

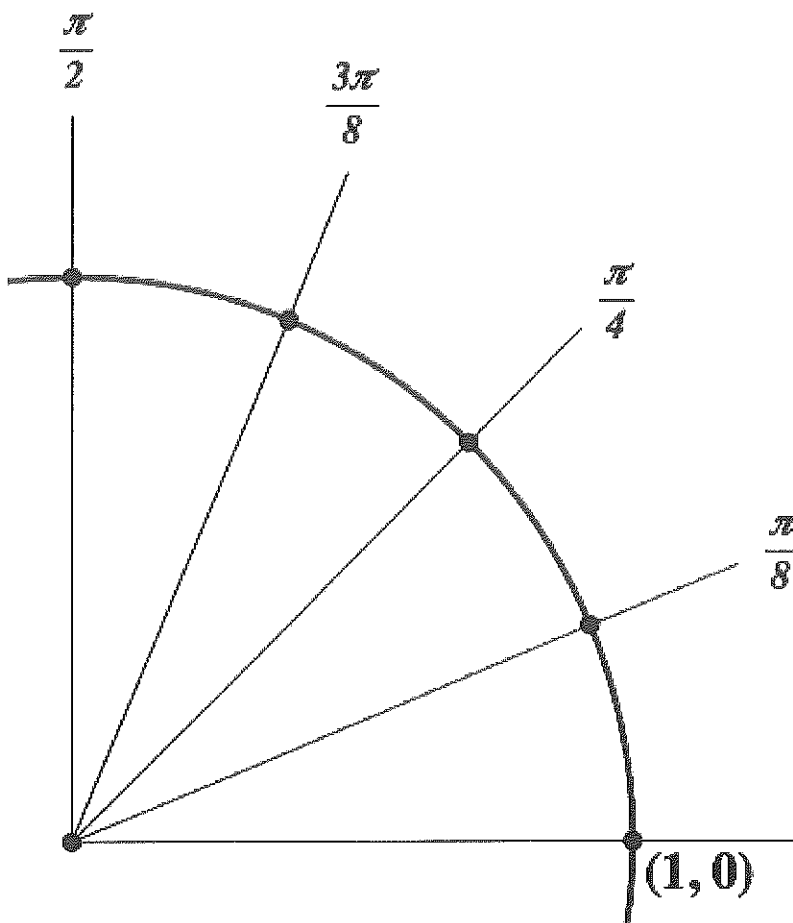
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6.8 “Sine”ing and “Cosine”ing It

A Solidify Understanding Task

In the previous tasks of this module you have used the similarity of circles, the symmetry of circles, right triangle trigonometry and proportional reasoning to locate stakes on concentric circles. In this task we consider points on the simplest circle of all, the circle with a radius of 1, which is often referred to as “the unit circle.”

Here is a portion of a unit circle—the portion lying in the first quadrant of a coordinate grid. As in the previous task, *Staking It*, this portion of the unit circle has been divided into intervals measuring $\frac{\pi}{8}$ radians. As in the previous task, find the coordinates of each of the indicated points in the diagram. Also find the arc length, s , from the point $(1, 0)$ to each of the indicated points.



Javier has been wondering if his calculator will allow him to calculate trigonometric values for angles measured in radians, rather than degrees. He feels like this will simplify much of his computational work when trying to locate the coordinates of stakes on the circles surrounding the central tower of the archeological site.

After consulting his calculator's manual, Javier has learned that he can set his calculator in radian mode. After doing so, he is examining the following calculations.

1. With your calculator set in radian mode, find each of the following values. Record your answers as decimal approximations to the nearest thousandth.

$$\sin\left(\frac{\pi}{8}\right) =$$

$$\cos\left(\frac{\pi}{8}\right) =$$

$$\frac{\pi}{8} =$$

$$\sin\left(\frac{\pi}{4}\right) =$$

$$\cos\left(\frac{\pi}{4}\right) =$$

$$\frac{\pi}{4} =$$

$$\sin\left(\frac{3\pi}{8}\right) =$$

$$\cos\left(\frac{3\pi}{8}\right) =$$

$$\frac{3\pi}{8} =$$

$$\sin\left(\frac{\pi}{2}\right) =$$

$$\cos\left(\frac{\pi}{2}\right) =$$

$$\frac{\pi}{2} =$$

2. The coordinates and arc lengths you found for points on the unit circle seem to be showing up in Javier's computations. Why is that so? That is, ...

