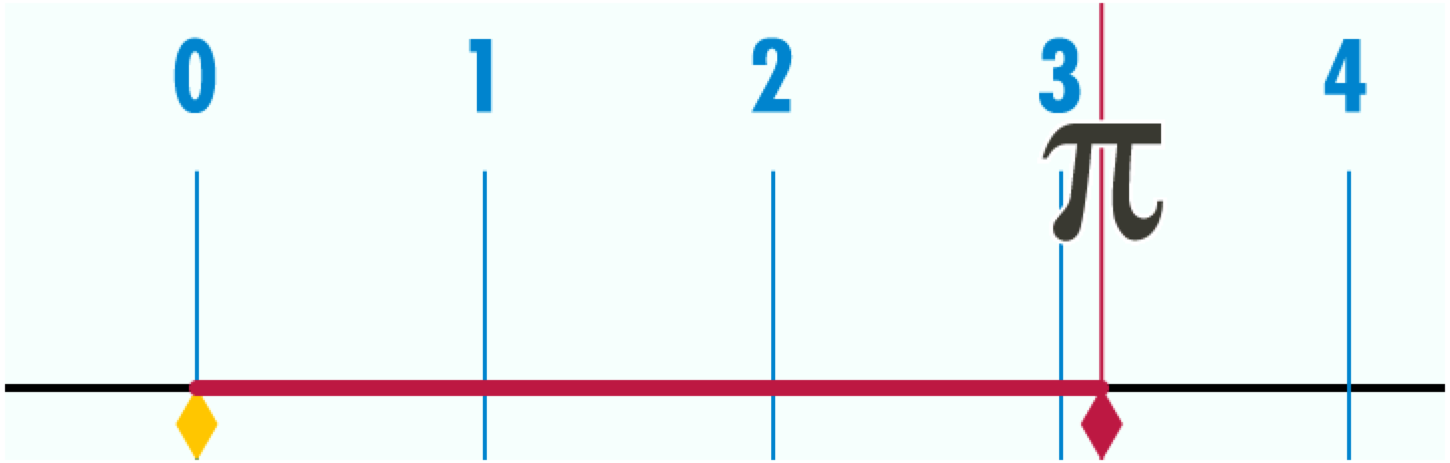
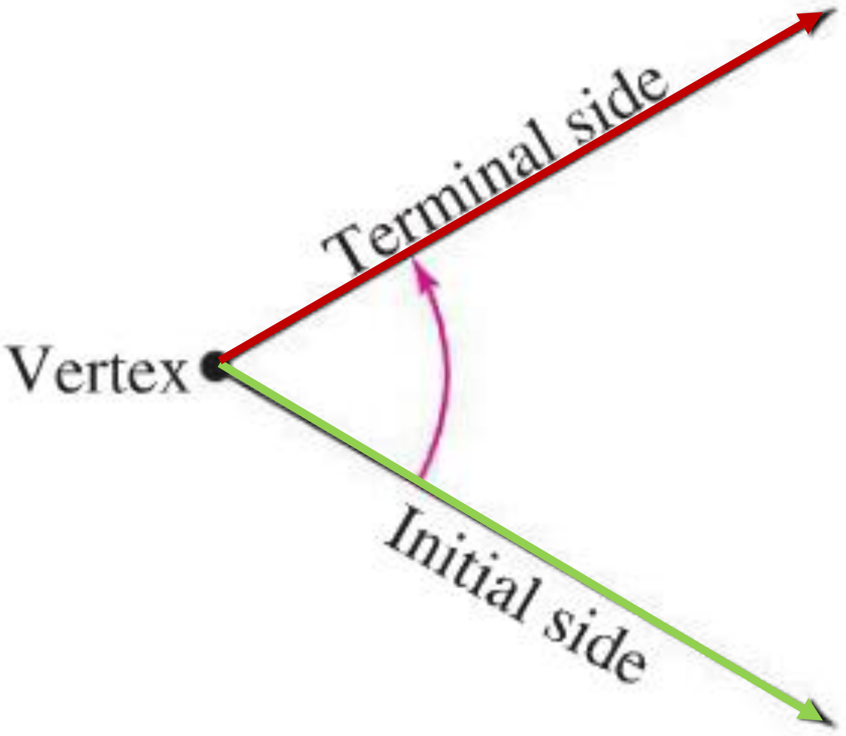
Radian and Degree Measure

