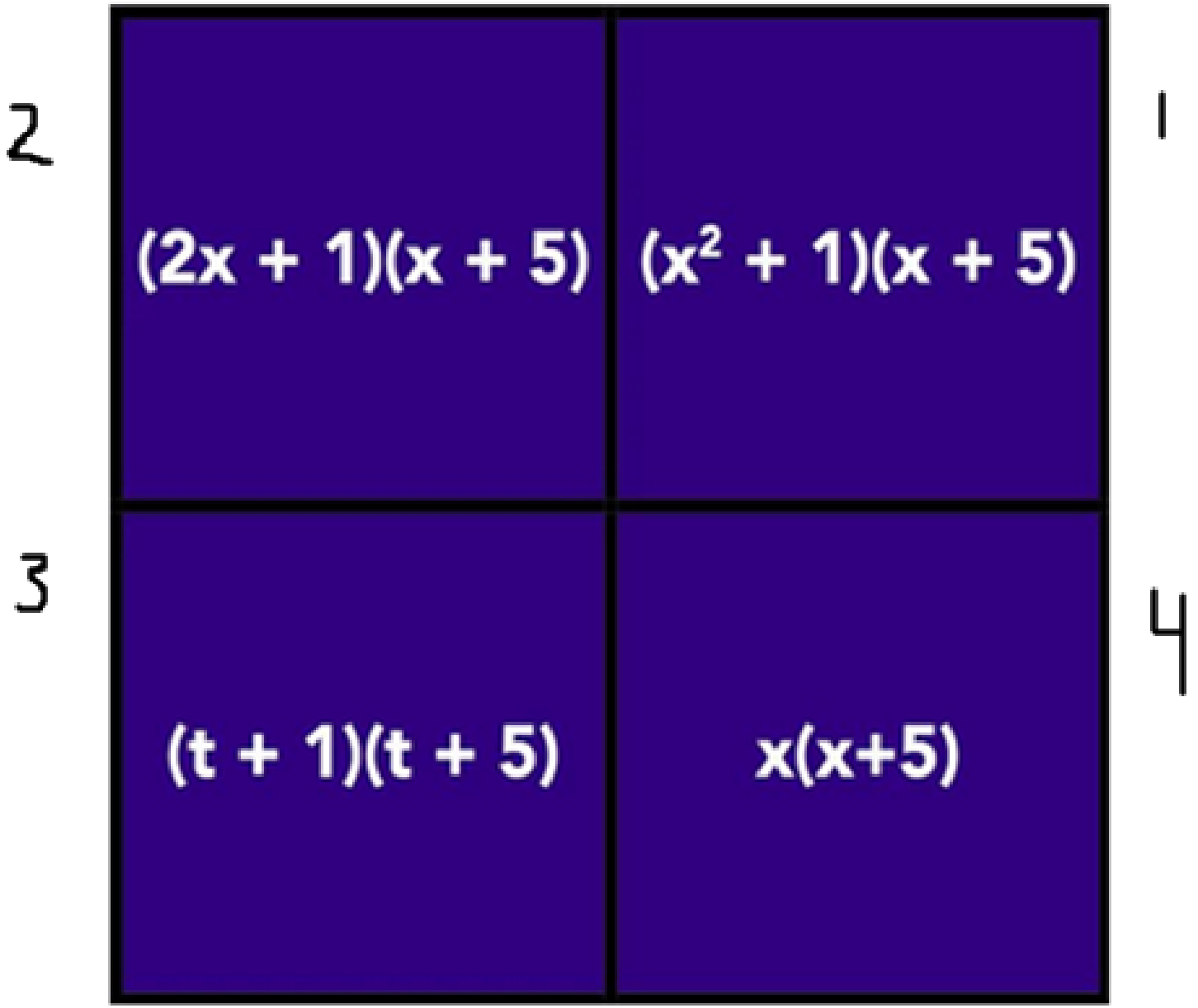
Which one doesn't belong??



