Ch. 9 Trigonometry

Algebra 2

9.1 Trigonometry with Right Triangles

- Study of Triangles
- Hypotenuse always opposite right angle
- One angle can make 6 ratios

9.1 Use Trig with Right Triangles

- Trig Functions: SOH CAH TOA
- $\sin\theta = \frac{Opposite}{Hypotenuse}$ $\quad\quad$ $\csc\theta = \frac{Hypotenuse}{Opposite}$
- $\cos\theta = \frac{Adjacent}{Hypotenuse}$ $\quad\quad$ $\sec\theta = \frac{Hypotenuse}{Adjacent}$
- $\tan\theta = \frac{Opposite}{Adjacent}$ $\quad\quad$ $\cot\theta = \frac{Adjacent}{Opposite}$

To Solve Right Triangles

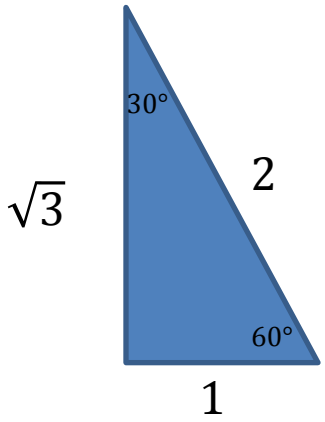
- To find the missing sides:

- 1. Use Pythagorean Theorem
- 2. Use Trig Functions
- 3. Use 2 'Special' Triangles
  - 30°-60°-90°
  - 45°-45°-90°

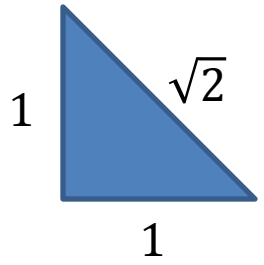
Special Right Triangles

Two Special :

1. $30° - 60° - 90°$

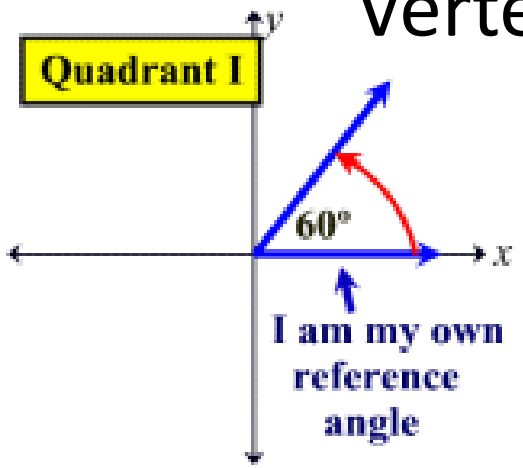


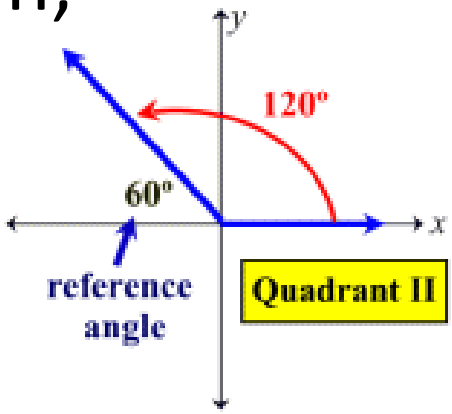
2. $45° - 45° - 90°$

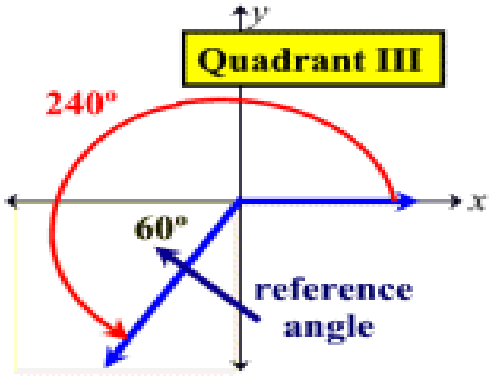


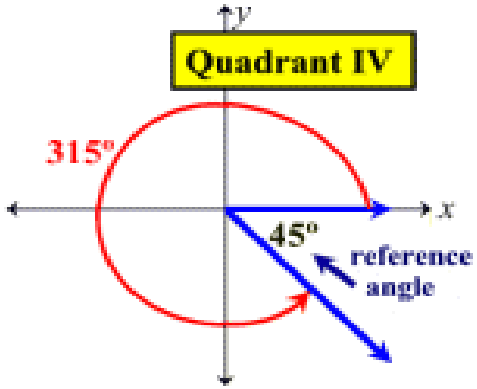
9.2 Define General Angles and Use Radian Measure

Vertex at origin;









