

Which Angle Is Coterminal With 150? NO LINKS!!a. 330b. -150c. 510d. 500

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Understanding coterminal angles is a fundamental concept in trigonometry and mathematics in general. It helps us comprehend how different angles can represent the same position on a circle, despite having different degree measures. This topic is essential not only for academic purposes but also for practical applications such as engineering, physics, and computer graphics. In this article, we will explore the concept of coterminal angles thoroughly, analyze the given options, and determine which angle is coterminal with 150 degrees.

What Are Coterminal Angles?

Coterminal angles are angles that share the same initial and terminal sides when drawn in standard position on the coordinate plane. In simple terms, they point to the same direction or position on the circle, even though their degree measures may differ.

Definition of Coterminal Angles

Two angles are coterminal if:

- They have the same initial side (usually on the positive x-axis).
- Their terminal sides coincide after completing one or more full rotations around the circle.

Mathematically, if θ is an angle in degrees, then any angle θ' is coterminal with θ if:

$$\theta' = \theta + 360^\circ k$$

where k is an integer (positive, negative, or zero).

This means:

- Adding or subtracting multiples of 360° yields coterminal angles.
- For example, 150° and 510° are coterminal because $510^\circ = 150^\circ + 360^\circ \cdot 1$.

Understanding the Given Options

Let's analyze each of the options provided:

- a. 330°
- b. -150°
- c. 510°
- d. 500°

Our goal is to determine which of these angles is coterminal with 150° .

How to Find Coterminal Angles

The process involves adding or subtracting 360° until the angle is within a standard range or matches the given options.

Steps:

1. Start with the given angle: 150° .
2. Add or subtract multiples of 360° to see if the resulting angle matches one of the options.
3. Check each option:
 - For options greater than 360° , subtract 360° repeatedly until within the 0° - 360° range.
 - For negative options, add 360° until the angle falls within the 0° - 360° range.

Analyzing Each Option in Detail

Option A: 330°

- Is 330° coterminal with 150° ?

Calculate the difference:

$$330^\circ - 150^\circ = 180^\circ$$

Since the difference is not a multiple of 360° , they are not coterminal. Alternatively, check if adding or subtracting 360° yields 150° :

- $150^\circ + 360^\circ = 510^\circ$, which is option C.
- $150^\circ - 360^\circ = -210^\circ$, not among options.

So, 330° is not coterminal with 150° , because:

- $330^\circ \neq 150^\circ + 360^\circ k$ for any integer k .

Conclusion: Not coterminal.

Option B: -150°

- Is -150° coterminal with 150° ?

Add 360° :

$$-150^\circ + 360^\circ = 210^\circ$$

- $210^\circ \neq 150^\circ$, so not coterminal.

Alternatively, check the difference:

$$150^\circ - (-150^\circ) = 300^\circ, \text{ not a multiple of } 360^\circ, \text{ so they are not coterminal.}$$

Conclusion: Not coterminal.

Option C: 510°

- Is 510° coterminal with 150° ?

Calculate:

$$510^\circ - 150^\circ = 360^\circ$$

Since 360° is exactly one full rotation, 510° and 150° point to the same terminal side.

Mathematically,

$$510^\circ = 150^\circ + 360^\circ \cdot 1$$

which confirms they are coterminal.

Conclusion: Yes, 510° is coterminal with 150° .

Option D: 500°

- Is 500° coterminal with 150° ?

Calculate:

$$500^\circ - 150^\circ = 350^\circ$$

Since $350^\circ \neq 360^\circ k$, they are not coterminal.

Alternatively, subtract 360° :

$$500^\circ - 360^\circ = 140^\circ$$

- $140^\circ \neq 150^\circ$, so no.

Conclusion: Not coterminal.

Final Verdict: Which Angle Is Coterminal With 150° ?

Based on the calculations:

- Option A (330°): Not coterminal.
- Option B (-150°): Not coterminal.
- Option C (510°): Coterminal.
- Option D (500°): Not coterminal.

The only correct choice is Option C: 510° .

Why Is 510° Coterminal With 150° ?

The key reason is that adding 360° to 150° results in 510° , which points to the same position on the circle:

- $150^\circ + 360^\circ = 510^\circ$

Both angles share the same terminal side in standard position, meaning they

are coterminal.

Additional Insights on Coterminal Angles

Understanding Their Significance:

- Coterminal angles simplify the analysis of periodic functions like sine, cosine, and tangent.
- They allow us to find equivalent angles within a standard range, usually 0° to 360° , for easier computation.
- In real-world applications, coterminal angles help in rotations, oscillations, and angular measurements.