4.1

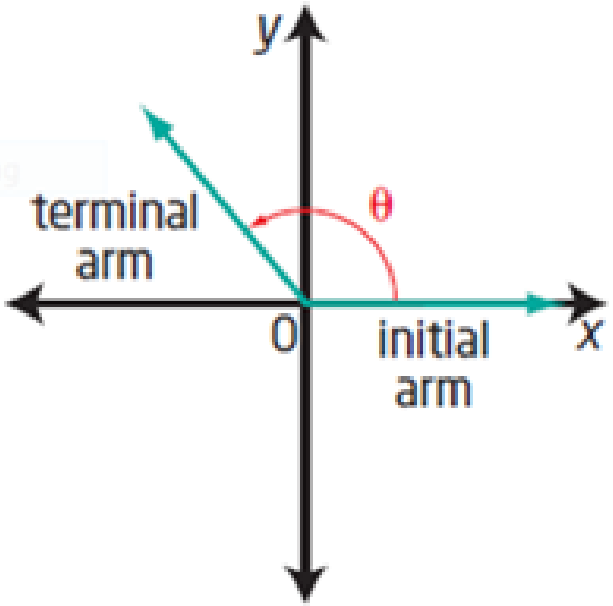
Angles and Angle Measure

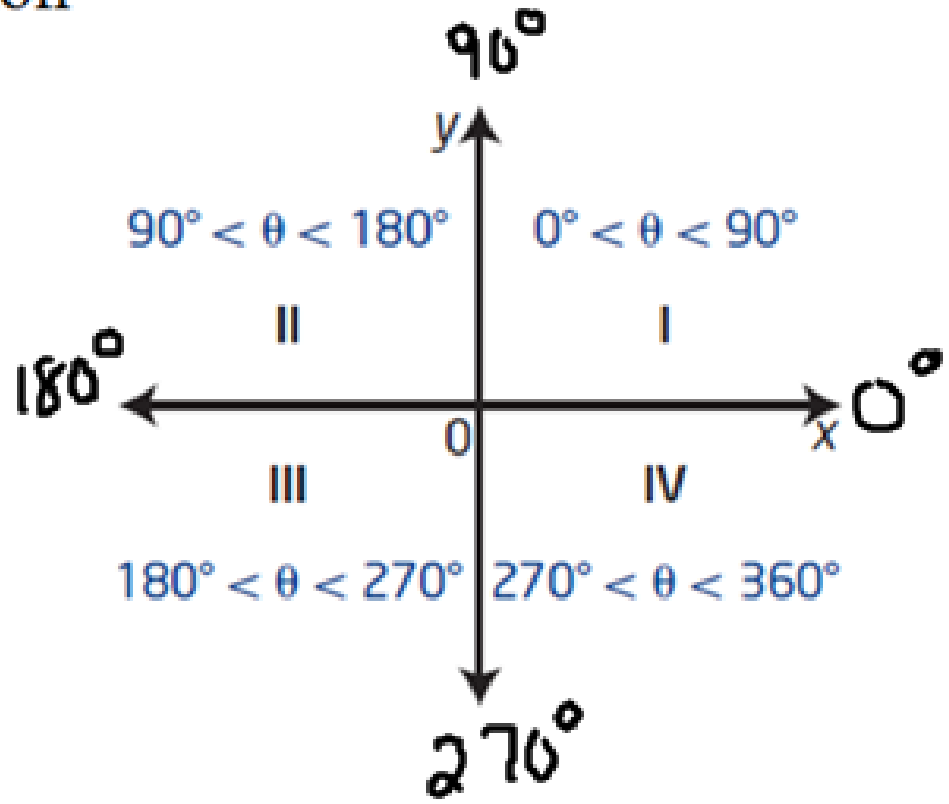
Focus on...

