ILLAWARRA TUTORING

In this worksheet you will understand the radian as a measure of angles and learn how to convert between degrees and radians. Recall that an angle measured in radians is defined by the ratio of the length of the subtended arc to the radius, and that the conversion between degrees and radians is given by

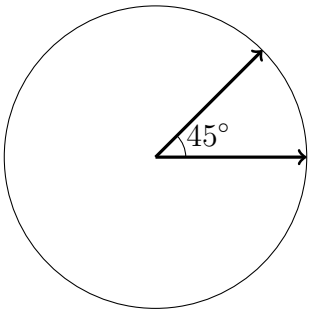
$$1^\circ = \frac{\pi}{180} \text{ rad} \quad \text{and} \quad 1 \text{ rad} = \frac{180^\circ}{\pi}.$$

Easy Questions

1. Define in your own words what a radian is.
2. Convert the angle 90° to radians.
3. Convert the angle 180° to radians.
4. Convert the angle 45° to radians.
5. Convert the angle 60° to radians.

Intermediate Questions

6. Convert the angle 135° to radians.
7. Convert the angle 0° to radians.
8. Convert the angle $\frac{\pi}{3}$ radians to degrees.
9. Convert the angle $\frac{2\pi}{3}$ radians to degrees.
10. Convert the angle $\frac{\pi}{6}$ radians to degrees.
11. Study the diagram. The central angle is 45°. Write its radian measure near the angle.



12. Convert the angle -30° to radians.
13. Convert the angle 270° to radians.
14. Convert the angle 315° to radians.
15. Convert the angle 22.5° to radians.
16. Convert the angle 405° to radians.
17. Convert the angle $\frac{5\pi}{4}$ radians to degrees.
18. Convert the angle $\frac{7\pi}{6}$ radians to degrees.
19. Convert the angle 3.5 radians to degrees (give your answer to one decimal place).
20. State the conversion formula between degrees and radians and use it to convert 120° to radians.

Hard Questions

21. Prove that $360^\circ = 2\pi$ radians and hence derive the conversion formula between degrees and radians.
22. Solve for x if $2x$ radians equals 150°. Express your answers in both radians and degrees.
23. Solve for x given that $x + \frac{\pi}{4}$ radians equals 60°. Provide your answer in degrees.
24. Solve the equation $3x^\circ = \frac{\pi}{2} - x$ for x. Express your final answer in both radians and degrees.
25. Convert the angle 765° to radians and simplify your answer.
26. Convert the angle -720° to radians.
27. If an angle measures α radians, its supplementary angle measures $\pi - \alpha$. Express the supplementary angle in degrees in terms of α.
28. If the sum of an angle (in radians) and its complement equals $\frac{\pi}{2}$, and one angle is β, find both angles in degrees.
29. A rotating object completes a rotation of 540°. Convert this total rotation to radians and simplify.
30. Convert the angle $\frac{7\pi}{3}$ radians to degrees. Explain each step of your conversion.