This worksheet focuses on learning to calculate the length of an arc when using radian measure. Recall that the arc length is given by $s = r\theta$, where r is the radius and θ the central angle in radians.

Easy Questions

1. A circle has a radius 5 and a central angle of 2 radians. Calculate the length of the arc.
2. A circle has an arc length of 12 and a radius of 4. Find the measure of the central angle in radians.
3. Convert 90° to radians and, for a circle with radius 8, determine the length of the corresponding arc.
4. For a circle with radius 3, find the arc lengths corresponding to a central angle of 0 radians and 2π radians.
5. Explain how the formula $s = r\theta$ reflects the idea that the arc length is the fraction of the circumference corresponding to the central angle (when the angle is in radians).

Intermediate Questions

6. A circular arc has a length of 7 and subtends a central angle of 1.4 radians. Find the radius of the circle.
7. A circle exhibits an arc length of 15 cm with a central angle of 3 radians. Calculate the radius.
8. The arc of a sector measures 9 and the central angle is 1.5 radians. Compute the radius.
9. If a circle's radius is doubled while the central angle remains unchanged, describe how the arc length changes.
10. For a circle with radius 10 and a central angle of $\dfrac{3\pi}{4}$ radians, calculate the arc length.
11. A circular arc has an arc length of $\dfrac{25}{9}$ and its subtended angle is $\dfrac{5}{6}$ radians. Find the radius.

12. Determine the central angle in radians for a circle with an arc length of 10 and a radius of 5.

13. Demonstrate that the arc length is directly proportional to the central angle. Use a circle with radius 6 and provide two different angles with their corresponding arc lengths.

14. Calculate the arc length for a circle with radius 7 and a central angle of $\frac{\pi}{3}$ radians.

15. A circular arc has an arc length of 20 cm and a central angle of 2 radians. Determine the radius.

16. For a circle of radius 4, find the arc length corresponding to a central angle of 1 radian.

17. A circular track has an arc of length 50 m that corresponds to a central angle of 2 radians. Calculate the radius of the track.

18. For a circle with radius 12 and central angle 0.5 radians, compute the arc length.

19. The formula for arc length is $s = r\theta$. If a circle has an arc length 18 and a central angle of 1.2 radians, what is the radius?

20. A circle has a radius of 9. Find the length of the arc corresponding to a central angle of 2.5 radians.

Hard Questions

21. A circular track has an arc length of 100 m corresponding to a central angle of 1.6 radians. If a similar track is constructed with a radius increased by 20%, what is the new arc length for the same central angle?

22. A circle has a circumference of 31.4 cm. Determine the length of the arc corresponding to a 90° angle.

23. Show that the arc length of a circle can be written as $s = \frac{\theta}{2\pi} \times (\text{circumference})$ and verify this formula when $\theta = \frac{\pi}{2}$.

24. A decorative circular arch has an arc length of 18 m for a central angle of 1.2 radians. If the circumference of the circle is increased by enlarging the radius by 15%, what is the new arc length for the same central angle?

25. For a circle, if the length of an arc is one-sixth of the total circumference, determine the measure of the central angle in radians.

26. An arc on a circle subtends an angle θ and has a length $s = r\theta$. If the radius is increased by 20% and, as a result, the arc length increases by 40%, find the ratio of the new central angle to the original central angle.

27. A circular track has an arc length of 30 m corresponding to a central angle of 2 radians. (a) Determine the radius of the track. (b) If the central angle is doubled while the radius remains unchanged, what is the new arc length?

28. For a circle with a fixed central angle of 0.8 radians, calculate the percentage increase in arc length when the radius is increased from 10 to 15.

29. Derive the formula $s = r\theta$ for the length of an arc and show that when the central angle is 2π radians, this formula yields the circumference of the circle.

30. If a circular arc has a length s and subtends a central angle of 0.75 radians, express the radius in terms of s. Then, compute the radius when $s = 9$ m.