

## Topic: Triangles

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### Lesson Objectives

By the end of this lesson, students should be able to:

- Identify and classify different **types of triangles**
  - **Construct triangles** given sides and angles
  - **Inscribe** and **circumscribe** circles in triangles
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### 1. What is a Triangle?

A **triangle** is a **closed plane figure** with **three sides and three angles**.

It is the **simplest polygon** and forms the basis of many geometrical constructions.

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### 2. Types of Triangles

Triangles can be classified by:

#### a) Sides

Type of Triangle	Description	Example
Equilateral Triangle	All <b>three sides are equal</b> ; all angles are <b>60°</b>	Triangular warning sign
Isosceles Triangle	<b>Two sides are equal</b> , and <b>two angles are equal</b>	Roof trusses
Scalene Triangle	<b>No sides are equal</b> ; all angles are <b>different</b>	Irregular triangular object

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#### b) Angles

Type of Triangle	Description	Example
Acute-angled Triangle	All angles are <b>less than 90°</b>	Standard roof design
Right-angled Triangle	One angle is <b>exactly 90°</b>	L-shaped bracket, carpenter square
Obtuse-angled Triangle	One angle is <b>more than 90°</b>	Decorative patterns

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### 3. Construction of Triangles

#### Tools Required:

- **Compass**
  - **Ruler**
  - **Protractor**
  - **Pencil (2H or HB)**
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#### a) Constructing a Triangle When Three Sides Are Known (SSS)

##### Steps:

1. Draw the **longest side** as a base.
  2. Use the **compass** to draw arcs from each endpoint of the base using the other two side lengths.
  3. The point where the arcs **intersect** is the **third vertex**.
  4. Join the sides to form the **triangle**.
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#### b) Constructing a Triangle When Two Sides and One Angle Are Known (SAS)

##### Steps:

1. Draw one of the given sides.
  2. At one end, use a **protractor** to measure the given angle.
  3. Draw the second side from the angle.
  4. Use the **compass** to measure and cut the remaining side to meet the other side.
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#### c) Constructing a Right-angled Triangle

##### Steps:

1. Draw the **base**.

2. Use a **set square** to draw a **90° angle** at one end.
3. Mark the length of the other side along the perpendicular line.
4. Connect the top of this side to the other end of the base.

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## 4. Inscribing and Circumscribing Circles in Triangles

### a) Inscribed Circle (Incircle)

An **inscribed circle** is a circle that **fits perfectly inside a triangle**, touching all three sides.

#### Steps to Construct an Incircle:

1. **Bisect two angles** of the triangle.
2. The point where the **angle bisectors meet** is the **center of the incircle (incenter)**.
3. Use a **compass** to draw a circle from the center, with radius equal to the **distance from the incenter to one side of the triangle**.

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### b) Circumscribed Circle (Circumcircle)

A **circumscribed circle** is a circle that **passes through all three vertices of a triangle**.

#### Steps to Construct a Circumcircle:

1. **Perpendicularly bisect two sides** of the triangle.
2. The **intersection of the bisectors** is the **center of the circumcircle (circumcenter)**.
3. Use a **compass** to draw a circle from this center, passing through all three triangle corners.

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## 5. Real-Life Applications of Triangles

Use	Example
Construction and Architecture	Roof trusses, bridges
Engineering	Gears, supports
Design	Art, tiling patterns

Use	Example
Navigation and Mapping	Triangulation
Safety Signs	Triangular road signs

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## 6. Importance of Triangles in Technical Drawing

- **Structural stability:** Triangles provide strength in design.
- **Geometric construction:** Many drawings begin with basic triangles.
- **Engineering and architecture:** Triangles distribute force efficiently.

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## 7. Summary of Key Points

Concept	Details
Triangle	3-sided polygon with 3 angles
Types (Sides)	Equilateral, Isosceles, Scalene
Types (Angles)	Acute, Right, Obtuse
Construction Methods	SSS, SAS, Right-angled
Circle in Triangle	Incircle (inscribed), Circumcircle (circumscribed)