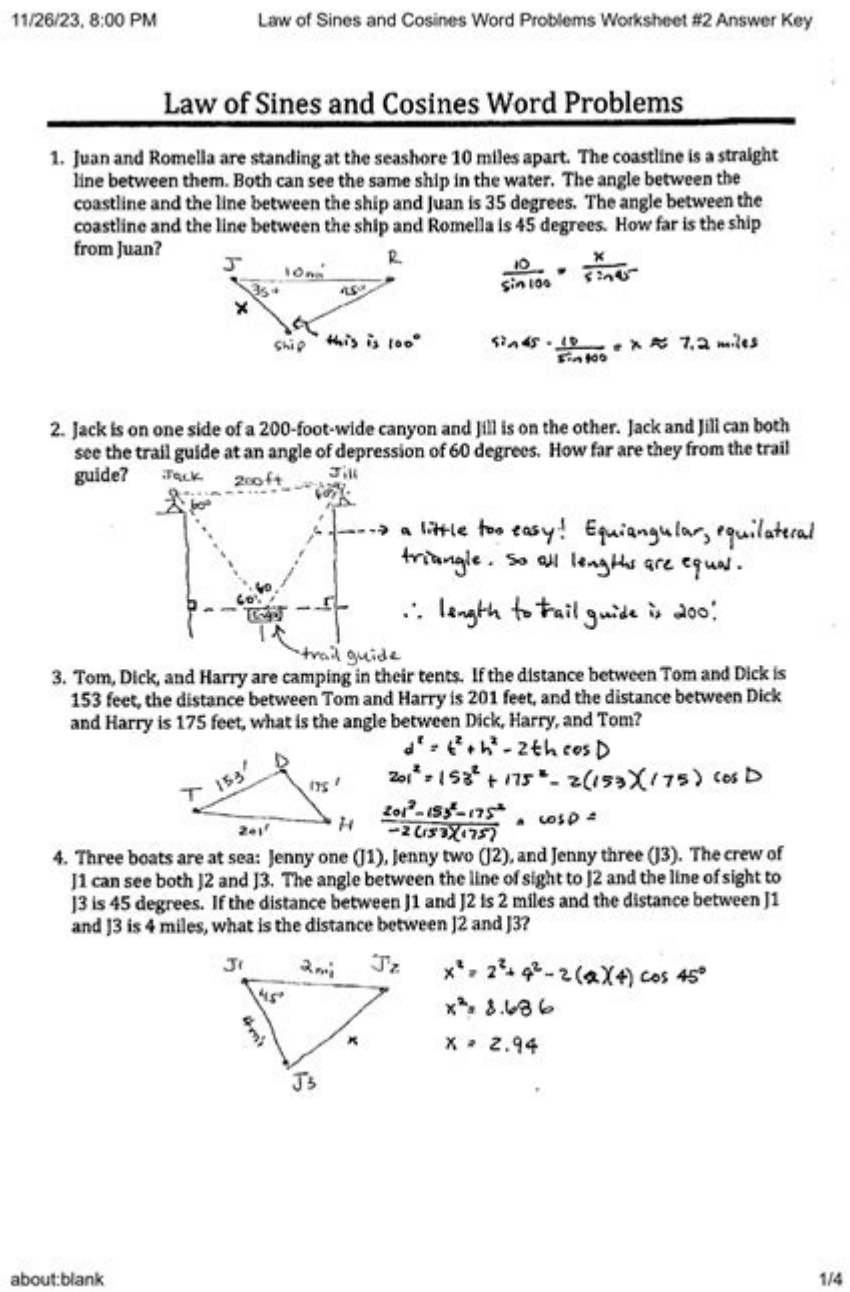
125 Law Of Cosines Worksheet Answers



11/26/23, 8:00 PM Law of Sines and Cosines Word Problems Worksheet #2 Answer Key

Law of Sines and Cosines Word Problems

1. Juan and Romella are standing at the seashore 10 miles apart. The coastline is a straight line between them. Both can see the same ship in the water. The angle between the coastline and the line between the ship and Juan is 35 degrees. The angle between the coastline and the line between the ship and Romella is 45 degrees. How far is the ship from Juan?

