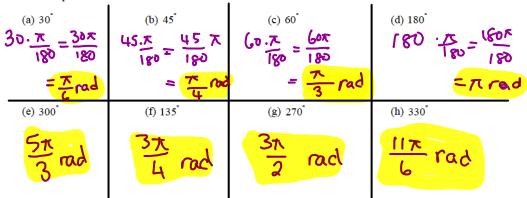# Practice Problems

1. Convert each of the following common degree angles to angles in radians. Express your answers in exact terms of pi.

(a) 30°	(b) 45°	(c) 60°	(d) 180°
$30 \cdot \frac{\pi}{180} = \frac{30\pi}{180}$ $= \frac{\pi}{6}$ rad	$45 \cdot \frac{\pi}{180} = \frac{45\pi}{180}$ $= \frac{\pi}{4}$ rad	$60 \cdot \frac{\pi}{180} = \frac{60\pi}{180}$ $= \frac{\pi}{3}$ rad	$180 \cdot \frac{\pi}{180} = \frac{180\pi}{180}$ $= \pi$ rad
(e) 300°	(f) 135°	(g) 270°	(h) 330°
$\frac{5\pi}{3}$ rad	$\frac{3\pi}{4}$ rad	$\frac{3\pi}{2}$ rad	$\frac{11\pi}{6}$ rad

2. Convert each of the following angles, given in radians, into degree. Your answers will be integers.

(a) $\frac{2\pi}{3}$	(b) $-\frac{\pi}{2}$	(c) $\frac{11\pi}{4}$	(d) $-\frac{4\pi}{3}$
$\frac{2\pi}{3} \cdot \frac{180}{\pi} = \frac{360\pi}{3\pi}$ $= 120°$	$-\frac{\pi}{4} \cdot \frac{180}{\pi} = \frac{-180\pi}{4\pi}$ $= -90°$	$\frac{11\pi}{4} \cdot \frac{180}{\pi} = \frac{1980\pi}{4\pi}$ $= 495°$	$\frac{-4\pi}{3} \cdot \frac{180}{\pi} = \frac{-720\pi}{3\pi}$ $= -240°$

3. If an angle is drawn in standard position with each of the following radians angles, determine the quadrant its terminal ray lies in. <mark>Hint – convert each angle into degrees.</mark>

(a) 4.75	(b) −5.28	(c) 1.65	(d) 7.38
$4.75 \cdot \frac{180}{\pi} = 272.15$ $\approx 272° = Q\,IV$	$\frac{-5.28 \times 180}{\pi} = -302.52$ $-360-303 = 57°$ $\approx -303 = Q\,I$	$\frac{1.65 \times 180}{\pi} = 94.53$ $\approx 95 = Q\,II$	$\frac{7.38 \times 180}{\pi} = 423.84$ $\approx 423 \Rightarrow 63° \left(\frac{423-}{360}\right)$ $Q\,I$

4. Draw a rotation diagram for each of the following radian angles, which are expressed in terms of pi. Then, determine the reference angle for each, also in terms of pi. Think back to how you did this with degrees.

(a) $\frac{2\pi}{3}$

$\beta_r = \pi - \frac{2\pi}{3} = \frac{3\pi}{3} - \frac{2\pi}{3} = \frac{\pi}{3}$

(b) $\frac{11\pi}{6}$

$\beta_r = 2\pi - \frac{11\pi}{6} = \frac{12\pi}{6} - \frac{11\pi}{6} = \frac{\pi}{6}$

(c) $\frac{5\pi}{4}$

$\beta_r = \frac{5\pi}{4} - \pi = \frac{5\pi}{4} - \frac{4\pi}{4} = \frac{\pi}{4}$