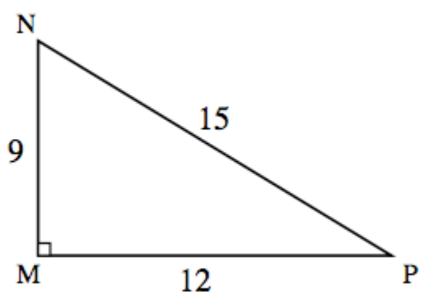
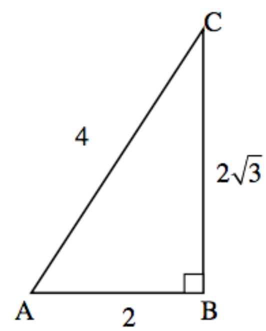
# Problem Set 6.1 | Unit 6 – Trigonometry

BIG PICTURE of this Unit

- How can we extend our geometry skills with triangles to go beyond right triangles to (i) obtuse triangles and (ii) circles and Cartesian Planes?
- What do triangles have to do with sinusoidal functions in the first place?
- How can we connect previously learned function concepts and skills to sinusoidal functions?
- How can use the equation of a sinusoidal function be used to analyze for key features of a graph of a sinusoidal curve?
- When and how can triangles and sinusoidal functions be used to model real world scenarios?

1. (CI) Use the triangles to find the given trigonometric ratios (express final answers as non-reduced fractions): {1}

<table>
<tr>
<td>(i) cos(N)<br>(ii) sin(N)<br>(iii) tan(N)<br>(iv) cos(P)<br>(v) sin(P)<br>(vi) tan(P)</td>
<td>
</td>
<td>(i) sin(C)<br>(ii) cos(C)<br>(iii) tan(C)<br>(iv) sin(A)<br>(v) cos(A)<br>(vi) tan(A)</td>
<td>
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2. (CA) Use your calculator to evalaute the following (make sure your calculator is set in "degree" mode) {1}

| | | | | | |
|---|---|---|---|---|---|
| (i) sin(40°) | (ii) cos(35°) | (iii) tan(70°) | (iv) sin(85°) | (v) cos(53°) | (vi) tan(11°) |
| (vii) $\sin^{-1}(0.75)$ | (viii) $\sin^{-1}(0.20)$ | (ix) $\cos^{-1}(0.6)$ | (x) $\cos^{-1}(1.2)$ | (xi) $\tan^{-1}(0.30)$ | (xii) $\tan^{-1}(1.75)$ |

3. Understanding Meanings

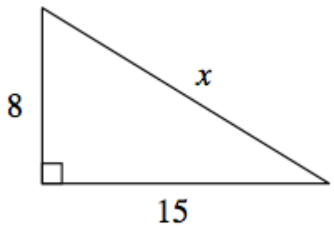
   a. You know that sin(20) = 0.342. If sine can be understood as a "function", explain what the input of 20 means and explain what the output of 0.342 means.

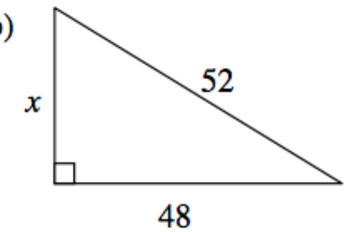
   b. You know that $\cos^{-1}(0.6) = 53.13$. If $\cos^{-1}$ can be understood as a "function", explain what the input of 0.6 means and explain what the output of 53.13 means.

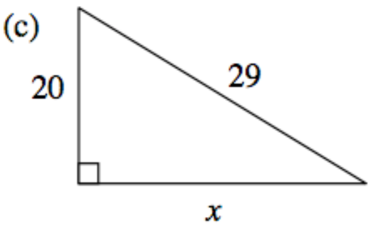
   c. Since you know that $\cos^{-1}(0.6) = 53.13$, use your calculator to evaluate cos(53.13). Now explain why $\cos^{-1}$ is referred to as "inverse cosine."

