

facing math lesson 17 sine cosine and tangent answer key

Facing Math Lesson 17: Sine, Cosine, and Tangent Answer Key

In the world of mathematics, particularly in trigonometry, understanding the fundamental concepts of sine, cosine, and tangent is crucial for students. Facing Math Lesson 17 delves into these essential trigonometric functions, providing students with the knowledge they need to succeed in their math journey. This article will provide a comprehensive overview of the lesson, including explanations of the key concepts, the importance of these functions, examples, and a detailed answer key to ensure students can confidently tackle their assignments.

Understanding Trigonometric Functions

Trigonometric functions are mathematical functions that relate the angles of a triangle to the lengths of its sides. They are particularly useful in the study of right triangles, where one angle measures 90 degrees. The three primary trigonometric functions are:

1. Sine (sin) - This function relates the opposite side of a right triangle to its hypotenuse.
2. Cosine (cos) - This function relates the adjacent side of a right triangle to its hypotenuse.
3. Tangent (tan) - This function relates the opposite side to the adjacent side of a right triangle.

Definitions and Formulas

To better understand these functions, it is essential to define them mathematically:

- Sine:

$$\sin(\theta) = \frac{\text{Opposite Side}}{\text{Hypotenuse}}$$

- Cosine:

$$\cos(\theta) = \frac{\text{Adjacent Side}}{\text{Hypotenuse}}$$

- Tangent:

$$\tan(\theta) = \frac{\text{Opposite Side}}{\text{Adjacent Side}} = \frac{\sin(\theta)}{\cos(\theta)}$$

Understanding these definitions is vital, as they form the basis for solving various problems in trigonometry.

The Importance of Sine, Cosine, and Tangent

The significance of sine, cosine, and tangent extends beyond academic exercises; they are widely used in various fields such as engineering, physics, architecture, and computer graphics. Here are some key reasons why these functions are essential:

- **Modeling Real-World Problems:** Trigonometric functions can model periodic phenomena, such as sound waves and light waves, making them invaluable in physics.
- **Navigation and Surveying:** Sine and cosine functions are frequently used in navigation, helping pilots and sailors determine their course.
- **Architecture and Construction:** Understanding angles and relationships between sides is crucial in designing stable structures.
- **Computer Graphics:** Trigonometric functions are used to create realistic animations and simulations in video games and films.

Examples of Sine, Cosine, and Tangent

To solidify understanding, it is important to go through some examples that illustrate the applications of sine, cosine, and tangent.

Example 1: Finding the Height of a Tree

Suppose you want to find the height of a tree. You stand 30 feet away from the base of the tree and measure the angle of elevation to the top of the tree at 60 degrees.

1. Identify the sides relative to the angle:
 - Opposite: Height of the tree (h)
 - Adjacent: Distance from the tree (30 feet)

2. Use the tangent function:

$$\tan(60^\circ) = \frac{h}{30}$$

3. Since $\tan(60^\circ) = \sqrt{3} \approx 1.732$:

$$1.732 = \frac{h}{30}$$

4. Solve for (h) :

$$h = 30 \times 1.732 \approx 51.96 \text{ feet}$$

Thus, the height of the tree is approximately 51.96 feet.

Example 2: Finding the Length of a Ladder

You want to find the length of a ladder that is leaning against a wall. The base of the ladder is 4 feet away from the wall, and it makes an angle of 30 degrees with the ground.

1. Identify the sides:

- Opposite: Height the ladder reaches on the wall (h)
- Adjacent: Distance from the wall (4 feet)
- Hypotenuse: Length of the ladder (L)

2. Use sine to find the height:

$$\sin(30^\circ) = \frac{h}{L}$$

3. Knowing that $\sin(30^\circ) = 0.5$:

$$0.5 = \frac{h}{L}$$

4. Use cosine to find the length of the ladder:

$$\cos(30^\circ) = \frac{4}{L}$$

$$L = \frac{4}{\cos(30^\circ)} \quad (\text{where } \cos(30^\circ) = \frac{\sqrt{3}}{2})$$

$$L = \frac{4}{\frac{\sqrt{3}}{2}} = \frac{8}{\sqrt{3}} \approx 4.62 \text{ feet}$$

Thus, the length of the ladder is approximately 4.62 feet.

