Mastering Right Triangles: Applying Trigonometric Ratios and the Pythagorean Theorem

Introduction (5 minutes)

Welcome to this worksheet on mastering right triangles! In this activity, you will learn how to apply trigonometric ratios and the Pythagorean Theorem to solve problems involving right triangles.

Section 1: Trigonometric Ratios (20 minutes)

Find the sine, cosine, and tangent of the following angles:

1. 30°
2. 45°
3. 60°

Use the following formulas:

- sin(θ) = opposite side / hypotenuse
- cos(θ) = adjacent side / hypotenuse
- tan(θ) = opposite side / adjacent side

Exercise 1: Finding the Sine, Cosine, and Tangent of an Angle (15 minutes)

Find the sine, cosine, and tangent of the following angles:

1. 30°
2. 45°
3. 60°

Use the following formulas:

- sin(θ) = opposite side / hypotenuse
- cos(θ) = adjacent side / hypotenuse
- tan(θ) = opposite side / adjacent side

Exercise 2: Solving Problems Using Trigonometric Ratios (20 minutes)

Solve the following problems using trigonometric ratios:

1. In a right triangle, the length of the hypotenuse is 10 cm and the length of the opposite side is 6 cm. Find the sine, cosine, and tangent of the angle.
2. In a right triangle, the length of the adjacent side is 8 cm and the length of the hypotenuse is 10 cm. Find the sine, cosine, and tangent of the angle.

Section 2: Pythagorean Theorem (20 minutes)

Use the Pythagorean Theorem to find the length of the hypotenuse of the following right triangles:

1. a = 3 cm, b = 4 cm
2. a = 5 cm, b = 12 cm

Use the formula: $c^2 = a^2 + b^2$

Exercise 3: Finding the Length of the Hypotenuse (15 minutes)

Use the Pythagorean Theorem to find the length of the hypotenuse of the following right triangles:

1. a = 3 cm, b = 4 cm
2. a = 5 cm, b = 12 cm

Use the formula: $c^2 = a^2 + b^2$

Exercise 4: Finding the Length of a Leg (15 minutes)

Use the Pythagorean Theorem to find the length of a leg of the following right triangles:

1. c = 10 cm, a = 6 cm
2. c = 15 cm, b = 9 cm

Use the formula: $c^2 = a^2 + b^2$

Section 3: Angles of Elevation and Depression (20 minutes)

Find the angle of elevation of the following right triangles:

1. The length of the opposite side is 6 cm and the length of the adjacent side is 8 cm.
2. The length of the opposite side is 9 cm and the length of the adjacent side is 12 cm.

Use the formula: $\tan(\theta) = \text{opposite side} / \text{adjacent side}$

Exercise 5: Finding the Angle of Elevation (15 minutes)

Find the angle of elevation of the following right triangles:

1. The length of the opposite side is 6 cm and the length of the adjacent side is 8 cm.
2. The length of the opposite side is 9 cm and the length of the adjacent side is 12 cm.

Use the formula: tan(θ) = opposite side / adjacent side

Exercise 6: Finding the Angle of Depression (15 minutes)

Find the angle of depression of the following right triangles:

1. The length of the opposite side is 6 cm and the length of the adjacent side is 8 cm.
2. The length of the opposite side is 9 cm and the length of the adjacent side is 12 cm.

Use the formula: tan(θ) = opposite side / adjacent side

Section 4: Word Problems (20 minutes)

Solve the following word problems using trigonometric ratios and the Pythagorean Theorem:

1. A ladder is leaning against a wall at an angle of 60°. If the length of the ladder is 10 m, how far is the base of the ladder from the wall?
2. A surveyor is measuring the distance from a point on the ground to the top of a building. The angle of elevation is 45° and the distance from the point to the base of the building is 50 m. How tall is the building?

Exercise 7: Solving Word Problems (20 minutes)

Solve the following word problems using trigonometric ratios and the Pythagorean Theorem:

1. A ladder is leaning against a wall at an angle of 60°. If the length of the ladder is 10 m, how far is the base of the ladder from the wall?
2. A surveyor is measuring the distance from a point on the ground to the top of a building. The angle of elevation is 45° and the distance from the point to the base of the building is 50 m. How tall is the building?

Conclusion (5 minutes)

Congratulations on completing this worksheet on mastering right triangles! You have learned how to apply trigonometric ratios and the Pythagorean Theorem to solve problems involving right triangles.

Answer Key

Check your answers with the following solutions:

1. sin(30°) = 1/2, cos(30°) = √3/2, tan(30°) = 1/√3
2. sin(45°) = 1/√2, cos(45°) = 1/√2, tan(45°) = 1
3. sin(60°) = √3/2, cos(60°) = 1/2, tan(60°) = √3