6-1

Study Guide

Angles and Radian Measure

An angle of one complete revolution can be represented either by 360° or by 2π radians. Thus, the following formulas can be used to relate degree and **radian** measures.

Degree/Radian Conversion Formulas	1 radian = $\frac{180}{\pi}$ degrees or about 57.3°
	1 degree = $\frac{\pi}{180}$ radians or about 0.017 radian

Example 1 **a. Change 36° to radian measure in terms of π.**
　　　　　　b. Change $-\frac{17\pi}{3}$ radians to degree measure.

　　　　a. $36° = 36° \times \frac{\pi}{180°}$　　　　　**b.** $-\frac{17\pi}{3} = -\frac{17\pi}{3} \times \frac{180°}{\pi}$
　　　　　　　$= \frac{\pi}{5}$　　　　　　　　　　　　　　$= -1020°$

Example 2 **Evaluate $\sin \frac{3\pi}{4}$.**

　　　　The reference angle for $\frac{3\pi}{4}$ is $\frac{\pi}{4}$. Since $\frac{\pi}{4} = 45°$,
　　　　the terminal side of the angle intersects the unit
　　　　circle at a point with coordinates of $\left(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$.
　　　　Because the terminal side of $\frac{3\pi}{4}$ lies in Quadrant II,
　　　　the x-coordinate is negative and the y-coordinate is
　　　　positive. Therefore, $\sin \frac{3\pi}{4} = \frac{\sqrt{2}}{2}$.

Example 3 **Given a central angle of 147°, find the length
　　　　of its intercepted arc in a circle of radius
　　　　10 centimeters. Round to the nearest tenth.**
　　　　First convert the measure of the central angle
　　　　from degrees to radians.

　　　　$147° = 147° \times \frac{\pi}{180°}$　　　　*1 degree* $= \frac{\pi}{180°}$
　　　　　　　$= \frac{49\pi}{60}$

　　　　Then find the length of the arc.

　　　　$s = r\theta$　　　　　　　　*Formula for the length of an arc*
　　　　$s = 10\left(\frac{49\pi}{60}\right)$　　　　*r = 10, $\theta = \frac{49\pi}{60}$*
　　　　$s \approx 25.65634$

　　　　The length of the arc is about 25.7 cm.

6-1 Practice

Angles and Radian Measure

Change each degree measure to radian measure in terms of π.

1. $-250°$ **2.** $6°$ **3.** $-145°$

4. $870°$ **5.** $18°$ **6.** $-820°$

Change each radian measure to degree measure. Round to the nearest tenth, if necessary.

7. 4π **8.** $\frac{13\pi}{30}$ **9.** -1

10. $\frac{3\pi}{16}$ **11.** -2.56 **12.** $-\frac{7\pi}{9}$

Evaluate each expression.

13. $\tan \frac{\pi}{4}$ **14.** $\cos \frac{3\pi}{2}$ **15.** $\sin \frac{3\pi}{2}$

16. $\tan \frac{11\pi}{6}$ **17.** $\cos \frac{3\pi}{4}$ **18.** $\sin \frac{5\pi}{3}$

Given the measurement of a central angle, find the length of its intercepted arc in a circle of radius 10 centimeters. Round to the nearest tenth.

19. $\frac{\pi}{6}$ **20.** $\frac{3\pi}{5}$ **21.** $\frac{\pi}{2}$

Find the area of each sector, given its central angle θ and the radius of the circle. Round to the nearest tenth.

22. $\theta = \frac{\pi}{6}, r = 14$ **23.** $\theta = \frac{7\pi}{4}, r = 4$