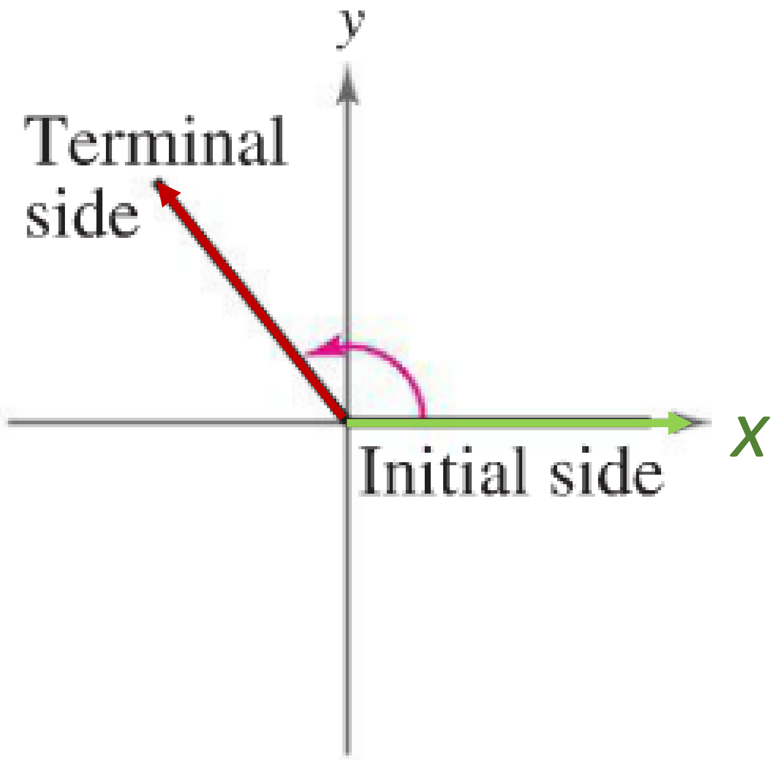
Section 4.1



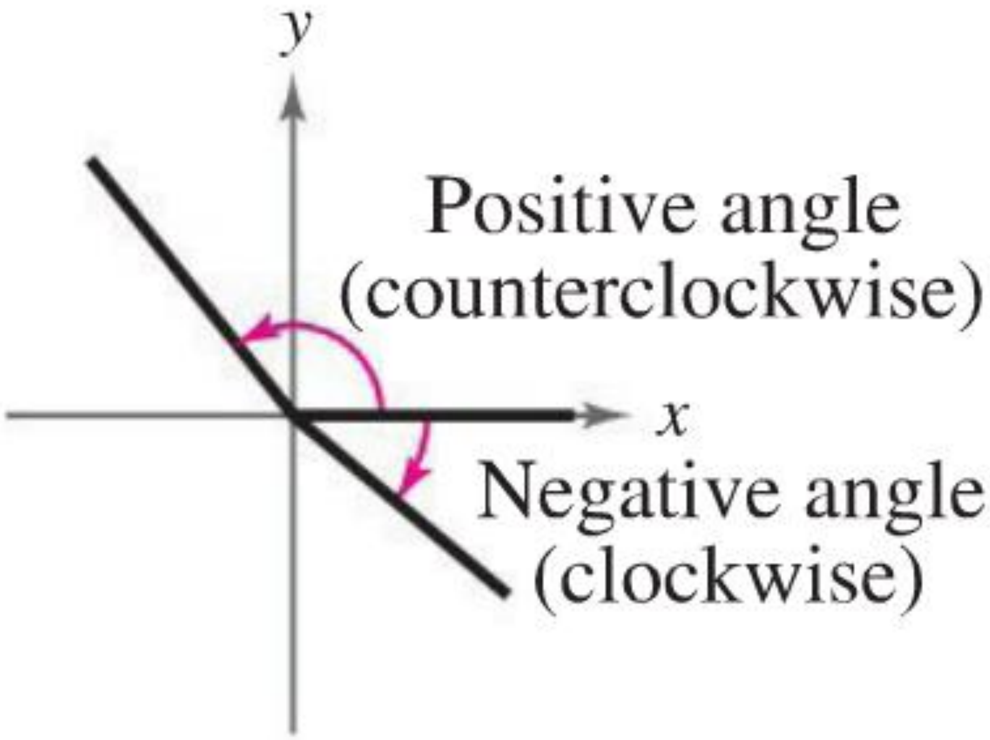
Source: wikimedia.org

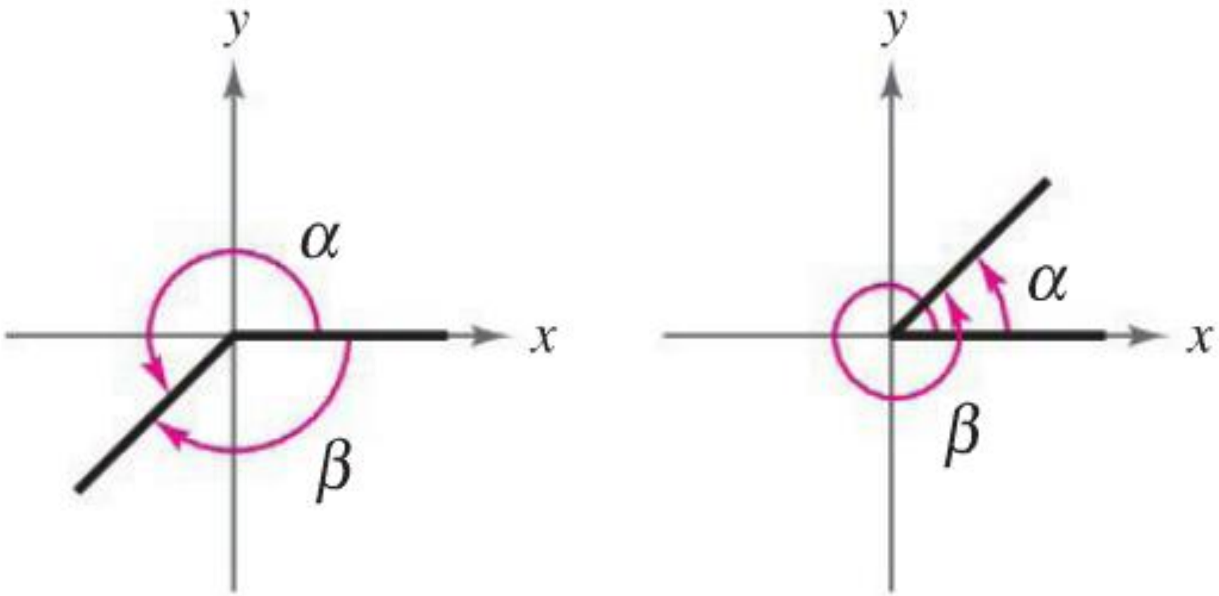
Angles





Angle in Standard Position

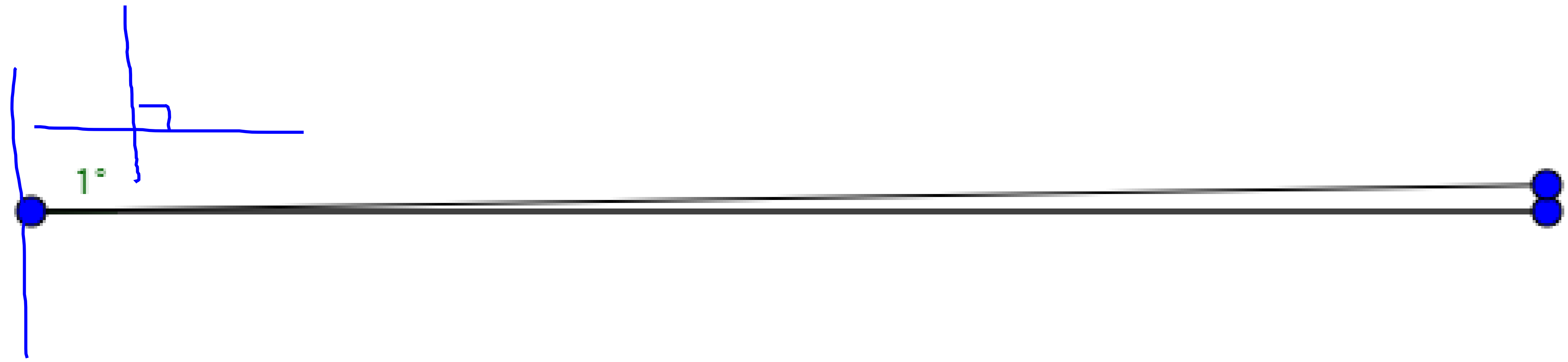




Coterminal angles

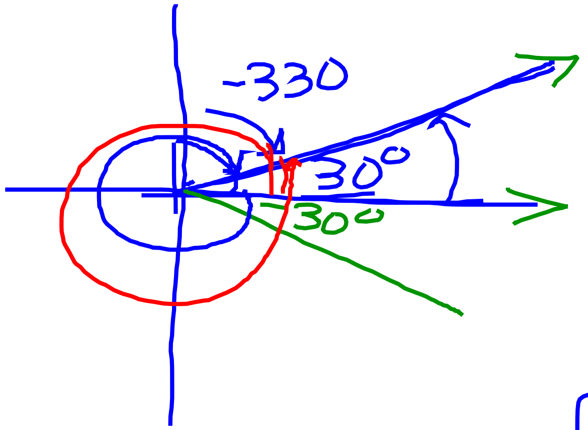
Degree Measure

A measure of 1° is a rotation of $\frac{1}{360}$ of a complete revolution about the vertex.



Find two coterminal angles (one positive and one negative) for the given angles.

