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Product Description

Unit Circle Resource

This resource is designed for Trigonometry but may be used in Geometry and PreCalculus. Having a good background and grasp of the basic Trig functions is invaluable in Calculus.

Included

* Three versions of the Unit Circle. One partially completed so that students can complete it, one with no information filled in (a template), and one totally filled in. Very often I give pop quizzes with these. I may ask for just the first quadrant, or only the sine. I try to vary so that they don’t memorize their way around the circle. It is strange to see a student in Calculus point their finger in a circle, while staring at the ceiling, just to find the sin of 7pi/6. There are lots of ways to vary these Unit circles. You can also use the template to write in the negative angles, or angles more than 2 pi.

* A table for students to fill in the values of the sine, cosine, and tangent for the important angles.

* A worksheet with questions about the values of the sine and cosine as the values move around the unit circle

* A quiz or HW assignment.

* A fabulous handout showing the students the BEST EVER method for remembering the values of 30 45 60. My students use this no matter what course they are in. As easy as 1 - 2 - 3!

* An innovative reference handout showing the students how to remember the signs of the trig functions.

* All answer keys
Fill in the missing values.

\[ (x, y) = (\cos \theta, \sin \theta) \]
Fill in the missing values.

__°, ___ radians

\((x, y) = (\cos \theta, \sin \theta)\)
Complete this table:

<table>
<thead>
<tr>
<th>Angle (degrees)</th>
<th>sin θ</th>
<th>cos θ</th>
<th>tan θ</th>
<th>Angle (radians)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0°</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30°</td>
<td></td>
<td></td>
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<tr>
<td>45°</td>
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</tr>
<tr>
<td>60°</td>
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<td>90°</td>
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<td>120°</td>
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<td>135°</td>
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<td>210°</td>
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<td>300°</td>
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<tr>
<td>330°</td>
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<td></td>
</tr>
<tr>
<td>360°</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Complete this table:

<table>
<thead>
<tr>
<th>Angle (degrees)°</th>
<th>sin θ</th>
<th>cos θ</th>
<th>tan θ</th>
<th>Angle (radians)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0°</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>30°</td>
<td>(\frac{1}{2})</td>
<td>(\frac{\sqrt{3}}{2})</td>
<td>(\frac{\sqrt{3}}{3})</td>
<td>(\frac{\pi}{6})</td>
</tr>
<tr>
<td>45°</td>
<td>(\frac{\sqrt{2}}{2})</td>
<td>(\frac{\sqrt{2}}{2})</td>
<td>1</td>
<td>(\frac{\pi}{4})</td>
</tr>
<tr>
<td>60°</td>
<td>(\frac{\sqrt{3}}{2})</td>
<td>(\frac{1}{2})</td>
<td>(\sqrt{3})</td>
<td>(\frac{\pi}{3})</td>
</tr>
<tr>
<td>90°</td>
<td>1</td>
<td>0</td>
<td>undef</td>
<td>(\frac{\pi}{2})</td>
</tr>
<tr>
<td>120°</td>
<td>(\frac{\sqrt{3}}{2})</td>
<td>(-\frac{1}{2})</td>
<td>(-\sqrt{3})</td>
<td>(\frac{2\pi}{3})</td>
</tr>
<tr>
<td>135°</td>
<td>(\frac{\sqrt{2}}{2})</td>
<td>(-\frac{\sqrt{2}}{2})</td>
<td>-1</td>
<td>(\frac{3\pi}{4})</td>
</tr>
<tr>
<td>150°</td>
<td>(\frac{1}{2})</td>
<td>(-\frac{\sqrt{3}}{2})</td>
<td>(-\frac{\sqrt{3}}{3})</td>
<td>(\frac{5\pi}{6})</td>
</tr>
<tr>
<td>180°</td>
<td>0</td>
<td>-1</td>
<td>0</td>
<td>(\pi)</td>
</tr>
<tr>
<td>210°</td>
<td>(-\frac{1}{2})</td>
<td>(-\frac{\sqrt{3}}{2})</td>
<td>(\frac{\sqrt{3}}{3})</td>
<td>(\frac{7\pi}{6})</td>
</tr>
<tr>
<td>225°</td>
<td>(-\frac{\sqrt{2}}{2})</td>
<td>(-\frac{\sqrt{2}}{2})</td>
<td>1</td>
<td>(\frac{5\pi}{4})</td>
</tr>
<tr>
<td>240°</td>
<td>(-\frac{\sqrt{3}}{2})</td>
<td>(-\frac{1}{2})</td>
<td>(\sqrt{3})</td>
<td>(\frac{4\pi}{3})</td>
</tr>
<tr>
<td>270°</td>
<td>-1</td>
<td>0</td>
<td>undef</td>
<td>(\frac{3\pi}{2})</td>
</tr>
<tr>
<td>300°</td>
<td>(\frac{1}{2})</td>
<td>(\frac{1}{2})</td>
<td>(-\sqrt{3})</td>
<td>(\frac{5\pi}{3})</td>
</tr>
<tr>
<td>315°</td>
<td>(-\frac{\sqrt{2}}{2})</td>
<td>(\frac{\sqrt{2}}{2})</td>
<td>-1</td>
<td>(\frac{7\pi}{4})</td>
</tr>
<tr>
<td>330°</td>
<td>(-\frac{1}{2})</td>
<td>(\frac{\sqrt{3}}{2})</td>
<td>(-\frac{\sqrt{3}}{3})</td>
<td>(\frac{11\pi}{6})</td>
</tr>
<tr>
<td>360°</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>(2\pi)</td>
</tr>
</tbody>
</table>
1. The maximum value of the $\sin \theta$ is: ________ . It occurs at what angle? ________ .
2. The minimum value of the $\sin \theta$ is: ________ . It occurs at what angle? ________ .
3. As the angle $\theta$ goes from $0^\circ$ to $90^\circ$ the value of the $\sin \theta$ goes from ________ to ________ .
4. As the angle $\theta$ goes from $90^\circ$ to $180^\circ$ the value of the $\sin \theta$ goes from ________ to ________ .
5. As the angle $\theta$ goes from $180^\circ$ to $270^\circ$ the value of the $\sin \theta$ goes from ________ to ________ .
6. As the angle $\theta$ goes from $270^\circ$ to $360^\circ$ the value of the $\sin \theta$ goes from ________ to ________ .
7. The maximum value of the $\cos \theta$ is: ________ . It occurs at what angle? ________ .
8. The minimum value of the $\cos \theta$ is: ________ . It occurs at what angle? ________ .
9. As the angle $\theta$ goes from $0^\circ$ to $90^\circ$ the value of the $\cos \theta$ goes from ________ to ________ .
10. As the angle $\theta$ goes from $90^\circ$ to $180^\circ$ the value of the $\cos \theta$ goes from ________ to ________ .
11. As the angle $\theta$ goes from $180^\circ$ to $270^\circ$ the value of the $\cos \theta$ goes from ________ to ________ .
12. As the angle $\theta$ goes from $270^\circ$ to $360^\circ$ the value of the $\cos \theta$ goes from ________ to ________ .
1. The maximum value of the $\sin \theta$ is: ____1____. It occurs at what angle? ____90º____.

2. The minimum value of the $\sin \theta$ is: ____-1____. It occurs at what angle? ____270º____.

3. As the angle $\theta$ goes from 0° to 90°, the value of the $\sin \theta$ goes from ____0____ to ____1____.

4. As the angle $\theta$ goes from 90° to 180°, the value of the $\sin \theta$ goes from ____1____ to ____0____.

5. As the angle $\theta$ goes from 180° to 270°, the value of the $\sin \theta$ goes from ____0____ to ____-1____.

6. As the angle $\theta$ goes from 270° to 360°, the value of the $\sin \theta$ goes from ____-1____ to ____0____.

7. The maximum value of the $\cos \theta$ is: ___1____. It occurs at what angle? ____0º____.

8. The minimum value of the $\cos \theta$ is: ___-1____. It occurs at what angle? ____180º____.

9. As the angle $\theta$ goes from 0° to 90°, the value of the $\cos \theta$ goes from ____1____ to ____0____.

10. As the angle $\theta$ goes from 90° to 180°, the value of the $\cos \theta$ goes from ____0____ to ____-1____.

11. As the angle $\theta$ goes from 180° to 270°, the value of the $\cos \theta$ goes from ____-1____ to ____0____.

12. As the angle $\theta$ goes from 270° to 360°, the value of the $\cos \theta$ goes from ____0____ to ____1____.
### How to Remember the Basics

