Geometry and transformations - Applications test

16 questions | 54 marks | 60 minutes

Use geometric reasoning to evaluate plans, repair procedures and justify constructions in practical situations.

Equivalent correct methods earn the corresponding marks.

1. A triangular sign has two angles of 54° and 61°. Find its third angle. [2 marks]

$180°-54°-61°=65°$.

Answer: 65°

2. A map image is enlarged so that a 4 cm route becomes 10 cm. Find the positive scale factor. [2 marks]

$10\div4=2.5$.

Answer: 2.5

3. A rectangular logo is 5 cm by 4 cm. It is enlarged by factor 1.2. Find its new area. [3 marks]

Original area is 20 cm².

Area factor is $1.2^2=1.44$, so area=28.8 cm².

Answer: 28.8 cm²

4. A safety sign is translated to a new position. State whether its perimeter, area and angles change. [2 marks]

A translation moves every point by the same displacement without changing size or shape.

Answer: All three stay unchanged.

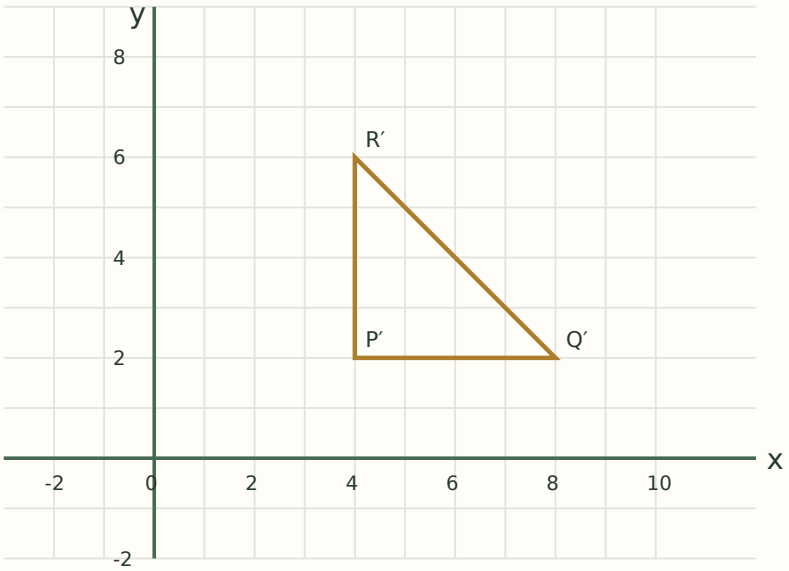
5. A design uses centre C(2,1). Enlarge corner P(5,3) by factor 2. [3 marks]

$P-C=(3,2)$.

$C+2(P-C)=(2,1)+(6,4)=(8,5)$.

Answer: P′(8,5).

6. A logo has P(1,1), Q(3,1), R(1,3). Translate it by (1,0), then enlarge by factor 2 from the origin. Draw the final triangle on the supplied grid. [4 marks]



Each grid square represents 1 unit.

The intermediate vertices are (2,1), (4,1), (2,3).

Double both coordinates of each point and join matching vertices.

Answer: P′(4,2), Q′(8,2), R′(4,6).

7. A fountain must be equally far from gates A(0,0) and B(8,0), and lie on path y=3. Find its position and explain the construction line used. [4 marks]

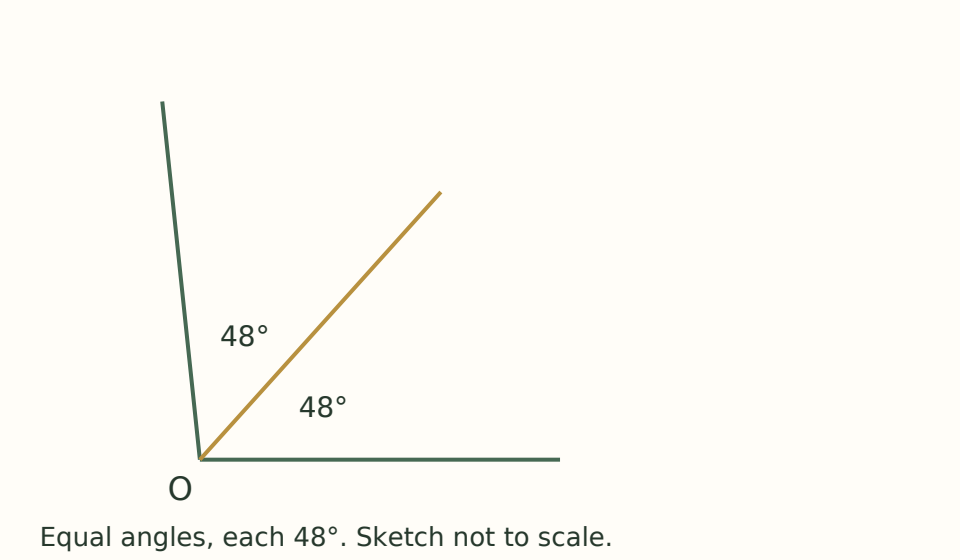
Equal distances require the perpendicular bisector of AB.

