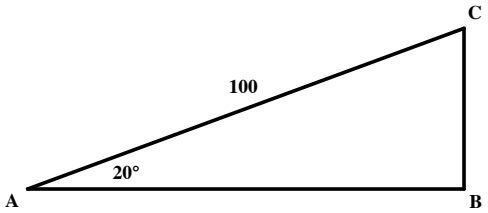
Algebra 2/Pre-Calculus

Name_____

Introduction (Day 1, Right Triangle Trigonometry)

In this problem set, we will explore right triangle trigonometry. Many of the ideas in this assignment will be familiar from previous classes. As you work, think carefully about *what the ideas mean* as well as how to do the problems.

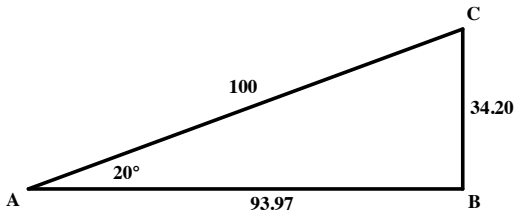
1. Here's a picture of a right triangle. It is drawn to scale.



a. Without using your calculator, estimate the lengths of sides *AB* and *BC*. (Don't do any calculations. Just make your best guess based on how it looks.)

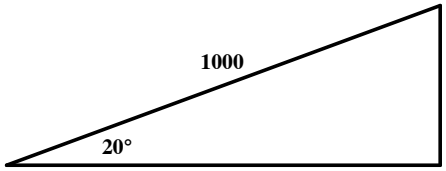
b. In turns out that the length of *AB* is almost exactly 93.97. (How close was your estimate?) Using this piece of information, find the length of *BC*.

2. The Pythagorean theorem tells us that the length of *BC* is 34.20.

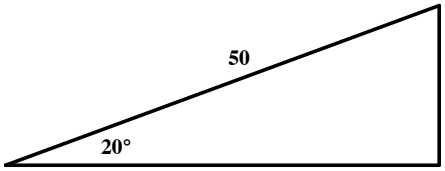


Use the information about this triangle to find the missing sides for each of the following triangles.

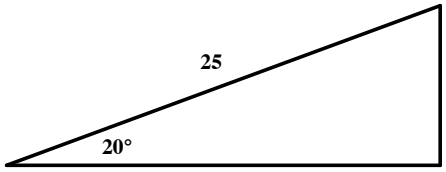
a.



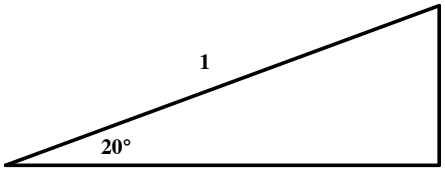
b.



c.



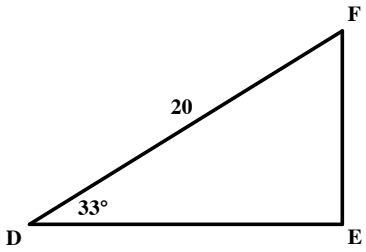
d.



Answers a. 939.7 and 342 b. 46.99 and 17.10 c. 23.49 and 8.55 d. 0.9397 and 0.342

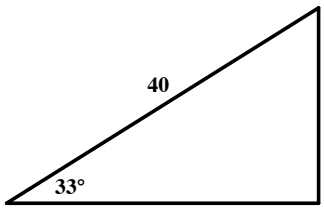
3. Here's a picture of another right triangle. It is drawn to scale.

a. Without using your calculator, estimate the lengths of sides *DE* and *EF*. (Again, just make your best guess based on how it looks.)

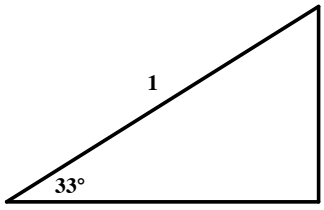


b. In turns out that the length of *EF* is almost exactly 10.89. (How close was your estimate?) Using this piece of information, find the length of *DE*.

c. Here's another triangle. Use the information about the last triangle to find the lengths of the sides for this triangle.

