

Foundation GCSE: Arcs and Sectors of Circles

Name: _____

Class: _____

Instructions: Answer all questions. Questions are ordered from easiest (1) to hardest (20). Working out should be shown where appropriate.

1. Calculate the length of an arc of a circle with radius 12 cm and sector angle 180° . Give your answer in terms of π .
2. Calculate the area of a sector with radius 10 cm and angle 90° . Give your answer in terms of π .
3. Calculate the arc length of a circle with radius 6 cm and angle 60° . Give your answer in terms of π .
4. Calculate the area of a sector with radius 12 cm and angle 60° . Give your answer in terms of π .
5. Calculate the perimeter of a semi-circular sector of radius 7 cm, using $\pi \approx \frac{22}{7}$.
6. Calculate the arc length of a circle with radius 8 cm and angle 45° . Give your answer in terms of π .
7. Calculate the area of a sector with radius 9 cm and angle 40° . Give your answer in terms of π .
8. A sector has a radius of 10 cm and an angle of 120° . Calculate its arc length, giving your answer to 1 decimal place (use $\pi \approx 3.14$).
9. Calculate the perimeter of a quarter-circle sector with a radius of 14 cm, using $\pi \approx \frac{22}{7}$.
10. A sector has a radius of 15 cm and an area of $30\pi \text{ cm}^2$. Calculate its sector angle.
11. An arc has a length of 5π cm and a radius of 12 cm. Calculate its sector angle.
12. Calculate the total perimeter of a sector with a radius of 8 cm and an angle of 90° . Give your answer in terms of π .
13. A sector of a circle has an area of $24\pi \text{ cm}^2$ and a sector angle of 60° . Calculate its radius.
14. A sector has a radius of 10 cm and an arc length of 4π cm. Calculate its area in terms of π .
15. A windshield wiper sweeps out an arc of angle 120° with an arm length of 45 cm. Calculate the area cleaned, giving your answer to 1 decimal place (use $\pi \approx 3.14$).
16. A sector has an arc length of 7π cm and a radius of 14 cm. Calculate its perimeter.
17. A pizza slice is a sector of a circle with radius 12 cm and angle 45° . Calculate its surface area, giving your answer to 1 decimal place (use $\pi \approx 3.14$).
18. A sector of radius r has an area of $10\pi \text{ cm}^2$ and an arc length of 4π cm. Calculate the radius r .
19. A circular running track curve has an inner radius of 20 m and spans an angle of 135° . Calculate the outer arc length if the track width is 2 m, giving your answer to 1 decimal place (use $\pi \approx 3.14$).
20. An algebraic sector has a radius of x cm and a sector angle of 72° . If its area is $20\pi \text{ cm}^2$, calculate the exact value of x .

Answers & Worked Solutions

1. 12π cm : $\frac{180}{360} \times (2 \times \pi \times 12) = 12\pi$.
2. 25π cm² : $\frac{90}{360} \times (\pi \times 10^2) = 25\pi$.
3. 2π cm : $\frac{60}{360} \times (2 \times \pi \times 6) = 2\pi$.
4. 24π cm² : $\frac{60}{360} \times (\pi \times 12^2) = 24\pi$.
5. 36 cm : Arc = $\frac{1}{2} \times \frac{22}{7} \times 14 = 22$; Perimeter = $22 + 7 + 7 = 36$.
6. 2π cm : $\frac{45}{360} \times (2 \times \pi \times 8) = 2\pi$.
7. 9π cm² : $\frac{40}{360} \times (\pi \times 9^2) = 9\pi$.
8. 20.9 cm : $\frac{120}{360} \times (2 \times 3.14 \times 10) \approx 20.9$.
9. 36 cm : Arc = $\frac{1}{4} \times \frac{22}{7} \times 28 = 22$; Perimeter = $22 + 14 + 14 = 36$.
10. 48° : Area fraction = $\frac{30\pi}{\pi \times 15^2} = \frac{30}{225} = \frac{2}{15}$;
Angle = $\frac{2}{15} \times 360^\circ = 48^\circ$.
11. 75° : Circumference = 24π ; Fraction = $\frac{5\pi}{24\pi} = \frac{5}{24}$; Angle = $\frac{5}{24} \times 360^\circ = 75^\circ$.
12. $(2\pi + 16)$ cm : Arc = $\frac{90}{360} \times (2 \times \pi \times 8) = 4\pi$;
Perimeter = $4\pi + 8 + 8 = 4\pi + 16$.
13. 12 cm : Area fraction = $\frac{60}{360} = \frac{1}{6}$; $\frac{1}{6}\pi r^2 = 24\pi \implies r^2 = 144 \implies r = 12$.
14. 20π cm² : Area = $\frac{1}{2} \times \text{radius} \times \text{arc length} = \frac{1}{2} \times 10 \times 4\pi = 20\pi$.
15. 2119.5 cm² : $\frac{120}{360} \times 3.14 \times 45^2 \approx 2119.5$.
16. $(7\pi + 28)$ cm : Perimeter = arc + two radii = $7\pi + 14 + 14 = 7\pi + 28$.
17. 56.5 cm² : $\frac{45}{360} \times 3.14 \times 12^2 \approx 56.5$.
18. 5 cm : Using Area = $\frac{1}{2}r \times \text{arc} \implies 10\pi = \frac{1}{2}r \times 4\pi \implies 10\pi = 2\pi r \implies r = 5$.
19. 51.8 m : Outer radius = $20 + 2 = 22$ m; Outer arc = $\frac{135}{360} \times (2 \times 3.14 \times 22) \approx 51.8$.
20. 10 : Area fraction = $\frac{72}{360} = \frac{1}{5}$; $\frac{1}{5}\pi x^2 = 20\pi \implies x^2 = 100 \implies x = 10$.