

Section 5.7: More Word Problems Involving Trig.

Area of an Arbitrary Triangle: Given any triangle (not necessarily a right triangle), we can compute the area as long as we are given three bits of information: Side-Angle-Side. That is, given an angle θ formed by two line segments of length a and b , we have:

$$\text{AREA} = \frac{1}{2} \cdot a \cdot b \cdot \sin(\theta)$$

Note that this formula only works when you have a Side-Angle-Side setup. If the angle is in the wrong place, the formula will not work. Note also that it does not matter whether or not your angle is in degree or radian mode, just be careful to use the degree symbol when necessary.

Examples:

1. An obtuse triangle has interior angle 107° and its shorter two sides are lengths 15 and a . If the area of the triangle is 85, determine a .
2. A regular hexagon is inscribed in a circle of radius 15. Determine the area of the shaded region.
3. An equilateral triangle is inscribed in a circle of radius 19. Determine the area of the shaded region.
4. An equilateral arch is drawn about an equilateral triangle, having sides of length 9. For example, arc AC is a circular arc having center B. Calculate the area and perimeter of the equilateral arch.
5. A circle is inscribed in a regular octagon of side 12. Determine $m\angle AOB$, OA , and the area of the circle.
6. A ladder 24 feet long leans against the side of a building, and the angle between the ladder and the building is 25° .
 - (a) Approximate the distance from the bottom of the ladder to the building.
 - (b) If the distance from the bottom of the ladder to the building is increased by 2 feet, approximately how far does the top of the ladder move down the building?
7. A drawbridge is 100 feet long when stretched across a river. As shown in the figure, the two sections of the bridge can be rotated upward through an angle of $\theta = 34^\circ$.
 - (a) If the water level is 5 feet below the closed bridge, find the distance d between the end of a section and the water level when the bridge is fully open.
 - (b) Approximately how far apart are the ends of the two sections when the bridge is fully opened, as shown in the figure?
8. An airplane flying at an altitude of 40,000 feet passes directly over a fixed object on the ground. One minute later, the angle of depression of the object is 43° . Approximate the speed of the airplane to the nearest mile per hour.
9. From a point A that is 8.80 meters above level ground, the angle of elevation of the top of a building is 35° and the angle of depression of the base of the building is 18° . Approximate the height of the building.
10. From a point 23.3m above level ground a surveyor measures the angle of depression of an object on the ground as 50° . Determine the distance d in meters from the object to the point on the ground directly below the surveyor.
11. From a point on level ground, an observer measures the angle of elevation to the top of a hill to be 35° . He then walks away 400 meters directly away from the hill and measures the angle of elevation to now be 22° . Determine the height of the hill.

