

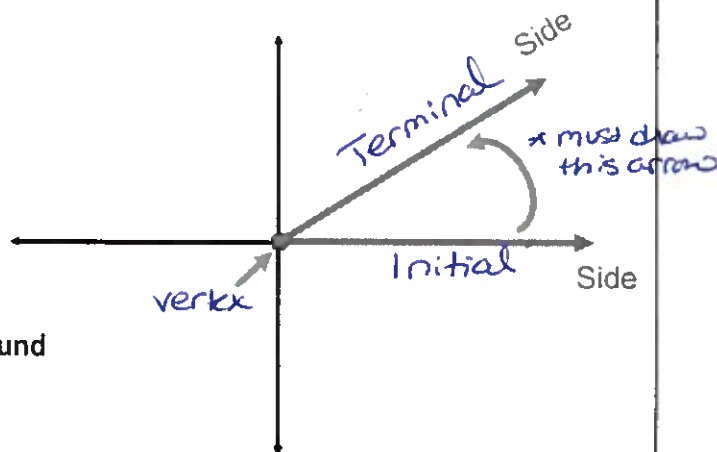
## 6.3 Angles

- I can draw angles in standard position
- I can find coterminal and reference angles

### VOCABULARY

#### Standard Position of an Angle:

- **Vertex** is on the origin
- **Initial Side** is the x-axis
- **Terminal Side** is the other ray
- Angles can exceed  $360^\circ$  by wrapping around the origin multiple times.

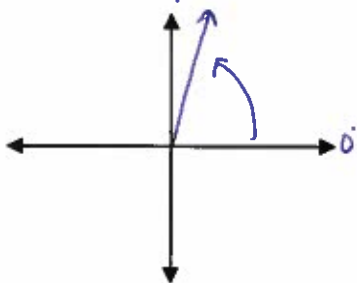


Positive Angles are drawn counter-clockwise. From the initial side, go UP.  $\uparrow$

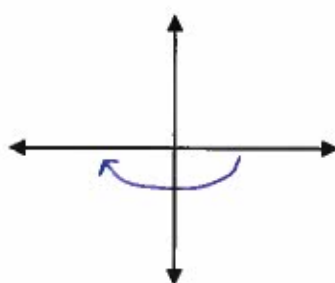
Negative Angles are drawn clockwise. From the initial side, go DOWN.  $\downarrow$

EX: Draw the given angle.

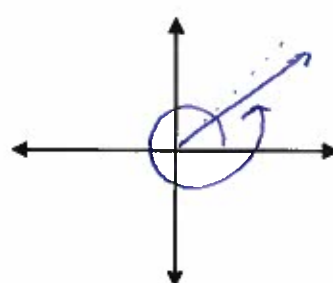
1.  $80^\circ$   $90^\circ$



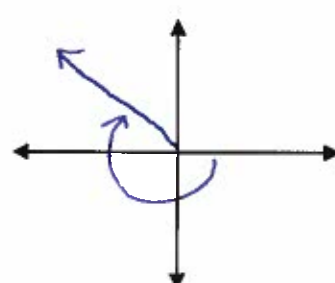
2.  $-180^\circ$



3.  $400^\circ = 360 + 40$

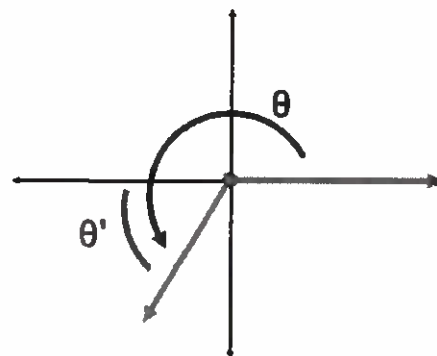


4.  $-225^\circ$



#### Reference Angle:

- The acute angle from the terminal side to the x-axis.
- Mathematically: The difference from  $0^\circ$ ,  $180^\circ$ , or  $360^\circ$ .
- ALWAYS POSITIVE.
- Often notated:  $\theta'$   $\rightarrow$  "theta prime"



EX: Use your drawings from above to help you find the reference angle for each.

