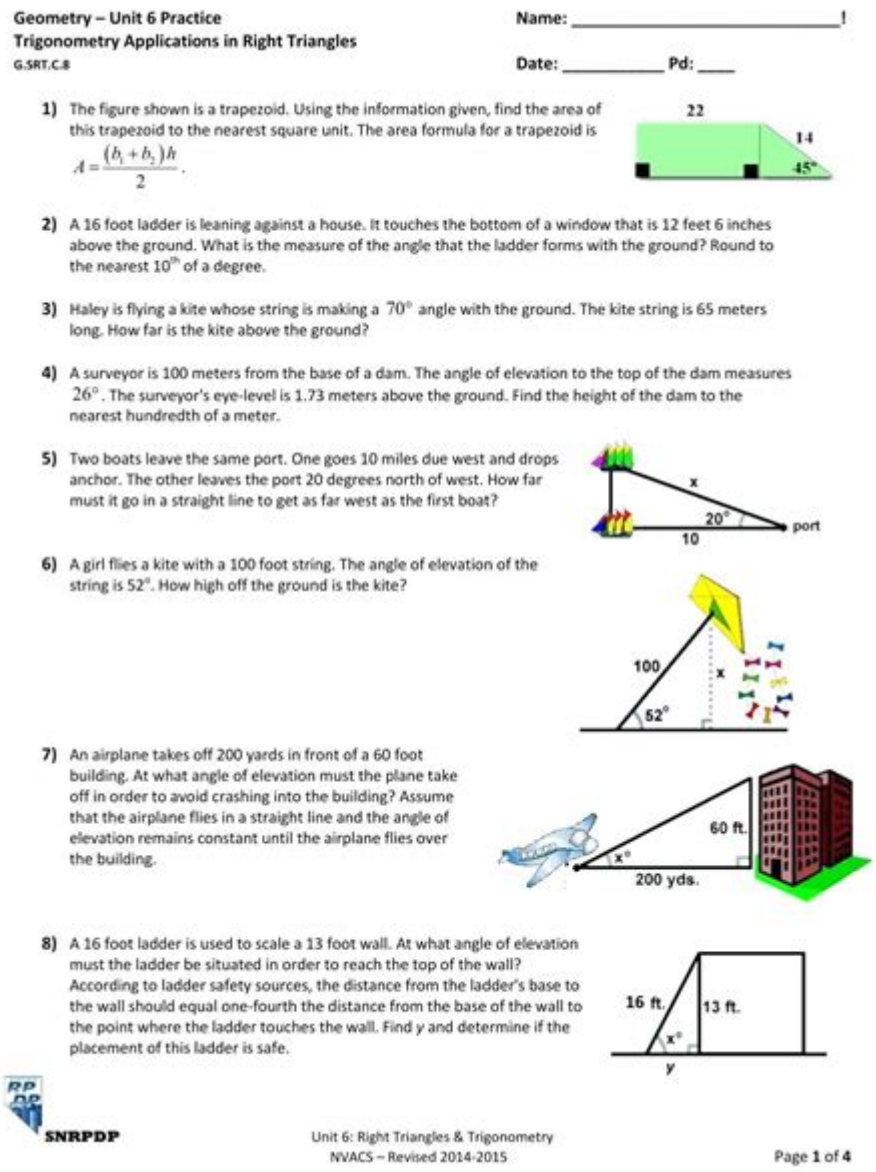
Right Triangle Trigonometry Solving Word Problems Answer Key



Geometry – Unit 6 Practice
Trigonometry Applications in Right Triangles
G.SRT.C.8

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1) The figure shown is a trapezoid. Using the information given, find the area of this trapezoid to the nearest square unit. The area formula for a trapezoid is $A=\frac{(b_1+b_2)h}{2}$.

22
14
45°

2) A 16 foot ladder is leaning against a house. It touches the bottom of a window that is 12 feet 6 inches above the ground. What is the measure of the angle that the ladder forms with the ground? Round to the nearest 10^{th} of a degree.

3) Haley is flying a kite whose string is making a $70°$ angle with the ground. The kite string is 65 meters long. How far is the kite above the ground?

4) A surveyor is 100 meters from the base of a dam. The angle of elevation to the top of the dam measures $26°$. The surveyor's eye-level is 1.73 meters above the ground. Find the height of the dam to the nearest hundredth of a meter.

5) Two boats leave the same port. One goes 10 miles due west and drops anchor. The other leaves the port 20 degrees north of west. How far must it go in a straight line to get as far west as the first boat?

x
20°
port
10

6) A girl flies a kite with a 100 foot string. The angle of elevation of the string is 52°. How high off the ground is the kite?

100
x
52°

7) An airplane takes off 200 yards in front of a 60 foot building. At what angle of elevation must the plane take off in order to avoid crashing into the building? Assume that the airplane flies in a straight line and the angle of elevation remains constant until the airplane flies over the building.

60 ft.
x°
200 yds.

8) A 16 foot ladder is used to scale a 13 foot wall. At what angle of elevation must the ladder be situated in order to reach the top of the wall? According to ladder safety sources, the distance from the ladder's base to the wall should equal one-fourth the distance from the base of the wall to the point where the ladder touches the wall. Find *y* and determine if the placement of this ladder is safe.

16 ft.
13 ft.
x°
y

SNRPDP

Unit 6: Right Triangles & Trigonometry
NVACS – Revised 2014-2015

Page 1 of 4

Right triangle trigonometry solving word problems answer key is an essential topic in mathematics, especially for students who are delving into the world of geometry and trigonometry. Right triangle problems often present real-world scenarios that can be solved using the principles of trigonometry. This article will explore various techniques for solving word problems involving right triangles, provide examples, and present an answer key to help clarify these concepts.

