GRADE: 7

LESSON: Congruence of Triangles

DETAILED ANSWERS

SECTION A (4 × 10 = 40 marks)

1. Choose the correct option:

a) Two triangles are congruent if their:

- **Correct Answer:** (iii) Both corresponding sides and angles are equal.

b) The congruence rule **SAS** states that two triangles are congruent if:

- **Correct Answer:** (ii) Two sides and the included angle are equal.

c) If $\triangle ABC \cong \triangle PQR$, then:

- **Correct Answer:** (iii) Both (i) and (ii) d) The **ASA** congruence rule states that:

- **Correct Answer:** (i) Two angles and the included side must be equal.

2. Solve the following:

a) **Definition of Congruence and Examples**

- **Congruence** means two triangles have the same shape and size.
- **Real-life examples:**
  - Two identical traffic signboards.
  - Two blades of a pair of scissors.

b) **Checking Congruence:**

- Given sides: 5 cm, 6 cm, 7 cm and 5 cm, 6 cm, 7 cm
- Since all three sides are equal, the triangles are congruent by **SSS criterion**.

c) **Finding the Missing Angle:**

- Sum of angles in a triangle = 180°
- Missing angle = 180° - (65° + 45°) = **70°**

3. Solve the following equations:

a) **Proof of Congruence using SSS Rule**

- Given: AB = DE = 5 cm, BC = EF = 7 cm, CA = FD = 6 cm
- Since all three sides are equal, $\triangle ABC \cong \triangle DEF$ by **SSS**.

b) **Finding missing values in congruent triangles:**

- Since $\triangle XYZ \cong \triangle PQR$, corresponding sides are equal.
- XY = PQ = 8 cm, YZ = QR = 10 cm, XZ = PR = 6 cm.

c) **Finding the Third Angle:**

- Sum of angles in a triangle = 180°
- Third angle = 180° - (50° + 60°) = **70°**

4. TRUE or FALSE:

a) **True** (Congruent triangles have equal perimeters.)

b) **False** (Two triangles can have the same area but different shapes.)

c) **True** (By RHS theorem, right-angled triangles with equal hypotenuses and one leg are congruent.)

d) **False** (**AAA** does not ensure congruence, only similarity.)

5. Solve the following problems:

a) **Proof of RHS Congruence:**

- Given: Right triangles with equal hypotenuses and one equal leg.
- By **RHS rule**, the two triangles are congruent.

b) **Proof of Congruence using SSS Criterion:**

- Given: AB = XY = 5 cm, AC = XZ = 7 cm, BC = YZ = 6 cm
- Since all three sides are equal, **ΔABC ≅ ΔXYZ** by **SSS rule**.

c) **Finding Triangle Sides and Proving Right-Angled Triangle:**

- Ratio: 3:4:5, Perimeter = 36 cm.
- Side lengths: $3x + 4x + 5x = 36 \longrightarrow x = 3 \longrightarrow$ Sides: **9 cm, 12 cm, 15 cm**.
- Applying **Pythagoras theorem:** $9^2 + 12^2 = 15^2 \longrightarrow$ **Right-angled triangle.**

SECTION B (4 × 10 = 40 marks)

6. Congruence of Triangles – Practical Applications:

a) **Information needed for SAS Congruence:**

- Two sides of the triangular plots.
- The included angle between them.

b) **Congruence of Bridge Supports:**

- Given equal bases and equal heights.
- The triangles are congruent using the **ASA rule**.

c) **Congruence in Road Intersections:**

- If two roads form equal angles and have a common side, then the triangles are **congruent by ASA**.

7. Properties of Congruent Triangles:

a) **Proving RHS Rule:**

- If two right triangles have equal hypotenuses and one equal leg, their third sides must be equal by **Pythagoras theorem**.

b) **Isosceles Triangle Congruence:**

- An isosceles triangle has two equal sides and equal angles.
- If two isosceles triangles have equal bases, they are **congruent by SSS or ASA**.

c) **Superimposing Congruent Triangles:**

- If two congruent triangles are placed on each other with aligned sides, their angles remain **unchanged**.

8. Real-Life Application Problems:

a) **Congruence of Metal Sheets:**

- Given sides: 6 cm, 8 cm, 10 cm.
- The triangles are **congruent by SSS rule**.
- Also, **right-angled by Pythagoras theorem**.

b) **Congruence of Garden Beds:**

- Given sides: 12 m, 16 m, 20 m.
- The triangles are **congruent by SSS rule**.
- Area = $\frac{1}{2} \times 12 \times 16 = 96m^2$.

c) **Congruence of Windows:**

- Given sides: 3 ft, 4 ft, 5 ft.
- Triangles are congruent by **SSS rule**.
- Also, **right-angled by Pythagoras theorem**.

9. HOTS (Higher Order Thinking Skills):

a) **Checking Congruence of Cut Banners:**

- If cut along the **median**, both parts remain **congruent**.
- Check using **SSS or ASA rule**.

b) **Congruence of Overlapping Equilateral Triangles:**

- Equilateral triangles have all equal sides and angles.
- Placing one over the other keeps them **congruent**.

c) **Flipping and Rotating a Triangle:**

- A triangle remains **congruent** to its original shape even when flipped or rotated.

10. Bonus Challenge Questions:

a) **Triangular Shadows of Flagpoles:**

- Given base and height are equal, the shadows form **congruent triangles by SAS**.

b) **Congruence of Mountain Peaks:**

- If slopes and angles match, the triangles are **congruent by ASA rule**.

c) **Carpenter Cutting Identical Triangles:**

- He can ensure congruence by **measuring equal sides and angles** before cutting.

END OF SOLUTIONS