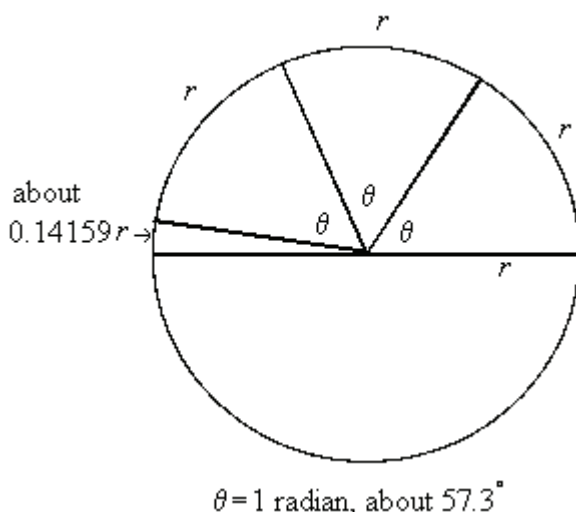


## Radian Measure of an Angle



Take any circle. Take the circle's radius  $r$ . Wrap  $r$  around the circumference. This will create an angle just a little over 57 degrees. We call this 1 radian. If you wrap another radius around the circle starting at the end of the first wrapped  $r$ , and then another, and then another, you will find that the semi-circle will have 3 **and about** 0.14159 radii wrapped around it in all. We give the number of radii wrapped around the semi-circle the name  $\pi$ . So  $\pi \doteq 3.14159$  and  $\pi$  radians =  $180^\circ$ .

**It is customary (Don't ask me why!) to omit the word "radians" but not "degrees"!**

**Example 1)** Convert the following radian measures to degrees:

(a)  $\frac{\pi}{2}$       (b)  $\frac{7\pi}{3}$       (c) 2

**Solution** Since  $\pi$  radians =  $180^\circ$ ,  $\therefore 1$  radian =  $\left(\frac{180}{\pi}\right)^\circ$ . From now on, we will omit "radians"

(a)  $\frac{\pi}{2} = \frac{\pi}{2} \left(\frac{180}{\pi}\right)^\circ = 90^\circ$       (b)  $\frac{7\pi}{3} = \frac{7\pi}{3} \left(\frac{180}{\pi}\right)^\circ = 420^\circ$

(c)  $2 = 2 \left(\frac{180}{\pi}\right)^\circ = \left(\frac{360}{\pi}\right)^\circ \doteq 2(57.3)^\circ = 114.6^\circ$

**Example 2)** Convert the following degree measures to radians:

(a)  $45^\circ$       (b)  $-40^\circ$       (c)  $\pi^\circ$

**Solution** Since  $180^\circ = \pi$  radians,  $\therefore 1$  degree =  $\left(\frac{\pi}{180}\right)$  radians. Again, we will now omit "radians".

(a)  $45^\circ = 45 \left(\frac{\pi}{180}\right) = \frac{\pi}{4}$       (b)  $-40^\circ = -40 \left(\frac{\pi}{180}\right) = -\frac{2\pi}{9}$       (c)  $\pi^\circ = \pi \left(\frac{\pi}{180}\right) = \frac{\pi^2}{180} \doteq 0.055$

**Two for you.**

1) Convert to degree measure: (a)  $\pi/6$       (b)  $-1.8$

2) Convert to radian measure: (a)  $-60^\circ$       (b)  $12^\circ$

**Answers** 1)(a)  $30^\circ$       (b)  $\left(\frac{-324}{\pi}\right)^\circ \doteq -103.1^\circ$       2)(a)  $-\frac{\pi}{3}$       (b)  $\frac{12\pi}{180} = \frac{\pi}{15} \doteq 0.21$