

# Trigonometry: Full Instructional Guide

## 1. Introduction to Trigonometry

**Objective:** Understand what trigonometry is and why it's important.

Trigonometry is the study of relationships between the angles and sides of triangles. It plays a crucial role in fields like architecture, engineering, astronomy, and physics.

## 2. Prerequisites

Before diving into trigonometry, students should be comfortable with:

- Algebra (equation solving, manipulating expressions)
- Geometry (properties of triangles, Pythagorean theorem)
- Basic arithmetic and number operations

## 3. Real-Life Applications

- Measuring the height of a building without climbing it
- Calculating distances in astronomy
- Analyzing waves and oscillations

## 4. Key Terms and Definitions

- Angle: Formed by two rays with a common endpoint
- Right Triangle: A triangle with one  $90^\circ$  angle
- Hypotenuse: The side opposite the right angle in a right triangle
- Opposite side: The side opposite a given angle
- Adjacent side: The side next to a given angle (not the hypotenuse)

## 5. Trigonometric Ratios

These are defined for a right-angled triangle:

- Sine ( $\sin$ ) = Opposite / Hypotenuse
- Cosine ( $\cos$ ) = Adjacent / Hypotenuse
- Tangent ( $\tan$ ) = Opposite / Adjacent

## 6. Teaching Sequence

**Step 1: Labelling Triangle Sides**

Use a right triangle diagram and help students label the hypotenuse, opposite, and adjacent sides based on a given angle.

### **Step 2: Introducing Trigonometric Ratios**

Explain and write down the three basic ratios using the labelled triangle. Use the acronym SOH-CAH-TOA for a memory aid.

### **Step 3: Practice Problems**

Example:

- If the opposite side is 3 cm and the hypotenuse is 5 cm, what is  $\sin(\theta)$ ?
- $\sin(\theta) = 3/5 = 0.6$

### **Step 4: Using a Calculator**

Show students how to calculate sine, cosine, and tangent values using a calculator. Emphasize checking whether the calculator is in degree or radian mode.

### **Step 5: Solving Triangles**

Guide students to find unknown angles and sides using trigonometric ratios.

## **7. The Unit Circle**

Introduce the unit circle as a way to extend trigonometry beyond right triangles. Cover:

- Definition (circle with radius 1 centred at the origin)
- Coordinates representing  $\cos(\theta)$  and  $\sin(\theta)$
- Special angles ( $0^\circ$ ,  $30^\circ$ ,  $45^\circ$ ,  $60^\circ$ ,  $90^\circ$ )

### **8. Common Mistakes to Address**

- Confusing opposite and adjacent sides
- Forgetting to check the calculator mode
- Using degrees instead of radians or vice versa

### **9. Practice Set (Basic Level)**

1. In a right triangle, if the opposite side is 4 and the adjacent is 3, find  $\tan(\theta)$ .
2. Given  $\sin(\theta) = 0.8$ , find the angle  $\theta$  (use calculator).
3. Find the hypotenuse if the opposite side is 5 and  $\sin(\theta) = 0.6$ .

### **10. Advanced Topics (for Extension)**

- Trigonometric Identities

- Graphs of sine, cosine, and tangent functions
- Inverse trigonometric functions
- Solving real-world problems using trigonometry

### **11. Review & Recap**

- Create a summary diagram showing SOH-CAH-TOA
- Provide a mini-quiz
- Encourage group problem-solving activities

### **12. Transition Topics**

After mastering Trigonometry, students should move on to:

- Trigonometric identities
- Coordinate geometry
- Vectors and forces

Note: This structured dataset can be broken into smaller .md or .jsonl chunks with metadata for RAG use.