Understanding Right Triangle Trigonometry

Right triangle trigonometry focuses on the relationships between the angles and sides of

right triangles. The key functions used in trigonometry are:

- Sine (sin): The ratio of the length of the opposite side to the hypotenuse.
- Cosine (cos): The ratio of the length of the adjacent side to the hypotenuse.
- Tangent (tan): The ratio of the length of the opposite side to the adjacent side.

These functions can be expressed mathematically as follows for a right triangle with angle θ:

- $\sin(\theta) = \frac{\text{opposite}}{\text{hypotenuse}}$
- $\cos(\theta) = \frac{\text{adjacent}}{\text{hypotenuse}}$
- $\tan(\theta) = \frac{\text{opposite}}{\text{adjacent}}$

Solve Word Problems Involving Right Triangles

To solve word problems involving right triangles, follow these steps:

1. Read the Problem Carefully

Understanding the problem is crucial. Identify what is being asked and what information is provided. Look for keywords that indicate trigonometric relationships, such as "height," "distance," "angle," and "line of sight."

2. Draw a Diagram

Creating a visual representation of the problem can help clarify the relationships between the sides and angles. Label the sides and angles of the triangle based on the information given.

3. Identify Known and Unknown Values

List out what you know and what you need to find. This will guide your use of trigonometric functions.

4. Select the Appropriate Trigonometric Function

Choose the correct trigonometric function based on the sides and angles you have identified.

5. Solve the Equation

Substitute the known values into the selected trigonometric equation and solve for the unknown variable.

6. Interpret the Results

Make sure to interpret the results in the context of the problem. Ensure that your answer makes sense and is in the correct units.

Examples of Right Triangle Word Problems

Let’s look at a few examples to illustrate the steps outlined above.

Example 1: Finding the Height of a Tree

Problem: A person is standing 30 feet away from a tree. The angle of elevation to the top of the tree is 45 degrees. How tall is the tree?

Solution Steps:

1. Draw the Diagram: Create a right triangle where:
- The distance from the person to the tree is the adjacent side (30 feet).
- The height of the tree is the opposite side.
- The angle of elevation is 45 degrees.

2. Identify Known and Unknown Values:
- Adjacent side = 30 feet
- Angle $\theta = 45^\circ$
- Opposite side = height of the tree (unknown)

3. Select the Appropriate Trigonometric Function:
Since we have the adjacent side and need the opposite side, we can use the tangent function:
$$
\tan(45^\circ) = \frac{\text{opposite}}{\text{adjacent}} \Rightarrow \tan(45^\circ) = \frac{\text{height}}{30}
$$

4. Solve the Equation:
Since $\tan(45^\circ) = 1$,
$$
1 = \frac{\text{height}}{30} \Rightarrow \text{height} = 30 \text{ feet}
$$

5. Interpret the Results: The height of the tree is 30 feet.

Example 2: Finding the Distance Across a River

Problem: A person is 100 meters from the base of a cliff. They measure the angle of elevation to the top of the cliff as 60 degrees. How tall is the cliff?

Solution Steps:

1. Draw the Diagram: Identify the right triangle where:
- The base distance from the person to the cliff is the adjacent side (100 meters).
- The height of the cliff is the opposite side.
- The angle of elevation is 60 degrees.

2. Identify Known and Unknown Values:
- Adjacent side = 100 meters
- Angle $\theta = 60^\circ$
- Opposite side = height of the cliff (unknown)

3. Select the Appropriate Trigonometric Function:
We will use the tangent function:
$$
\tan(60^\circ) = \frac{\text{height}}{100}
$$

4. Solve the Equation:
Since $\tan(60^\circ) = \sqrt{3} \approx 1.732$,
$$
\sqrt{3} = \frac{\text{height}}{100} \Rightarrow \text{height} = 100\sqrt{3} \approx 173.2 \text{ meters}
$$

5. Interpret the Results: The height of the cliff is approximately 173.2 meters.

Answer Key for Word Problems

Here’s a summary answer key for the problems discussed:

1. Example 1: Height of the tree = 30 feet
2. Example 2: Height of the cliff = 173.2 meters

Conclusion

Right triangle trigonometry is a powerful tool for solving real-world problems. By following a systematic approach, students can confidently tackle word problems that involve right

triangles. With practice, understanding of trigonometric concepts, and familiarity with the problem-solving process, learners will enhance their mathematical skills and apply them effectively in various situations. This article has provided a foundation for solving such problems, and the answer key serves as a useful reference for ensuring accuracy in calculations.

Frequently Asked Questions

What is the first step in solving a right triangle trigonometry word problem?

Identify the right triangle and label the sides relative to the angle of interest (opposite, adjacent, and hypotenuse).

How do you determine which trigonometric ratio to use in a right triangle problem?

Choose the trigonometric ratio based on the given information: use sine for opposite/hypotenuse, cosine for adjacent/hypotenuse, and tangent for opposite/adjacent.

What should you do if a right triangle word problem gives you angles and one side?

Use the known angle and side to find the other sides using the appropriate trigonometric ratios (sine, cosine, or tangent).

Can you solve for the angle in a right triangle using trigonometry?

Yes, you can use the inverse trigonometric functions (arcsin, arccos, arctan) to find an angle if you have the lengths of the sides.

What is the significance of drawing a diagram when solving a right triangle word problem?

Drawing a diagram helps visualize the problem, making it easier to identify sides, angles, and the relationships between them.

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