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]

(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 15/6=2.5.

4×2.5=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.

√(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⊥PA.

√(225−81)=12.

Answer: 12 m

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

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

Answer: 6

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

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°.

√(100−36)=8.

Answer: 8

9. ABCD is a cyclic quadrilateral, with its vertices in that order. ∠A=75° and ∠B=108°. Find ∠C and ∠D. [2 marks]

Opposite angles sum 180°.

Answer: 105° and 72°

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

2 x+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.

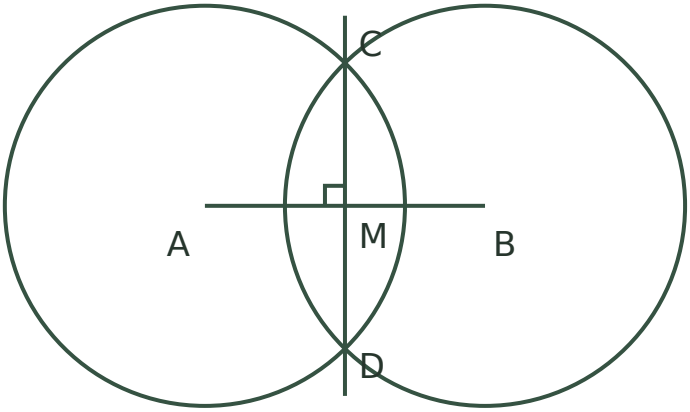
Answer: It is cyclic by the converse theorem.

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 ∠AOM=∠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 radius>AB/2.

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