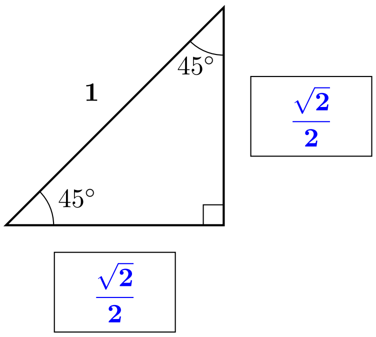
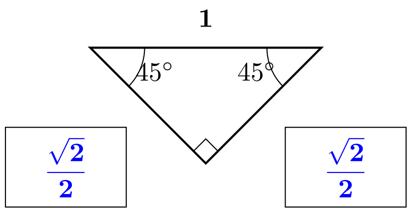
Section 1: Special Right Triangles

Each right triangle below has a hypotenuse equal to 1. Write the length of each leg in each label box.

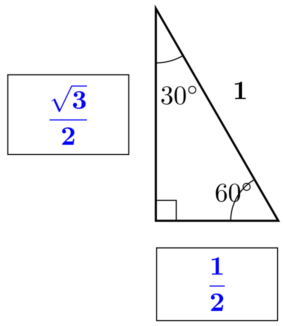
1.



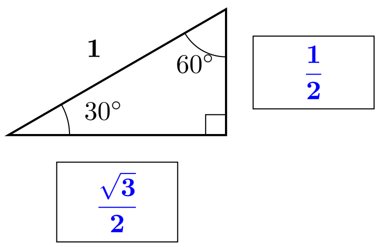
2.



3.



4.



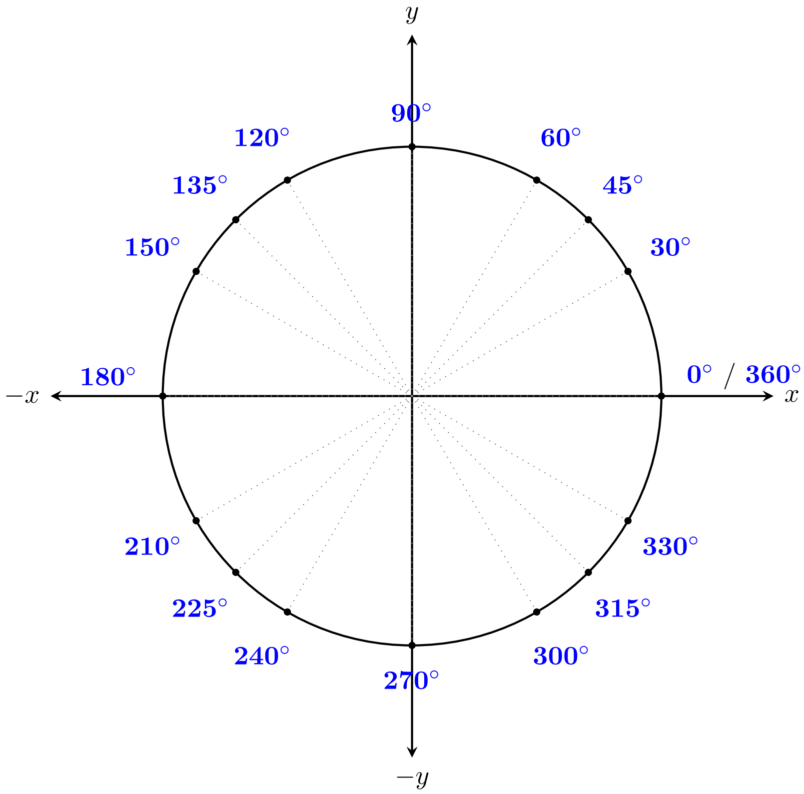
Section 2: Basic Trigonometric Evaluations

Find the exact radical value of each trigonometric expression. Rationalize denominators where necessary.

