5-1

Study Guide

Angles and Degree Measure

Decimal degree measures can be expressed in **degrees(°), minutes(′),** and **seconds(″).**

Example 1 **a. Change 12.520° to degrees, minutes, and seconds.**

$12.520° = 12° + (0.520 \cdot 60)'$ *Multiply the decimal portion of*
$= 12° + 31.2'$ *the degrees by 60 to find minutes.*
$= 12° + 31' + (0.2 \cdot 60)''$ *Multiply the decimal portion of*
$= 12° + 31' + 12''$ *the minutes by 60 to find seconds.*

12.520° can be written as 12° 31′ 12″.

b. Write 24° 15′ 33″ as a decimal rounded to the nearest thousandth.

$$24° \ 15' \ 33'' = 24° + 15'\left(\frac{1°}{60'}\right) + 33''\left(\frac{1°}{3600''}\right)$$
$$= 24.259°$$

24° 15′ 33″ can be written as 24.259°.

An angle may be generated by the rotation of one ray multiple times about the origin.

Example 2 **Give the angle measure represented by each rotation.**

a. 2.3 rotations clockwise

$2.3 \times -360 = -828$ *Clockwise rotations have negative measures.*

The angle measure of 2.3 clockwise rotations is −828°.

b. 4.2 rotations counterclockwise

$4.2 \times 360 = 1512$ *Counterclockwise rotations have positive measures.*

The angle measure of 4.2 counterclockwise rotations is 1512°.

If α is a nonquadrantal angle in standard position, its **reference angle** is defined as the acute angle formed by the terminal side of the given angle and the x-axis.

Reference Angle Rule	For any angle α, $0° < \alpha < 360°$, its reference angle α' is defined by a. α, when the terminal side is in Quadrant I, b. $180° - \alpha$, when the terminal side is in Quadrant II, c. $\alpha - 180°$, when the terminal side is in Quadrant III, and d. $360° - \alpha$, when the terminal side is in Quadrant IV.

Example 3 **Find the measure of the reference angle for 220°.**

Because 220° is between 180° and 270°, the terminal side of the angle is in Quadrant III.

$220° - 180° = 40°$

The reference angle is 40°.