

Trigonometry and Pre- Calculus Tutor Worksheet 7

Finding Sin, Cos, Tan Using the Unit Circle

Trigonometry and Pre-Calculus Tutor – Worksheet 7 – Finding Sin, Cos, Tan Using the Unit Circle

1. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a measure of 135° .

$$\sin 135^\circ = \underline{\hspace{1cm}}, \cos 135^\circ = \underline{\hspace{1cm}}, \tan 135^\circ = \underline{\hspace{1cm}}$$

2. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a radian measure of $\frac{7\pi}{6}$.

$$\sin \frac{7\pi}{6} = \underline{\hspace{1cm}}, \cos \frac{7\pi}{6} = \underline{\hspace{1cm}}, \tan \frac{7\pi}{6} = \underline{\hspace{1cm}}$$

3. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a measure of 150° .

$$\sin 150^\circ = \underline{\hspace{1cm}}, \cos 150^\circ = \underline{\hspace{1cm}}, \tan 150^\circ = \underline{\hspace{1cm}}$$

4. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a radian measure of $\frac{5\pi}{3}$.

$$\sin \frac{5\pi}{3} = \underline{\hspace{1cm}}, \cos \frac{5\pi}{3} = \underline{\hspace{1cm}}, \tan \frac{5\pi}{3} = \underline{\hspace{1cm}}$$

5. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a measure of 270° .

$$\sin 270^\circ = \underline{\hspace{1cm}}, \cos 270^\circ = \underline{\hspace{1cm}}, \tan 270^\circ = \underline{\hspace{1cm}}$$

6. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a radian measure of $\frac{\pi}{2}$.

$$\sin \frac{\pi}{2} = \underline{\hspace{1cm}}, \cos \frac{\pi}{2} = \underline{\hspace{1cm}}, \tan \frac{\pi}{2} = \underline{\hspace{1cm}}$$

7. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a measure of 300° .

$$\sin 300^\circ = \underline{\hspace{1cm}}, \cos 300^\circ = \underline{\hspace{1cm}}, \tan 300^\circ = \underline{\hspace{1cm}}$$

8. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a radian measure of $\frac{3\pi}{4}$.

$$\sin \frac{3\pi}{4} = \underline{\hspace{1cm}}, \cos \frac{3\pi}{4} = \underline{\hspace{1cm}}, \tan \frac{3\pi}{4} = \underline{\hspace{1cm}}$$

9. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a measure of 210° .

$$\sin 210^\circ = \underline{\hspace{1cm}}, \cos 210^\circ = \underline{\hspace{1cm}}, \tan 210^\circ = \underline{\hspace{1cm}}$$

10. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a radian measure of $\frac{\pi}{6}$.

$$\sin \frac{\pi}{6} = \underline{\hspace{1cm}}, \cos \frac{\pi}{6} = \underline{\hspace{1cm}}, \tan \frac{\pi}{6} = \underline{\hspace{1cm}}$$

11. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a measure of 120° .

$$\sin 120^\circ = \underline{\hspace{1cm}}, \cos 120^\circ = \underline{\hspace{1cm}}, \tan 120^\circ = \underline{\hspace{1cm}}$$

12. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a radian measure of $\frac{11\pi}{6}$.

$$\sin \frac{11\pi}{6} = \underline{\hspace{1cm}}, \cos \frac{11\pi}{6} = \underline{\hspace{1cm}}, \tan \frac{11\pi}{6} = \underline{\hspace{1cm}}$$

13. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a measure of 30° .

$$\sin 30^\circ = \underline{\hspace{1cm}}, \cos 30^\circ = \underline{\hspace{1cm}}, \tan 30^\circ = \underline{\hspace{1cm}}$$

14. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a radian measure of 2π .

$$\sin 2\pi = \underline{\hspace{1cm}}, \cos 2\pi = \underline{\hspace{1cm}}, \tan 2\pi = \underline{\hspace{1cm}}$$

15. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a measure of 225° .

$$\sin 225^\circ = \underline{\hspace{1cm}}, \cos 225^\circ = \underline{\hspace{1cm}}, \tan 225^\circ = \underline{\hspace{1cm}}$$

16. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a radian measure of $\frac{5\pi}{4}$.

