Geometry Review Solutions

1. A triangle has sides that are each 8 m long. Find the area of the triangle.

   Solution:

   For this problem, we know the lengths of all of the sides of a triangle. The formula for finding the area of a triangle if we know the sides is $A = \sqrt{s(s-a)(s-b)(s-c)}$ where $s = \frac{1}{2}(a+b+c)$. For our particular problem a, b, and c are all 8. Thus we have $s = \frac{1}{2}(8+8+8) = 12$. So the area of the triangle is $A = \sqrt{12(12-8)(12-8)(12-8)} = 27.7128$ or 27.7128 square meters.

2. A cord of seasoned almond wood contains 128 cubic feet and costs $190. How much should you pay for a pile of wood that is 5 feet wide, 3 feet high and 8 feet long?

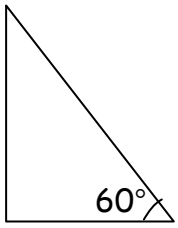
   Solution:

   Our first step here is to find out the volume of the pile of wood that we have. This stack of wood is in the shape of a rectangular solid (block). Thus we find the volume using the formula $V = lwh$. Our pile of wood has a volume of $V = 5*3*8 = 120$ or 120 cubic feet. In order to determine what we should pay for this pile of wood, we need to find out what fraction of a cord it is. We do this by dividing our volume of wood by the volume of a cord of wood. This will give us $\frac{120}{128} = .9375$. We now multiply this number by the price of a cord of wood to find out how much we should pay for our pile of wood. This gives us $.9375*190 = 178.125$. Thus we should pay $178.13 for our pile of wood.

3. In a right triangle having one angle of 60°, the length of the side adjacent to the 60°angle is 7 inches. What is the length of the hypotenuse?

   Solution:

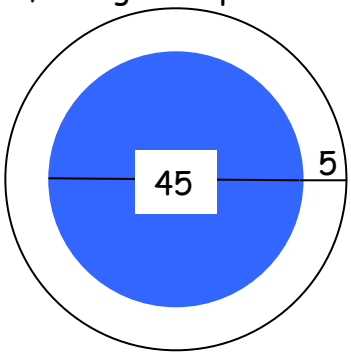
   This is a right triangle. We know that the sides of a right triangle are related by trigonometric functions. Our triangle here looks like



. We are being asked for the hypotenuse. In order to find this we will use the cosine function of the angle given. This will give us $\cos(60^\circ) = \frac{7}{\text{hypotenuse}}$. When we solve this equation, we get $\text{hypotenuse} = \frac{7}{\cos(60^\circ)} = 14$. The hypotenuse if 14 inches.

4. A circular swimming pool has a diameter of 45 feet and is surrounded by a concrete sidewalk that is 5 feet wide. What is the area of the sidewalk?

Solution:

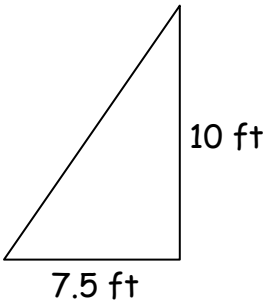
For this problem, it might help to draw a picture. This would look about like this 

. We want to first find the area of the bigger circle. We then need to find the area of the smaller circle. We will then subtract the area of the smaller circle from the area of the bigger circle. The radius of the smaller circle is $\frac{45}{2} = 22.5$. This will make the radius of the larger circle $22.5 + 5 = 27.5$. Thus the area of the larger circle was $A = \pi(27.5)^2 = 2375.8294$. For the smaller circle, the area is $A = \pi(22.5)^2 = 1590.4313$. Now we subtract the area of the smaller circle from the area of the larger circle to get the area of just the sidewalk $2375.8294 - 1590.4313 = 785.398$. Thus the area of the sidewalks is 785.398 square feet.

5. A ladder is leaning against a building. If the bottom of the ladder is $7\frac{1}{2}$ feet from the wall and the top of the ladder is 10 feet above the ground, how long is the ladder?

Solution:

The picture for this problem will look like a right triangle



. We can use the Pythagorean Theorem to find the length of the ladder (hypotenuse of the triangle). We will get $ladder^2 = 7.5^2 + 10^2$. When we simplify this we get $ladder^2 = 156.25$. Finally we have $ladder = 12.5$. The ladder is 12.5 feet long.

6. Ron Thiele bought an older house and wants to put in a new concrete driveway. The driveway will be 36 feet long, 9 feet wide, and 6 inches thick. Concrete is measured by the cubic yard. One sack of dry cement mix costs $7.30, and it takes four sacks to mix up 1 cubic yard of concrete. How much will it cost Ron to buy the cement?