J 10mi R 35° 45° x ship this is 100°

$\frac{10}{\sin 100} = \frac{x}{\sin 45}$

$\sin 45 \cdot \frac{10}{\sin 100} = x \approx 7.2$ miles

2. Jack is on one side of a 200-foot-wide canyon and Jill is on the other. Jack and Jill can both see the trail guide at an angle of depression of 60 degrees. How far are they from the trail guide?

Jack 200ft Jill 60° 60° 60° 60° trail guide

→ a little too easy! Equiangular, equilateral triangle. So all lengths are equal.

∴ length to trail guide is 200'.

3. Tom, Dick, and Harry are camping in their tents. If the distance between Tom and Dick is 153 feet, the distance between Tom and Harry is 201 feet, and the distance between Dick and Harry is 175 feet, what is the angle between Dick, Harry, and Tom?

$d^2 = t^2 + h^2 - 2th\cos D$

$201^2 = 153^2 + 175^2 - 2(153)(175)\cos D$

T 153' D 175' H 201'

$\frac{201^2 - 153^2 - 175^2}{-2(153)(175)} = \cos D$

4. Three boats are at sea: Jenny one (J1), Jenny two (J2), and Jenny three (J3). The crew of J1 can see both J2 and J3. The angle between the line of sight to J2 and the line of sight to J3 is 45 degrees. If the distance between J1 and J2 is 2 miles and the distance between J1 and J3 is 4 miles, what is the distance between J2 and J3?

J1 2mi J2 45° 4mi x J3

$x^2 = 2^2 + 4^2 - 2(2)(4)\cos 45°$

$x^2 = 8.686$

$x = 2.94$

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125 Law of Cosines Worksheet Answers are an essential resource for students and educators tackling the complexities of trigonometry, specifically in the context of solving triangles. The Law of Cosines is a fundamental theorem used to find unknown lengths and angles in triangles, particularly when the triangle does not conform to the properties of right triangles. This article explores the Law of Cosines, how it is applied, and provides a comprehensive overview of a worksheet designed to reinforce these concepts, along with answers to various problems.

Understanding the Law of Cosines

The Law of Cosines is a formula used in trigonometry to relate the lengths of the sides of a triangle to the cosine of one of its angles. The formula can be stated as follows:

For any triangle with sides a, b, and c opposite to angles A, B, and C respectively, the Law of Cosines is given by:

1. $c^2 = a^2 + b^2 - 2ab \cdot \cos(C)$
2. $b^2 = a^2 + c^2 - 2ac \cdot \cos(B)$
3. $a^2 = b^2 + c^2 - 2bc \cdot \cos(A)$

This relationship allows for the calculation of the lengths of sides or the measures of angles when certain other measurements are known.

Applications of the Law of Cosines

The Law of Cosines is particularly useful in various scenarios:

- Finding a side when two sides and the included angle are known: This is common in non-right triangles where one needs to calculate the length of a side.
- Finding an angle when all three sides are known: This is often the case in problems where the triangle is completely defined by its three sides.
- Real-world applications: The Law of Cosines is used in fields like engineering, physics, architecture, and computer graphics, where triangulation is necessary.

Components of the Law of Cosines Worksheet

A well-structured worksheet on the Law of Cosines typically includes a variety of problems designed to assess and enhance students' understanding. The following components are common in a comprehensive worksheet:

Types of Problems

1. Finding the length of a side:
- Given two sides and the included angle.
- Example: Given $a = 5$, $b = 7$, and $C = 60^\circ$, find c.

2. Finding an angle:
- Given all three sides.
- Example: Given $a = 5$, $b = 7$, and $c = 8$, find C.

3. Mixed problems:
- A combination of finding sides and angles using the Law of Cosines.

4. Word problems:
- Real-life scenarios where students must apply the Law of Cosines to solve a problem, such as determining the height of a tree or the distance between two points.

