

Hello! I can certainly help you solve these trigonometry problems.

The goal is to find all values of  $\theta$  in the interval  $0^\circ \leq \theta \leq 360^\circ$  for each given trigonometric ratio, rounding the final answer to the nearest degree.

For each problem, we'll use the following steps:

1. **Find the reference angle ( $\alpha$ ):** Use the inverse trigonometric function of the *absolute value* of the given ratio.
  2. **Determine the quadrants:** Use the sign of the trigonometric ratio (positive or negative) to determine which quadrants  $\theta$  lies in. (Remember the **CAST Rule** or **All Students Take Calculus** to identify where each function is positive: **Cos** is positive in IV, **All** are positive in I, **Sin** is positive in II, **Tan** is positive in III).  
**3. Calculate the angles ( $\theta$ ):** Use the reference angle to find the actual angles in the appropriate quadrants:
    - **Quadrant I:**  $\theta = \alpha$
    - **Quadrant II:**  $\theta = 180^\circ - \alpha$
    - **Quadrant III:**  $\theta = 180^\circ + \alpha$
    - **Quadrant IV:**  $\theta = 360^\circ - \alpha$
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## Solutions

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a)  $\sin \theta = 0.4815$

1. Reference Angle ( $\alpha$ ):

$$\alpha = \arcsin(0.4815) \approx 28.786^\circ$$

2. **Quadrants:** Sine is **positive**, so  $\theta$  is in **Quadrant I** and **Quadrant II**.

3. **Angles ( $\theta$ ):**

- **QI:**  $\theta_1 = \alpha \approx 28.786^\circ$
- **QII:**  $\theta_2 = 180^\circ - \alpha \approx 180^\circ - 28.786^\circ = 151.214^\circ$

4. Nearest Degree:

$$\theta \approx **29^\circ** \text{ and } **151^\circ**$$


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**b)**  $\tan \theta = -0.1623$

1. Reference Angle ( $\alpha$ ):

$$\alpha = \arctan(|-0.1623|) = \arctan(0.1623) \approx 9.224^\circ$$

2. **Quadrants:** Tangent is **negative**, so  $\theta$  is in **Quadrant II** and **Quadrant IV**.

3. **Angles ( $\theta$ ):**

- **QII:**  $\theta_1 = 180^\circ - \alpha \approx 180^\circ - 9.224^\circ = 170.776^\circ$
- **QIV:**  $\theta_2 = 360^\circ - \alpha \approx 360^\circ - 9.224^\circ = 350.776^\circ$

4. Nearest Degree:

$$\theta \approx **171^\circ** \text{ and } **351^\circ**$$


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**c)**  $\cos \theta = -0.8722$

1. Reference Angle ( $\alpha$ ):

$$\alpha = \arccos(|-0.8722|) = \arccos(0.8722) \approx 29.317^\circ$$

2. **Quadrants:** Cosine is **negative**, so  $\theta$  is in **Quadrant II** and **Quadrant III**.

3. **Angles ( $\theta$ ):**

- **QII:**  $\theta_1 = 180^\circ - \alpha \approx 180^\circ - 29.317^\circ = 150.683^\circ$

- **QIII:**  $\theta_2 = 180^\circ + \alpha \approx 180^\circ + 29.317^\circ = 209.317^\circ$

4. Nearest Degree:

$$\theta \approx **151^\circ** \text{ and } **209^\circ**$$


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**d)  $\cot \theta = 8.1516$**

First, convert to the tangent function, since  $\tan \theta = \frac{1}{\cot \theta}$ :

$$\tan \theta = \frac{1}{8.1516} \approx 0.12267$$

1. Reference Angle ( $\alpha$ ):

$$\alpha = \arctan(0.12267) \approx 6.992^\circ$$

2. **Quadrants:** Cotangent (and Tangent) is **positive**, so  $\theta$  is in **Quadrant I** and **Quadrant III**.

3. **Angles ( $\theta$ ):**

- **QI:**  $\theta_1 = \alpha \approx 6.992^\circ$
- **QIII:**  $\theta_2 = 180^\circ + \alpha \approx 180^\circ + 6.992^\circ = 186.992^\circ$

4. Nearest Degree:

$$\theta \approx **7^\circ** \text{ and } **187^\circ**$$


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**e)  $\csc \theta = -2.3424$**

First, convert to the sine function, since  $\sin \theta = \frac{1}{\csc \theta}$ :

$$\sin \theta = \frac{1}{-2.3424} \approx -0.42699$$

1. Reference Angle ( $\alpha$ ):

$$\alpha = \arcsin(| - 0.42699 |) = \arcsin(0.42699) \approx 25.268^\circ$$

**2. Quadrants:** Cosecant (and Sine) is **negative**, so  $\theta$  is in **Quadrant III** and **Quadrant IV**.

**3. Angles ( $\theta$ ):**

- **QIII:**  $\theta_1 = 180^\circ + \alpha \approx 180^\circ + 25.268^\circ = 205.268^\circ$

- **QIV:**  $\theta_2 = 360^\circ - \alpha \approx 360^\circ - 25.268^\circ = 334.732^\circ$

**4. Nearest Degree:**

$$\theta \approx * * 205^\circ * * \text{ and } * * 335^\circ * *$$


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**f)**  $\sec \theta = 0$

First, convert to the cosine function, since  $\cos \theta = \frac{1}{\sec \theta}$ :

$$\cos \theta = \frac{1}{0}$$

This expression is **undefined** (division by zero).

The secant function,  $\sec \theta = \frac{1}{\cos \theta}$ , is only defined when  $\cos \theta \neq 0$ .

Since the range of the cosine function is  $-1 \leq \cos \theta \leq 1$ , and  $\sec \theta$  is the reciprocal of  $\cos \theta$ :

- If  $0 < \cos \theta \leq 1$ , then  $\sec \theta \geq 1$ .
- If  $-1 \leq \cos \theta < 0$ , then  $\sec \theta \leq -1$ .

The values of  $\sec \theta$  are always  $|\sec \theta| \geq 1$  or  $\sec \theta$  is undefined.

Therefore,  $\sec \theta$  **can never equal 0**.

**Solution: No solution** for  $0^\circ \leq \theta \leq 360^\circ$ .

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Would you like to practice another problem using a different trigonometric function?