

Day 1 AFM Notes: Angles

I. Definitions:

Standard Position of an Angle: *starts on positive x-axis*

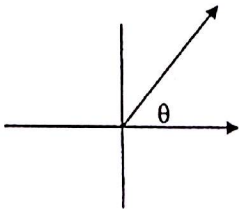
Positive Angles:

counterclockwise

Negative Angles:

clockwise

II. Types of Angles



Acute:

less than 90°

Obtuse:

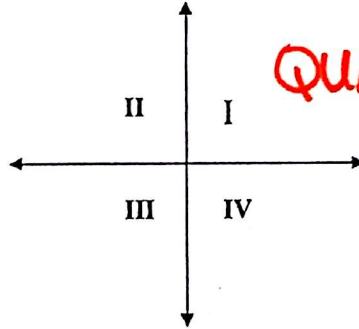
more than 90°

Right:

equals 90°

Straight:

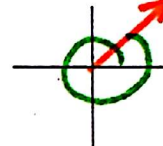
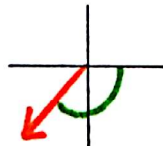
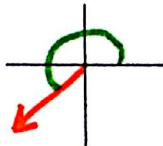
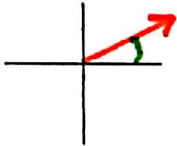
equals 180°



QUADRANTS

Example: Draw each angle to determine in which quadrant it lies:

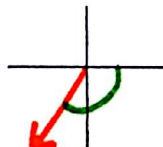
1. $\theta = 45^\circ$ **I** 2. $\theta = 225^\circ$ **III** 3. $\theta = -135^\circ$ **III** 4. $\theta = 405^\circ$ **I**



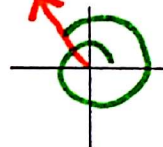
5. $\theta = 30^\circ$ **I**



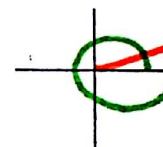
6. $\theta = -120^\circ$ **III**



7. $\theta = 480^\circ$ **II**



8. $\theta = 390^\circ$ **I**



III. Coterminal Angles: Two angles with the same initial and terminating sides.

An angle of x° is coterminal with angles of the form $x^\circ + 360k$, where k is an integer.
Example: Find a positive angle less than 360 that is coterminal with the following.

1. 420° **60°**
3. 400° **40°**

2. -120° **240°**
4. -135° **225°**

add/subtract 360°

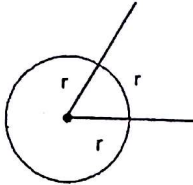
IV. Complementary and Supplementary Angles

A. Complementary Angles: angles whose sum is 90° .

B. Supplementary Angles: angles whose sum is 180° .

V. Radian – measure of the central angle of a circle that intercepts an arc equal in length to the radius of a circle.

Radians have no units or symbols! They are only given as a number!!



R: length of the radius

$\theta = 1$ radian

A. Radians and Degrees: 2π radians = 360.

1. Converting degrees to radians: multiply by the conversion factor $\frac{\pi \text{ radians}}{180^\circ}$.

EX. Convert the following degrees to radians.

1. $30^\circ = \frac{\pi}{6}$

2. $90^\circ = \frac{\pi}{2}$

3. $-135^\circ = -\frac{3\pi}{4}$

4. $60^\circ = \frac{\pi}{3}$

5. $260^\circ = \frac{13\pi}{9}$

6. $-300^\circ = -\frac{5\pi}{3}$

2. Converting radians to degrees: multiply by the conversion factor $\frac{180^\circ}{\pi \text{ radians}}$.

EX. Convert the following radians to degrees.

1. $\frac{\pi}{3} = 60^\circ$

2. $-\frac{5\pi}{3} = -300^\circ$

3. $3 = 171.9^\circ$

4. $\frac{7\pi}{6} = 210^\circ$

5. $\frac{3\pi}{4} = 135^\circ$

6. $6 \text{ radians} = 343.8^\circ$

Find the radian measure of the angle with the given degree measure.

1. 330° $\frac{11\pi}{6}$

2. -80° $-\frac{4\pi}{9}$

3. 765° $\frac{17\pi}{4}$

Find the degree measure of the angle with the given radian measure.

4. $\frac{3\pi}{4}$ 135°

5. $\frac{-7\pi}{2}$ -630°

6. $\frac{\pi}{5}$ 36°

The measure of an angle in standard position is given. Find two positive angles and two negative angles that are coterminal with the given angle.

7. 300°

8. $\frac{3\pi}{4}$

9. -50°

$310^\circ, 670^\circ,$

$-410^\circ, -770^\circ$

$660^\circ, 1020^\circ, -60^\circ, -420^\circ$

$\frac{11\pi}{4}, \frac{19\pi}{4}, -\frac{5\pi}{4}, -\frac{13\pi}{4}$

The measure of two angles in standard position are given. Determine whether the angles are coterminal.

10. $70^\circ, 430^\circ$

11. $-30^\circ, 330^\circ$

Yes

Yes

Find an angle between 0 and 360° that is coterminal with the given angle.

12. 733° 13°

13. -100° 260°

Find an angle between 0 and 2π that is coterminal with the given angle.

14. $\frac{12\pi}{5}$ $\frac{2\pi}{5}$