1. $\sin\left(\frac{\pi}{3}\right) = \boldsymbol{\frac{\sqrt{3}}{2}}$
2. $\cos(45°) = \boldsymbol{\frac{\sqrt{2}}{2}}$
3. $\tan\left(\frac{\pi}{6}\right) = \boldsymbol{\frac{\sqrt{3}}{3}}$
4. $\cos\left(\frac{2\pi}{3}\right) = \boldsymbol{-\frac{1}{2}}$
5. $\sin(210°) = \boldsymbol{-\frac{1}{2}}$
6. $\tan\left(\frac{3\pi}{4}\right) = \boldsymbol{-1}$
7. $\sec(60°) = \boldsymbol{2}$
8. $\csc\left(\frac{5\pi}{4}\right) = \boldsymbol{-\sqrt{2}}$
9. $\cot(330°) = \boldsymbol{-\sqrt{3}}$
10. $\sin(\pi) = \boldsymbol{0}$
11. $\cos\left(\frac{3\pi}{2}\right) = \boldsymbol{0}$
12. $\tan(180°) = \boldsymbol{0}$

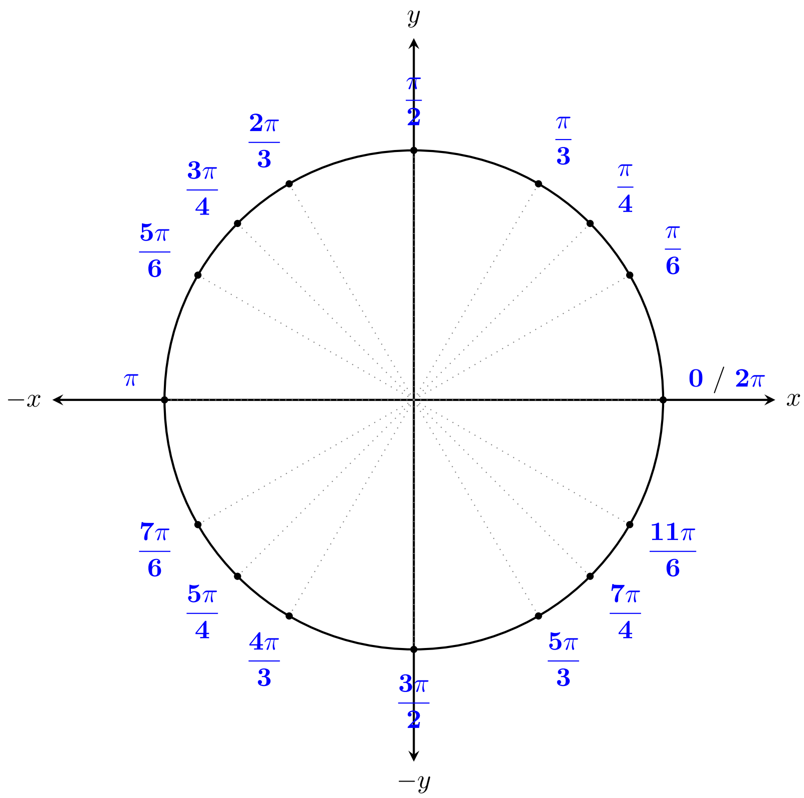
Section 3: The Degree Circle

Label all 16 standard positions along the unit circle with their degree values.