$$\sin \frac{5\pi}{4} = \underline{\hspace{1cm}}, \cos \frac{5\pi}{4} = \underline{\hspace{1cm}}, \tan \frac{5\pi}{4} = \underline{\hspace{1cm}}$$

17. Use the unit circle to find the measures of two angles, in degrees, whose sine ratio is $\frac{\sqrt{2}}{2}$.

18. Use the unit circle to find the measures of two angles, in radians, whose tangent ratio is -1 .

19. Use the unit circle to find the measures of two angles, in degrees, whose cosine ratio is $-\frac{1}{2}$.

20. Use the unit circle to find the measures of two angles, in radians, whose tangent ratio is 1 .

21. Use the unit circle to find the measures of two angles, in degrees, whose cosine ratio is $\frac{\sqrt{3}}{2}$.

22. Use the unit circle to find the measures of two angles, in radians, whose sine ratio is $\frac{\sqrt{3}}{2}$.

23. Use the unit circle to find the measures of two angles, in degrees, whose tangent ratio is $-\sqrt{3}$.

24. Use the unit circle to find the measures of two angles, in radians, whose sine ratio is 0.

25. Use the unit circle to find the measures of two angles, in degrees, whose cosine ratio is 0.

26. Use the unit circle to find the measures of two angles, in radians, whose sine ratio is $-\frac{1}{2}$.

27. Use the unit circle to find the measures of two angles, in degrees, whose cosine ratio is $-\frac{\sqrt{2}}{2}$.

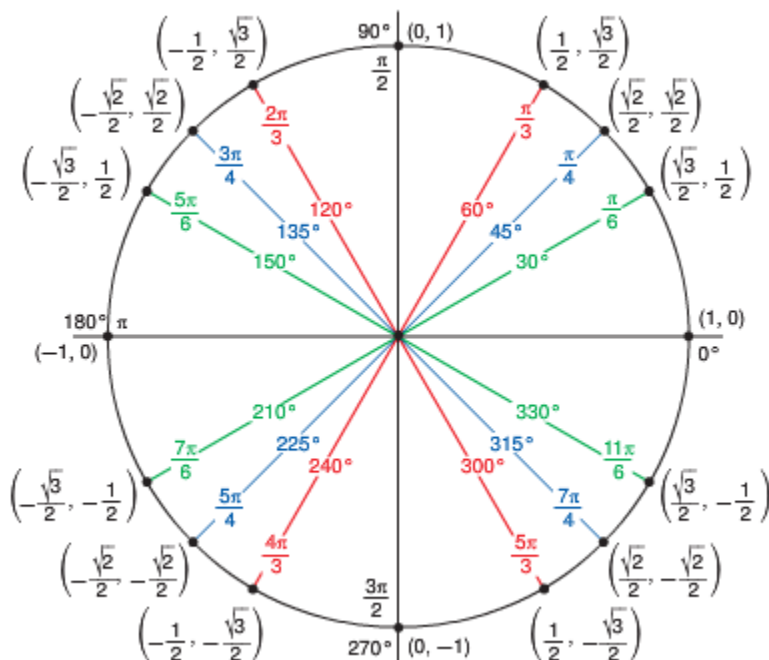
28. Use the unit circle to find the measures of two angles, in radians, whose tangent ratio is 0.

29. Use the unit circle to find the measures of two angles, in degrees, whose sine ratio is $\frac{1}{2}$.

30. Use the unit circle to find the measures of two angles, in radians, whose tangent ratio is $-\frac{\sqrt{3}}{3}$.

Answers – Trigonometry and Pre-Calculus Tutor – Worksheet 7 – Finding Sin, Cos, Tan Using the Unit Circle

The unit circle with all of its values is:



You can use the unit circle to find the value of the trig ratios only of angles that can be expressed as multiples of 30° , 45° , 60° , or 90° or in their radian equivalents $\frac{\pi}{6}$, $\frac{\pi}{4}$, $\frac{\pi}{3}$, or $\frac{\pi}{2}$.

In the unit circle, the hypotenuse is always 1, so the sine ratio is the y –value, the cosine ratio is the x –value, and the tangent ratio is the ratio $\frac{y}{x}$. Furthermore, you only have to memorize the values in the first quadrant, and then change the signs of these ratios in the other quadrants, depending on the signs of x and y .

1. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a measure of 135° .

In the unit circle, $\sin\theta = y$, $\cos\theta = x$, $\tan\theta = \frac{y}{x}$. The unit circle shows the point $\left(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$ at 135° because 135° is a mirror image of 45° across the y –axis.

Answer: $\sin 135^\circ = \frac{\sqrt{2}}{2}, \cos 135^\circ = -\frac{\sqrt{2}}{2}, \tan 135^\circ = \frac{\left(\frac{\sqrt{2}}{2}\right)}{\left(-\frac{\sqrt{2}}{2}\right)} = -1$

2. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a radian measure of $\frac{7\pi}{6}$.

In the unit circle, $\sin \theta = y, \cos \theta = x, \tan \theta = \frac{y}{x}$. The unit circle shows the point $\left(-\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$ at $\frac{7\pi}{6}$ radians because $\frac{7\pi}{6}$ is a mirror image of $\frac{\pi}{6}$ across the origin.

Answer: $\sin \frac{7\pi}{6} = -\frac{1}{2}, \cos \frac{7\pi}{6} = -\frac{\sqrt{3}}{2}, \tan \frac{7\pi}{6} = \frac{\left(-\frac{1}{2}\right)}{\left(-\frac{\sqrt{3}}{2}\right)} = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$

3. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a measure of 150° .

In the unit circle, $\sin \theta = y, \cos \theta = x, \tan \theta = \frac{y}{x}$. The unit circle shows the point $\left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$ at 150° because 150° is a mirror image of 30° across the y -axis.

Answer: $\sin 150^\circ = \frac{1}{2}, \cos 150^\circ = -\frac{\sqrt{3}}{2}, \tan 150^\circ = \frac{\left(\frac{1}{2}\right)}{\left(-\frac{\sqrt{3}}{2}\right)} = -\frac{1}{\sqrt{3}} = -\frac{\sqrt{3}}{3}$

4. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a radian measure of $\frac{5\pi}{3}$.

In the unit circle, $\sin \theta = y, \cos \theta = x, \tan \theta = \frac{y}{x}$. The unit circle shows the point $\left(\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$ at $\frac{5\pi}{3}$ radians because $\frac{5\pi}{3}$ is a mirror image of $\frac{\pi}{3}$ across the x -axis.

Answer: $\sin \frac{5\pi}{3} = -\frac{\sqrt{3}}{2}, \cos \frac{5\pi}{3} = \frac{1}{2}, \tan \frac{5\pi}{3} = \frac{\left(-\frac{\sqrt{3}}{2}\right)}{\left(\frac{1}{2}\right)} = -\sqrt{3}$

5. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a measure of 270° .

In the unit circle, $\sin\theta = y$, $\cos\theta = x$, $\tan\theta = \frac{y}{x}$. The unit circle shows the point $(0, -1)$ at 270° because 270° is a mirror image of 90° across the x -axis.

Answer: $\sin 270^\circ = -1$, $\cos 270^\circ = 0$, $\tan 270^\circ = -\frac{1}{0} = \text{undefined}$

6. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a radian measure of $\frac{\pi}{2}$.

In the unit circle, $\sin\theta = y$, $\cos\theta = x$, $\tan\theta = \frac{y}{x}$. The unit circle shows the point $(0, 1)$ at $\frac{\pi}{2}$ radians.

Answer: $\sin \frac{\pi}{2} = 1$, $\cos \frac{\pi}{2} = 0$, $\tan \frac{\pi}{2} = \frac{1}{0} = \text{undefined}$

7. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a measure of 300° .

In the unit circle, $\sin\theta = y$, $\cos\theta = x$, $\tan\theta = \frac{y}{x}$. The unit circle shows the point $(\frac{1}{2}, -\frac{\sqrt{3}}{2})$ at 300° because 300° is a mirror image of 60° across the x -axis.

Answer: $\sin 300^\circ = -\frac{\sqrt{3}}{2}$, $\cos 300^\circ = \frac{1}{2}$, $\tan 300^\circ = \frac{(-\frac{\sqrt{3}}{2})}{(\frac{1}{2})} = -\sqrt{3}$

8. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a radian measure of $\frac{3\pi}{4}$.