Answer Key for Facing Math Lesson 17

The answer key for Facing Math Lesson 17 provides solutions to various problems regarding sine, cosine, and tangent. Here, we will outline the solutions for some typical questions you might encounter in this lesson.

Sample Problems and Solutions

1. Question: If a right triangle has an angle of 45 degrees and the length of the adjacent side is 10, what is the length of the opposite side?

- Solution:

$$\begin{aligned} & \left[\right. \\ & \tan(45^\circ) = \frac{\text{Opposite}}{10} \rightarrow 1 = \frac{\text{Opposite}}{10} \rightarrow \text{Opposite} = 10 \\ & \left. \right] \end{aligned}$$

2. Question: Calculate the sine of a 30-degree angle.

- Solution:

$$\begin{aligned} & \left[\right. \\ & \sin(30^\circ) = 0.5 \\ & \left. \right] \end{aligned}$$

3. Question: In a right triangle, if the hypotenuse is 13 and one angle is 90 degrees, find the length of the adjacent side when the angle is 60 degrees.

- Solution:

$$\begin{aligned} & \left[\right. \\ & \cos(60^\circ) = \frac{\text{Adjacent}}{13} \rightarrow 0.5 = \frac{\text{Adjacent}}{13} \rightarrow \text{Adjacent} = 6.5 \\ & \left. \right] \end{aligned}$$

4. Question: What is the tangent of a 45-degree angle?

- Solution:

$$\begin{aligned} & \left[\right. \\ & \tan(45^\circ) = 1 \\ & \left. \right] \end{aligned}$$

Conclusion

Facing Math Lesson 17 provides students with a crucial understanding of sine, cosine, and tangent, equipping them with the skills necessary to solve real-world problems involving angles and triangles. Mastering these concepts not only benefits students academically but also enhances their problem-solving abilities in various fields. By studying the examples, definitions, and answer keys outlined in this article, students can gain a solid grasp of trigonometric functions, preparing them for more advanced topics in mathematics.

Frequently Asked Questions

What is the primary focus of Facing Math Lesson 17?

Facing Math Lesson 17 focuses on the concepts of sine, cosine, and tangent, which are fundamental trigonometric functions.

How do you define sine in a right triangle?

Sine is defined as the ratio of the length of the opposite side to the hypotenuse.

What does cosine represent in trigonometry?

Cosine represents the ratio of the length of the adjacent side to the hypotenuse in a right triangle.

What is the tangent function and how is it calculated?

Tangent is the ratio of the length of the opposite side to the adjacent side, calculated as $\text{tangent} = \text{sine}/\text{cosine}$.

Can you provide a real-world application of sine, cosine, and tangent?

These functions are used in various fields like engineering, physics, and architecture to calculate angles and distances.

What is the Pythagorean identity related to sine and cosine?

The Pythagorean identity states that $\sin^2(\theta) + \cos^2(\theta) = 1$ for any angle θ .

How can you find the sine, cosine, and tangent of common angles like 30°, 45°, and 60°?

These values can be memorized or derived from the unit circle; for example, $\sin(30^\circ) = 1/2$, $\cos(45^\circ) = \sqrt{2}/2$, and $\tan(60^\circ) = \sqrt{3}$.

What tools or methods can be used to solve problems involving sine, cosine, and tangent?

Graphing calculators, trigonometric tables, and software tools can be used to solve these problems.

What is the significance of learning sine, cosine, and tangent in mathematics?

Understanding these functions is crucial for solving problems in trigonometry, calculus, and various applied sciences.

Where can I find the answer key for Facing Math Lesson 17?

The answer key for Facing Math Lesson 17 is typically provided in the teacher's edition of the textbook or through educational resources associated with the curriculum.

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