Solution:

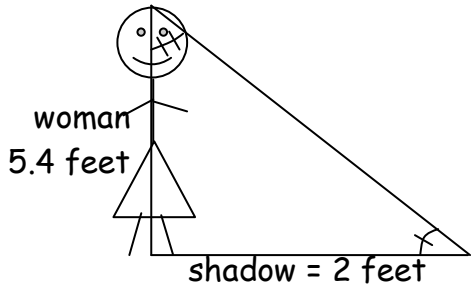
For this problem we need to find the volume of concrete that will be needed for the driveway. Since concrete is measured by the cubic yard, it will be easiest to change all the driveway measurements into yards before calculating. The length of the driveway in yards is $36\,\textbf{feet} = \frac{36}{3}\,\textbf{yards} = 12\,\textbf{yards}$. The width of the driveway in yards is $9\,\textbf{feet} = \frac{9}{3}\,\textbf{yards} = 3\,\textbf{yards}$. The thickness of the driveway in yards is $6\,\textbf{inches} = \frac{6}{36}\,\textbf{yard} = \frac{1}{6}\,\textbf{yard}$. The volume (number of cubic yards) of the driveway is $V = 12 * 3 * \frac{1}{6} = 6$. We need to use 4 bags of concrete for each cubic yard. Thus we need 24 bags (**number of bags needed** $= 6 * 4$) of concrete. Since each bag of concrete costs $7.30, we need to multiply the number of bags needed

by the price per bag to find out how must the driveway will cost. Thus the cost is 7.30 * 24 = $175.20

7. A 5.4-foot-tall woman casts a shadow of 2 feet at the same instant that a telephone pole casts a shadow of 9 feet. How tall is the pole?

Solution:

This problem requires the use of similar triangles. The two triangle will look like



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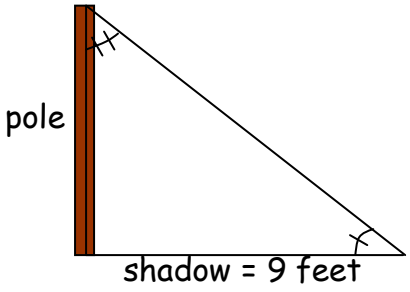

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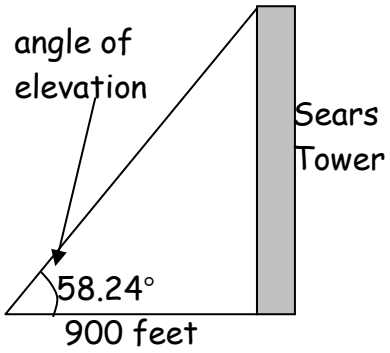
We now need to form the ratios to be able to find the length of the pole. These ratios will be $\frac{9}{2} = \frac{pole}{5.4}$. When we solve this, we get $(5.4)\frac{9}{2} = pole$. Thus the telephone pole is 24.3 feet tall.

8. The Sears Tower (in Chicago – now known as the Willis Tower) is the tallest building in the United States. From a point 900 feet from the building, you measure the angle of elevation of the top of the building. If the angle is 58.24°, how tall (to the nearest foot) is the Sears Tower?

Solution:

For this problem, we will again make use of a right triangle and use a trigonometric function. The picture for this problem looks like



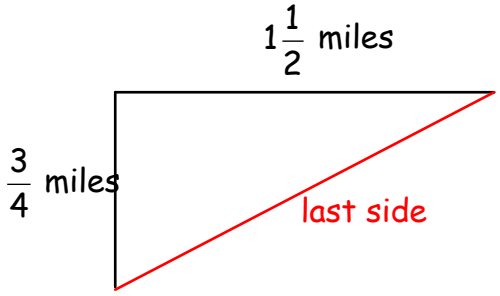
The height of the building can be found using the ratio of the building divided by the distance from the building which we know is equal to

the tangent of the angle of elevation. Thus we have $\tan(58.24^\circ) = \frac{\textbf{building height}}{900}$. The Sears Tower is 1453.82 feet. When we round to the nearest foot, we get 1454 feet.

9. You jog $\frac{3}{4}$ mile due north, then jog $1\frac{1}{2}$ miles due east, and then return to your starting point via a straight line path. How many miles have your jogged?

Solution:

For this problem a picture will be helpful.



We need to find the lengths of all of the sides of the triangle that was jogged. We can find the last side using the Pythagorean Theorem. This will look like $(\textbf{last side})^2 = \left(\frac{3}{4}\right)^2 + \left(1\frac{1}{2}\right)^2$. The last side is equal to 1.677 miles. We now add together all the sides of the triangle jogged to get .75 + 1.5 + 1.677 = 3.927 total miles jogged.