Sample Problems and Answers

To illustrate the application of the Law of Cosines, here are some sample problems along with their answers:

1. Problem 1: Given $a = 8$, $b = 6$, and $C = 45^\circ$, find c.

Solution:
$$
c^2 = a^2 + b^2 - 2ab \cdot \cos(C)
$$
$$
c^2 = 8^2 + 6^2 - 2 \cdot 8 \cdot 6 \cdot \cos(45^\circ)
$$
$$
c^2 = 64 + 36 - 96 \cdot \frac{\sqrt{2}}{2}
$$
$$
c^2 = 100 - 48\sqrt{2}
$$
$$
c \approx 5.66
$$

2. Problem 2: Given $a = 7$, $b = 9$, and $c = 12$, find angle C.

Solution:
$$
\cos(C) = \frac{a^2 + b^2 - c^2}{2ab}
$$
$$
\cos(C) = \frac{7^2 + 9^2 - 12^2}{2 \cdot 7 \cdot 9}
$$
$$
\cos(C) = \frac{49 + 81 - 144}{126}
$$
$$
\cos(C) = \frac{-14}{126} = -\frac{1}{9}
$$
$$
C \approx 95.74^\circ
$$

3. Problem 3: If a triangle has sides of lengths 10, 14, and 20, find the angle opposite the side of length 20.

Solution:
$$
\cos(C) = \frac{10^2 + 14^2 - 20^2}{2 \cdot 10 \cdot 14}
$$
$$
\cos(C) = \frac{100 + 196 - 400}{280}
$$
$$
\cos(C) = \frac{-104}{280} = -\frac{13}{35}
$$
$$
C \approx 120.53^\circ
$$

Tips for Solving Law of Cosines Problems

When working with the Law of Cosines, consider the following tips to enhance accuracy and efficiency:

- Draw a diagram: Visualizing the triangle can help in understanding the relationships between sides and angles.
- Check your calculator: Ensure that your calculator is in the correct mode (degrees or radians) based on the problem requirements.
- Practice with a variety of problems: Exposure to different types of problems will increase familiarity and proficiency with the Law of Cosines.
- Review trigonometric identities: Understanding related concepts such as sine and tangent can provide additional tools for solving problems.

Conclusion

The 125 Law of Cosines Worksheet Answers serve as a valuable tool for both students and educators in mastering the concepts of trigonometry. Through practice and application of the Law of Cosines, learners can develop a solid foundation in solving triangles, preparing them for more advanced mathematical concepts. By systematically approaching problems and utilizing the Law of Cosines, students can ensure thorough comprehension and the ability to apply these principles in various contexts. Whether through classroom exercises or self-study, the Law of Cosines remains an indispensable part of the mathematical toolkit.

Frequently Asked Questions

What is the Law of Cosines and how is it applied in

problems?

The Law of Cosines is a formula used in geometry to find the lengths of sides or measures of angles in a triangle. It states that for any triangle with sides a, b, and c opposite to angles A, B, and C, respectively, the formula is $c^2 = a^2 + b^2 - 2ab \cos(C)$. This is particularly useful for solving triangles that are not right-angled.

How can I find the missing side of a triangle using the Law of Cosines?

To find a missing side using the Law of Cosines, you need to know the lengths of the other two sides and the measure of the included angle. For example, if you know sides a and b and angle C, you can rearrange the formula to find side c: $c = \sqrt{(a^2 + b^2 - 2ab \cos(C))}$.

What types of problems can a '125 law of cosines worksheet' solve?

A '125 law of cosines worksheet' can include various problems such as finding missing sides or angles in triangles, solving real-world problems involving distances, and applying the Law of Cosines in scenarios like navigation or architecture.

Are the answers on the worksheet typically provided, and how can I verify them?

Yes, most worksheets provide answers for each problem, either at the end of the document or as a separate answer key. You can verify the answers by redoing the calculations or using a scientific calculator or software to check the results.

What should I do if I'm struggling with the Law of Cosines problems on the worksheet?

If you're struggling, consider reviewing the formula and practicing with simpler problems first. You can also seek help through online tutorials, study groups, or tutoring sessions that focus on geometry and the Law of Cosines.

Can the Law of Cosines be used for non-triangular shapes?

No, the Law of Cosines is specifically designed for use with triangles. However, it can be applied in problems involving polygons by breaking them down into triangles and applying the Law of Cosines to each triangle individually.

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