# GRADE: 7

## Lesson: Triangles and Its Properties

## DETAILED ANSWERS

## SECTION A (4 × 10 = 40 marks)

### 1. Choose the correct option:

a) **The sum of all three angles of a triangle is always:**

- **Correct Answer:** (iii) 180°

b) **An equilateral triangle has:**

- **Correct Answer:** (ii) All angles equal to 60°

c) **The longest side in a right-angled triangle is called:**

- **Correct Answer:** (iii) Hypotenuse d) **If the sides of a triangle are 5 cm, 12 cm, and 13 cm, then it is a:**
- **Correct Answer:** (ii) Right-angled triangle

### 2. Solve the following:

a) **Definition of a Triangle and its Six Elements:**

- A triangle is a **closed figure** formed by three line segments.
- **Elements:** Three **sides**, three **angles**, and three **vertices**.

b) **Finding the Third Angle:**

- Given: Two angles = 65° and 75°
- Using the **Angle Sum Property**: $180° - (65° + 75°) = 180° - 140° = 40°$

- **Third angle = 40°**

c) **Classifying Triangles Based on Angles:**

- (i) 45°, 45°, 90° → **Right-angled isosceles triangle**
- (ii) 30°, 60°, 90° → **Right-angled scalene triangle**
- (iii) 110°, 40°, 30° → **Obtuse-angled triangle**

## 3. Solve the following equations:

a) **Finding the Missing Angle:**

- Given: **50° and 40°**
- $180° - (50° + 40°) = 90°$
- **Third angle = 90°** (Right-angled triangle)

b) **Range for Third Side:**

- Given: **Two sides = 7 cm and 9 cm**
- By **Triangle Inequality Theorem**:
  - The third side must be **greater than** 9 - 7 = 2 cm
  - The third side must be **less than** 9 + 7 = 16 cm
- **Possible range: 2 cm < Third side < 16 cm**

c) **Using Pythagoras Theorem:**

- Given sides: 6 cm, 8 cm, 10 cm
- Check: $6^2 + 8^2 = 10^2$
  - 36 + 64 = 100
- Since **LHS = RHS**, it is a **right-angled triangle**.

## 4. TRUE or FALSE:

a) **True** (Triangle inequality theorem states this)

b) **True** (Exterior angle theorem)

c) **False** (A right-angled triangle can be isosceles if two sides are equal)

d) **False** (In an obtuse triangle, one altitude lies outside the triangle)

## 5. Solve the following problems:

a) **Angles in Ratio 2:3:4:**

- Let angles be **2x, 3x, 4x**
- 2x + 3x + 4x = 180°
- 9x = 180°
- x = 20°
- **Angles = 40°, 60°, 80°**

b) **Finding Hypotenuse in Right-Angled Triangle:**

- Given: Base = 9 cm, Perpendicular = 12 cm
- By **Pythagoras theorem**: $h^2 = 9^2 + 12^2$ $h^2 = 81 + 144 = 225$ $h = 15cm$
- **Hypotenuse = 15 cm**

c) **Proving Angles Opposite Equal Sides are Equal (Isosceles Triangle Theorem)**

- Draw an **isosceles triangle** with sides **AB = AC**
- Draw **altitude AD**, which bisects **BC**
- By **RHS congruence**, $\triangle ABD \cong \triangle ACD$
- **Thus, ∠B = ∠C**

# SECTION B (4 × 10 = 40 marks)

## 6. Properties of Triangles:

a) **Angle Sum Property:**

- The sum of the angles in a triangle is always **180°**.
- Example: In a **45°-45°-90° triangle** → 45° + 45° + 90° = 180°

b) **Triangle Inequality Theorem:**

- In any triangle, the sum of any two sides is **greater than** the third side.

c) **Pythagoras Theorem with Real-Life Example:**

- Used in construction, navigation, and sports.
- Example: Ladder against a wall (forms a right triangle).

## 7. Types of Triangles:

a) **Scalene Triangle (5 cm, 6 cm, 7 cm):**

- No sides are equal.
- Construct using **SSS criterion**.

b) **Isosceles Triangle (Base = 6 cm, Equal sides = 7 cm):**

- Two equal sides.
- Construct using **base and height**.

c) **Right-Angled Triangle (Base = 8 cm, Perpendicular = 6 cm):**

- Construct using **Pythagoras theorem**.

## 8. Real-Life Applications:

a) **Ladder Problem:**

- Using **Pythagoras theorem**:
  - $h^2 + 9^2 = 15^2$
  - $h^2 + 81 = 225$
  - $h^2 = 144$
  - $h = 12m$
- **Ladder touches at 12 m height**

b) **Checking Right-Angled Triangle:**

- Given: 40 m, 30 m, 50 m
- Check: $40^2 + 30^2 = 50^2$
- **Yes, it is a right-angled triangle.**

c) **Total Fencing Required for Field:**

- Perimeter = **100 + 120 + 150 = 370 m**

## 9. HOTS (Higher Order Thinking Skills):

a) **Finding Opposite Interior Angle:**

- Given: **Exterior angle = 110°**, **Interior angle = 40°**
- Other angle = **110° - 40° = 70°**

b) **Angles of an Isosceles Triangle:**

- Given one angle = 40°
- Other two angles = (180° - 40°) / 2 = 70°

c) **Finding Triangle Angles (Ratio 5:7:8):**

- 5x + 7x + 8x = 180°
- 20x = 180°
- x = 9°
- **Angles = 45°, 63°, 72°**

## END OF SOLUTIONS