Testing/refining construction algorithms

6 questions | 18 marks

Equivalent correct methods earn the corresponding marks.

1. Test radius r=5 cm on segment AB=10 cm for the usual two-crossing bisector. [3 marks]

The chosen radius equals half the segment.

Two distinct crossings require more than half.

Answer: It fails: the circles touch once. Choose r>5 cm.

2. A factor-2 enlargement rule doubles x but leaves y unchanged. Test P(2,3). [3 marks]

An enlargement from the origin scales both coordinates.

Changing only one coordinate distorts the figure.

Answer: It gives (4,3), but the correct image is (4,6).

3. Why is P(4,0) a poor only test for the faulty factor-2 rule (x,y)→(2x,y)? [3 marks]

Doubling zero leaves it zero.

Use a point with nonzero y, such as (1,2).

Answer: Both the faulty and correct rules give (8,0).

4. Test the midpoint rule $((x_1+x_2)/2,(y_1+y_2)/2)$ on A(−4,2), B(2,8). [2 marks]

Average x to get −1.

Average y to get 5.

Answer: M(−1,5).

5. A factor-1/2 rule rounds every image coordinate to a whole number. Test P(1,3) and refine the rule. [3 marks]

Whole-number rounding changes the required distance ratio and direction.

Keep exact halves or use a half-unit grid.

Answer: The exact image is (0.5,1.5); retain these values.

6. Give three useful types of test for a bisector construction and explain why tests alone are not a proof. [4 marks]

Choose inputs that expose different possible faults.

A general argument must explain why equal-radius crossings give the required line.

Answer: Vary segment length, direction and radii near the half-length boundary. Tests check selected cases only.