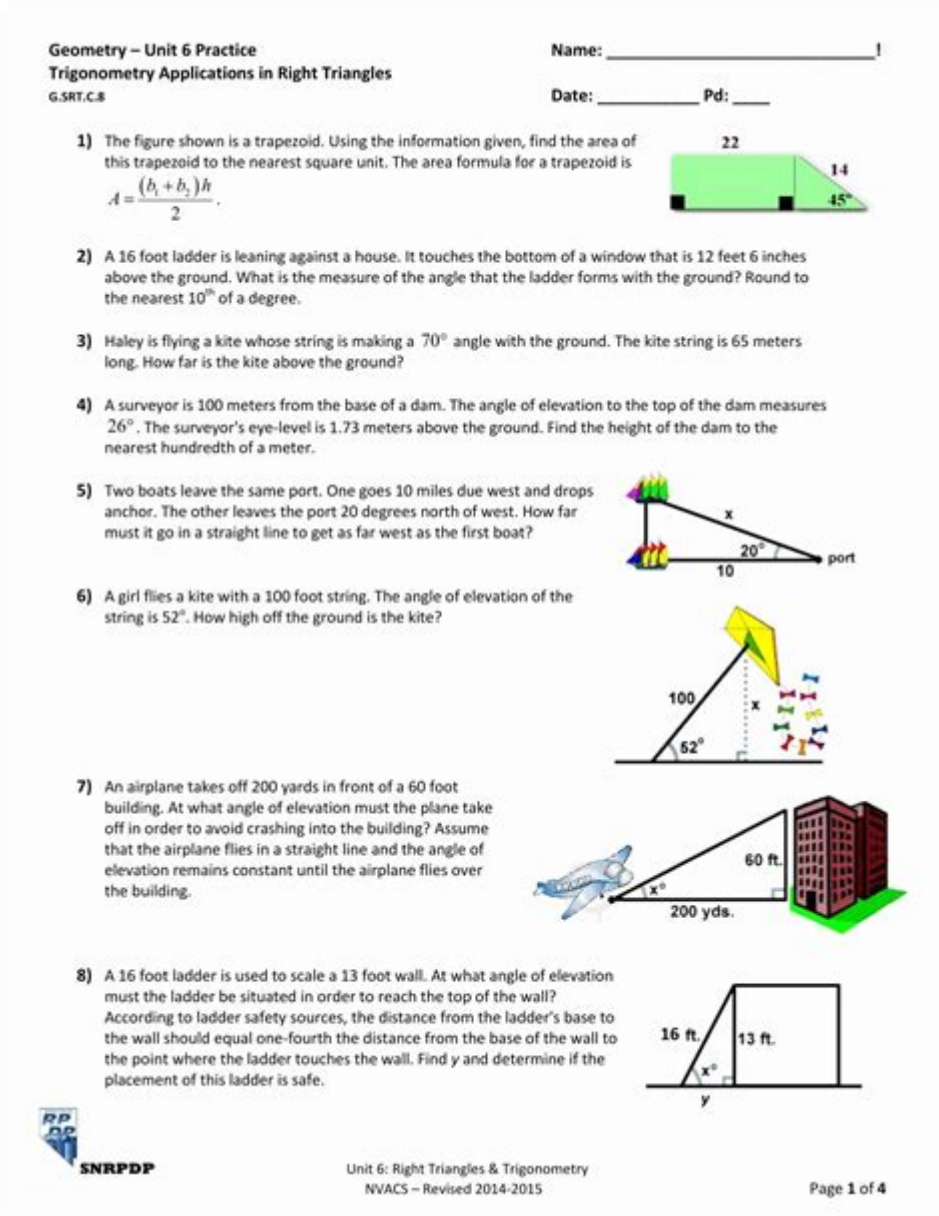
Right Triangle Trig Word Problems Worksheet



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

Name: _____!

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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 trig word problems worksheet are essential tools for students learning trigonometry, specifically in the context of right triangles. These problems help learners apply their knowledge of trigonometric ratios, such as sine, cosine, and tangent, to real-world situations. In this article, we will explore the significance of right triangle trigonometry, discuss various types of word problems, provide strategies for solving them, and include a sample worksheet to facilitate practice.

Understanding Right Triangle Trigonometry

Right triangle trigonometry is a branch of mathematics that deals with the relationships between the angles and sides of right triangles. A right

triangle is characterized by one angle measuring 90 degrees. The sides of a right triangle are referred to as:

- Hypotenuse: The longest side opposite the right angle.
- Opposite side: The side opposite the angle of interest.
- Adjacent side: The side next to the angle of interest, not including the hypotenuse.

The primary trigonometric ratios used in right triangle problems are:

1. Sine (sin): The ratio of the length of the opposite side to the hypotenuse.
- $\sin(\theta)$ = opposite/hypotenuse
2. Cosine (cos): The ratio of the length of the adjacent side to the hypotenuse.
- $\cos(\theta)$ = adjacent/hypotenuse
3. Tangent (tan): The ratio of the length of the opposite side to the adjacent side.
- $\tan(\theta)$ = opposite/adjacent

Types of Right Triangle Trig Word Problems

Right triangle trig word problems can be categorized into several types, each requiring different approaches for solving. Here are some common types of problems:

1. Finding a Side Length

In these problems, you may be given an angle and one side length, and you are required to find the length of another side. For example, if you know the length of the hypotenuse and one of the angles, you can use the sine or cosine functions to find the lengths of the other sides.

2. Finding an Angle

In this type of problem, you are given two side lengths and must determine the angles of the triangle. You can use the inverse trigonometric functions, such as arcsin, arccos, and arctan, to find the angles based on the ratios of the sides.

