

13.2 Angles of Rotation

- Obj: 1. Find coterminal & reference angles.
 2. Find trig. values of $\angle s$ in standard position.

Standard position: initial side is on the positive x-axis.

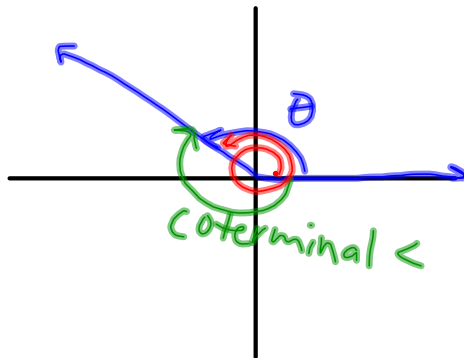
positive angles: rotate counterclockwise

negative angles: rotate clockwise



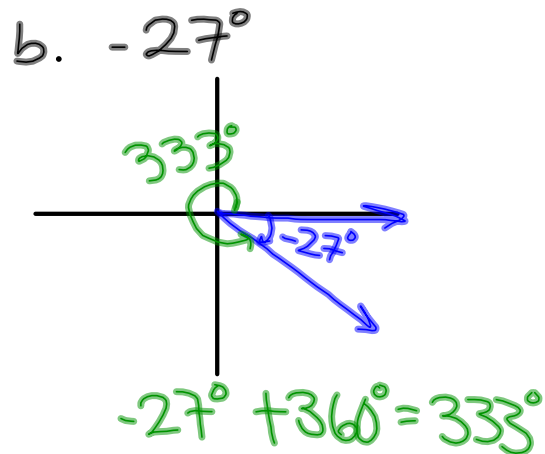
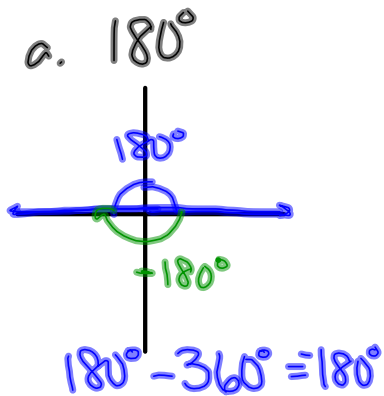
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Coterminal angles: share the same initial side & same terminal side, but have different angle measures.



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Find the coterminal angle θ so that
 $-360^\circ < \theta < 360^\circ$ for:



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1-4

$$1. 47^\circ - 360^\circ = -313^\circ$$

$$2. -123^\circ + 360^\circ = 237^\circ$$

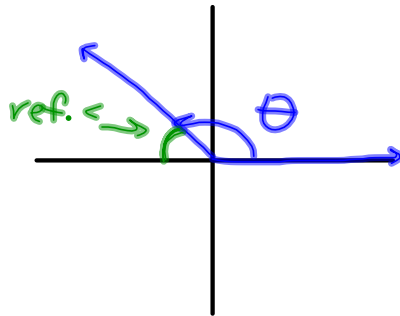
$$3. 218^\circ - 360^\circ = -142^\circ$$

$$4. 512^\circ - 360^\circ = \boxed{152^\circ} - 360^\circ = \boxed{-208^\circ}$$

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Reference Angles:

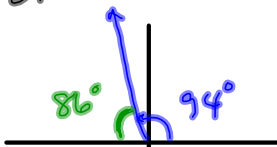
- always positive
- always acute
- measures the distance from the terminal side to the closest x-axis.



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Find the reference <:

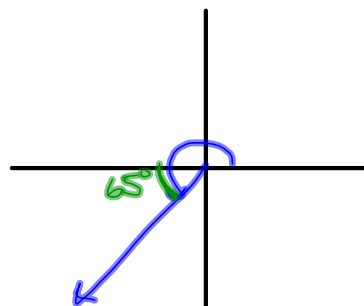
a. 94°



$$180^\circ - 94^\circ = 86^\circ$$

$$|94^\circ - 180^\circ| = |-86^\circ| = 86^\circ$$

b. 245°



$$245^\circ - 180^\circ = 65^\circ$$

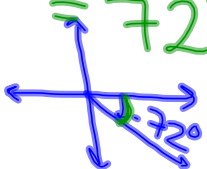
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10, 11, 13, 15

$$10. |105^\circ - 180^\circ| = |-75^\circ| = 75^\circ$$

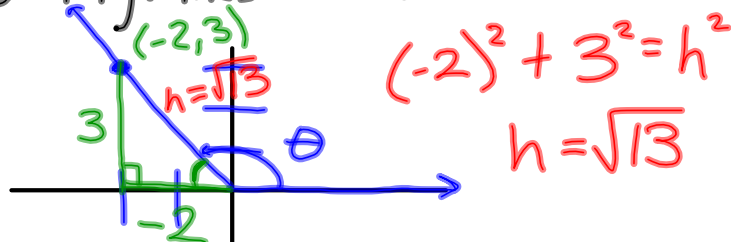
$$11. |-213^\circ + 180^\circ| = |-33^\circ| = 33^\circ$$

$$13. -144^\circ + 180^\circ = 36^\circ$$

$$15. |-72^\circ| = 72^\circ$$


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Let $P(-2, 3)$ be a point on the terminal side of θ in standard position. Find all 6 trig. fncs. of θ .



$$\sin \theta = \frac{3}{\sqrt{13}}$$

$$\csc \theta = \frac{\sqrt{13}}{3}$$

$$\cos \theta = \frac{-2}{\sqrt{13}}$$

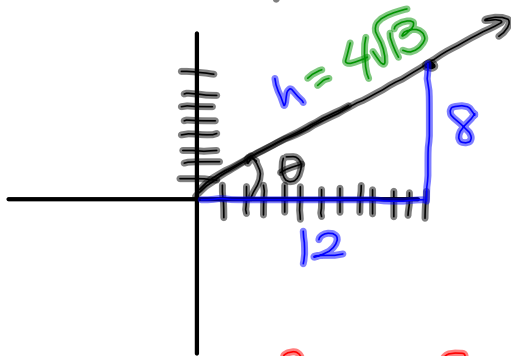
$$\sec \theta = \frac{\sqrt{13}}{-2}$$

$$\tan \theta = \frac{3}{-2}$$

$$\cot \theta = \frac{-2}{3}$$

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19. (12, 8)



$$8^2 + 12^2 = h^2$$

$$h = \sqrt{208}$$

$$\sqrt{16 \cdot 13}$$

$$4\sqrt{13}$$

$$\sin \theta = \frac{8}{4\sqrt{13}} = \frac{2}{\sqrt{13}} \cdot \frac{\sqrt{13}}{\sqrt{13}} = \frac{2\sqrt{13}}{13}$$

$$\csc \theta = \frac{\sqrt{13}}{2}$$

$$\cos \theta = \frac{12}{4\sqrt{13}} = \frac{3}{\sqrt{13}} = \frac{3\sqrt{13}}{13}$$

$$\sec \theta = \frac{\sqrt{13}}{3}$$

$$\tan \theta = \frac{8}{12} = \frac{2}{3}$$

$$\cot \theta = \frac{3}{2}$$

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