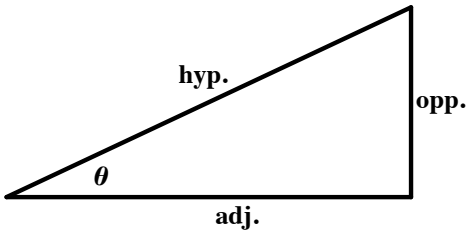


d. Another triangle. Find the lengths of the missing sides.



Some answers b. 16.78 c. 21.78 and 33.56 d. 0.5445 and 0.839

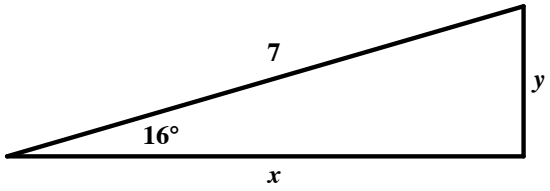
In the last few problems, we had to estimate to find the values of sides for the triangles. Fortunately, we can use the trigonometric functions on our calculators to do this more accurately. Here's a reminder of the definitions of sine, cosine, and tangent in a right triangle.



Definitions In a right triangle, we define sine, cosine, and tangent in the following way:

$$\cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}} \qquad \sin\theta = \frac{\text{opposite}}{\text{hypotenuse}} \qquad \tan\theta = \frac{\text{opposite}}{\text{adjacent}}$$

4. Here's a picture of a right triangle.



a. Using the trigonometric functions on your calculator, find the value of x. ***Reminder:*** Make sure your calculator is in degree mode.

b. Here's a way you could have found the value of x in part **a**:

$$\cos 16^\circ = \frac{x}{7}$$

$$0.961 = \frac{x}{7}$$

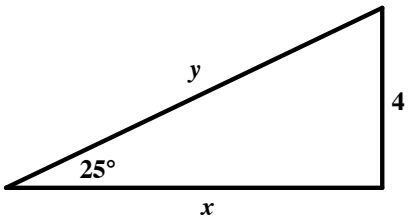
$$x = 6.729$$

Now use a similar strategy to find the value of y.

c. Use the Pythagorean theorem to check your answers to parts **a** and **b**.

Answers a. 6.729 b. 1.929 c. $6.729^2 + 1.929^2 = 7^2$

5. Here's a picture of a right triangle.



a. Using the trigonometric functions on your calculator, find the value of x.

b. Here's a way you could have found the value of x in part **a**:

$$\tan 25^\circ = \frac{4}{x}$$

$$0.466 = \frac{4}{x}$$

$$0.466x = 4$$

$$x = 8.578$$

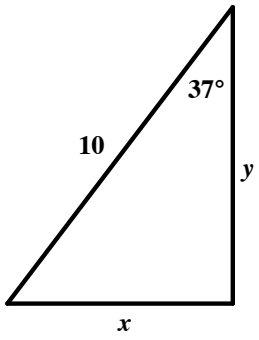
Now use a similar strategy to find the value of y.

c. You should have found that $y = 9.465$. Use the Pythagorean theorem to check your answers to parts **a** and **b**.

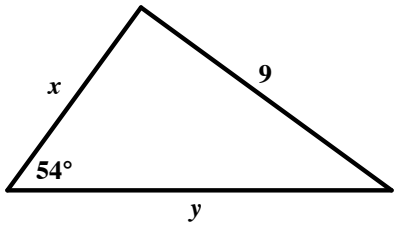
d. You should have found that $8.578^2 + 4^2 = 89.582$ and $9.465^2 = 89.586$. While these are very close, they're not exactly equal. Why not?

6. Find the values of the missing sides in each of the following right triangles. ***Note:*** Answers are provided at the end of this problem.

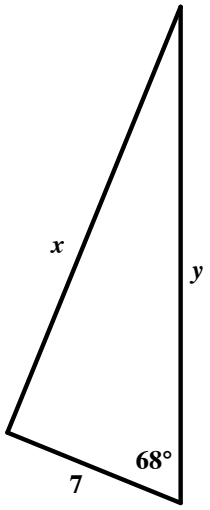
a.