3. Application Problems

These problems involve real-world scenarios where right triangles are used to model situations. For example, they might involve the height of a building, the distance across a river, or the angle of elevation from a point on the ground to the top of a mountain.

4. Problems Involving Multiple Triangles

Sometimes, problems involve more than one right triangle where the solution to one triangle helps in solving another. These problems often require using the relationships between the triangles to find the required values.

Strategies for Solving Right Triangle Trig Word Problems

Solving right triangle trigonometry word problems can be challenging, but with the right strategies, students can effectively tackle them. Here are some steps to follow:

1. Read the Problem Carefully

Understanding the context of the problem is crucial. Identify what is being asked and what information is provided. Highlight or underline key information, such as known side lengths and angles.

2. Draw a Diagram

Creating a visual representation of the problem can help clarify the relationships between the different elements. Label all sides and angles, and use the appropriate notation for the angles (e.g., θ).

3. Determine Which Trigonometric Ratios to Use

Based on the given information, decide which trigonometric ratios are applicable. Ask yourself:
- Do I know an angle and the length of one side?
- Do I know two sides and need to find an angle?

4. Set Up the Equation

Using the correct trigonometric ratio, set up the equation. Ensure that you are using the correct side lengths corresponding to the angle you are working with.

5. Solve for the Unknown

Perform algebraic manipulations to isolate the unknown variable. Use inverse trigonometric functions when necessary to find angles.

6. Check Your Work

After finding a solution, it is crucial to check your calculations. Verify that the answer makes sense in the context of the problem and that it adheres to the properties of triangles.

Sample Right Triangle Trig Word Problems

Here are a few examples of right triangle trig word problems along with their solutions:

Problem 1: Finding a Side Length

A ladder leans against a wall, forming a right triangle with the ground. The ladder is 10 feet long, and the angle between the ladder and the ground is 60 degrees. How high up the wall does the ladder reach?

Solution:
- Use sine: $\sin(60°) = \text{opposite/hypotenuse}$
- $\sin(60°) = \text{height}/10$
- Height = $10 \sin(60°) = 10 (\sqrt{3}/2) \approx 8.66$ feet

Problem 2: Finding an Angle

A person is standing 30 meters away from the base of a tree. They look up at the top of the tree, forming an angle of elevation of 45 degrees. What is the height of the tree?

Solution:
- Use tangent: $\tan(45°) = \text{opposite/adjacent}$
- $\tan(45°) = \text{height}/30$
- Height = $30 \tan(45°) = 30\ 1 = 30$ meters

Problem 3: Real-World Application

A ramp is used to load a truck. The height of the ramp is 4 feet, and the ramp makes an angle of elevation of 30 degrees with the ground. How long is the ramp?

Solution:
- Use sine: $\sin(30°) = \text{opposite/hypotenuse}$
- $\sin(30°) = 4/\text{hypotenuse}$
- Hypotenuse = $4/\sin(30°) = 4/(1/2) = 8$ feet

Creating a Right Triangle Trig Word Problems Worksheet

To help students practice, here is a sample worksheet with various problems:

Worksheet: Right Triangle Trig Word Problems

1. A 12-foot ladder leans against a wall, forming an angle of 60 degrees with the ground. How high does the ladder reach up the wall?

2. A tree casts a shadow that is 15 feet long. If the angle of elevation to the top of the tree is 30 degrees, how tall is the tree?

3. A right triangle has one side measuring 5 cm and an adjacent angle of 45 degrees. Find the length of the hypotenuse.

4. A person is standing 50 meters from the base of a building. If they look up at an angle of 60 degrees, how tall is the building?

5. A ramp is 3 feet high and makes an angle of 45 degrees with the ground. Find the length of the ramp.

Answers:
1. 10.39 feet
2. 8.66 feet
3. $5\sqrt{2}$ cm ≈ 7.07 cm
4. 86.60 meters
5. 4.24 feet

Conclusion

Right triangle trig word problems are a vital component of understanding trigonometry, providing students with the opportunity to apply mathematical concepts to real-life situations. By mastering the techniques for solving these problems, students can enhance their problem-solving skills and gain confidence in their mathematical abilities. Utilizing worksheets and practice problems can help reinforce these concepts and prepare students for more advanced topics in trigonometry and geometry.

Frequently Asked Questions

What is a right triangle trig word problem?

A right triangle trig word problem typically involves real-world scenarios where the relationships between the angles and sides of a right triangle are used to find unknown measurements, often using trigonometric functions like sine, cosine, and tangent.

How can I use the Pythagorean theorem in right triangle trig word problems?

The Pythagorean theorem can be used to find the length of a side in a right triangle when the lengths of the other two sides are known. It states that the square of the hypotenuse is equal to the sum of the squares of the other two sides ($a^2 + b^2 = c^2$).

What trigonometric functions are most commonly used in right triangle trig word problems?

The most commonly used trigonometric functions in right triangle problems are

sine (sin), cosine (cos), and tangent (tan), which relate the angles of the triangle to the ratios of its sides.

Can you give an example of a real-world right triangle trig word problem?

Sure! For example, if a ladder leans against a wall and the foot of the ladder is 3 feet away from the wall while the ladder reaches a height of 4 feet on the wall, you can use the Pythagorean theorem to find the length of the ladder.

What strategies can help solve right triangle trig word problems effectively?

Strategies include drawing a diagram, identifying known and unknown values, using appropriate trigonometric functions based on the given information, and systematically applying the Pythagorean theorem or trig ratios to solve for unknowns.

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