30°

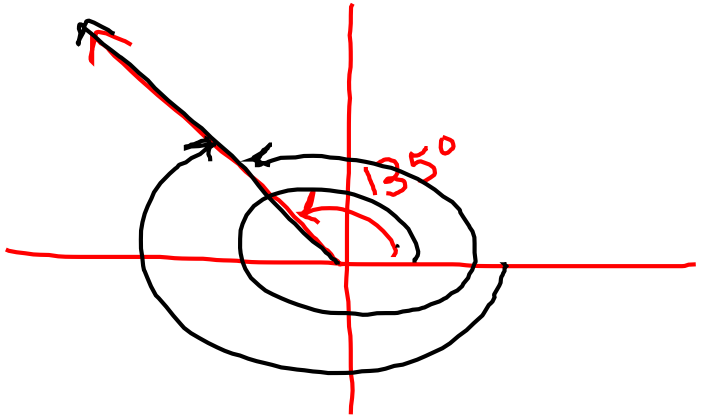


-360 +30
-330

30 - 360
-330

30 + 360 = 390

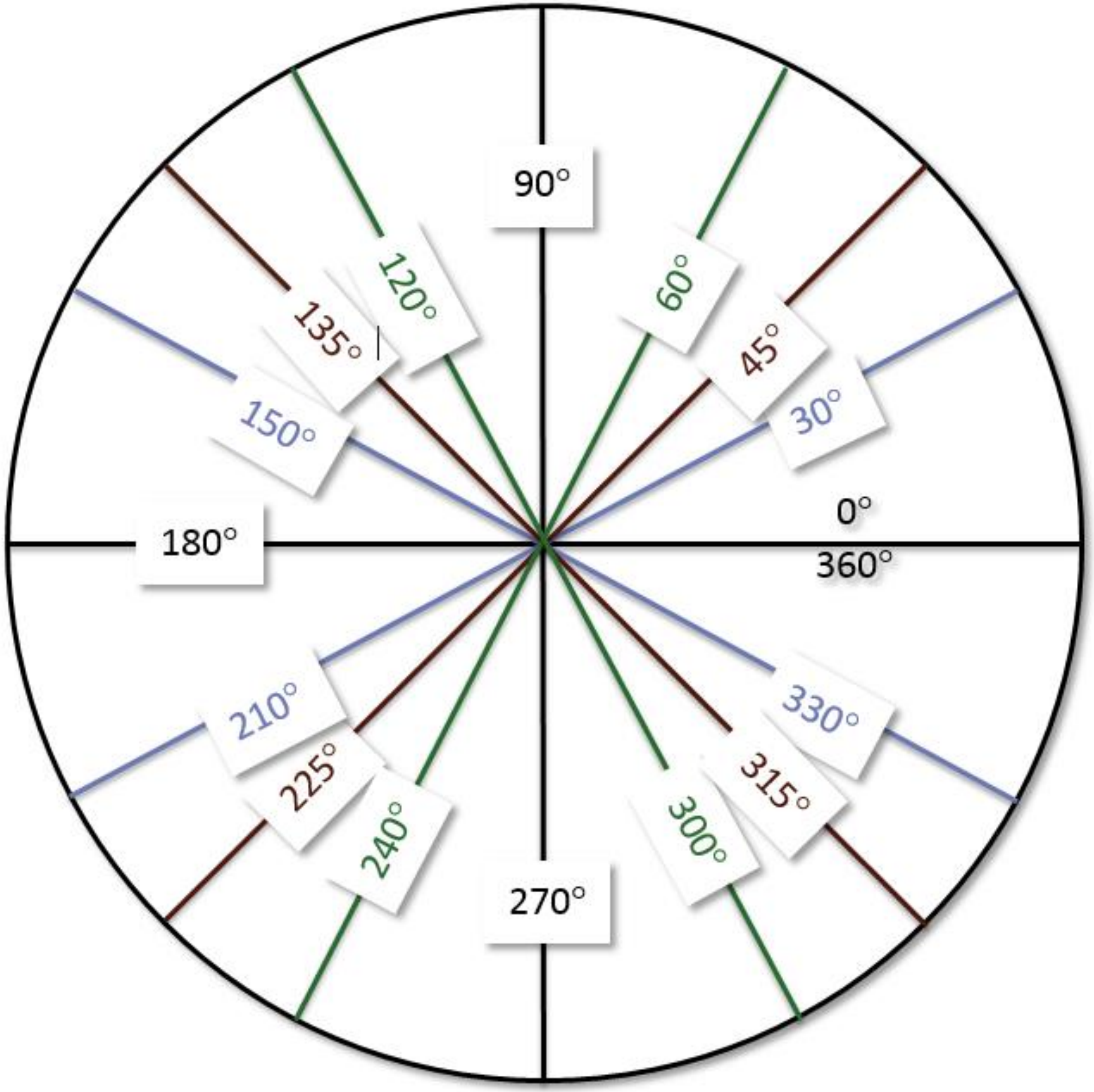
135°



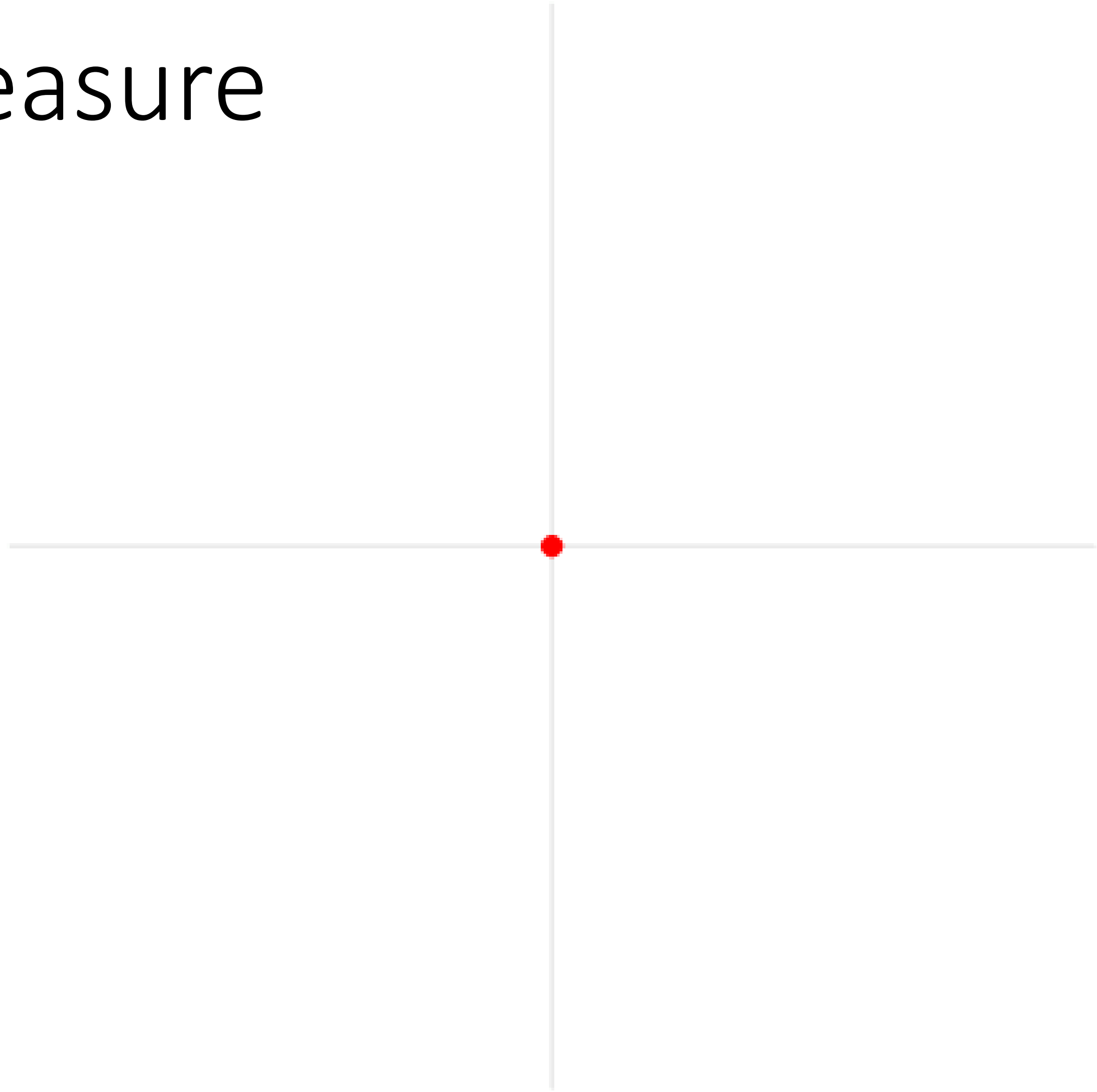