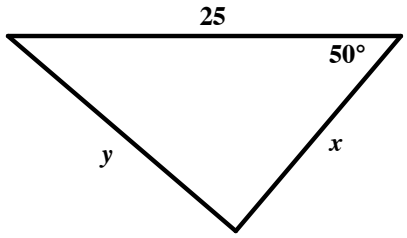
b.



c.



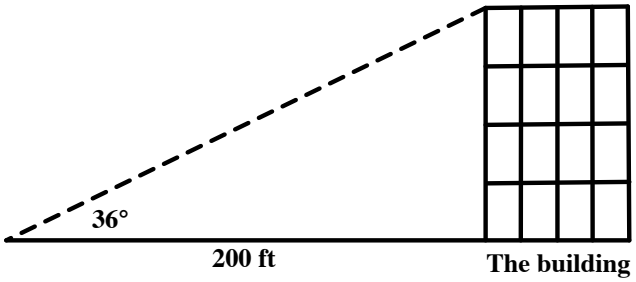
d.



Answers a. $x = 6.018$, $y = 7.986$ b. $x = 6.539$ and $y = 11.125$

c. $x = 17.326$ and $y = 18.686$ d. $x = 16.070$ and $y = 19.151$

7. Rykelle was trying to find the height of a tall building. She stood 200 feet from its base and found that the angle formed by the ground and the top of the building was 36° (as pictured below). What was the height of the building?

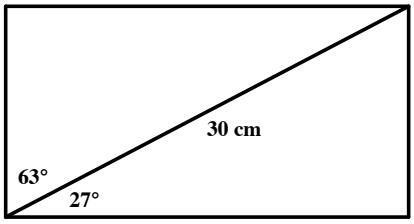


Answer The height of the building is 145.3 feet.

8. Omari was trying to find the height of another building. He stood 300 feet from the base of the building and found that the angle formed by the ground and the top of the building was 41°. Draw a picture of this situation. Then find the height of the building.

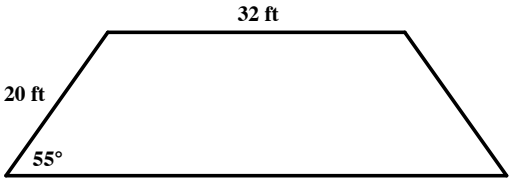
Answer The height of the building is 260.8 feet.

9. The rectangle below has a diagonal that is 30 cm long. Find the perimeter and area of the rectangle.



Answer The perimeter is 80.70 cm and the area is 364.1 cm^2 .

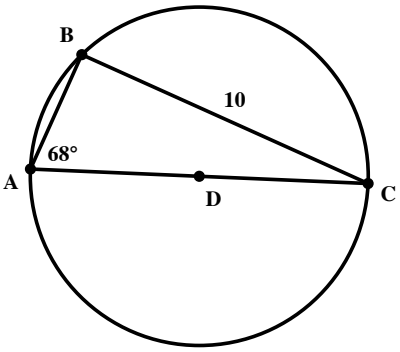
10. Find the area and perimeter of the isosceles trapezoid pictured below. ***Hint:*** Drawing some additional lines on the diagram is helpful!



Answer The perimeter is 126.9 ft and the area is 712 ft^2 .

11. Consider the circle pictured below.

a. Is $\angle ABC$ a right angle? Explain how you can tell.



b. Find the area of ΔABC.

c. Find the area of the circle. ***Hint:*** Start by finding the diameter.

d. Suppose a point in the circle is chosen at random. What is the probability that the point will also be in ΔABC?

Answers a. Since AC is a diameter, $\angle ABC$ must be a right angle. (This is a theorem from geometry) b. 20.20 c. 91.36 d. The probability is 0.221 (because $\frac{20.20}{91.36} = 0.221$)

12. Optional Challenge Problem Karuna was trying to find the height of a building. She found the angle formed by the ground and the top of the building was 62°. Then she walked back 50 feet and found that the angle formed by the ground and the top of the building was 39°. (See the diagram below, which is not drawn to scale.) What was the height of the building? ***Hint:*** There are two right triangles. Start by setting up a system of equations. (Two equations and two variables.) Then solve.