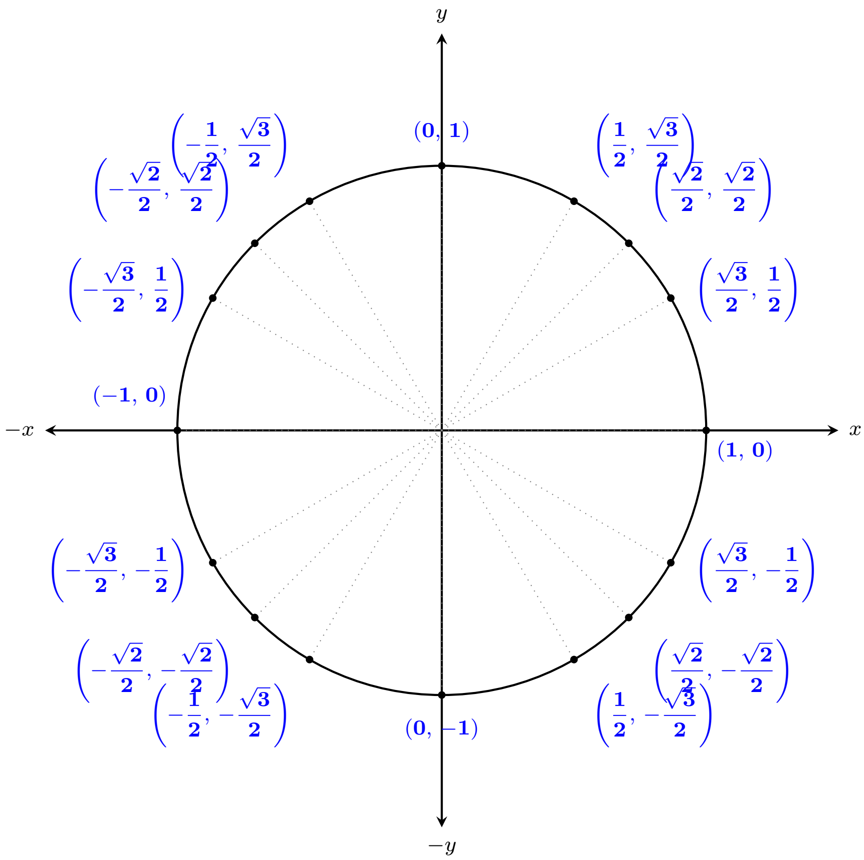
Section 4: The Radian Circle

Label all 16 standard positions along the unit circle with their radian values in terms of π.



Section 5: The Coordinate Circle

Label all 16 standard positions with their exact unit circle coordinates, $(x, y) = (\cos\theta, \sin\theta)$.



Section 6: Trigonometric Identities & Equivalences

Rewrite or simplify each expression using fundamental quotient, reciprocal, and Pythagorean identities.

6. Rewrite $\cot\theta$ as a quotient of sine and cosine.

$$\cot\theta = \frac{\cos\theta}{\sin\theta}$$

7. Rewrite $\sec\theta$ in terms of cosine.

$$\sec\theta = \frac{\mathbf{1}}{\cos\theta}$$

8. Rewrite $\csc\theta$ in terms of sine.

$$\csc\theta = \frac{\mathbf{1}}{\sin\theta}$$

9. Rewrite $\tan\theta$ using only secant and cosecant.

$$\tan\theta = \frac{\sec\theta}{\csc\theta}$$

10. Simplify completely: $\cos\theta \cdot \tan\theta \cdot \csc\theta$

$$\cos\theta \cdot \left(\frac{\sin\theta}{\cos\theta}\right) \cdot \left(\frac{\mathbf{1}}{\sin\theta}\right) = \mathbf{1}$$

11. Simplify completely: $\dfrac{\sin\theta \cdot \sec\theta}{\tan\theta}$

$$\frac{\sin\theta \cdot \frac{1}{\cos\theta}}{\tan\theta} = \frac{\tan\theta}{\tan\theta} = \mathbf{1}$$

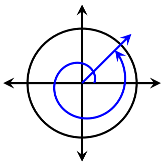
12. Simplify completely: $\tan\theta \cdot \csc\theta \cdot \cos\theta$

$$\left(\frac{\sin\theta}{\cos\theta}\right) \cdot \left(\frac{\mathbf{1}}{\sin\theta}\right) \cdot \cos\theta = \mathbf{1}$$

Section 7: Angle Sketching (Rotations and Direction)

For each item, sketch a directional spiral arrow showing the total rotation starting from the positive x-axis, draw the terminal ray, and identify the reference angle θ'.