4. It is known that $\tan^{-1}\left(\frac{6}{9}\right) = 33.7$. Draw a diagram of a right triangle, wherein you label the sides and angles of the triangle, so that you demonstrate the **meaning** of the statement $\tan^{-1}\left(\frac{6}{9}\right) = 33.7$. {1}

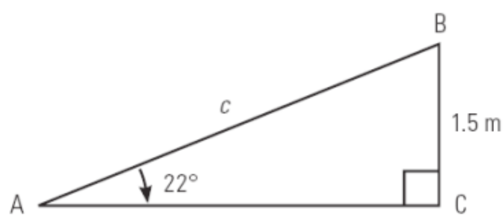
5. (CA) Find the value of *x* in the following diagrams. Round to the nearest *tenth* if necessary. {1,2}

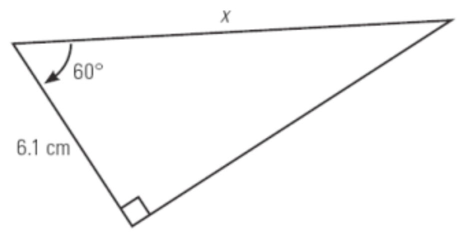
(a)


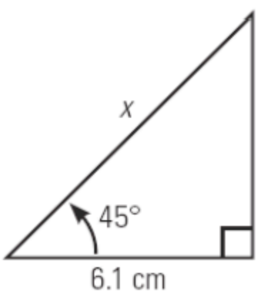

(b)


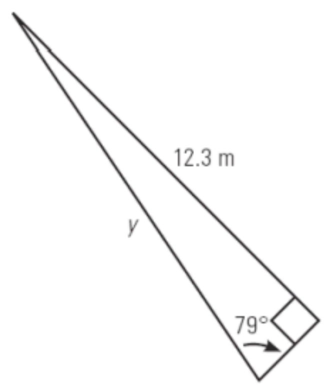

(c)


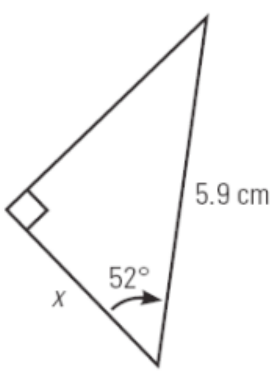

6. Calculate the length of the indicated side: {1,2}

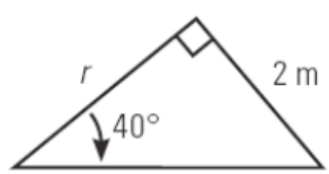
(a)



(b)



c)


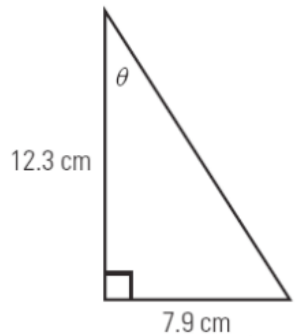

(d)



(e)


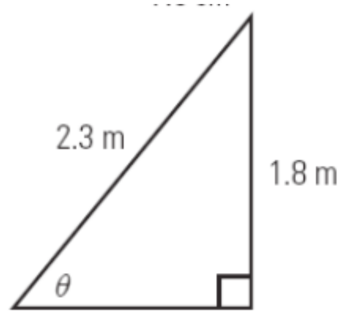

(f)


7. Calculate the measure of the indicated angle: {1,2}

(a)




(b)

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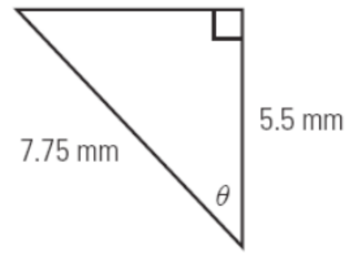
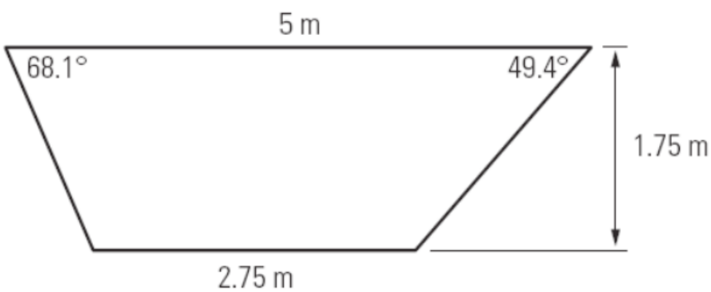
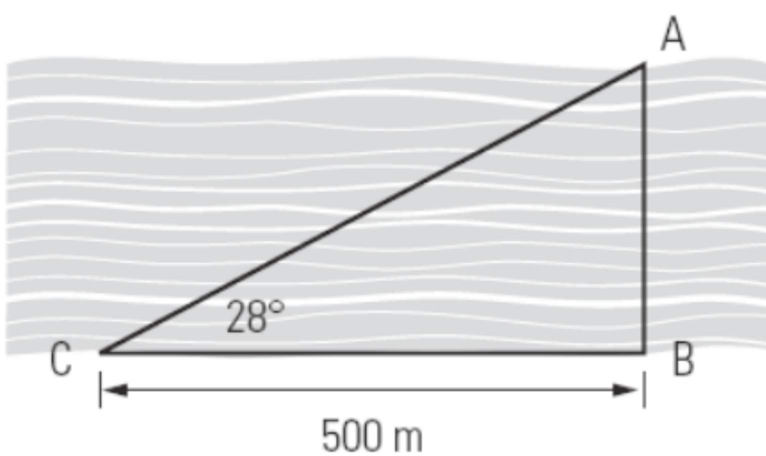



