

Compass and Straightedge Constructions

Grade 10 – Geometry math · Test Answer Key · Standards: G-CO.D.12, G-CO.D.13

Each solution gives the reasoning and the points awarded. For justifications, name the theorem or definition rather than saying that the figure looks right.

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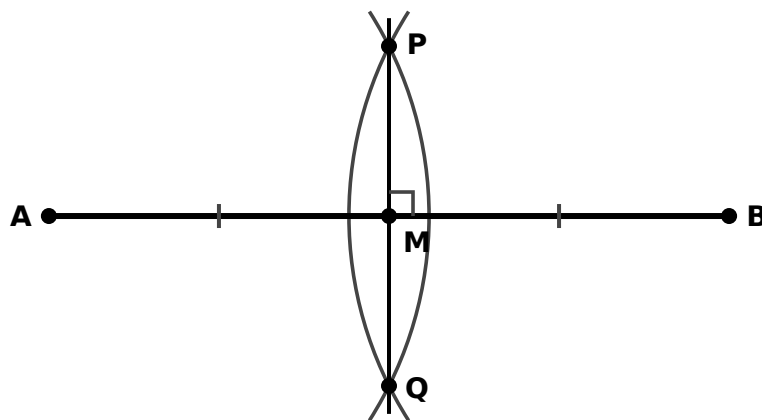
Question 1 Order the bisector steps (2 points)

The arc at O comes first (step 2). Next come the arcs from X and Y , using an opening larger than half of XY (steps 4 and 3). The ray comes last (step 1).

2, 4, 3, 1

Scoring: 2 points for the full order, 1 point if only one step is out of place.

Question 2 Perpendicular bisector (3 points)



Solved figure: $AM = MB = 7.7$ cm.

- $AM = 15.4 \div 2 = 7.7$ centimeters.
- More than half of AB , that is, more than 7.7 centimeters.
- Both arcs have the same radius, so $PA = PB$; the Perpendicular Bisector Theorem says every point on the bisector is equidistant from the endpoints.

(a) 7.7 cm, (b) more than 7.7 cm, (c) Perpendicular Bisector Theorem

Scoring: 1 point per part.

Question 3 Copy an angle (2 points)

The copy is congruent to the original: 57° . The chord joining the two arc crossings on the original angle and the chord marked on the new arc must have equal length, so that the two small triangles are congruent by SSS.

57° ; the two chords

Scoring: 1 point for the angle, 1 point for naming the chords.

Question 4 Hexagon in a circle (3 points)

- a. Each side equals the radius: 7.5 centimeters.
- b. Perimeter = $6 \cdot 7.5 = 45$ centimeters.
- c. $360^\circ \div 6 = 60^\circ$.

(a) 7.5 cm, (b) 45 cm, (c) 60°

Scoring: 1 point per part.

Question 5 Inscribed square (3 points)

- a. The diagonal is a diameter: $2(12) = 24$ centimeters.
- b. Side = $24 \div \sqrt{2} = 12\sqrt{2} \approx 17.0$ centimeters.
- c. Area = $(12\sqrt{2})^2 = 288$ square centimeters.

(a) 24 cm, (b) ≈ 17.0 cm, (c) 288 cm^2

Scoring: 1 point per part.

Question 6 Prove the triangle is equilateral (3 points)

The arc centered at A has radius AB , so $AC = AB$ (radii of the same arc). The arc centered at B has radius AB , so $BC = AB$. Therefore $AC = BC = AB$ by substitution, and all three sides are equal, so $\triangle ABC$ is equilateral.

Scoring: 1 point for $AC = AB$ with its reason, 1 point for $BC = AB$ with its reason, 1 point for the conclusion.

Question 7 Midpoint and perpendicular slope (2 points)

Midpoint: $((2 + 8) \div 2, (-3 + 5) \div 2) = (5, 1)$. Slope of $AB = (5 + 3) \div (8 - 2) = 4/3$, so the perpendicular bisector has slope $-3/4$.

Midpoint (5, 1); slope $-3/4$

Scoring: 1 point per part.

Question 8 Parallel line construction (2 points)

The copied angles are congruent corresponding angles, so the converse of the Corresponding Angles Theorem proves the lines parallel. Alternate interior angles of parallel lines are congruent, so that angle measures 65° .

Converse of the Corresponding Angles Theorem; 65°

Scoring: 1 point per part.