- explain why the radian measure of an angle on the unit circle is the same as the arc length?
- explain why the sine of an angle measured in radians is the same as the y-coordinate of a point on the unit circle?

- explain why the cosine of an angle measured in radians is the same as the x -coordinate of a point on the unit circle?

3. Based on this work, find the following without using a calculator:

$$\sin\left(\frac{5\pi}{8}\right) =$$

$$\cos\left(\frac{7\pi}{8}\right) =$$

$$\cos(\pi) =$$

READY, SET, GO!
Name _____
Period _____
Date _____

READY

Topic: Reducing complex fractions

Write each of the following as a simple fraction. Rationalize the denominators when appropriate.

1. $\frac{\frac{1}{\sqrt{2}}}{\frac{1}{\sqrt{2}}}$

2. $\frac{\frac{8\sqrt{3}}{5}}{\frac{1}{5}}$

3. $\frac{8}{\frac{1}{2}}$

4. $\frac{\frac{7\sqrt{3}}{2}}{\frac{1}{2}}$

5. $\frac{1}{\sqrt{2}}$

6. $\frac{3}{\sqrt{3}}$

7. $\frac{4}{\sqrt{8}}$

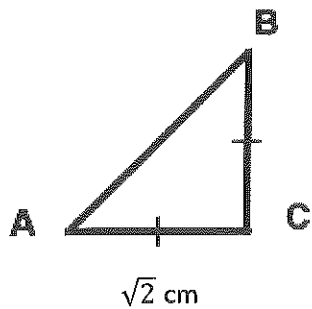
8. $\frac{\frac{2}{3}}{\frac{1}{2}}$

9. $\frac{\frac{2}{\sqrt{7}}}{\frac{5}{\sqrt{7}}}$

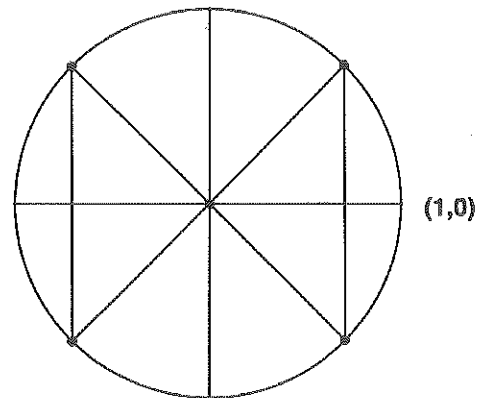
SET

Topic: Finding sine of an angle in radian measure

10. Triangle ABC is an isosceles right triangle. The length of one side is given. Fill in the values for the missing sides and angles A and B.

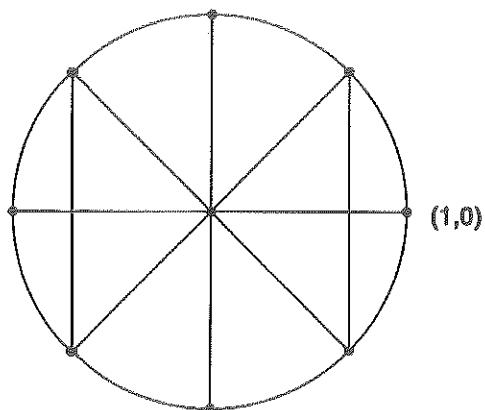


11. Label each point around the circle with the angle of rotation in radians starting from the point (1,0). (each section is equal)

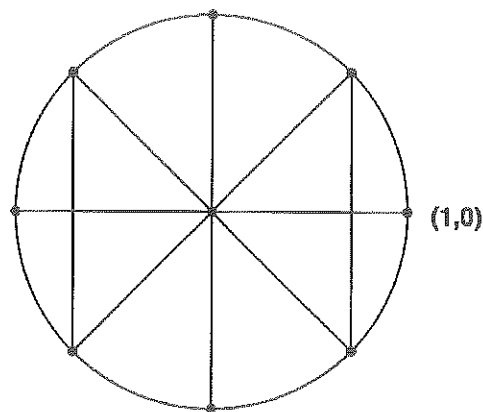


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12. Use the values in #10 to write the **exact** coordinates of the 4 points on the circle below. Be mindful of the numbers that are negative.



