Geometry and transformations - Practice test 2

16 questions | 47 marks | 55 minutes

A second mixed paper with algebraic angles, scale reasoning, construction checks and proof.

Equivalent correct methods earn the corresponding marks.

1. A triangle has angles (x+20)°, (2x)° and (x+40)°. Find x. [3 marks]

(x+20)+2x+(x+40)=180.

4x+60=180, so x=30.

Answer: x=30

2. An exterior angle of a triangle is 120°. One opposite interior angle is 47°. Find the other opposite interior angle. [2 marks]

An exterior angle equals the sum of the two opposite interior angles.

120°−47°=73°.

Answer: 73°

3. Find an interior angle of a regular octagon. [2 marks]

Sum=(8−2)×180°=1080°.

1080°÷8=135°.

Answer: 135°

4. Enlarge P(−8,6) by positive factor 1/2 from the origin. [2 marks]

Halve both coordinates.

Answer: (−4,3)

5. An enlargement about the origin maps (3,4) to (9,12). Find the scale factor. [2 marks]

$9 \div 3 = 3$ and $12 \div 4 = 3$.

Answer: 3

6. Two similar triangles have perimeters 24 cm and 36 cm. A side of the smaller triangle is 7 cm. Find the corresponding larger side. [3 marks]

Length factor is $36 \div 24 = 1.5$.

$7 \times 1.5 = 10.5$.

Answer: 10.5 cm

7. Two similar figures have areas 36 cm^2 and 81 cm^2. Find the positive length factor from smaller to larger. [3 marks]

Area factor is $81 \div 36 = 2.25$.

The length factor is $\sqrt{2.25} = 1.5$.

Answer: 1.5

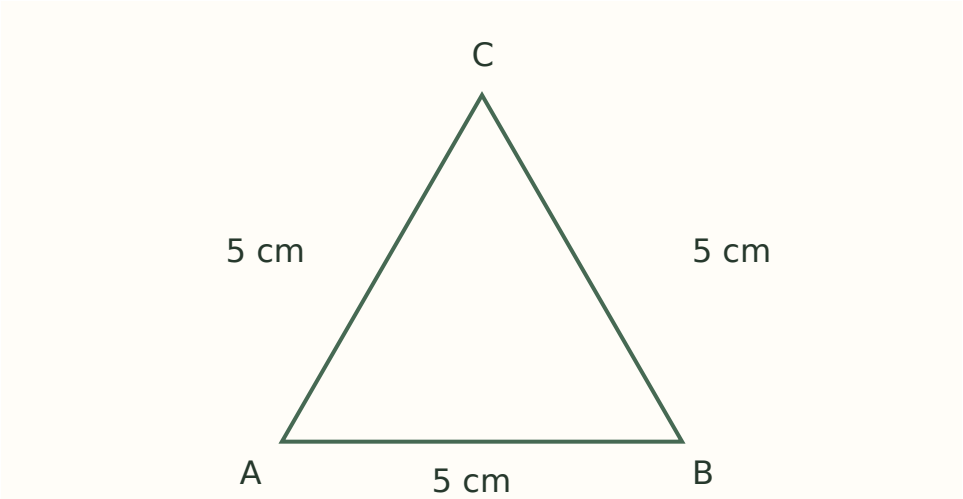
8. A reflection and a positive factor-2 enlargement are applied separately to a scalene triangle. Which preserves area? Which preserves angle sizes? [3 marks]

Reflection is a rigid motion.

Factor 2 multiplies area by 4 but keeps corresponding angles equal.

Answer: Only the reflection preserves area; both preserve angle sizes.

9. Construct an equilateral triangle with side length 5 cm using a compass and straightedge. Explain the equality of the sides. [4 marks]



Equal-radius circles locate C. Sketch not to scale.

Draw AB=5 cm and two circles of radius AB, centred at A and B.

Join an intersection C to both endpoints.

AC=BC=AB because each is the common radius.

Answer: All sides are 5 cm.

10. A(0,0) and B(6,0) are endpoints of a segment. A candidate bisector is x=3. Explain why it is correct. [3 marks]

The midpoint x-coordinate is (0+6)/2=3.

AB is horizontal, so the vertical line x=3 is perpendicular.

Answer: It meets AB at (3,0), its midpoint, at 90°.

11. In an angle-bisector construction, why should the first arc be centred at the angle's vertex? [3 marks]

Both marked distances are radii of the same circle.

The later equal-radius construction can then divide the angle equally.

Answer: It marks points equally far from the vertex on the two arms.

12. Start at P(2,−1). Compare these two procedures. [4 marks]

(a) Translate by (−1,3), then enlarge by factor 3 from the origin. [2 marks]

Translate to (1,2), then triple to (3,6).

Answer: (3,6)

(b) Enlarge by factor 3, then translate by (−1,3). Is it the same image? [2 marks]

Triple to (6,−3), then translate to (5,0).

The order changes the output.

Answer: (5,0); no

13. A procedure for an equilateral triangle draws a circle of radius AB at A, but radius AB/2 at B. Why does its justification fail? [3 marks]

AC would equal AB, but BC would equal AB/2.

The required common-radius equality is missing.

Answer: The new sides AC and BC would have different lengths.

14. Before attempting a compass construction, a student is given triangle sides 2 cm, 3 cm and 6 cm. Explain why the procedure should reject this input. [3 marks]

A non-degenerate triangle needs the sum of any two sides to exceed the third.

Answer: The two shorter lengths total 5 cm, less than 6 cm, so they cannot form a triangle.

15. Two triangles have angles 38°, 72° and 70°. One has a 4 cm side corresponding to a 6 cm side in the other. State whether they are similar and whether they are congruent. Explain. [3 marks]

Matching angles establish similarity.

The corresponding side factor is $6 \div 4 = 1.5$, not 1.

Answer: They are similar but not congruent.

16. A claimed midpoint rule is $M=((x_2-x_1)/2,(y_2-y_1)/2)$. Give a numerical counterexample and the corrected formula. [4 marks]

The wrong rule gives half the displacement.

$M=((x_1+x_2)/2,(y_1+y_2)/2)$.

Answer: For A(2,2), B(6,4), it gives (2,1) instead of (4,3). Correct rule averages coordinates.