Its midpoint is (4,0), and AB is horizontal.

Intersect vertical line x=4 with path y=3.

Answer: (4,3), using the perpendicular bisector x=4.

8. A 96° entrance angle is to be divided equally by a compass construction. Describe the steps and give each angle. [4 marks]



Equal angles, each 48°. Sketch not to scale.

Mark equal-distance points on both arms with an arc from the vertex.

Draw equal-radius arcs from those points to meet inside.

Join the vertex to that crossing; 96°÷2=48°.

Answer: 48° and 48°.

9. A plotting robot doubles x and triples y. It is claimed to enlarge every figure. Test a 2 cm by 2 cm square and explain the result. [4 marks]

The image side ratio becomes 4:6 instead of 1:1.

A true enlargement uses the same factor in every direction.

Answer: Its image is 4 cm by 6 cm, so it is not an enlargement of the square.

10. A plan tells a worker to construct a bisector of a 10 cm segment using radius 6 cm from A and 7 cm from B. Repair the instruction and explain why. [3 marks]

Both radii must exceed 5 cm and be equal.

Equal radii make each crossing equally far from the two endpoints.

Answer: Use the same radius, for example 6 cm, from both endpoints.

11. A similar triangular shade has an angle of 68° before enlargement. A designer changes it to 72° in the image. Explain why the revised shade is not a true enlargement. [2 marks]

Enlargement changes size, not angle measures.

Answer: Corresponding angles must stay equal, so the image angle must remain 68°.

12. A screen rounds all image coordinates to the nearest whole number after a factor-1/2 enlargement from the origin. [5 marks]

(a) Find the exact image of P(1,5). [2 marks]

Multiply each coordinate by 1/2.

Answer: (0.5,2.5)

(b) Explain why rounding those coordinates can spoil the enlargement, and suggest a repair. [3 marks]

The original point and image must align with the origin.

Preserve the calculated values until display precision is chosen.

Answer: Rounding changes the ray and distance ratio; keep exact halves or use half-unit grid points.

13. A triangular roof brace has two equal sloping sides and a 46° vertex angle. Find its two base angles and justify your method. [3 marks]

Equal sides give equal base angles.

The remaining sum is $180° - 46° = 134°$.

Each base angle is 67°.

Answer: 67° each.

14. A pupil checks a transformation rule on (0,0) only and concludes the rule doubles every coordinate correctly. Why is this weak evidence? Give two better points to test. [4 marks]

Nonzero coordinates reveal whether each coordinate is scaled.

A negative coordinate checks sign handling.

Tests can find errors, but a general argument is still needed.

Answer: Many wrong rules fix the origin. For example test (2,3) and (−1,4).

15. A garden shape has perimeter 24 m and area 32 m². A similar garden has positive scale factor 1.5. [5 marks]

(a) Find the new perimeter and area. [3 marks]

24×1.5=36.

32×1.5²=72.

Answer: 36 m and 72 m²

(b) Paving costs 2 dollars per square metre. Find the extra paving cost for the larger garden. [2 marks]

The extra area is 72−32=40 m².

40×2=80 dollars.

Answer: 80 dollars

16. A worker says a compass-made bisector is correct because it looks centred. Give the two geometric conditions to check and a reason the equal-radius construction guarantees them. [4 marks]

Each crossing is equally far from the two endpoints.

The line through two such crossings is the perpendicular bisector, not merely an estimated central line.

Answer: It must pass through the midpoint and meet the segment at 90°. Equal-radius crossings lie on the perpendicular bisector.