5.  $80^\circ \rightarrow 80^\circ$

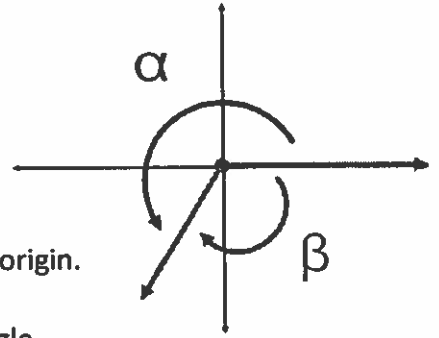
6.  $-180^\circ \rightarrow 0^\circ$

7.  $400^\circ \rightarrow 40^\circ$

8.  $-225^\circ \rightarrow 45^\circ$

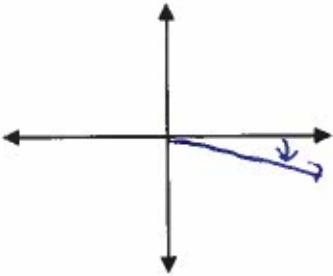
**Coterminal Angles:**

- Angles with the SAME terminal side, but are different measures.
- May go the opposite direction or go the same direction, wrapping around the origin.
- We are usually asked to find a + and a - coterminal angle.
- Mathematically: Add or Subtract 360° or use the reference angle.



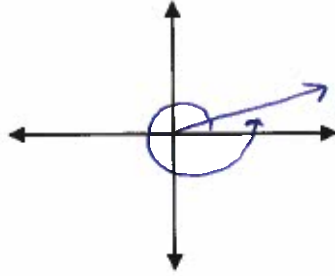
EX: Draw the given angle. Then use the drawing to find positive and negative coterminal angles.

9.  $-20^\circ$



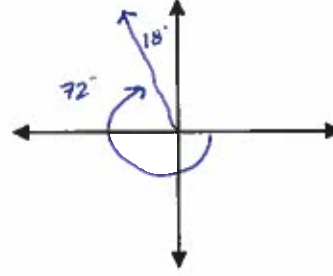
+:  $340^\circ$   
 -:  $-380^\circ$

10.  $370^\circ$



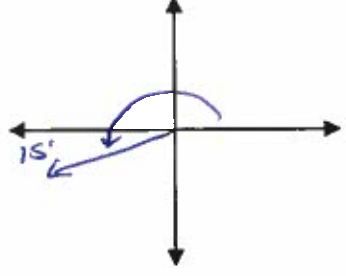
+:  $10^\circ$   
 -:  $-350^\circ$

11.  $-252^\circ$



+:  $108^\circ$   
 -:  $-612^\circ$

12.  $195^\circ$



+:  $555^\circ$   
 -:  $-165^\circ$

**Quick Check**

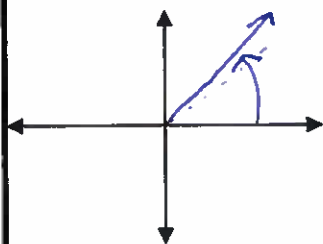
a) Draw the angle

b) Reference  $\angle$

c) Positive Coterminal  $\angle$

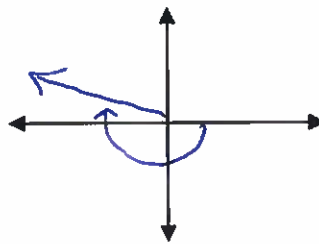
d) Negative Coterminal  $\angle$

13.  $55^\circ$



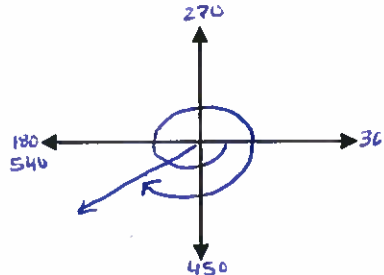
b)  $55^\circ$   
 c)  $415^\circ$   $360+55$   
 d)  $-305^\circ$

14.  $-210^\circ$



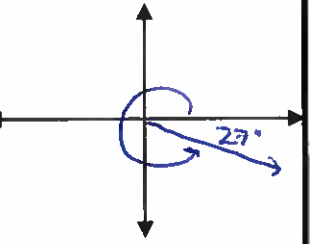
b)  $30^\circ$   
 c)  $150^\circ$   
 d)  $-570^\circ$   $360+210$

15.  $-500^\circ$



b)  $40^\circ$   
 c)  $220^\circ$   
 d)  $-140^\circ$

16.  $333^\circ$



b)  $27^\circ$   
 c)  $693^\circ$   $333+360$   
 d)  $-27^\circ$

**Additional Resources:**

- Textbook Chapter 13.2 pg.859 (ignore radians)