13. Find the arc length, s , from the point $(1,0)$ to each point around the circle. Record your answers as decimal approximations to the nearest thousandth.



Use your calculator to find the following values.

14. $\sin \frac{5\pi}{4} =$

15. $\sin \frac{7\pi}{4} =$

16. Why are both of your answers negative?

17. $\cos \frac{\pi}{4} =$

18. $\cos \frac{7\pi}{4} =$

19. Why are both of your answers positive?

20. $\sin \frac{3\pi}{4} =$

21. $\cos \frac{3\pi}{4} =$

22. Why is one answer positive and one answer negative?

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GO

Topic: Recalling trigonometric values of special triangles

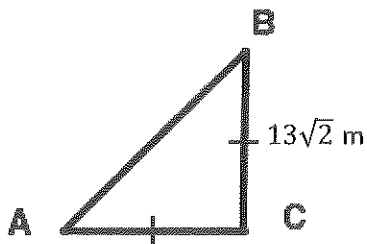
Angle C is the right angle in each of the triangles below. Use the given information to find the missing sides and the missing angles. Then find the indicated trig values. Rationalize denominators when appropriate. Do NOT change the values to decimals. Square roots are exact values. Decimal representations of the square roots are approximations.

23.

$\sin A =$

$\cos A =$

$\tan A =$

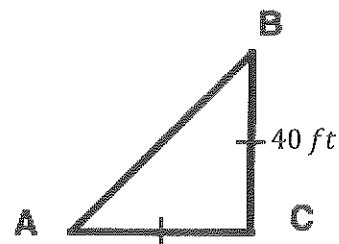


24.

$\sin B =$

$\cos B =$

$\tan B =$



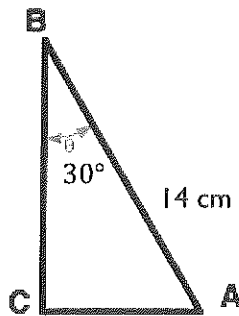
25. Explain why the trig values were the same for angle A and angle B even though the dimensions of the triangles were different.

26.

$\sin B =$

$\cos B =$

$\tan B =$

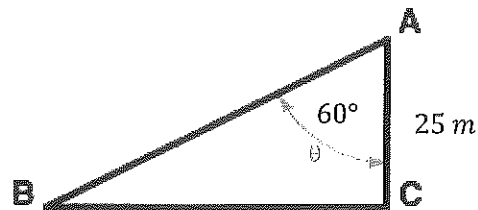


27.

$\sin A =$

$\cos A =$

$\tan A =$

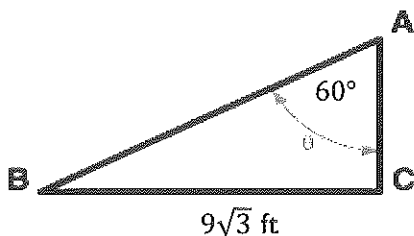


28.

$\sin A =$

$\cos A =$

$\tan A =$

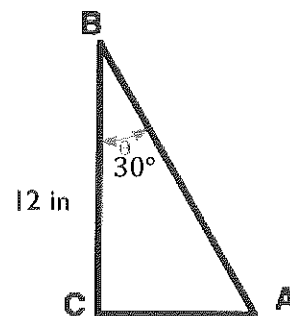


29.

$\sin B =$

$\cos B =$

$\tan B =$



30. Explain where you see the meaning of the identity $\sin \theta = \cos(90^\circ - \theta)$ in problems 26, 27, 28, and 29.

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