#### Steps

1. **Square Roots:**
   - 1, 2, 3, 3, 2, 1
   - Over 2, over 2, over 2, ...over 2

2. **Square Roots:**
   - \(\sqrt{1}\) \(\sqrt{2}\) \(\sqrt{3}\)
   - Square root, square root, square root, .......... square root

3. **30°, 45°, 60°:**
   - Sin: \(\sqrt{1}\) \(\sqrt{2}\) \(\sqrt{3}\)
   - Cos: \(\sqrt{3}\) \(\sqrt{2}\) \(\sqrt{1}\)
   - 30, 45, 60, sin, cos
   - Tahdah!!!!!!!!

4. **π/6, π/4, π/3:**
   - Sin: \(\sqrt{1}\) \(\sqrt{2}\) \(\sqrt{3}\)
   - Cos: \(\sqrt{3}\) \(\sqrt{2}\) \(\sqrt{1}\)

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- Wait, there's more.
- Sine over cosine is tangent.....
- Denominators cancel..
- Flip for csc, sec, cot
- Signs for all quadrants
- **All Students Take Calculus**
Signs of the Trig Functions
Where are the Trig Functions Positive?

All Students Take Calculus

Quadrant II
sin $\theta$: +
cos $\theta$: −
tan $\theta$: −

Quadrant III
sin $\theta$: −
cos $\theta$: −
tan $\theta$: +

Quadrant I
sin $\theta$: +
cos $\theta$: +
tan $\theta$: +

Quadrant IV
sin $\theta$: −
cos $\theta$: +
tan $\theta$: −
Find the exact value of the following expression without using a calculator.

1) \( \sin \frac{5\pi}{3} \)

2) \( \tan \left( \frac{4\pi}{3} \right) \)

3) \( \cos 2\pi \)

4) \( \tan \left( \frac{\pi}{3} \right) \)

5) \( \cos \frac{5\pi}{6} \)

6) \( \sin (30^\circ) \)

7) \( \tan (45^\circ) \)

8) \( \sin \frac{5\pi}{6} \)

9) \( \tan(\pi/2) \)

10) \( \cos (60^\circ) \)

11) \( \cos \pi \)

12) \( \cos \frac{\pi}{6} \)
Answer Key
UNIT CIRCLE HW QUIZ

1) $\frac{-\sqrt{3}}{2}$
2) $\sqrt{3}$
3) 1
4) $\sqrt{3}$
5) $-\frac{\sqrt{3}}{2}$
6) $\frac{1}{2}$
7) 1
8) $\frac{1}{2}$
9) Undefined
10) $\frac{1}{2}$
11) -1
12) $\frac{\sqrt{3}}{2}$
Signs of the Trig Functions

Name the quadrant in which the angle \( \theta \) lies.

1) \( \tan \theta > 0, \ \sin \theta < 0 \)
   A) I          B) II          C) III          D) IV

2) \( \cos \theta < 0, \ \sin \theta < 0 \)
   A) I          B) II          C) III          D) IV

3) \( \sin \theta > 0, \ \cos \theta < 0 \)
   A) I          B) II          C) III          D) IV

4) \( \tan \theta < 0, \ \cos \theta > 0 \)
   A) I          B) II          C) III          D) IV

5) \( \sin \theta > 0, \ \cos \theta > 0 \)
   A) I          B) II          C) III          D) IV

6) \( \cos \theta < 0, \ \tan \theta < 0 \)
   A) I          B) II          C) III          D) IV

7) \( \tan \theta < 0, \ \sin \theta < 0 \)
   A) I          B) II          C) III          D) IV

8) \( \cos \theta > 0, \ \sin \theta < 0 \)
   A) I          B) II          C) III          D) IV
Answer Key
SIGNS OF TRIG FUNCTIONS

1) C
2) C
3) B
4) D
5) A
6) B
7) D
8) D