- sketching angles in standard position measured in degrees and radians
- converting angles in degree measure to radian measure and vice versa

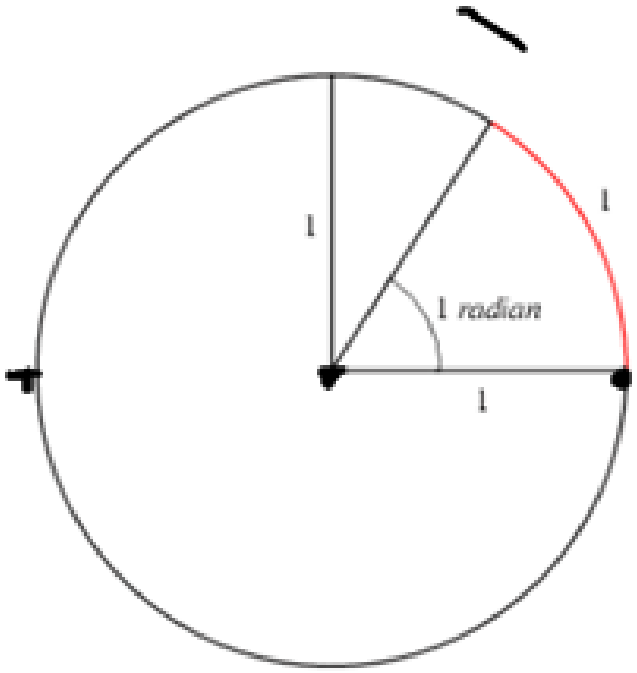
Recall from math 11 PreCal:

Angles in standard position-





Radians



Radians are another way to measure angles. A radian is defined as the length of a circular arc that is equal to the radius of the circle.

To calculate arc length, recall that the circumference of a circle is given by:

$$C = 2\pi r$$

1. If you walked along the arc of a circle with a radius of 1, the full 360°, how far will you have walked?

$C = 2\pi r$

$C = 2\pi(1)$

$= 2\pi$

2. How far would you travel if you walked halfway around a circle with radius 1?

$\text{walked} = \frac{1}{2}C = \frac{1}{2}(2\pi r)$

$= \pi$

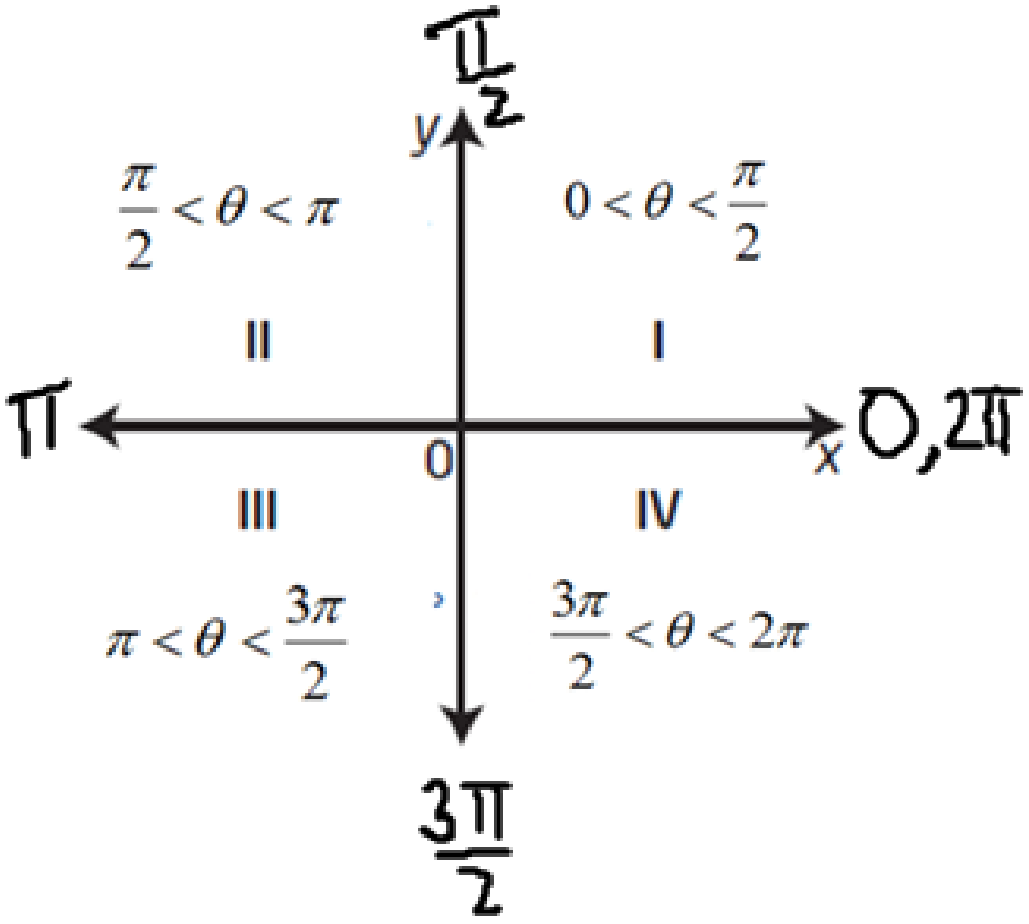
3. How far would you travel if you walked one-quarter the distance around a circle with radius 1?