Radian Measure

Converting: Degrees → Radians $\Theta \cdot \left(\frac{\pi}{180^\circ}\right)$

Radians → Degrees $\Theta \cdot \left(\frac{180^\circ}{\pi}\right)$

To Find coterminal angles:

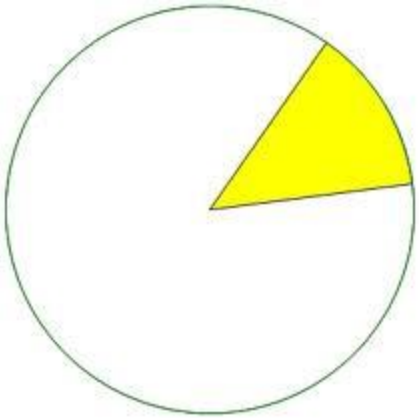
add one rotation: 360° or 2π

subtract one rotation: 360° or 2π

Arc Length and Area of Sector

- **Arc Length**: Part of circle, Circumference
  - $S = r \cdot \Theta$ * **Θ must be in radians**
  - r is radius

- **Area of a Sector:** piece of the pie

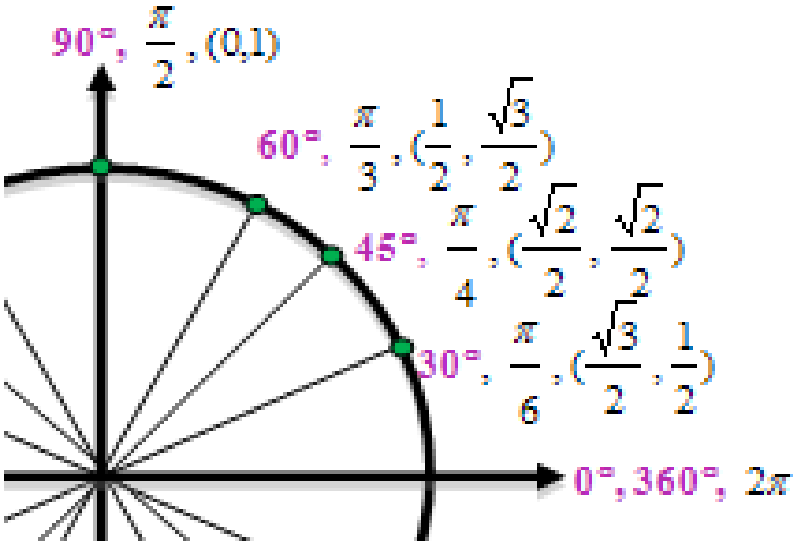


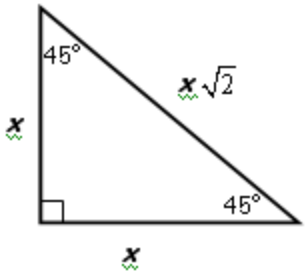
$$A = \frac{1}{2} r^2 \Theta$$ **Θ in radians**

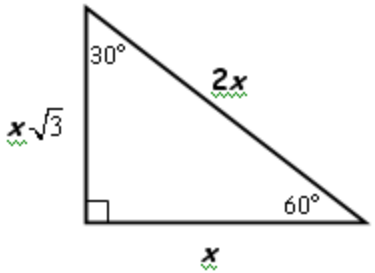
Coterminal Angles: Two angles in standard position with the same terminal side

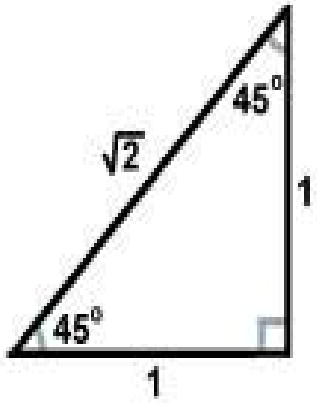
Ex: 30˚ and 390 ˚

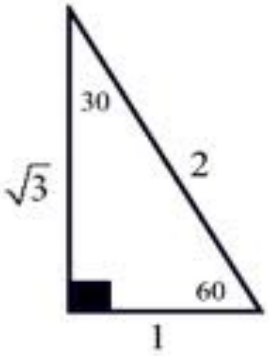
Common Angles:



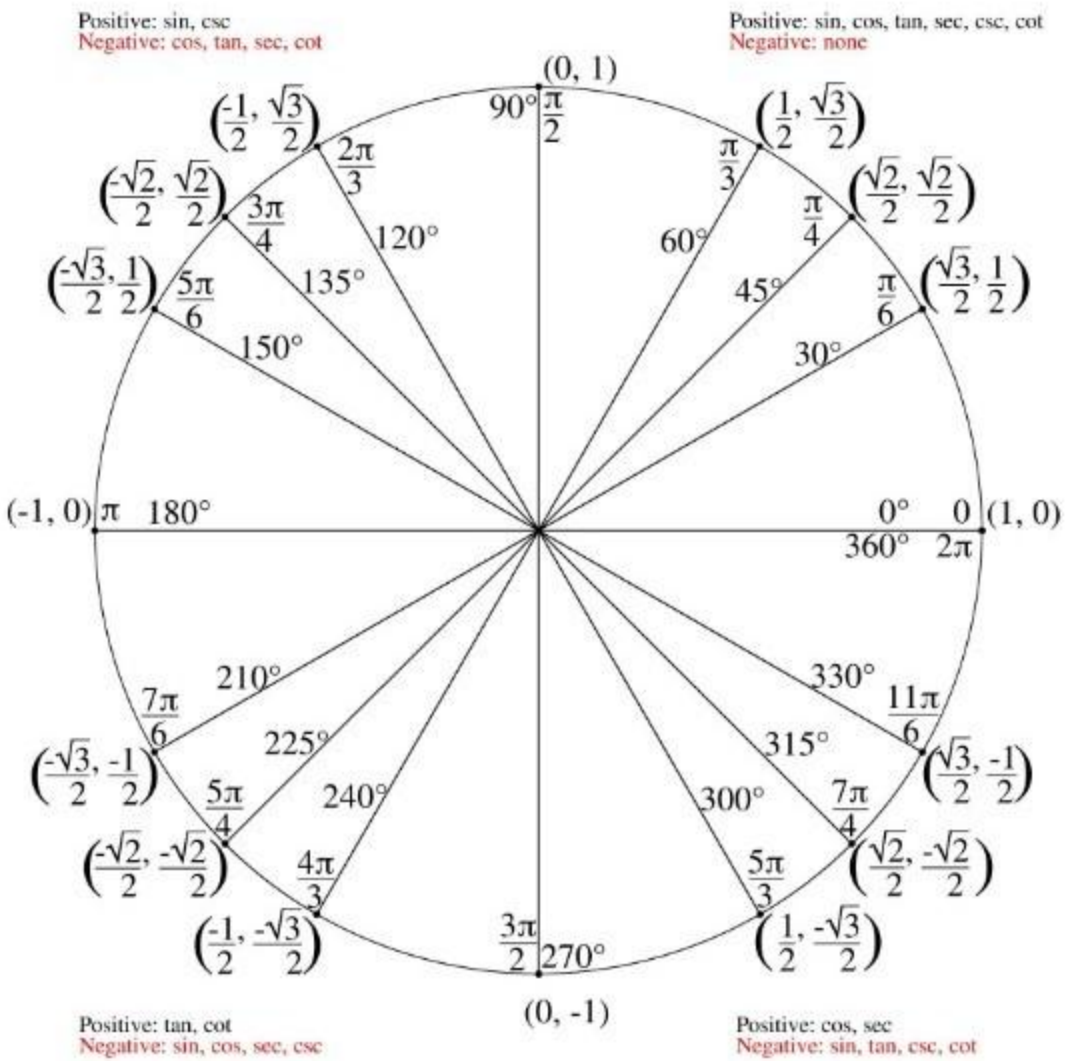








The Unit Circle



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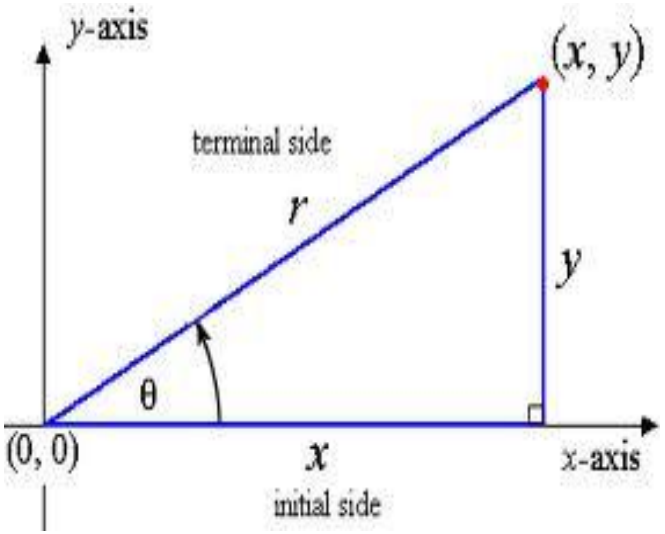
9.3 Evaluate Trig Functions of Any Angle