In the unit circle, $\sin\theta = y$, $\cos\theta = x$, $\tan\theta = \frac{y}{x}$. The unit circle shows the point $(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2})$ at $\frac{3\pi}{4}$ radians because $\frac{3\pi}{4}$ is a mirror image of $\frac{\pi}{4}$ across the y -axis.

Answer: $\sin \frac{3\pi}{4} = \frac{\sqrt{2}}{2}, \cos \frac{3\pi}{4} = -\frac{\sqrt{2}}{2}, \tan \frac{3\pi}{4} = \frac{\left(\frac{\sqrt{2}}{2}\right)}{\left(-\frac{\sqrt{2}}{2}\right)} = -1$

9. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a measure of 210° .

In the unit circle, $\sin\theta = y, \cos\theta = x, \tan\theta = \frac{y}{x}$. The unit circle shows the point $\left(-\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$ at 210° because 210° is a mirror image of 30° across the origin.

Answer: $\sin 210^\circ = -\frac{1}{2}, \cos 210^\circ = -\frac{\sqrt{3}}{2}, \tan 210^\circ = \frac{\left(-\frac{1}{2}\right)}{\left(-\frac{\sqrt{3}}{2}\right)} = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$

10. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a radian measure of $\frac{\pi}{6}$.

In the unit circle, $\sin\theta = y, \cos\theta = x, \tan\theta = \frac{y}{x}$. The unit circle shows the point $\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$ at $\frac{\pi}{6}$ radians.

Answer: $\sin \frac{\pi}{6} = \frac{1}{2}, \cos \frac{\pi}{6} = \frac{\sqrt{3}}{2}, \tan \frac{\pi}{6} = \frac{\left(\frac{1}{2}\right)}{\left(\frac{\sqrt{3}}{2}\right)} = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$

11. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a measure of 120° .

In the unit circle, $\sin\theta = y, \cos\theta = x, \tan\theta = \frac{y}{x}$. The unit circle shows the point $\left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$ at 120° because 120° is a mirror image of 60° across the y -axis.

Answer: $\sin 120^\circ = \frac{\sqrt{3}}{2}, \cos 120^\circ = -\frac{1}{2}, \tan 120^\circ = \frac{\left(\frac{\sqrt{3}}{2}\right)}{\left(-\frac{1}{2}\right)} = \frac{\sqrt{3}}{-1} = -\sqrt{3}$

12. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a radian measure of $\frac{11\pi}{6}$.

In the unit circle, $\sin\theta = y$, $\cos\theta = x$, $\tan\theta = \frac{y}{x}$. The unit circle shows the point $\left(\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$ at $\frac{11\pi}{6}$ radians because $\frac{11\pi}{6}$ is a mirror image of $\frac{\pi}{6}$ across the x -axis.

Answer: $\sin \frac{11\pi}{6} = -\frac{1}{2}$, $\cos \frac{11\pi}{6} = \frac{\sqrt{3}}{2}$, $\tan \frac{11\pi}{6} = \frac{\left(-\frac{1}{2}\right)}{\left(\frac{\sqrt{3}}{2}\right)} = \frac{-1}{\sqrt{3}}$ or $-\frac{\sqrt{3}}{3}$

13. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a measure of 30° .

In the unit circle, $\sin\theta = y$, $\cos\theta = x$, $\tan\theta = \frac{y}{x}$. The unit circle shows the point $\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$ at 30° .

Answer: $\sin 30^\circ = \frac{1}{2}$, $\cos 30^\circ = \frac{\sqrt{3}}{2}$, $\tan 30^\circ = \frac{\left(\frac{1}{2}\right)}{\left(\frac{\sqrt{3}}{2}\right)} = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$

14. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a radian measure of 2π .

In the unit circle, $\sin\theta = y$, $\cos\theta = x$, $\tan\theta = \frac{y}{x}$. The unit circle shows the point $(1, 0)$ at 2π radians because 2π is equivalent to 0 radians.

Answer: $\sin 2\pi = 0$, $\cos 2\pi = 1$, $\tan 2\pi = \frac{0}{1} = 0$

15. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a measure of 225° .

