

Introduction to Trigonometry: Angles & Their Measurement

Trigonometry Worksheet · Grade 9–11

Name: _____

Date: _____

Learning Objectives

- Identify and draw angles in standard position, including initial and terminal sides
- Distinguish between positive (counter-clockwise) and negative (clockwise) angles
- Convert between degree and radian measures and identify angles by quadrant

Problems

1. An angle is formed by two rays with the same initial point. What is the name of the fixed ray that lies along the positive x-axis in standard position?

2. A full rotation around a circle in the counter-clockwise direction equals how many degrees?

3. State whether the following angle measures are positive or negative based on the direction of rotation: 230 degrees and negative 150 degrees.

230° and – 150°

4. Identify the quadrant in which the terminal side of a 230-degree angle in standard position lies.

230°

5. Identify the quadrant in which the terminal side of a negative 150-degree angle in standard position lies.

–150°

6. Convert 270 degrees to radians. Express your answer in terms of pi.

270° × $\frac{\pi}{180^\circ}$

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7. Convert 3π over 4 radians to degrees.

$$\frac{3\pi}{4} \text{ radians} \times \frac{180^\circ}{\pi}$$

8. The table below shows angle measures in degrees. Fill in the corresponding radian measures and the quadrant of the terminal side for each angle.

Degrees	Radians	Quadrant
90°		
180°		
270°		
360°		

9. Find two angles — one positive and one negative — that are coterminal with a 60-degree angle in standard position.

$$60^\circ$$

10. A terminal side rotates clockwise from the initial side and stops at negative 510 degrees. Find the reference angle and determine in which quadrant the terminal side lies.

$$-510^\circ$$

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Introduction to Trigonometry: Angles & Their Measurement — Answer Key

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Answer Key

1. Answer: Initial side

- In standard position, an angle is placed on the coordinate plane.
- The fixed ray along the positive x-axis is called the initial side.
- The ray that rotates from the initial side is called the terminal side.

2. Answer: 360 degrees

- One complete rotation around the origin returns the terminal side to the initial side.
- By definition, one full counter-clockwise rotation = 360° .

3. Answer: 230° is positive (counter-clockwise); -150° is negative (clockwise)

- A positive angle is formed by rotating the terminal side counter-clockwise from the initial side.
- A negative angle is formed by rotating the terminal side clockwise from the initial side.
- $230^\circ > 0$, so it is a positive angle (counter-clockwise rotation).
- $-150^\circ < 0$, so it is a negative angle (clockwise rotation).

4. Answer: Quadrant III

- Quadrant I: 0° to 90°
- Quadrant II: 90° to 180°
- Quadrant III: 180° to 270°
- Since $180^\circ < 230^\circ < 270^\circ$, the terminal side lies in Quadrant III.

5. Answer: Quadrant III

- Rotating -150° clockwise from the positive x-axis.
- -90° lands at the negative y-axis, -180° lands at the negative x-axis.
- -150° is between -90° and -180° , so the terminal side is in Quadrant III.

6. Answer: $3\pi/2$ radians

- Use the conversion factor: multiply degrees by $\pi/180$.
- $270 \times (\pi/180) = 270\pi/180$
- Simplify: $270/180 = 3/2$
- Answer: $3\pi/2$ radians

7. Answer: 135 degrees

- Use the conversion factor: multiply radians by $180/\pi$.
- $(3\pi/4) \times (180/\pi) = (3 \times 180) / 4$
- $= 540 / 4 = 135^\circ$

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8. Answer: See completed table

Degrees	Radians	Quadrant
90°	$\pi/2$	Positive y-axis (between Q I & II)
180°	π	Negative x-axis (between Q II & III)
270°	$3\pi/2$	Negative y-axis (between Q III & IV)
360°	2π	Positive x-axis (back to start)

- $90^\circ \times (\pi/180) = \pi/2$; terminal side on positive y-axis.
- $180^\circ \times (\pi/180) = \pi$; terminal side on negative x-axis.
- $270^\circ \times (\pi/180) = 3\pi/2$; terminal side on negative y-axis.
- $360^\circ \times (\pi/180) = 2\pi$; terminal side completes full rotation back to positive x-axis.

9. Answer: Positive: 420°; Negative: -300°

- Coterminal angles share the same terminal side.
- To find a positive coterminal angle, add 360°: $60^\circ + 360^\circ = 420^\circ$.
- To find a negative coterminal angle, subtract 360°: $60^\circ - 360^\circ = -300^\circ$.
- Both 420° and -300° are coterminal with 60°.

10. Answer: Reference angle = 30°; Quadrant III

- First, find a coterminal angle between 0° and 360° by adding multiples of 360°.
- $-510^\circ + 360^\circ = -150^\circ$; still negative, so add another 360°.
- $-150^\circ + 360^\circ = 210^\circ$; this is between 0° and 360°.
- 210° lies in Quadrant III (between 180° and 270°).
- Reference angle = $210^\circ - 180^\circ = 30^\circ$.

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