135 · 360

135 + 360

Unit Circle



Radian Measure

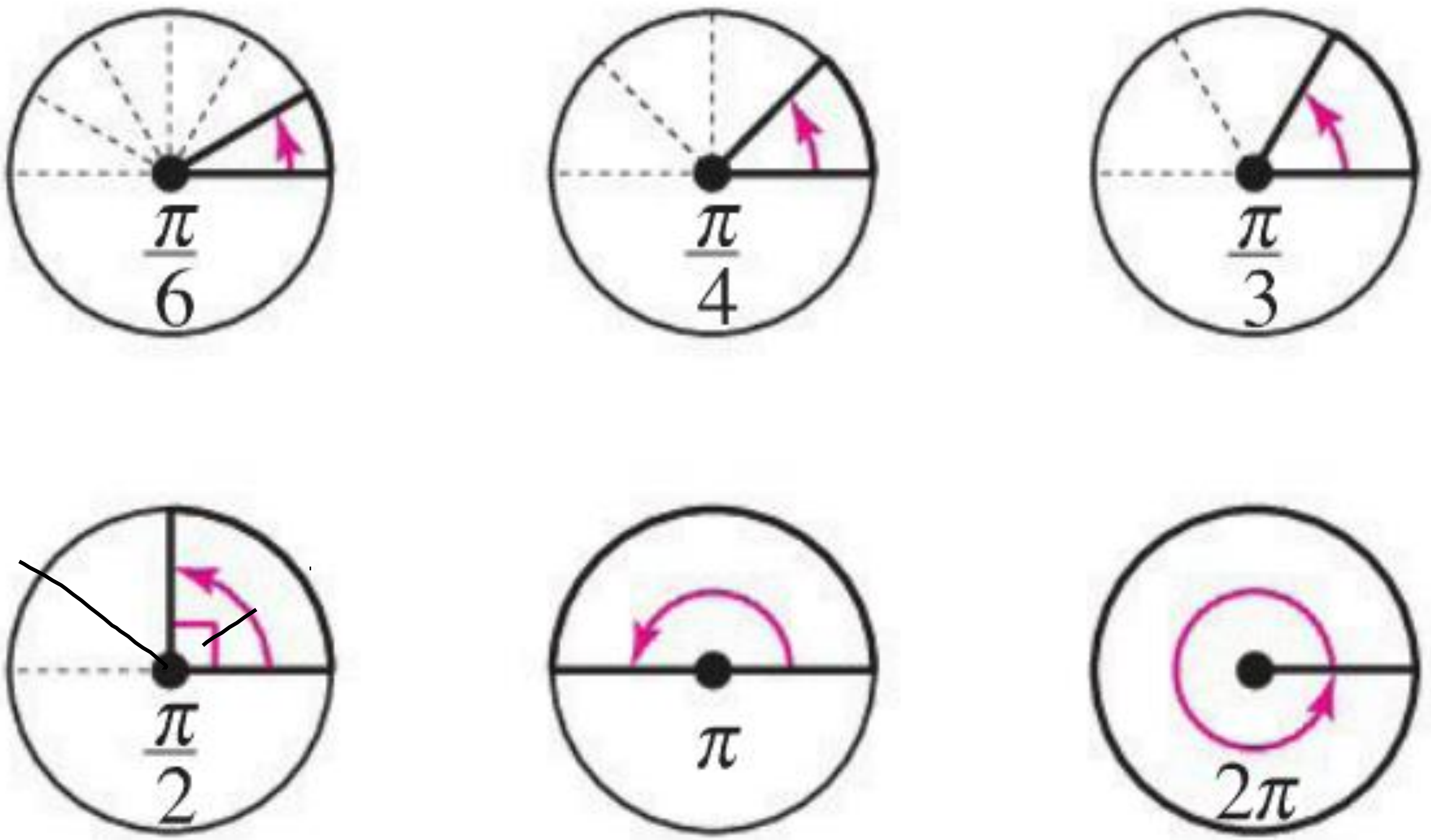


$$\theta = \frac{s}{r}$$

Where θ is the central angle, s = arc length, and r = radius

Source: http://distractify-media-prod.cdn.bingo/1537611-980x.jpg

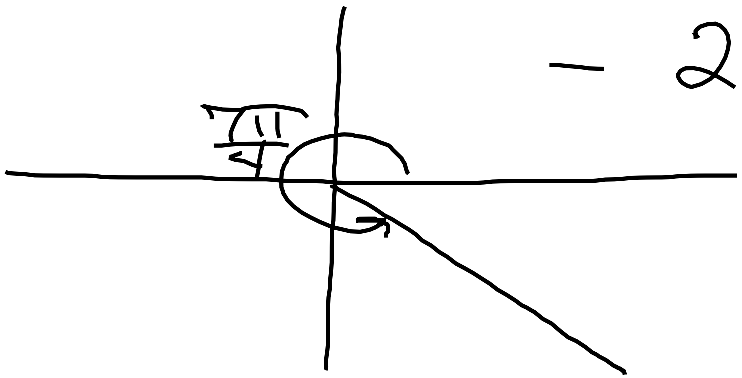
Common Angles in Radian Measure



Find a coterminal angle for the given angles.