$\text{walked} = \frac{1}{4}C$

$= \frac{2\pi}{2}$

The radian system of measurement is based on using arc length – the angle (measured in radians) is the distance traveled along the arc of a circle with radius 1.

Angle (degrees)	Angle (radians)
360°	2π
180°	π
90°	$\frac{\pi}{2}$



To convert from degrees to radians:

$$x^\circ \cdot \left(\frac{\pi}{180^\circ}\right) = y \text{ rad}$$

To convert from radians to degrees:

$$y \text{ rad} \cdot \left(\frac{180^\circ}{\pi}\right) = x^\circ$$

Example: Convert the following degree measures to radians:

A) $30°$

$30°\left(\frac{\pi}{180°}\right) = \frac{30\pi}{180} = \frac{3\pi}{18}$

$= \frac{\pi}{6}$

B) $155°$

$155°\left(\frac{\pi}{180°}\right) = \frac{155\pi}{180}$

$= \frac{31\pi}{36}$

Example: Convert the following radians to degrees:

A) $\frac{5\pi}{6}$

$\left(\frac{5\pi}{6}\right)\left(\frac{180°}{\pi}\right)$ $\quad 30°$

$= (30°)(5)$

$= 150°$ ← exact

B) 5.20

$(5.20)\left(\frac{180°}{\pi}\right) = \frac{936°}{\pi}$

$= 297.938°$

$= 297.9°$ → rounded

Examples:

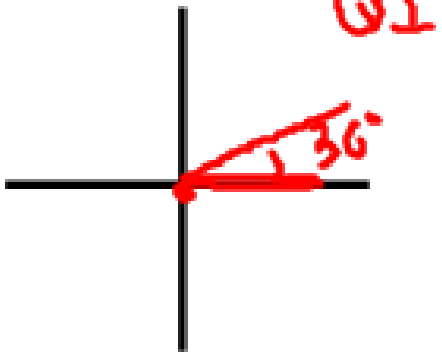
Draw each angle in standard position. Change each degree measure to radians and each radian measure to degrees. Give answers as both exam and approximate measures to the nearest hundredth of a unit.

Recall:

* An angle in standard position has its centre at the origin and its initial arm along the positive *x*-axis.

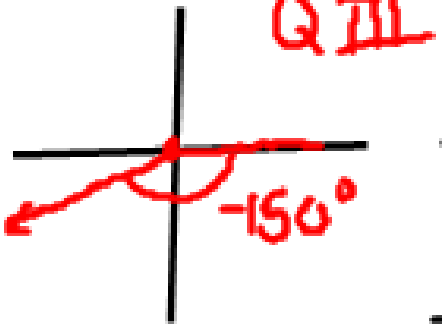
* Positive angles are measured in a **counter-clockwise** direction.

