

Geometry · Geometric Constructions · Test Answer Key

Common Core G-CO.D.12, G-CO.D.13 · mathovore.fr

Each solution gives the expected construction steps or calculations, then a scoring guide. Give partial credit for correct reasoning with a small slip, and accept any valid order of steps that leads to the same construction. Check that arcs are shown, because the arcs are the evidence of the method.

Geometry Common Core: G-CO.D.12 · G-CO.D.13

Question 1: Perpendicular bisector measurements (2 points)

- a. M is the midpoint: $AM = \frac{10}{2} = 5$ cm.
- b. Triangle AMP is a right triangle: $PM^2 = 13^2 - 5^2 = 169 - 25 = 144$, so $PM = 12$. By symmetry $QM = 12$, so $PQ = 24$ cm.

a) 5 cm; b) 24 cm

Scoring: 1 point for $AM = 5$ cm; 1 point for $PQ = 24$ cm with the right-triangle work.

Question 2: Angle bisector with a variable (2 points)

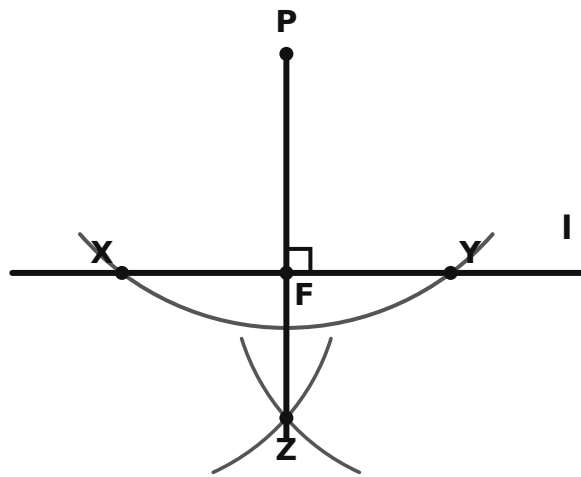
A bisector makes equal angles: $4x - 6 = 3x + 9$, so $x = 15$. Then $m\angle ABD = 4(15) - 6 = 54^\circ$ and $m\angle DBC = 3(15) + 9 = 54^\circ$, so $m\angle ABC = 2(54) = 108^\circ$.

$$x = 15, m\angle ABC = 108^\circ$$

Scoring: 1 point for the equation and $x = 15$; 1 point for 108 degrees.

Question 3: Perpendicular from a point (3 points)

1. Draw an arc centered at P that crosses l at two points, X and Y .
2. Draw arcs of the same radius, greater than half of XY , centered at X and Y that cross at Z .
3. Draw line PZ ; it is perpendicular to l .



Completed construction: line PZ is perpendicular to l.

Scoring: 1 point for the arc at P giving X and Y; 1 point for equal arcs at X and Y (wider than half of XY) meeting at Z; 1 point for drawing PZ.

Question 4: Justify an angle copy (2 points)

Triangles APQ and $DP'Q'$ have $AP = DP'$, $AQ = DQ'$ and $PQ = P'Q'$. The triangles are congruent by SSS, and corresponding parts of congruent triangles are congruent, so $\angle QAP$ is congruent to $\angle Q'DP'$.

Scoring: 1 point for naming the three pairs of equal sides; 1 point for SSS and the conclusion.

Question 5: Parallel line construction (2 points)

- The copy is congruent to the original, so it measures 58° .
- The converse of the corresponding angles theorem: the two congruent angles are corresponding angles.

a) 58° ; b) converse of the corresponding angles theorem

Scoring: 1 point for each part.

Question 6: Equilateral triangle (2 points)

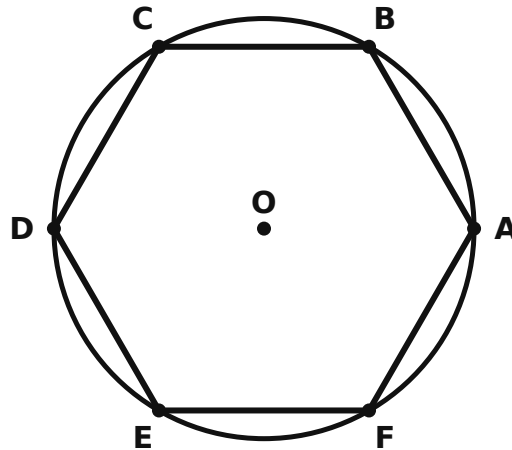
- All three sides equal the compass width, 9 in. Perimeter $3(9) = 27$ in.
- The triangle is equilateral, so its angles are equal and add to 180° : $m\angle C = \frac{180}{3} = 60^\circ$.

a) 27 in; b) 60°

Scoring: 1 point for 27 in; 1 point for 60 degrees with a reason.

Question 7: Regular hexagon in a circle (3 points)

- a. Each side equals the radius: 8 cm.
- b. $6(8) = 48$ cm.
- c. Each triangle with the center is equilateral, so each interior angle is $60^\circ + 60^\circ = 120^\circ$.



Hexagon ABCDEF: all sides 8 cm and all interior angles 120 degrees.

a) 8 cm; b) 48 cm; c) 120°

Scoring: 1 point for each part.

Question 8: Square in a circle (2 points)

- a. Diagonal AC is a diameter, so $AC = 12$ in.
- b. The diagonals of a square are perpendicular, so $m\angle AOB = 90^\circ$. (Four equal central angles: $\frac{360}{4} = 90^\circ$.)

a) 12 in; b) 90°

Scoring: 1 point for each part.

Question 9: Compass width (2 points)

Each arc reaches only 3 cm from its center, and $3+3=6$ is less than 8, so the arcs from A and B never cross and no points P and Q exist. The radius must be greater than half of AB , that is, greater than 4 cm.

Scoring: 1 point for explaining that the arcs do not meet; 1 point for the condition radius greater than 4 cm (half of AB).

Total
20 points