8. Pauline is building a fence around her vegetable garden, shown below. What length of fence will she need to build? {1,2,3}

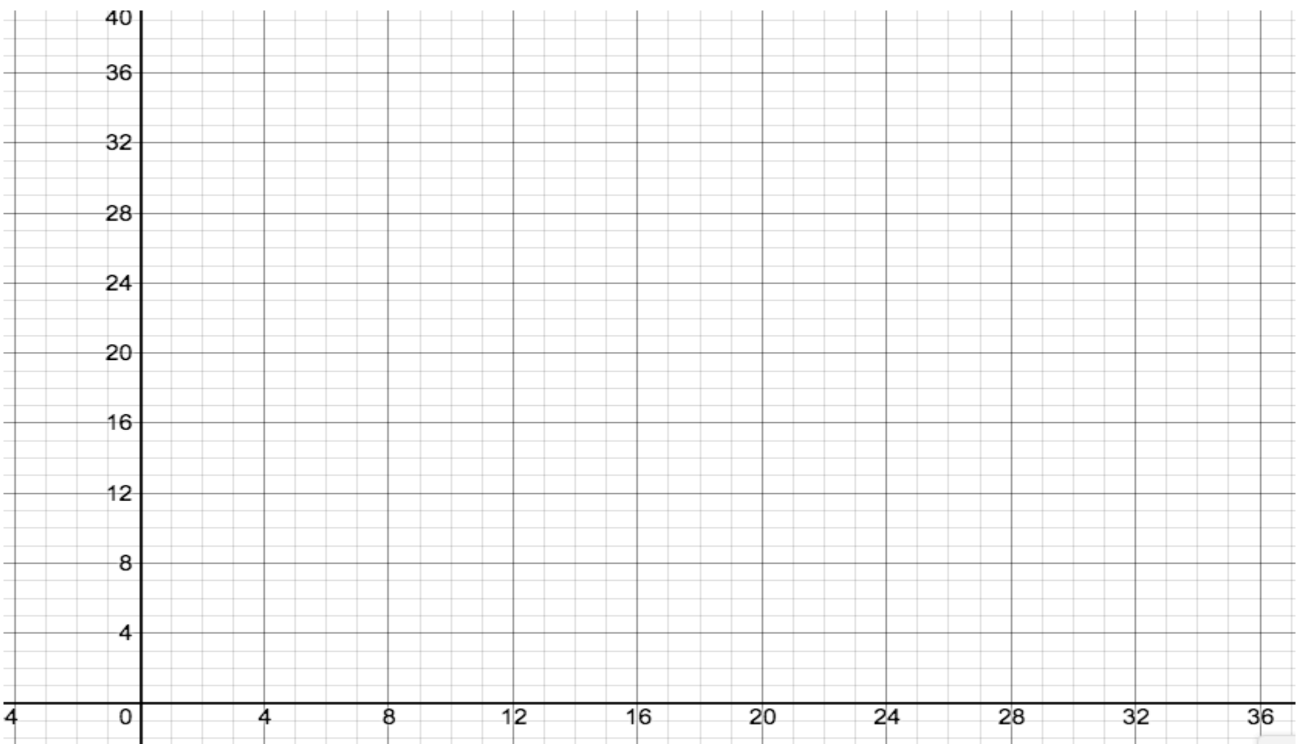



9. A surveyor must determine the distance, AB, across a river. He stands at point C, downriver 500 m from B, measures the angle of vision to A as 28°. How wide is the river? {1,2,3}



