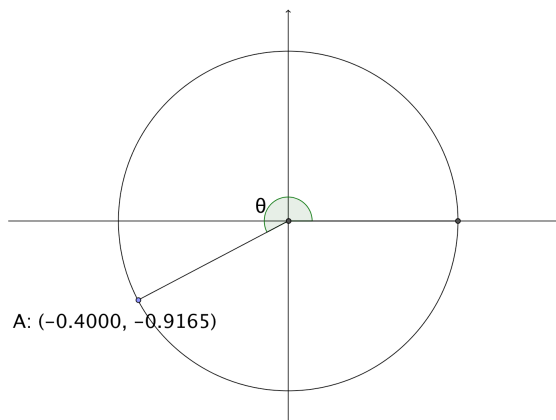


Directions: You may NOT use Right Triangle Trigonometry for any of these problems! Use your unit circle knowledge to solve these problems. No SOHCAHTOA allowed! If you see the symbol , you may use your calculator for that problem. Otherwise, no scientific calculator allowed.

Part 1: If the point $(1,0)$ is rotated θ° counterclockwise around the origin, its image is $(\cos\theta, \sin\theta)$.

- Let angle θ be 125° . For questions a-d, only use angles from 0 to 360 degrees.
 - State the measure of another angle that has the same sine as angle θ . _____
 - State the measure of another angle that has the same cosine as angle θ . _____
 - State the measures of two angles that have the opposite sine as angle θ . _____
 - State the measures of two angles that have the opposite cosine as angle θ . _____
- The point $(1, 0)$ is rotated x° counterclockwise about the origin. The coordinates of its image are as follows: $(-0.7986, 0.6018)$.
 - What is $\sin x$? _____
 - What is $\cos x$? _____
- Using the diagram below find the values of $\sin\theta$ and $\cos\theta$.



$$\sin\theta = \underline{\hspace{2cm}}$$

$$\cos\theta = \underline{\hspace{2cm}}$$

- The point $(1, 0)$ is rotated 30° counterclockwise about the origin. What are the EXACT (no trig expressions) coordinates of the image?
- The point $(1, 0)$ is rotated 240° counterclockwise about the origin. What are the EXACT (no trig expressions) coordinates of the image?
- The point $(1, 0)$ is rotated 135° counterclockwise about the origin. What are the EXACT (no trig expressions) coordinates of the image?

7.  The point $(1, 0)$ is rotated 320° counterclockwise about the origin. What are the approximate coordinates of the image? Round to 4 decimal places.
8. Arrange the following in ascending order: $\sin 60^\circ$, $\sin 100^\circ$, $\sin 140^\circ$, $\sin 180^\circ$, $\sin 220^\circ$
9. Arrange the following in descending order: $\cos 70^\circ$, $\cos 140^\circ$, $\cos 210^\circ$, $\cos 280^\circ$, $\cos 350^\circ$
10. The point $(1, 0)$ is rotated 435° **clockwise** about the origin. What are the EXACT coordinates of the image?

Part 2: For any point $P(x, y)$ in the coordinate plane, $x = r\cos\theta$, $y = r\sin\theta$, and $x^2 + y^2 = r^2$ where r is the distance between P and the origin $O(0, 0)$ and θ is the counterclockwise angle of rotation from the positive x -axis to the terminal side, $\overrightarrow{OP}$.

1. When the point $(7, 0)$ is rotated counterclockwise about the origin by 117° it lands on point R. State the EXACT coordinates of point R.

R (_____ , _____)

2. When the point $(2, 0)$ is rotated counterclockwise about the origin by 60° it lands on point S. State the EXACT coordinates of point S.

S (_____ , _____)

3. When the point $(10, 0)$ is rotated counterclockwise about the origin by 315° it lands on point T. State the EXACT coordinates of point T.

T (_____ , _____)

4. When the point $(0.75, 0)$ is rotated counterclockwise about the origin by 270° it lands on point W. State the EXACT coordinates of point W.

W (_____ , _____)

5. A point on the positive x -axis is rotated θ° counterclockwise about the origin and lands on point P. The coordinates of point P are (5, 12). Find EXACT values of $\sin\theta$ and $\cos\theta$.
6. A point on the positive x -axis is rotated θ° counterclockwise about the origin and lands on point P. The coordinates of point P are (24, -7). Find EXACT values of $\sin\theta$ and $\cos\theta$.
7. A point on the positive x -axis is rotated θ° counterclockwise about the origin and lands on point P. The coordinates of point P are $(-1, \sqrt{3})$. Find EXACT values of $\sin\theta$ and $\cos\theta$. What's θ ?
8. A point on the positive x -axis is rotated θ° counterclockwise about the origin and lands on point P. The coordinates of point P are (1, 2). Find EXACT values of $\sin\theta$ and $\cos\theta$. Simplify all radicals and rationalize all denominators.
9. A point on the positive x -axis is rotated θ° counterclockwise about the origin and lands on point P. The coordinates of point P are (-3, 5). Find EXACT values of $\sin\theta$ and $\cos\theta$. Simplify all radicals and rationalize all denominators.
10. A point on the positive x -axis is rotated θ° counterclockwise about the origin and lands on point P. The coordinates of point P are (-4, -6). Find EXACT values of $\sin\theta$ and $\cos\theta$. Simplify all radicals and rationalize all denominators.

Part 3: Find θ . Remember that when using the inverse trig functions, the calculator will only give you a value within a specific range. You may have to carry out an extra step or two to find the correct θ .

1.  The point $(17, 0)$ is rotated θ° counterclockwise about the origin and its image is $(15, 8)$. Find θ to the nearest hundredth of a degree. $0 \leq \theta < 360^\circ$.
2.  A point on the positive x -axis is rotated θ° counterclockwise about the origin and its image is $(-7, 9)$. Find θ to the nearest hundredth of a degree. $0 \leq \theta < 360^\circ$.
3.  A point on the positive x -axis is rotated θ° counterclockwise about the origin and its image is $(-3, 8)$. Find θ to the nearest hundredth of a degree.
4.  A point on the positive x -axis is rotated θ° counterclockwise about the origin and its image is $(7, -6)$. Find θ to the nearest hundredth of a degree. $0 \leq \theta < 360^\circ$.
5.  A point on the positive x -axis is rotated θ° counterclockwise about the origin and its image is $(-5, 0)$. Find θ to the nearest hundredth of a degree. $0 \leq \theta < 360^\circ$.

Part 4: Challenge! A picture can be very helpful!

1. The point $(-9, 0)$ is rotated 45° counterclockwise about the origin. Find the EXACT coordinates of its image.
2. The point $(0, 2)$ is rotated 120° counterclockwise about the origin. Find the EXACT coordinates of its image.
3.  The point $(-4, 0)$ is rotated 50° **clock**wise about the origin. Find the approximate coordinates of its image. Round to the nearest hundredth.
4.  The point $(5, 5)$ is rotated 60° counterclockwise about the origin. Find the approximate coordinates of its image. Round to the nearest hundredth.
5.  The point $(-7, 24)$ is rotated 98° counterclockwise about the origin. Find the approximate coordinates of its image. Round to the nearest hundredth.