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 $(x+20)^\circ$, $(2x)^\circ$ and $(x+40)^\circ$. 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.

$120^\circ-47^\circ=73^\circ$.

Answer: 73°

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

Sum $=(8-2)\times180^\circ=1080^\circ$.

$1080^\circ\div8=135^\circ$.

Answer: 135°

4. Enlarge $P(-8,6)$ by positive factor $\frac{1}{2}$ 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 cm² and 81 cm². 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

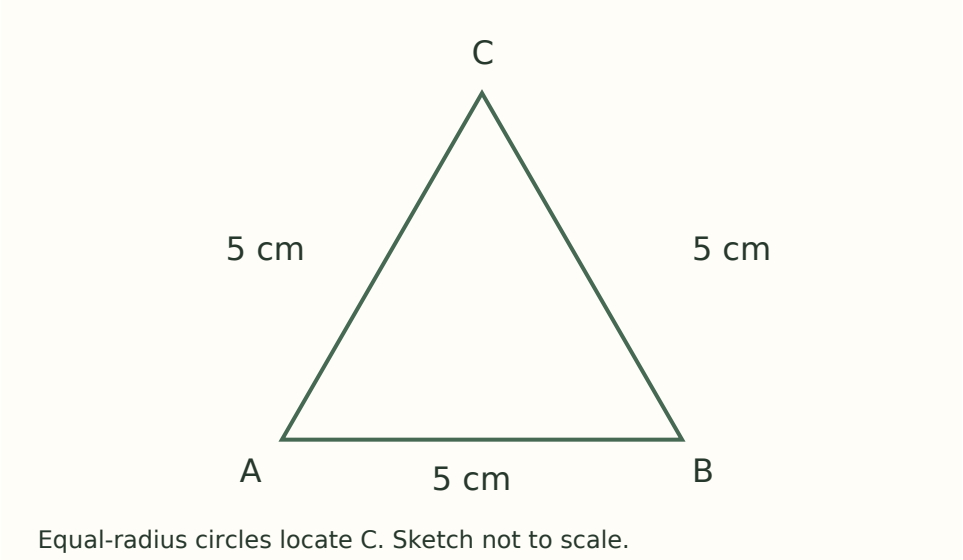
8. A reflection and a positive factor-2 enlargement are applied separately to a scalene triangle. Which preserves area? Which preserves angle sizes? [3 marks]

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 $\frac{0+6}{2} = 3$.

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 $\frac{AB}{2}$ at B. Why does its justification fail? [3 marks]

AC would equal AB, but BC would equal $\frac{AB}{2}$.

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 $M = \left(\frac{x_2 - x_1}{2}, \frac{y_2 - y_1}{2}\right)$. Give a numerical counterexample and the corrected formula. [4 marks]

The wrong rule gives half the displacement.

$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$.

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