10. A carnival Ferris wheel with a radius of 14 m makes one complete revolution every 16 seconds. The bottom of the wheel is 2.0 m above the ground. A person starts a ride at the bottom of the Ferris wheel and times their ride. To help you draw a graph showing the riders height as a function of time, complete the following table {15}

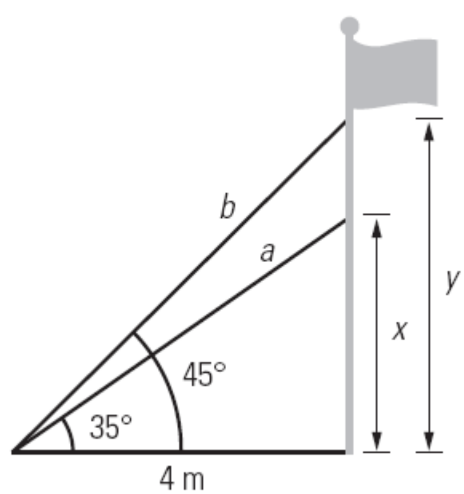
| Time (in seconds) | 0 | 4 | 8 | 12 | 16 | 20 | 24 | 28 | 32 |
|---|---|---|---|---|---|---|---|---|---|
| Height (in meters) | | | | | | | | | |




a. Estimate how high above the ground that person will be after 1 minute and 8 seconds. {15}

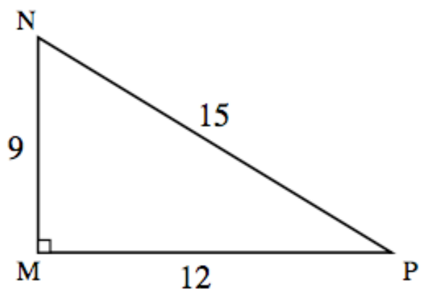
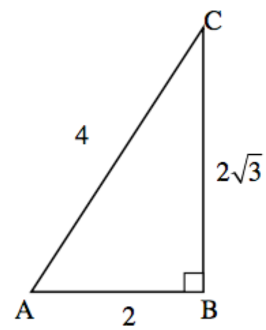
11. A flagpole is supported by two guy wires, each attached to a peg in the ground 4 m from the base of the pole. The guy wires have angles of elevations of 35° and 45°. {1,2,3}

    a. How much higher up the flagpole is the top guy wire attached?
    b. How long is each guy wire?



**Higher Level Questions for More Complex Concepts OR an EXTENSION of basic concepts**

1. (CI) Use the triangle given to find the given **secondary trigonometric ratios** (express final answers as non-reduced fractions):

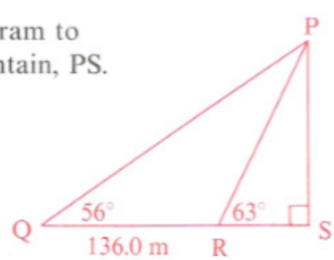
| | | | |
|---|---|---|---|
| (i) sec(N)<br>(ii) csc(N)<br>(iii) cot(N)<br>(iv) sec(P)<br>(v) csc(P)<br>(vi) cot(P) |  | (i) csc(C)<br>(ii) sec(C)<br>(iii) cot(C)<br>(iv) csc(A)<br>(v) sec(A)<br>(vi) cot(A) |  |

2. (CI) It is known that $\sec(66.4) = \frac{r}{x}$. Draw a diagram of a right triangle, wherein you label the sides and angles of the triangle, so that you demonstrate the **meaning** of the statement $\sec(66.4) = \frac{r}{x}$. Hence, evaluate the following (in terms of *r* and *x*):

   a. $\cos(66.4)$ b. $\csc(66.4)$ c. $\cot(66.4)$ d. $(\cos(66.4))^2 + (\sin(66.4))^2$

3.

Use the information in the diagram to calculate the height of the mountain, PS.




4.

An engineer wishes to find the distance across a canyon. She takes a sighting from A and then a sighting from B to a point C on the opposite side of the canyon. The measurements are given on the diagram.

Find distance *d* across the canyon.