In the unit circle, $\sin\theta = y$, $\cos\theta = x$, $\tan\theta = \frac{y}{x}$. The unit circle shows the point $\left(-\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)$ at 225° because 225° is a mirror image of 45° across the origin.

Answer: $\sin 225^\circ = -\frac{\sqrt{2}}{2}, \cos 225^\circ = -\frac{\sqrt{2}}{2}, \tan 225^\circ = \frac{\left(-\frac{\sqrt{2}}{2}\right)}{\left(-\frac{\sqrt{2}}{2}\right)} = 1$

16. Use the unit circle to find the sine, cosine, and tangent ratios of an angle with a radian measure of $\frac{5\pi}{4}$.

In the unit circle, $\sin \theta = y$, $\cos \theta = x$, $\tan \theta = \frac{y}{x}$. The unit circle shows the point $\left(-\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)$ at $\frac{5\pi}{4}$ radians because $\frac{5\pi}{4}$ is a mirror image of $\frac{\pi}{4}$ across the origin.

Answer: $\sin \frac{5\pi}{4} = -\frac{\sqrt{2}}{2}, \cos \frac{5\pi}{4} = -\frac{\sqrt{2}}{2}, \tan \frac{5\pi}{4} = \frac{\left(-\frac{\sqrt{2}}{2}\right)}{\left(-\frac{\sqrt{2}}{2}\right)} = 1$

17. Use the unit circle to find the measures of two angles, in degrees, whose sine ratio is $\frac{\sqrt{2}}{2}$.

The sine ratio is the y –value of a point on the unit circle. The ratio $\frac{\sqrt{2}}{2}$ is the y –value of 45° so one angle is 45° . The other angle in the unit circle with the same value and sign of the sine ratio is the angle that is the mirror image of 45° across the y –axis, which is 135° .

Answer: $45^\circ, 135^\circ$

18. Use the unit circle to find the measures of two angles, in radians, whose tangent ratio is -1 .

The tangent ratio is the ratio of $\frac{y}{x}$ of a point on the unit circle. The ratio $\frac{-1}{1}$ is the reflection of the tangent ratio of $\frac{\pi}{4}$ across the y –axis and across the x – axis, so the angles are $\frac{3\pi}{4}$ and $-\frac{\pi}{4}$ which is $\frac{7\pi}{4}$.

Answer: $\frac{3\pi}{4}, \frac{7\pi}{4}$

19. Use the unit circle to find the measures of two angles, in degrees, whose cosine ratio is $-\frac{1}{2}$.

The cosine ratio is the x -value of a point on the unit circle. The ratio $-\frac{1}{2}$ is the mirror image of the x -value of 60° across the y -axis, and across the origin, so one angle is 120° . The other angle in the unit circle with the same x -value that is the mirror image of 60° across the origin is 240° .

Answer: $120^\circ, 240^\circ$

20. Use the unit circle to find the measures of two angles, in radians, whose tangent ratio is 1.

The tangent ratio is the ratio of $\frac{y}{x}$ of a point on the unit circle. The ratio 1 is the tangent ratio of $\frac{\pi}{4}$ so one angle is $\frac{\pi}{4}$. The other angle that has the tangent ratio with the same value is the reflection of $\frac{\pi}{4}$ across the origin, so that angle is $\frac{5\pi}{4}$.

Answer: $\frac{\pi}{4}, \frac{5\pi}{4}$

21. Use the unit circle to find the measures of two angles, in degrees, whose cosine ratio is $\frac{\sqrt{3}}{2}$.

The cosine ratio is the x -value of a point on the unit circle. The ratio $\frac{\sqrt{3}}{2}$ is the x -value of 30° . The other angle in the unit circle with the same x -value is a reflection across the x -axis, so that angle is 330° .

Answer: $30^\circ, 330^\circ$

22. Use the unit circle to find the measures of two angles, in radians, whose sine ratio is $\frac{\sqrt{3}}{2}$.

The sine ratio is the y –value of a point on the unit circle. The ratio $\frac{\sqrt{3}}{2}$ is the y –value of $\frac{\pi}{3}$ so one angle is $\frac{\pi}{3}$. The other angle that has the same y –value is a reflection across the y –axis, so that angle is $\frac{2\pi}{3}$.

