

**Inverse Trigonometric Relationships**

The inverse trigonometric relationships  $\sin^{-1}$ ,  $\cos^{-1}$ , and  $\tan^{-1}$ , are built into your calculator and used to determine the angle, given a trigonometric ratio. Remember to check MODE to ensure that you are in degree mode.

Evaluate  $\theta$  when  $\theta = 0.5$ .

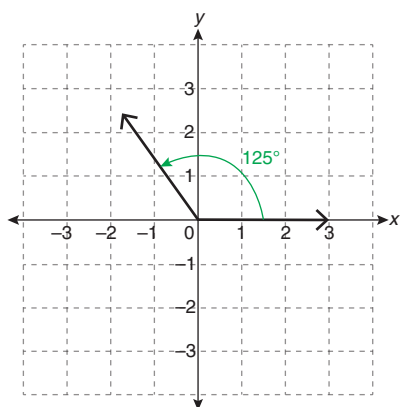


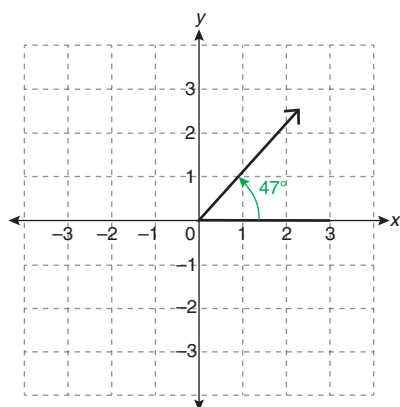
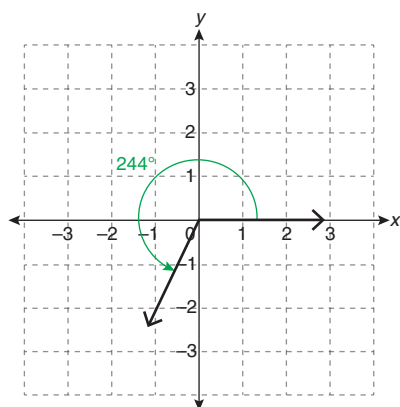
- Press [2<sup>nd</sup>] [SIN]
- Press [0] [.] [5] [)]
- Press [ENTER]

**Appendix 2: Solutions****Lesson 4.1: Angles in Standard Position****Practice Solutions – I**

1. Use a protractor to sketch the following angles in standard position.

- a.  $125^\circ$



b.  $47^\circ$ c.  $244^\circ$ 

2. Determine the reference angle for each of the angles in Question 1.

a.  $125^\circ$ 

This angle terminates in Quadrant II, therefore the reference angle is:

$$\begin{aligned}\theta_R &= 180^\circ - \theta \\ &= 180^\circ - 125^\circ \\ &= 55^\circ\end{aligned}$$

b.  $47^\circ$ 

This angle terminates in Quadrant I, therefore the reference angle is:

$$\begin{aligned}\theta_R &= \theta \\ &= 47^\circ\end{aligned}$$

c.  $244^\circ$ 

This angle terminates in Quadrant III, therefore the reference angle is:

$$\begin{aligned}\theta_R &= \theta - 180^\circ \\ &= 244^\circ - 180^\circ \\ &= 64^\circ\end{aligned}$$

3. Determine the angle(s) in standard position, from  $0^\circ \leq \theta < 360^\circ$ , that have a reference angle of  $50^\circ$ .

Quadrant I:

$$\theta_R = \theta = 50^\circ$$

Quadrant II:

$$\theta_R = 180^\circ - \theta$$

$$50^\circ = 180^\circ - \theta$$

$$\theta = 130^\circ$$

Quadrant III:

$$\theta_R = \theta - 180^\circ$$

$$50^\circ = \theta - 180^\circ$$

$$230^\circ = \theta$$

Quadrant IV:

$$\theta_R = 360^\circ - \theta$$

$$50^\circ = 360^\circ - \theta$$

$$\theta = 310^\circ$$

4. Given the point  $(-2, 5)$ , on the terminal arm of an angle in standard position, determine three other points on the terminal arms of other angles, from  $0^\circ \leq \theta \leq 360^\circ$ , that have the same reference angle.

Points with the same reference angle are:

$(2, 5)$ ,  $(2, -5)$ , and  $(-2, -5)$

5. Using a clock as a reference, answer the following questions.



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- a. Determine the angle in standard position formed by the hour hand when it points at 4:00.

Determine the angle formed by each hour on the clock with the centre of the clock, using a proportion.

$$\frac{1}{12} = \frac{x}{360^\circ}$$

$$x = 30^\circ$$

This is the reference angle of 4:00. The hour hand at 4:00 is found in Quadrant IV, therefore the angle in standard position is:

$$\theta = 360^\circ - \theta_R$$

$$\theta = 360^\circ - 30^\circ$$

$$\theta = 330^\circ$$

- b. Determine other hours with the same reference angle as 5:00.

5:00 has a reference angle of  $60^\circ$ . The four times on the clock that all have a reference angle of  $60^\circ$  will be found by reflecting 5:00 about the  $y$ -axis, and then reflecting both of these about the  $x$ -axis.

Reflecting about the  $y$ -axis gives 7:00. Reflecting both about the  $x$ -axis gives 1:00 and 11:00.

The four times that all have a reference angle of  $60^\circ$  are 1:00, 5:00, 7:00, and 11:00.

Please complete *Lesson 4.1 Explore Your Understanding Assignment* located in *Workbook 4A* before proceeding to *Lesson 4.2*.