MCQ 1: Congruence Criterion for Triangles

Two triangles, $\triangle ABC$ and $\triangle PQR$, have the following properties:

- $AB = PQ$
- $BC = QR$
- $\angle B = \angle Q$

Which congruence criterion can be used to prove that $\triangle ABC \cong \triangle PQR$?

Options:

1. RHS (Right Angle-Hypotenuse-Side)
2. ASA (Angle-Side-Angle)
3. SSS (Side-Side-Side)
4. SAS (Side-Angle-Side)

Answer: (a) SAS (Side-Angle-Side)

Step-by-Step Solution:

Hint 1: Start by identifying what information is given:

- Two sides of each triangle are equal.
- The angle between these two sides is also equal.

Does this match any congruence criteria you know?

Hint 2: Recall that for the **SAS criterion**, you need two sides and the included angle (the angle formed between the two sides). Check if the conditions match.

Solution: Yes, the given information satisfies the **SAS criterion** because:

- $AB = PQ$ (one pair of corresponding sides are equal),
- $BC = QR$ (another pair of corresponding sides are equal),
- $\angle B = \angle Q$ (the angle between the two sides is equal).

The other options are incorrect because:

- **ASA:** Requires two angles and the side between them, which isn't given.
- **SSS:** Requires all three sides to be equal, which isn't stated here.
- **RHS:** Applies only to right triangles, which these are not mentioned to be.

MCQ 2: Properties of Tangents

A circle has a center O, and M is a point outside the circle. Tangents MA and MB are drawn from M to the circle, touching it at A and B, respectively. Which of the following statements is **true**?

Options:

1. $MA = MB$
2. $MA > MB$
3. $MA < MB$
4. $MA + MB = 2 \times OM$

Answer: (a) MA = MB

Step-by-Step Solution:

Hint 1: What do you know about tangents drawn from an external point to a circle? Consider their lengths and the geometry of the problem.

Hint 2: Tangents drawn from an external point to a circle are special. Can you recall a specific property that applies to them?

Solution: Tangents drawn from an external point to a circle are **equal in length**. This means $MA = MB$.

Reasoning: The tangents are equal due to the symmetry of the circle, and because the tangents form right angles with the radius at the points of contact:

$$\angle OAM = 90^\circ \quad \text{and} \quad \angle OBM = 90^\circ.$$

The other options are incorrect because:

- **(b) and (c):** Tangents from the same external point cannot have different lengths.
- **(d):** There's no such formula relating the tangents' lengths to the distance from the external point to the center.