours and then changes to a course of  $185^{\circ}$  for 2 hours. Find the distance and the bearing the cutter ship must travel to return to Camp Comal.

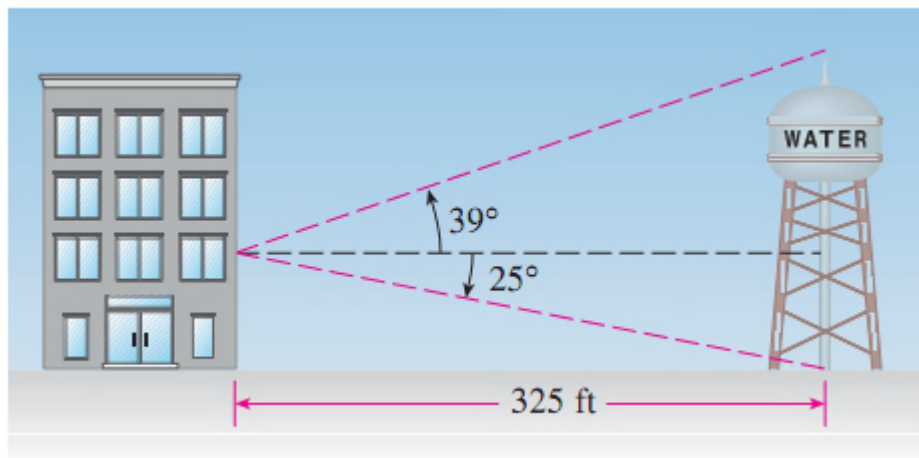
10. A shoreline runs north-south, and a boat is due east of the shoreline. The bearings of the boat from two points on the shore are  $110^{\circ}$  and  $100^{\circ}$ . Assume the two points are 550 feet apart (as shown in the picture at right). How far is the boat from the shore?



11. Solve for  $x$  correct to three decimal places.



12. A water tower is located 325 feet from a building (as show in the picture). From a window in the building, an ambitious precal student with his homemade sextant observes that the angle of elevation to the top of the tower is  $39^{\circ}$  and that the angle of depression to the bottom of the tower is  $25^{\circ}$ . How tall is the tower? How high is the window? What's the name of the student?



13. A 96-foot tree casts a 120 foot long shadow. What is the angle of elevation of the sun?

14. The **Great Trigonometric Survey**, begun in India on April 10, 1802, was a project of the Survey of India throughout most of the 19th century. It was piloted in its initial stages by William Lambton, and later by George Everest and Thomas Montgomerie. Among the many accomplishments of the Survey were the demarcation of the British territories in India and the measurement of the height of the Himalayan and Karakoram giants: Everest and K2.



*T. Montgomerie L.S. Esq.*

*Thomas Montgomerie's original 1856 sketch of K2 and K1. Notice that K1 (now called "Masherbrum") on the right is drawn larger than the actually-taller K2. How can this be?*

At some distance away, at an elevation of 15,072 feet above sea level, Thomas Montgomerie recorded an angle of elevation to the top of the 2<sup>nd</sup> peak he observed in the Karakoram range (K2) to be  $1.144^\circ$ . From the same elevation but 5 miles closer, he records the angle of elevation to the summit of K2 to be  $1.191^\circ$ . Based on his calculations, how high above sea level (in feet) is the summit of K2? If K2 is actually 28,251 feet tall, how far off was Montgomerie in his 1856 calculation? Did he over- or under-approximate K2's height? CAREFUL ON YOUR UNITS. I WOULD CONVERT MILES TO FEET IF I WERE YOU!

