Decision-tree algorithms and digital geometry

6 questions | 14 marks

Equivalent correct methods earn the corresponding marks.

1. Apply the side algorithm to triangles with sides 4, 5, 6 cm and 4, 5, 6 cm. State the result. [2 marks]

The three side pairs are equal, so SSS applies.

Answer: Congruent, and therefore also similar.

2. Apply the side algorithm to side lists 3, 4, 5 cm and 6, 8, 9 cm. State the result. [2 marks]

The ratios 2, 2 and 1.8 do not all match.

Answer: Not similar.

3. A program declares SAS congruence after checking two sides and any angle. What condition is missing? [2 marks]

SAS requires the included angle, not an arbitrary angle.

Answer: The equal angle must lie between the two checked sides.

4. A digital quadrilateral is intended to be a parallelogram. What construction constraints should be used? [2 marks]

Visual appearance alone is not a maintained geometric condition.

Answer: Both pairs of opposite sides must be constrained parallel.

5. A student drags ten parallelograms and observes that each pair of diagonals bisects. Is this a universal proof? Explain. [3 marks]

Ten examples cannot establish all possible parallelograms.

A congruent-triangle argument can justify the general result.

Answer: No. It is useful evidence, but a deductive proof is still needed.

6. Write a short algorithm to decide whether two given triangles are similar when all side lengths are known. [3 marks]

Check that each list contains valid positive triangle side lengths.

Match smallest/middle/largest.

Calculate all three new-to-original ratios.

Compare all three factors and give the appropriate conclusion.

Answer: Order corresponding sides, calculate three matching ratios, and report similar only if all are equal.