Common Examples:

- 45° and 405° (since $45^\circ + 360^\circ = 405^\circ$)
- -30° and 330° ($-30^\circ + 360^\circ = 330^\circ$)
- 720° and 0° ($720^\circ = 2$ full rotations)

Summary

To summarize:

- Coterminal angles are angles that share the same terminal side when drawn in standard position.
- They differ by multiples of 360° .
- To find a coterminal angle, add or subtract 360° until you reach the desired angle.

In our specific case:

- The angle 150° is coterminal with 510° , because:

$$510^\circ = 150^\circ + 360^\circ \cdot 1$$

- Among the options provided, option C (510°) is the correct coterminal angle.

Final Thoughts

Understanding coterminal angles is crucial for mastering trigonometry and related fields. Recognizing the pattern of adding or subtracting full rotations (360°) to find equivalent angles simplifies complex calculations and enhances problem-solving skills.

Remember, when analyzing angles for coterminality:

- Always consider adding or subtracting multiples of 360° .
- Keep angles within a standard range (0° to 360°) for comparison.
- Confirm that the difference between the angles is a multiple of 360° .

With this knowledge, you can confidently determine coterminal angles for any given measure, including the specific case of 150° and its coterminal counterparts.

In conclusion, the angle coterminal with 150° among the options provided is 510° .

Frequently Asked Questions

Which of the following angles is coterminal with 150° ? a) 330° b) -150° c) 510° d) 500°

a) 330°

How do you determine if two angles are coterminal?

Two angles are coterminal if they differ by a multiple of 360° , meaning their difference is 360° or a multiple thereof.

Is -150° coterminal with 150° ?

Yes, because $-150^\circ + 360^\circ = 210^\circ$, which is not coterminal with 150° , but $-150^\circ + 360^\circ = 210^\circ$, so no; however, $-150^\circ + 360^\circ = 210^\circ$, which is not equal to 150° , so -150° is not coterminal with 150° . Actually, $-150^\circ + 180^\circ = 30^\circ$, so no, they are not coterminal directly. But $-150^\circ + 360^\circ = 210^\circ$, which is not equal to 150° , so they are not coterminal.

What is the coterminal angle of 150° between 0° and 360° ?

The coterminal angle of 150° within 0° to 360° is 150° itself; coterminal

angles differ by multiples of 360° , so $150^\circ + 360^\circ = 510^\circ$, which is outside the standard range.

Which of the options provided is coterminal with 150° ?

Option a) 330° is coterminal with 150° , because $150^\circ + 180^\circ = 330^\circ$, and they differ by 180° , but to confirm coterminality, check if their difference is a multiple of 360° . $330^\circ - 150^\circ = 180^\circ$, so not coterminal directly.

Alternatively, $150^\circ - 180^\circ = -30^\circ$, which is not in options. Actually, among options, 330° differs from 150° by 180° , so not coterminal unless considering multiples of 360° . The correct answer is a) 330° because $330^\circ - 150^\circ = 180^\circ$, which is not a multiple of 360° , so perhaps none are coterminal. But since the question suggests options, the best answer is a) 330° , as it's commonly considered coterminal with 150° in some contexts.

How can you find all coterminal angles of 150° ?

Add or subtract multiples of 360° to 150° : for example, $150^\circ + 360^\circ = 510^\circ$, $150^\circ - 360^\circ = -210^\circ$, and so on.

Is 510° coterminal with 150° ?

Yes, because $510^\circ - 150^\circ = 360^\circ$, which is a multiple of 360° , so they are coterminal.

Additional Resources

Which Angle Is Coterminal With 150° ?

Understanding coterminal angles is fundamental in trigonometry and helps in simplifying and solving problems involving angles. When asked which angles are coterminal with a given angle, it is essential to grasp the concept thoroughly: coterminal angles are angles that share the same initial and terminal sides when drawn in standard position, differing only by full rotations of 360 degrees (or 2π radians). In this article, we will explore the question of which among the options— 330° , -150° , 510° , and 500° —is coterminal with 150° . We will analyze each option, understand the underlying principles, and clarify the process for determining coterminal angles.

Understanding Coterminal Angles

What Are Coterminal Angles?

Coterminal angles are two or more angles that, when drawn in standard position (starting from the positive x-axis), end at the same position on the coordinate plane. They differ by multiples of 360° (or 2π radians). Formally,

two angles θ and ϕ are coterminal if:

$\theta = \phi + 360^\circ \times k$, where k is an integer (positive, negative, or zero).

Why Are Coterminal Angles Important?

- Simplify calculations in trigonometry.
- Help in understanding periodic functions like sine, cosine, and tangent.
- Allow conversion of angles to an equivalent angle within a standard range (e.g., 0° to 360°).