Answer: $\frac{\pi}{3}, \frac{2\pi}{3}$

23. Use the unit circle to find the measures of two angles, in degrees, whose tangent ratio is $-\sqrt{3}$.

The tangent ratio is the ratio of $\frac{y}{x}$ of a point on the unit circle. The ratio $-\sqrt{3}$ is equivalent to the opposite of the tangent ratio $\frac{\sqrt{3}}{\frac{1}{2}}$. This is the tangent ratio of 60° so the opposite ratio is the tangent of the angle that is a reflection across the y –axis which is 120° . The other angle that has the tangent ratio with the same value is the reflection of 60° across the origin, so that angle is 300° .

Answer: $120^\circ, 300^\circ$

24. Use the unit circle to find the measures of two angles, in radians, whose sine ratio is 0.

The sine ratio is the y –value of a point on the unit circle. The ratio 0 is the y –value of 0 radians so one angle is 0 radians. The other angle in the unit circle with the same value and sign of the sine ratio is the angle that is the mirror image of 0 radians across the y –axis, which is π .

Answer: $0, \pi$

25. Use the unit circle to find the measures of two angles, in degrees, whose cosine ratio is 0.

The cosine ratio is the x -value of a point on the unit circle. The ratio 0 is the x -value of 90° . The other angle in the unit circle with the same x -value is a reflection across the x -axis, so that angle is 270° .

Answer: $90^\circ, 270^\circ$

26. Use the unit circle to find the measures of two angles, in radians, whose sine ratio is $-\frac{1}{2}$.

The sine ratio is the y -value of a point on the unit circle. The ratio $-\frac{1}{2}$ is the opposite of the y -value of $\frac{\pi}{6}$ radians, which is a reflection of $\frac{\pi}{6}$ across the x -axis, so one angle is $\frac{11\pi}{6}$ radians. The other angle in the unit circle with the same value and sign of the sine ratio is the angle that is the mirror image of $\frac{\pi}{6}$ radians across the origin, which is $\frac{7\pi}{6}$.

Answer: $\frac{7\pi}{6}, \frac{11\pi}{6}$

27. Use the unit circle to find the measures of two angles, in degrees, whose cosine ratio is $-\frac{\sqrt{2}}{2}$.

The cosine ratio is the x -value of a point on the unit circle. The ratio $-\frac{\sqrt{2}}{2}$ is the opposite of the x -value of 45° , which is a reflection of 45° across the y -axis, so one angle is 135° . The other angle in the unit circle with the same x -value is a reflection of 45° across the origin, so that angle is 225° .

Answer: $135^\circ, 225^\circ$

28. Use the unit circle to find the measures of two angles, in radians, whose tangent ratio is 0.

The tangent ratio is the ratio of $\frac{y}{x}$ of a point on the unit circle. The ratio 0 is the opposite of the tangent ratio of 0 radians. The other angle that has the tangent ratio with the same value is the reflection of 0 radians across the y –axis, so that angle is π .

Answer: $0, \pi$

29. Use the unit circle to find the measures of two angles, in degrees, whose sine ratio is $\frac{1}{2}$.

The sine ratio is the y –value of a point on the unit circle. The ratio $\frac{1}{2}$ is the y –value of 30° , so one angle is 30° . The other angle in the unit circle with the same value and sign of the sine ratio is the angle that is the mirror image of 30° radians across the y –axis, which is 150° .

Answer: $30^\circ, 150^\circ$

30. Use the unit circle to find the measures of two angles, in radians, whose tangent ratio is $-\frac{\sqrt{3}}{3}$.

The tangent ratio is the ratio of $\frac{y}{x}$ of a point on the unit circle. The ratio $-\frac{\sqrt{3}}{3}$ is equivalent to the opposite of the tangent ratio $\frac{\frac{1}{2}}{\frac{\sqrt{3}}{2}}$. This is the tangent ratio of $\frac{\pi}{6}$ so the opposite ratio is the tangent of the angle that is a reflection across the x –axis which is $\frac{11\pi}{6}$. The other angle that has the tangent ratio with the same value is the reflection of $\frac{\pi}{6}$ across the y –axis, so that angle is $\frac{5\pi}{6}$.

Answer: $\frac{5\pi}{6}, \frac{11\pi}{6}$