# 13.4 Evaluate Inverse Trigonometric Functions

TEKS *a.1, a.3, 2A.4.C; P.3.A*

**Before** You found values of trigonometric functions given angles.

**Now** You will find angles given values of trigonometric functions.

**Why?** So you can find launch angles, as in Example 4.

**Key Vocabulary**
- **inverse sine**
- **inverse cosine**
- **inverse tangent**

So far in this chapter, you have learned to evaluate trigonometric functions of a given angle. In this lesson, you will study the reverse problem—finding an angle that corresponds to a given value of a trigonometric function.

Suppose you were asked to find an angle $\theta$ whose sine is 0.5. After considering the problem, you would realize *many* such angles exist. For instance, the angles

$$\frac{\pi}{6}, \frac{5\pi}{6}, \frac{13\pi}{6}, \frac{17\pi}{6}, \text{ and } -\frac{7\pi}{6}$$

all have a sine value of 0.5. To obtain a unique angle $\theta$ such that $\sin\theta = 0.5$, you must restrict the domain of the sine function. Domain restrictions allow the *inverse sine*, *inverse cosine*, and *inverse tangent* functions to be defined.

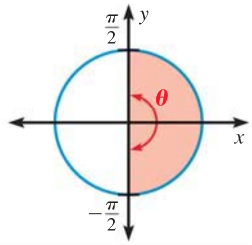
## KEY CONCEPT — *For Your Notebook*

### Inverse Trigonometric Functions

If $-1 \le a \le 1$, then the **inverse sine** of $a$ is an angle $\theta$, written $\theta = \sin^{-1} a$, where:

(1) $\sin\theta = a$

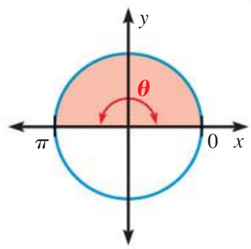
(2) $-\frac{\pi}{2} \le \theta \le \frac{\pi}{2}$ (or $-90° \le \theta \le 90°$)




If $-1 \le a \le 1$, then the **inverse cosine** of $a$ is an angle $\theta$, written $\theta = \cos^{-1} a$, where:

(1) $\cos\theta = a$

(2) $0 \le \theta \le \pi$ (or $0° \le \theta \le 180°$)




If $a$ is any real number, then the **inverse tangent** of $a$ is an angle $\theta$, written $\theta = \tan^{-1} a$, where:

(1) $\tan\theta = a$

(2) $-\frac{\pi}{2} < \theta < \frac{\pi}{2}$ (or $-90° < \theta < 90°$)