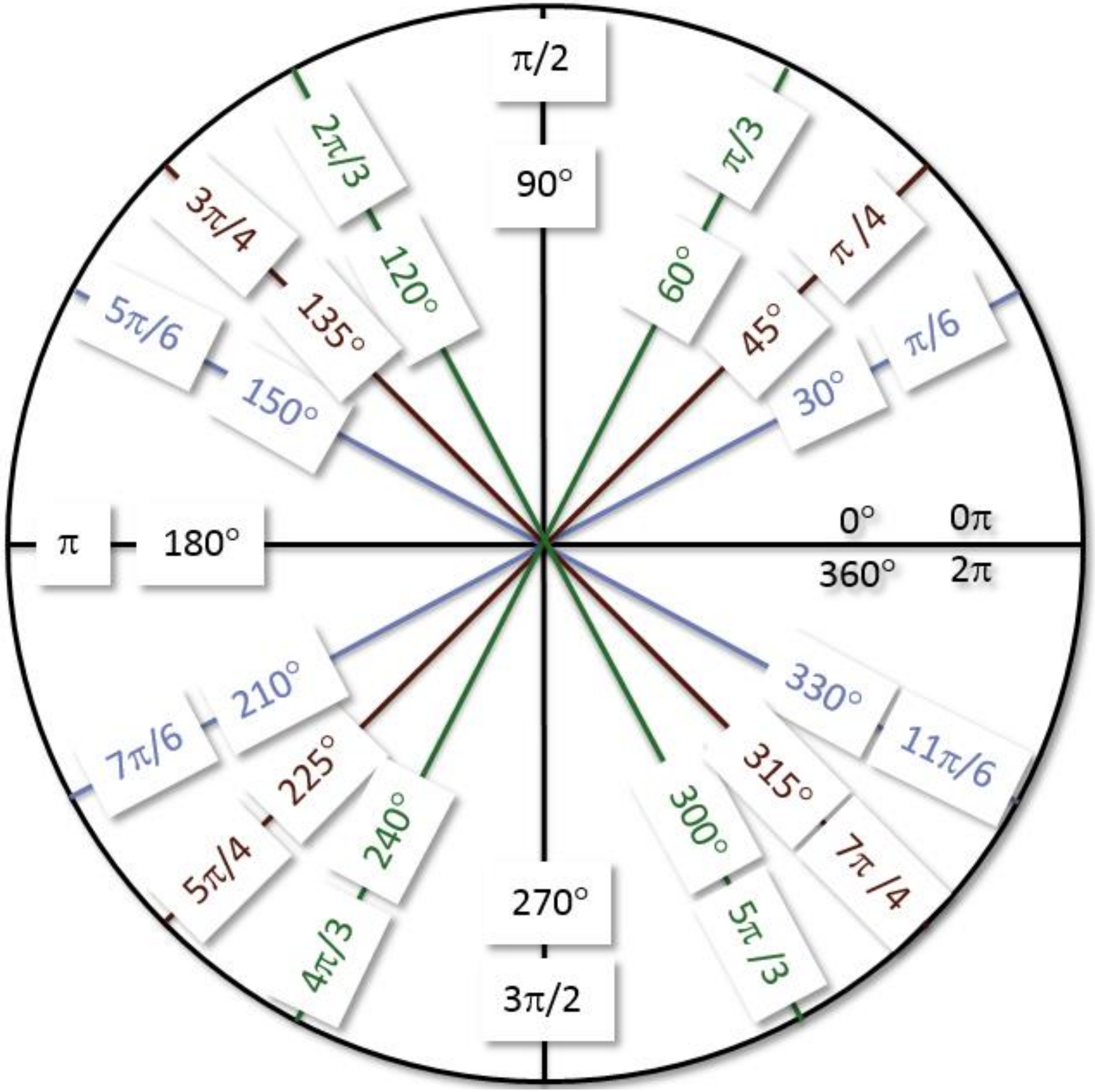
$$\frac{7\pi}{4} + 2\pi$$

$$- 2\pi$$



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

Unit Circle

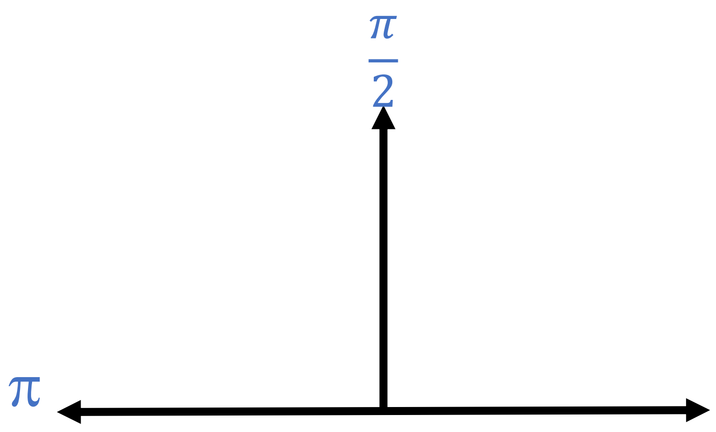


$30^\circ \quad \frac{\pi}{180^\circ}$

Complements and Supplements

Complementary angles add up to $\frac{\pi}{2}$.

