ILLAWARRA TUTORING

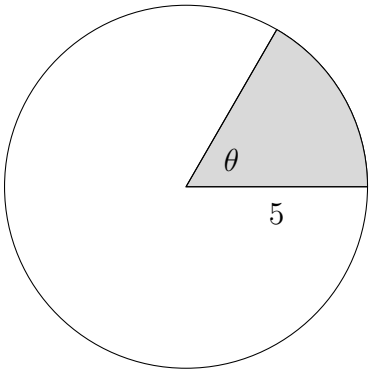
This worksheet focuses on determining the area of a sector using your understanding of radians. You will use the formula $A = \frac{1}{2}r^2\theta$ where r is the radius and θ is the central angle in radians. Work through the questions carefully.

Easy Questions

1. Calculate the area of a sector with radius 3 and central angle $\frac{\pi}{4}$ radians.
2. Write the formula for the area of a sector in a circle when the central angle is given in radians.
3. A circle has radius 4. Calculate the area of the sector with central angle 2 radians.
4. For a circle with radius 6, compute the area of a sector with central angle $\frac{\pi}{3}$ radians.
5. Verify that the sum of the areas of two sectors with central angles $\frac{\pi}{3}$ and $\frac{2\pi}{3}$ in a circle of radius 5 equals the area of a sector with central angle π. (Show all steps.)

Intermediate Questions

6. Calculate the area of a sector in a circle with radius 7 and central angle 1.2 radians.
7. A circular track has a radius of 50 m. Determine the area of the sector corresponding to a central angle of 0.5 radians.
8. Determine the area of a sector when the circle has a radius of 10 m and the central angle is 3 radians.
9. Given that the area of a sector is 20 and the radius is 4, find the measure of the central angle in radians.
10. In a circle of radius r, the area of a sector with central angle θ is $A = \frac{1}{2}r^2\theta$. Express θ in terms of A and r.
11. Consider the diagram below of a circle with radius 5 and a sector of area 10. Calculate the value of θ in radians.



12. Draw a diagram of a circle with radius 3 and a sector with central angle $\frac{\pi}{2}$ radians. Then, calculate the area of this sector.

13. Compare the area of a sector with central angle 1 radian to that with central angle 2 radians in a circle of radius 4. Compute both areas and state the ratio of the larger area to the smaller area.

14. A sector in a circle has an area that is one-quarter of the area of the circle. For a circle with radius 8, find its central angle in radians.

15. The area of a sector is 15 and the radius of the circle is 5. Determine the value of θ in radians.

16. A circle has radius 9. Calculate the area of a sector with a central angle of $\frac{4}{3}$ radians.

17. A student calculates the area of a sector with radius 6 and central angle 1.5 radians but mistakenly uses the formula $A = r^2\theta$. Determine the correct area by adjusting the result.

18. In a circle with radius 10, the difference between the areas of two sectors is 20. If the sectors have central angles θ_1 and θ_2, find the difference $\theta_2 - \theta_1$ in radians.

19. Given two sectors in a circle with radius 7, one with central angle 1.2 radians and the other with 2.3 radians, find the difference in their areas.

20. A circular pizza of radius 12 is cut into equal slices. If one slice (sector) has an area of 24, determine the total number of slices.

Hard Questions

21. Prove that if a sector's area is one-fifth of the area of the circle, then its central angle is $\frac{2\pi}{5}$ radians.

22. A sector of a circle with radius 10 has an area of $\frac{25\pi}{3}$. Find the measure of the central angle in radians.

23. Derive the formula for the area of a sector by comparing the area of the sector to the area of the full circle using proportions.

24. A circular garden has a radius of 15 metres. A sector of the garden is to be decorated with paving stones covering 50 square metres. Calculate the required central angle in radians.

25. A circle with radius 8 has a sector removed whose area is 20. Determine the measure of its central angle and express it as a fraction of the full circle's angle.

26. Consider a circle where a sector has an area of 10 and a central angle of 2 radians. Find the radius of the circle.

27. Two sectors from different circles have equal areas. The first sector is from a circle of radius 6 with central angle θ, and the second is from a circle of radius 9 with central angle ϕ. Derive a relation between θ and ϕ.

28. A circular pie of radius 5 is cut into slices of unequal sizes. The largest slice has an area of 18 and the smallest slice has an area of 6. Find the central angles of these slices and determine how many times larger the largest angle is than the smallest.

29. A sector with central angle θ and radius r has area $A = \frac{1}{2}r^2\theta$. If the radius is increased by 10% while the angle remains constant, by what percentage does the area of the sector increase? Express your answer as a whole number percentage.

30. A circular disc has a decorative shaded sector with an area of 7 m^2. If the central angle of the shaded sector is 0.5 radians greater than the central angle of the remaining part of the disc, find the radius of the disc and the measures of both central angles. (Hint: Let the shaded angle be x so that the remaining angle is $2\pi - x$, and set up the equation accordingly.)