

Arc Length, Sector Area and Radian Measure

Grade 10 – Geometry math · Test Answer Key · Standards: G-C.B.5

Each solution shows the fraction, the formula and the result. The scoring notes show how partial credit is awarded for the setup, the arithmetic and the final answer with its units.

Standards: G-C.B.5 · **Level:** Grade 10 Geometry

Question 1 Arc Length (2 points)

$$s = \frac{84}{360} \cdot 2\pi(7.5) = \frac{7}{30} \cdot 15\pi = \frac{7\pi}{2} \approx 11.00.$$

$7\pi/2$ in $\approx$ 11.00 in

Scoring: 1 point for the fraction setup, 1 point for the answer.

Question 2 Sector Area (2 points)

$$\text{Area} = \frac{105}{360} \cdot \pi(14^2) = \frac{7}{24} \cdot 196\pi = \frac{343\pi}{6} \approx 179.59.$$

$\approx$ 179.6 m²

Scoring: 1 point for the setup, 1 point for the answer.

Question 3 Convert the Angles (2 points)

$$(a) 165 \cdot \frac{\pi}{180} = \frac{11\pi}{12}.$$

$$(b) \frac{5\pi}{9} \cdot \frac{180}{\pi} = 100^\circ.$$

(a) $11\pi/12$ (b) 100°

Scoring: 1 point each.

Question 4 Radians from an Arc (3 points)

$$(a) \theta = 9.6 \div 4 = 2.4 \text{ radians.}$$

$$(b) 2.4 \cdot \frac{180}{\pi} \approx 137.51^\circ.$$

$$(c) \text{Area} = \frac{1}{2} \cdot 4^2 \cdot 2.4 = 19.2.$$

(a) 2.4 rad (b) $\approx 137.5^\circ$ (c) 19.2 cm^2

Scoring: 1 point per part.

Question 5 Radius from Area (3 points)

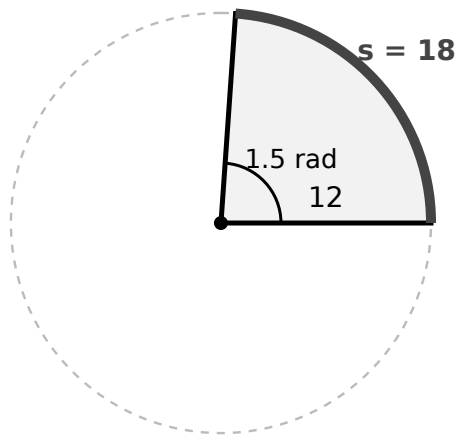
$\frac{135}{360} = \frac{3}{8}$. So $\frac{3}{8}\pi r^2 = 96\pi$, giving $r^2 = 96 \cdot \frac{8}{3} = 256$.

$r = 16$.

$r = 16 \text{ ft}$

Scoring: 1 point for the fraction, 1 point for the equation, 1 point for the radius.

Question 6 Perimeter of a Sector (3 points)



Arc length 18 cm.

Arc = $r\theta = 12 \cdot 1.5 = 18$. Perimeter = $12 + 12 + 18 = 42$.

Arc = 18 cm; perimeter = 42 cm

Scoring: 1 point for the arc length, 1 point for adding two radii, 1 point for the answer.

Question 7 Security Light (3 points)

Area = $\frac{140}{360} \cdot \pi(30^2) = \frac{7}{18} \cdot 900\pi = 350\pi \approx 1099.56$.

Far edge = $\frac{7}{18} \cdot 60\pi = \frac{70\pi}{3} \approx 73.3$.

Area $\approx 1099.6 \text{ ft}^2$; edge $\approx 73.3 \text{ ft}$

Scoring: 1 point for each correct formula, 1 point for both answers.

Question 8 Comparing Sectors (2 points)

Arc lengths scale with the radius: $10 \div 4 = 2.5$. Areas scale with the square of the radius: $2.5^2 = 6.25$.

Arcs 5 : 2 (2.5); areas 25 : 4 (6.25)

Scoring: 1 point for each ratio.