(a) 30°



$30^\circ = \frac{\pi}{6}$

(b) -150°



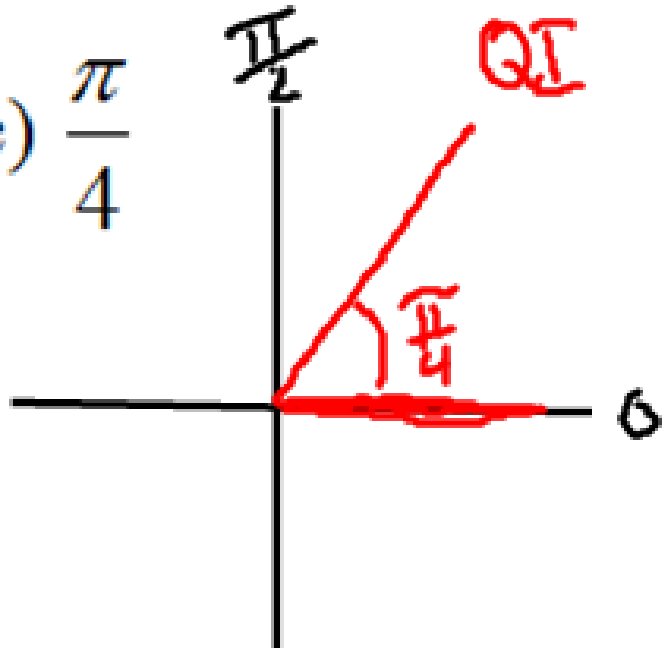
$-150^\circ\left(\frac{\pi}{180^\circ}\right)$

$= \frac{-150\pi}{180}$

$= \frac{-15\pi}{18}$

$= \frac{-5\pi}{6}$

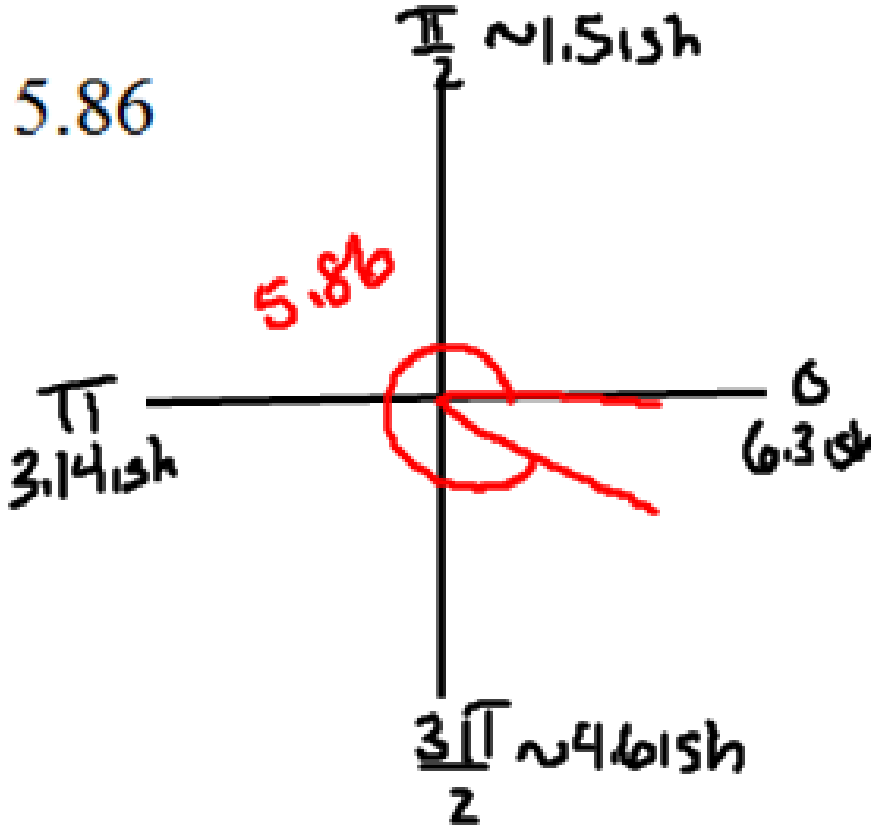
(c) $\frac{\pi}{4}$



$\frac{\pi}{4}\left(\frac{180^\circ}{\pi}\right) = \frac{180^\circ}{4}$

$= 45^\circ$

(d) 5.86



$5.86\left(\frac{180^\circ}{\pi}\right) = 335.7532\overline{67}$

$\approx 335.8^\circ$

HW: pg 175 #1-7 (left side only)