Marking guide | Geometry and proof

Geometry and proof - Applications test

16 questions | 44 marks | 60 minutes

Use geometric reasoning to evaluate designs, constructions and claims.

Equivalent correct methods earn the corresponding marks.

1. A roof cross-section is isosceles with vertex angle 38°. Find each base angle. [2 marks]

$\frac{180-38}{2}=71.$

Answer: 71°

2. A map uses similar triangles with corresponding bases 6 and 15 cm. The smaller height is 4 cm. Find larger height. [2 marks]

Factor $\frac{15}{6}=2.5.$

$4\times 2.5=10.$

Answer: 10 cm

3. A design has two triangles with sides 6, 8, 10 each. Explain a congruence claim. [2 marks]

All corresponding side lengths match.

Answer: SSS congruence.

4. A circular window has radius 10 cm and a horizontal chord 16 cm long. Find the centre-to-chord distance. [3 marks]

Half-chord 8.

$\sqrt{100-64}=6.$

Answer: 6 cm

5. A circular garden has centre O. From an exterior point P, a straight path PA touches the garden at A. $OA = 9$ m and $OP = 15$ m. Find PA. [3 marks]

$OA \perp PA$.

$\sqrt{225 - 81} = 12$.

Answer: 12 m

6. Two tangents from a pole P to one circle have lengths $5x + 2$ and $3x + 14$. Find x. [2 marks]

$5x + 2 = 3x + 14$ gives $x = 6$.

Answer: 6

7. A central minor angle AOB is 126°. C is on the major arc AB. Find $\angle ACB$. [2 marks]

$\frac{126}{2} = 63$.

Answer: 63°

8. A circular frame has diameter AB. A triangle ABC on the frame has $AB = 10$ and $AC = 6$. Find BC. [3 marks]

Angle $ACB = 90^\circ$.

$\sqrt{100 - 36} = 8$.

Answer: 8

9. ABCD is a cyclic quadrilateral, with its vertices in that order. $\angle A = 75^\circ$ and $\angle B = 108^\circ$. Find $\angle C$ and $\angle D$. [2 marks]

Opposite angles sum 180°.

Answer: 105° and 72°

10. A tangent-chord angle is 47°. The alternate-segment angle is $2x + 5$ degrees. Find x. [2 marks]

$2x + 5 = 47$ gives $x = 21$.

Answer: 21

11. A simple quadrilateral has opposite angles 102° and 78°. Explain why it can be drawn on one circle. [3 marks]

Its opposite angles are supplementary.

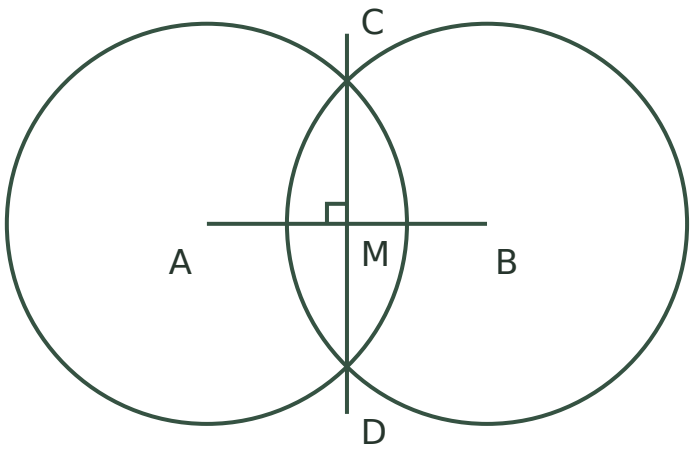
Answer: It is cyclic by the converse theorem.

12. A perpendicular-bisector algorithm changes compass radius between the two endpoints. Explain why its proof fails. [3 marks]

Equal radii are the condition establishing the required locus.

Answer: The arc intersections need not be equidistant from both endpoints.

13. Construct the perpendicular bisector of AB using equal-radius arcs and label the midpoint. [4 marks]



Choose one radius greater than half AB.

Use it unchanged from A and B.

Join both intersections.

Answer: The line through the two arc intersections meets AB at its midpoint at 90°.

14. A builder says two triangular braces are congruent because they have equal angles. Explain the missing information. [3 marks]

Equal angles establish shape only.

A scaled brace has the same angles but different lengths.

Answer: A corresponding size condition is needed.

15. O is the centre of a circle. M is the midpoint of a chord AB that is not a diameter. Prove that OM bisects the smaller angle AOB. [4 marks]

$OA = OB, AM = BM, OM$ common.

SSS congruence gives $\angle AOM = \angle MOB$.

Answer: Congruent triangles OMA and OMB give equal central angles.

16. A perpendicular-bisector construction appears correct for 20 examples. Explain what evidence would establish that it works for every segment AB with non-zero length. [4 marks]

Finite tests cannot cover every length or orientation.

Equal-radius intersections lie on the perpendicular bisector whenever $\text{radius} > \frac{AB}{2}$.

Answer: A general equidistance/congruence proof with its radius condition.