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CHAPTER TEST: TRIANGLES (HOTS)
Mathematics | Class IX | (2026/TRI-HOTS/09/001)

Section A: Multiple Choice Questions

- Answer: (c) Isosceles**
If altitudes from two vertices are equal, the corresponding sides are equal. Hence, the triangle is isosceles.
- Answer: (b) $\angle B = \angle Q$**
For SAS congruence, the included angle between equal sides must be equal.
- Answer: (b) Double the smallest side**
In a right-angled triangle, if one acute angle is double the other, the angles are 30° and 60° . The side opposite 30° is half the hypotenuse.
- Answer: (b) Isosceles**
If the bisector of the vertex angle also bisects the base, the triangle is isosceles.
- Answer: (a) $BD = CD$**
In an isosceles triangle, the altitude from the vertex bisects the base.
- Answer: (c) SSA**
SSA is not a valid congruence criterion.
- Answer: (c) CA**
Angles are 50° , 60° , and 70° . The side opposite the smallest angle (50°) is the shortest.
- Answer: (a) $PQ + QR + RP > 2PS$**
By triangle inequality, the sum of any two sides is greater than the third side.

Section B: Short Answer Questions

1. Since AD is the perpendicular bisector of BC , we have:

$$BD = DC \quad \text{and} \quad \angle ADB = \angle ADC = 90^\circ$$

In $\triangle ABD$ and $\triangle ACD$:

$$AD = AD \quad (\text{common}), \quad BD = DC, \quad \angle ADB = \angle ADC$$

By SAS congruence, $\triangle ABD \cong \triangle ACD$. Hence,

$$AB = AC$$

Therefore, $\triangle ABC$ is isosceles.

2. In an equilateral triangle, all sides are equal:

$$AB = BC = CA$$

Equal sides subtend equal angles. Hence,

$$\angle A = \angle B = \angle C$$

Therefore, every equilateral triangle is equiangular.

3. Let AD be the bisector of $\angle A$ and also bisect BC such that $BD = DC$.
In $\triangle ABD$ and $\triangle ACD$:

$$AB = AC \text{ (common), } BD = DC, \quad \angle BAD = \angle CAD$$

By SAS congruence, $\triangle ABD \cong \triangle ACD$. Hence,

$$AB = AC$$

So, the triangle is isosceles.

4. Given $\angle A = 90^\circ$ and $AB = AC$.
Sum of angles in a triangle:

$$\angle A + \angle B + \angle C = 180^\circ$$

$$90^\circ + \angle B + \angle C = 180^\circ \Rightarrow \angle B + \angle C = 90^\circ$$

Since $AB = AC$, $\angle B = \angle C$.

$$\angle B = \angle C = 45^\circ$$

Section C: Short Answer Questions

1. Draw $AP \perp BC$.
In $\triangle ABP$ and $\triangle ACP$:

$$AB = AC, \quad AP = AP, \quad \angle APB = \angle APC = 90^\circ$$

By RHS congruence, $\triangle ABP \cong \triangle ACP$. Hence,

$$\angle B = \angle C$$

2. In isosceles triangle ABC , $AB = AC$. Let AD be an altitude.
In $\triangle ABD$ and $\triangle ACD$:

$$AB = AC, \quad AD = AD, \quad \angle ADB = \angle ADC = 90^\circ$$

By RHS congruence, $\triangle ABD \cong \triangle ACD$. Hence,

$$BD = DC$$

Therefore, AD bisects BC .

3. Given $BA \perp AC$ and $DE \perp DF$, so both triangles are right-angled.
Also,

$$BA = DE, \quad BF = EC$$

The remaining sides are equal by subtraction. Hence, by RHS congruence,

$$\triangle ABC \cong \triangle DEF$$

Section D: Long Answer / HOTS Questions

1. Let AD be the median to side BC .

By triangle inequality:

$$AB + AC > BC$$

Since D is the midpoint of BC ,

$$BD = DC = \frac{1}{2}BC$$

Using triangle inequality in $\triangle ABD$ and $\triangle ACD$, we get:

$$AB + AC > 2AD$$

Hence proved.

2. Given D is the midpoint of BC and $AD = DE$.

- (a) In $\triangle ABD$ and $\triangle ECD$:

$$AD = DE, \quad BD = DC, \quad \angle ADB = \angle EDC$$

By SAS, $\triangle ABD \cong \triangle ECD$.

- (b) Corresponding angles are equal, hence $AB \parallel EC$.

- (c) Corresponding sides of congruent triangles are equal, so $AB = EC$.

3. Since $AD = \frac{1}{4}AB$ and $AE = \frac{1}{4}AC$, the segment DE is parallel to BC .

By midpoint theorem logic:

$$DE = \frac{1}{4}BC$$

Given $DE = 3$ cm,

$$BC = 4 \times 3 = 12 \text{ cm}$$

— End of Solutions —