$\sin\Theta = \frac{y}{r}$

$\cos\Theta = \frac{x}{r}$

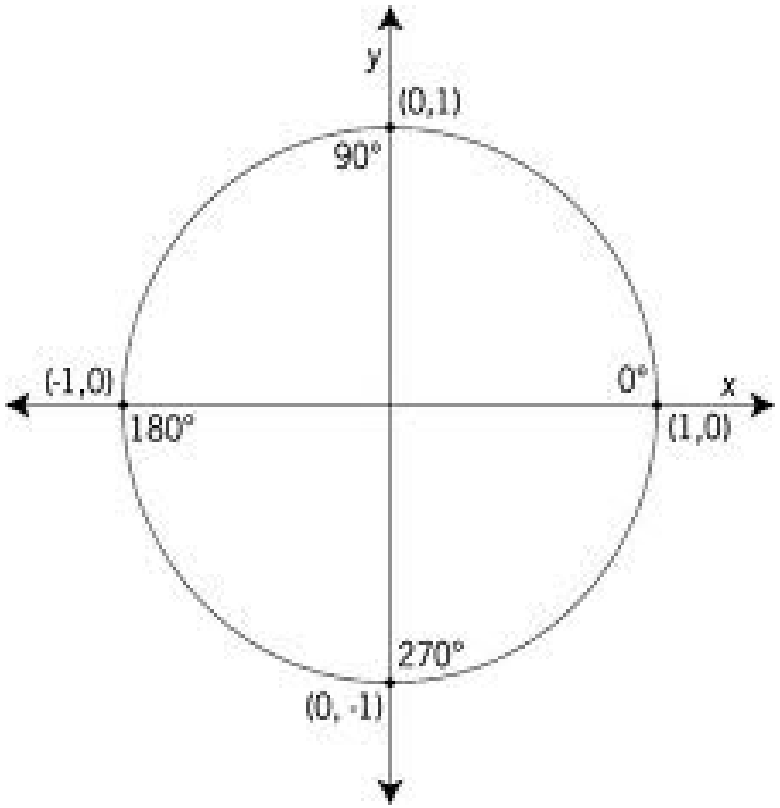
$\tan\Theta = \frac{y}{x}$

$\csc\Theta = \frac{r}{y}$

$\sec\Theta = \frac{r}{x}$

$\cot\Theta = \frac{x}{y}$

Quadrantal Angles



$\text{Sin}\Theta = y$

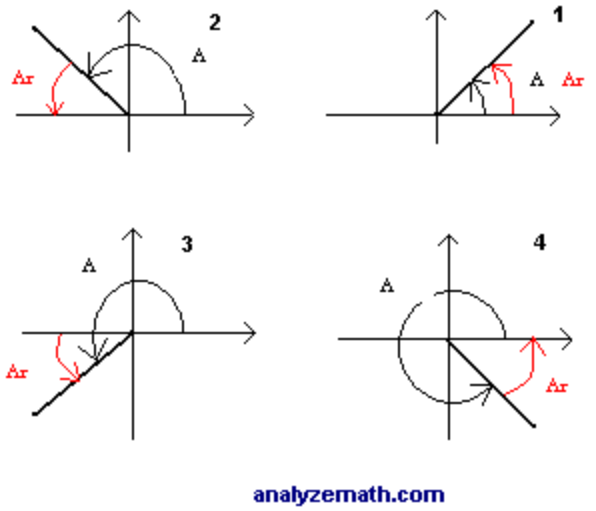
$\text{Cos}\Theta = x$

$\text{Tan}\,\Theta = \frac{y}{x}$

Where r = 1

- Determine what Quadrant angle is in (picture)

  Draw reference triangle



Determine positive or negative

9.4 Evaluate Inverse Trig Functions

- Before: Given Angle → Find ratio
- Now: Given ratio → Find Angle
- Use: $\sin^{-1}$ $\cos^{-1}$ $\tan^{-1}$ to find Angle

Rules for which angle to use:

- Sine: Quad I or Quad IV
- Cosine: Quad I or Quad II
- Tan: Quad I or Quad IV

9.5 Law of Sines

- For use on **ANY** triangle given:
  - AAS
  - ASA
  - SSA (special)

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

- To Find **Area** of Triangle:

- Given: SAS
- $A = \frac{1}{2} b\ c \sin A$
- $A = \frac{1}{2} a\ c \sin B$
- $A = \frac{1}{2} a\ b \sin C$

9.6 Law of Cosines

- For Use on ANY triangle given:
- SAS
- SSS

  Start with longest side
- $a^2 = b^2 + c^2 - 2bc\cos A$
- $b^2 = a^2 + c^2 - 2ac\cos B$
- $c^2 = a^2 + b^2 - 2ab\cos C$

- To find **Area** of triangle:
- Given SSS
- A = $\sqrt{s(s-a)(s-b)(s-c)}$

  – Where s = $\frac{1}{2}$(a + b + c)