This worksheet covers the topic "Length of an arc". You will learn to calculate the length of an arc when using radian measure using the formula

$$s = r\theta,$$

where s is the arc length, r is the radius and θ is the central angle in radians.

Easy Questions

1. Use the formula $s = r\theta$ to calculate the length of an arc in a circle with radius 5 and central angle $\frac{\pi}{3}$ radians.
2. Calculate the length of the arc in a circle with radius 3 when the central angle is π radians.
3. A circle has a radius of 10 units. If an arc on this circle has a length of 5π, find the measure of the central angle in radians.
4. Determine the length of the arc in a circle with radius 8 when the central angle is $\frac{2\pi}{5}$ radians.
5. A circle with radius 4 has an arc defined by a central angle of $\frac{\pi}{6}$ radians. Compute the length of the arc.

Intermediate Questions

6. Calculate the arc length for a circle with radius 12 and central angle $\frac{2\pi}{3}$ radians.
7. A circular track has a radius of 50 m. Find the length of the arc subtended by a central angle of 0.5 radians.
8. In a circle with radius 14, an arc has length 7. Determine the measure of the central angle in radians.
9. Consider a circle of radius 6. Find the arc length corresponding to a central angle of $\frac{\pi}{2}$ radians.
10. A circle with radius 9 has an arc with central angle $\frac{\pi}{4}$ radians. Calculate the arc length.

11. Compute the arc length when a circle of radius 15 has a central angle of 1.2 radians.

12. A circle of radius 11 has an arc length of 13.2. Determine the corresponding central angle in radians.

13. A circle has a circumference of 10π. Calculate the arc length corresponding to a central angle of $\frac{\pi}{2}$ radians.

14. A spoked wheel is designed so that the central angle between adjacent spokes is $\frac{\pi}{8}$ radians. If the wheel has a radius of 20, find the arc length between two adjacent spokes.

15. Determine the length of the arc in a circle with radius 16 when the central angle is 0.75 radians.

16. In a circle with radius 30, an arc has length 15π. Calculate the central angle in radians.

17. A circle with radius 7 has an arc of length 7. Compute the measure of the central angle in radians.

18. The arc length in a circle of radius 25 is 20. Determine the corresponding central angle.

19. If the central angle in a circle of radius 13 is 1.5 radians, find the length of the arc.

20. Given an arc length of 10 in a circle of radius 8, compute the central angle in radians.

Hard Questions

21. A designer is working with a circle of radius r and a central angle of θ radians such that the arc length is s. Express θ in terms of s and r. Then, compute θ for $s = 12$ and $r = 4$.

22. Prove that if the arc length of a circle with radius r is equal to the radius then the central angle in radians is 1. Write out all working steps.

23. Given that the arc length is calculated by $s = r\theta$, find the radius if the arc length is 9π and the central angle is $\frac{3\pi}{2}$ radians.

24. If the arc length in a circle is increased by 25% while the radius remains constant, determine the percentage increase in the central angle. Explain your reasoning.

25. Consider a circle with radius r and an arc length of 6. If the central angle is twice the radius, find the value of r.

26. A circular track has an arc length of 50 and the central angle is 2.5 radians. First, determine the radius. Then, using the same radius, calculate the new arc length if the central angle is increased to 3 radians.

27. The radius of a circle is given by $r = x + 2$, where x is a positive number. If an arc with central angle $\frac{\pi}{3}$ radians has a length of 3π, find the value of x.

28. A circle has a radius of 14. Compute the length of the arc corresponding to a central angle of $\frac{5\pi}{7}$ radians.

29. A manufacturing process uses a circular disc of unknown radius. A section of the disc has an arc length of 8 while the central angle is 1.6 radians. Determine the radius with full working.

30. Show that the formula for the length of an arc, $s = r\theta$, is dimensionally consistent. Then, given that $s = 10$ and $\theta = \frac{\pi}{2}$ radians, calculate the radius.