Example: $\theta = 405^\circ$

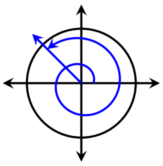


Direction of rotation: **Counter-clockwise (1 turn** $+45^\circ$)

Terminal Quadrant / Axis: **Quadrant I**

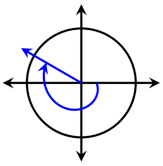
Acute Reference Angle θ': **45**°

1. $\theta = 495^\circ$



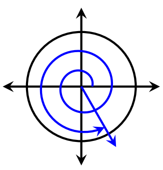
Direction: **Counter-clockwise (1 turn** $+135^\circ$)
Quadrant: **Quadrant II**
Reference Angle θ': **45**°

2. $\theta = -210^\circ$



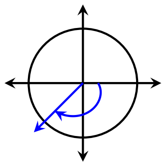
Direction: **Clockwise** (210°)
Quadrant: **Quadrant II**
Reference Angle θ': **30**°

3. $\theta = \dfrac{11\pi}{3}$



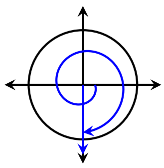
Degrees: **660**°
Quadrant: **Quadrant IV**
Reference Angle θ': **60**° or $\dfrac{\pi}{\mathbf{3}}$

4. $\theta = -\dfrac{3\pi}{4}$



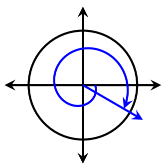
Degrees: **−135**°
Quadrant: **Quadrant III**
Reference Angle θ': **45**° or $\dfrac{\pi}{\mathbf{4}}$

5. $\theta = -450^\circ$



Coterminal $[0, 360^\circ)$**:** **270**°
Terminal Axis: **Negative y-axis**
Reference Angle θ': **90**° (Quadrantal)

6. $\theta = -\dfrac{13\pi}{6}$



Degrees: **−390**°
Quadrant: **Quadrant IV**
Reference Angle θ': **30**° or $\dfrac{\pi}{\mathbf{6}}$

Unit Circle Practice Worksheet 2 — Teacher Answer Key

Section 8: Evaluation and Inverse Reconstruction

Part A: Evaluating Trigonometric Functions

Evaluate each expression to its exact radical value. Rationalize denominators where necessary.

13. $\tan(-135°) = \mathbf{1}$
14. $\sec\left(\frac{5\pi}{3}\right) = \mathbf{2}$
15. $\csc\left(-\frac{7\pi}{6}\right) = \mathbf{2}$
16. $\cot(420°) = \frac{\sqrt{\mathbf{3}}}{\mathbf{3}}$
17. $\sin\left(\frac{7\pi}{4}\right) = -\frac{\sqrt{\mathbf{2}}}{\mathbf{2}}$
18. $\cos(-300°) = \frac{\mathbf{1}}{\mathbf{2}}$
19. $\cot\left(-\frac{2\pi}{3}\right) = \frac{\sqrt{\mathbf{3}}}{\mathbf{3}}$
20. $\sec(540°) = \mathbf{-1}$

Part B: Finding Unique Angles from Verbal Descriptions

Find the single, unique angle θ on the domain $0 \leq \theta < 2\pi$ satisfying each verbal description. Express all answers in radians.

21. Identify the angle in the second quadrant whose sine equals one-half.
$\theta = \frac{\mathbf{5}\pi}{\mathbf{6}}$

22. Identify the angle whose tangent is negative one and whose sine is positive.
$\theta = \frac{\mathbf{3}\pi}{\mathbf{4}}$

23. Identify the angle in the fourth quadrant whose cosine equals positive square root of three over two.
$\theta = \frac{\mathbf{11}\pi}{\mathbf{6}}$

24. Identify the angle located in the third quadrant whose secant equals negative two.
$\theta = \frac{\mathbf{4}\pi}{\mathbf{3}}$

25. Identify the quadrantal angle whose cosine is zero and whose cosecant is negative one.
$\theta = \frac{\mathbf{3}\pi}{\mathbf{2}}$

26. Identify the angle in the third quadrant whose cotangent equals the square root of three.
$\theta = \frac{\mathbf{7}\pi}{\mathbf{6}}$

27. Identify the angle whose cosecant is positive square root of two and whose cosine is negative.
$\theta = \frac{\mathbf{3}\pi}{\mathbf{4}}$

28. Identify the angle located along an axis whose sine is zero and whose secant is negative one.
$\theta = \pi$