Supplementary angles add up to π.



If possible, find the complement and supplement of each angle.

$$\frac{3\pi}{10}$$

$$\frac{9\pi}{10}$$

Suppl $\frac{10}{10}\pi - \frac{3\pi}{10}$

$\frac{7\pi}{10}$

Compl $\frac{5}{5}\frac{\pi}{2} - \frac{3\pi}{10}$

$\frac{5\pi}{10} - \frac{3\pi}{10} = \frac{2\pi}{10} = \pi/5$

Section 4.1 p. 269; 1-6, 8-34 even

Conversions Between Degrees and Radians

- To convert degrees to radians, multiply degrees by $\frac{\pi\, rad}{180°}$.
  - Convert 420° to radians. Do not use a calculator.
  - Convert 280 ° to radians.

$280° \cdot \frac{\pi}{180°}$

$\frac{14\pi}{9}$

- To convert radians to degrees , multiply radians by $\frac{180°}{\pi\, rad}$.
  - Convert $\frac{\pi}{9}$ to degrees. Do not use a calculator.

$\frac{\pi}{9} \cdot \frac{180°}{\pi} = 20°$

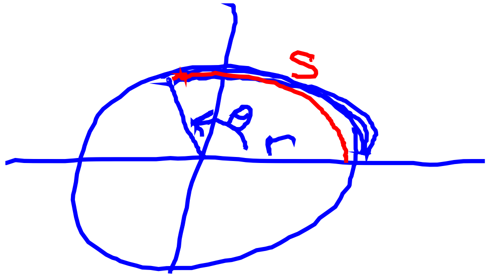
  - Convert $\frac{8\pi}{3}$ to degrees.

$\frac{8\pi}{3} \cdot \frac{180°}{\pi} = 480°$

Convert 3 radian to degrees.

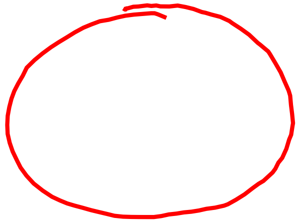
$3 \cdot \frac{180°}{\pi}$

Arc Length



For a circle of radius r, a central angle θ intercepts an arc of length s given by $s = r\theta$ where θ is measured in radians.

$C = 2\pi r$



A circle has a radius of 10 inches. Find the length of the arc intercepted by a central angle of 140°.

$S = r\theta$

$S = 10\left(\frac{140 \cdot \pi}{180}\right)$

$\frac{70}{9}\pi$

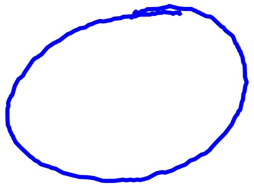
$\frac{140}{360}(2)(\pi)(10)$

$\frac{7}{18}(2)(\pi)(10)$

$\frac{140\pi}{18}$

Finding Angular and Linear Speeds

Night Riding



$\frac{7 \text{ revolutions}}{2 \text{ seconds}}$

$\frac{3.5 \text{ rev}}{\text{sec}}$

$\frac{\text{mi}}{\text{hour}}$

$\frac{3.5 \text{ rev}}{\text{sec}} \cdot 2\pi(13 \text{ in}) \cdot \frac{1 \text{ ft}}{12 \text{ in}} \cdot \frac{1 \text{ mi}}{5280 \text{ ft}} \cdot \frac{60 \text{ sec}}{1 \text{ min}} \cdot \frac{60 \text{ min}}{1 \text{ hr}}$

$\frac{3.5(2)(\pi)13(60)(60)}{12 \cdot 5280} \quad \frac{\text{mi}}{\text{hr}}$

Angular Speed $\omega = \frac{\theta}{t}$

Linear Speed $v = \frac{s}{t}$

The second hand of a watch is 1.3 cm long. Find the linear speed of the tip of this second hand as it passes around the watch face.

$\frac{1 \text{ rev}}{60 \text{ sec}}$ $2\pi(1.3)$

Area of a Sector of a Circle

$A = \frac{1}{2} r^2 \theta$ where θ is measured in radians.

A sprinkler on a golf course sprays water over a distance of 75 feet and rotates through an angle of 135°. Find the area watered by the sprinkler.

$A = \frac{1}{2}(75)^2 \, 135° \left(\frac{\pi}{180°}\right)$

$A = \pi r^2$

$\frac{1}{2}(75)^2 \frac{3\pi}{4}$

$\frac{135}{360} \pi (75)^2$

6626.8 ft^2

Section 4.1 p.270; 35-47, 49, 51-57, 63-66, 69-70