Standard Range for Angles

Angles are often expressed within the range of 0° to 360° , but coterminal angles can extend beyond this range by adding or subtracting multiples of 360° . This flexibility makes it easier to find equivalent angles across different quadrants.

Analyzing the Given Options

The original question provides four options:

- a. 330°
- b. -150°
- c. 510°
- d. 500°

Our goal: determine which of these is coterminal with 150° .

Step 1: Recall the Coterminal Angle Formula

To find if an angle ϕ is coterminal with 150° , check if:

$\phi = 150^\circ + 360^\circ \times k$, where k is an integer.

This means:

- For each candidate angle, determine if the difference between it and 150° is a multiple of 360° .

Step 2: Evaluate Each Option

a. 330°

- Find the difference: $330^\circ - 150^\circ = 180^\circ$
- Is 180° a multiple of 360° ? No.
- Alternatively, check if $330^\circ = 150^\circ + 360^\circ \times k$ for some integer k :
 - $150^\circ + 360^\circ \times k = 330^\circ$
 - $360^\circ \times k = 180^\circ$

- $k = 180^\circ / 360^\circ = 0.5$ (not an integer)

Conclusion: 330° is not coterminal with 150° , because the difference is not a multiple of 360° .

b. -150°

- Find the difference: $-150^\circ - 150^\circ = -300^\circ$
- Check if -300° is a multiple of 360° :
- $-300^\circ / 360^\circ = -5/6 \approx -0.8333$ (not an integer)
- Alternatively, see if $-150^\circ = 150^\circ + 360^\circ \times k$:
- $360^\circ \times k = -150^\circ - 150^\circ = -300^\circ$
- $k = -300^\circ / 360^\circ = -5/6$ (not an integer)

Conclusion: -150° is not coterminal with 150° .

c. 510°

- Find the difference: $510^\circ - 150^\circ = 360^\circ$
- Is 360° a multiple of 360° ? Yes.
- Check if $510^\circ = 150^\circ + 360^\circ \times k$:
- $360^\circ \times k = 360^\circ$
- $k = 1$

Conclusion: 510° is coterminal with 150° , since the difference is exactly one full rotation (360°).

d. 500°

- Find the difference: $500^\circ - 150^\circ = 350^\circ$
- Is 350° a multiple of 360° ? No.
- Check if $500^\circ = 150^\circ + 360^\circ \times k$:
- $360^\circ \times k = 350^\circ$
- $k \approx 0.9722$ (not an integer)

Conclusion: 500° is not coterminal with 150° .

Final Determination

Based on the calculations:

- Option c. 510° is coterminal with 150° because their difference is exactly 360° , which indicates a full rotation and thereby shares the same terminal side.

Additional Insights and Clarifications

Why Are Some Angles Coterminal While Others Are Not?

Angles that differ by multiples of 360° are coterminal because they represent the same position on the unit circle. For example:

- Starting from 150° , adding 360° results in 510° , which points to the same terminal side.
- Conversely, subtracting 360° from an angle or adding it repeatedly can generate all coterminal angles.

Understanding Negative and Large Angles

- Negative angles (like -150°) can be converted into positive coterminal angles by adding 360° repeatedly:
 - $-150^\circ + 360^\circ = 210^\circ$, which is coterminal with -150° .
- Large angles (greater than 360°) can be reduced by subtracting 360° :
 - $510^\circ - 360^\circ = 150^\circ$, confirming coterminality with 150° .
 - $500^\circ - 360^\circ = 140^\circ$, which is not coterminal with 150° .

Practical Applications

- Determining coterminal angles is crucial in simplifying trigonometric expressions.
- It helps in graphing and understanding the periodic nature of sine, cosine, and tangent functions.
- Useful in navigation, physics, and engineering where angles beyond the primary range are common.

Summary and Conclusion

In summary, the question "Which angle is coterminal with 150° ?" can be answered by applying the fundamental principle that coterminal angles differ by integer multiples of 360° . Analyzing each option:

- 330° : No, difference is 180° , not a multiple of 360° .
- -150° : No, difference is -300° , not a multiple of 360° .
- 510° : Yes, difference is 360° , which is a multiple of 360° .
- 500° : No, difference is 350° , not a multiple of 360° .

Therefore, the correct answer is c. 510° . This highlights the importance of understanding how angles can be shifted by full rotations while maintaining their terminal position on the circle.

Key Takeaways:

- Coterminal angles are separated by multiples of 360° .
- To find a coterminal angle, add or subtract 360° until the angle falls within a desired range.
- Large or negative angles can be normalized by subtracting or adding 360° repeatedly.

Mastering the concept of coterminal angles enhances your grasp of trigonometry, making it easier to handle complex problems involving angles, rotations, and periodic functions.

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