Chapter 4 Part 1 Summary Sheet

Conversion Between Degrees and Radians

1. To convert degrees to radians, multiply degrees by $\dfrac{\pi \text{ radians}}{180°}$

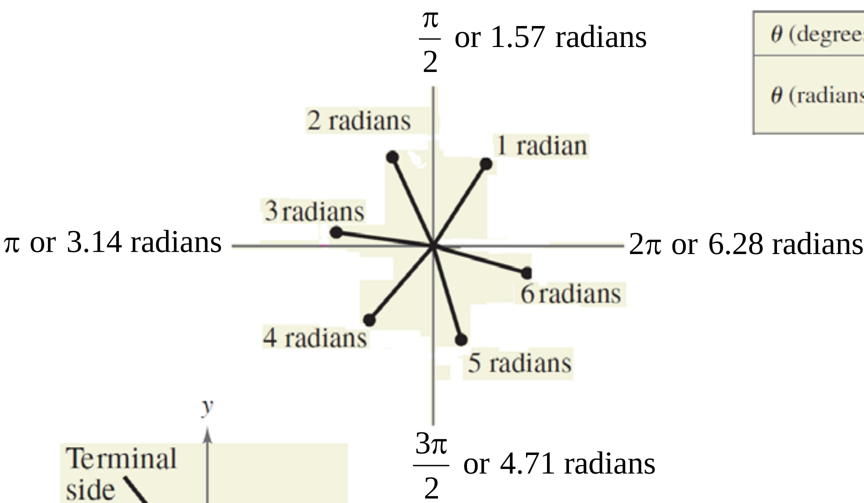
2. To convert radians to degrees, multiply radians by $\dfrac{180°}{\pi \text{ radians}}$

Note: If an angle measure has no units, then its unit of measurement is radians.

Coterminal Angles – angles whose terminal sides overlap. To find, add or subtract $360°$ or 2π repeatedly. There are infinitely many coterminal angles.

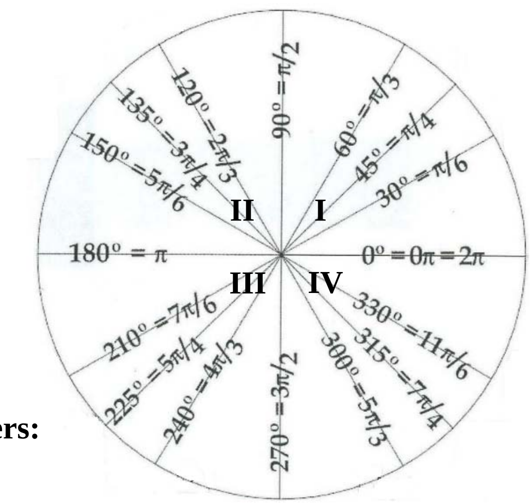
Important: For the following formulas, theta θ is always in radians.

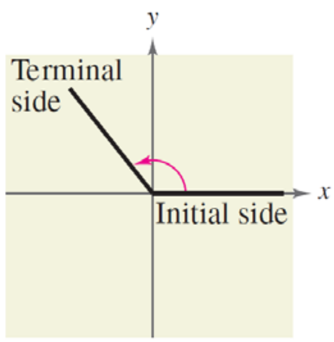
Arc Length: $s = r\theta$ **Linear Speed:** $v = \dfrac{s}{t}$ **Angular Speed:** $\omega = \dfrac{\theta}{t}$ **Area of a Sector:** $A = \dfrac{1}{2}r^2\theta$



Common Trig Angles

θ (degrees)	0°	30°	45°	60°	90°	180°	270°
θ (radians)	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$





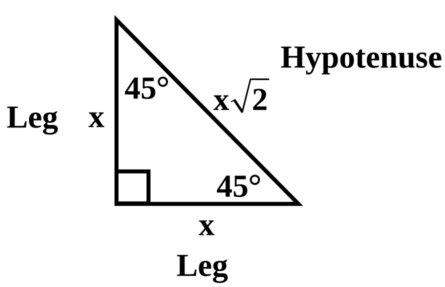
Angle in Standard Position

Angles Labeled with Greek Letters:
α (alpha), β (beta), and θ (theta)

Angular Speed: ω (omega)

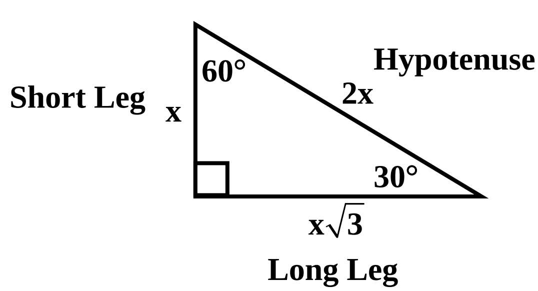
Pythagorean Theorem: $a^2 + b^2 = c^2$ **Pythagorean Triples:** 3, 4, 5 5, 12, 13 8, 15, 17

45°- 45°- 90°
Triangle Properties



Leg $\cdot \sqrt{2}$ = Hypotenuse

30°- 60°- 90°
Triangle Properties



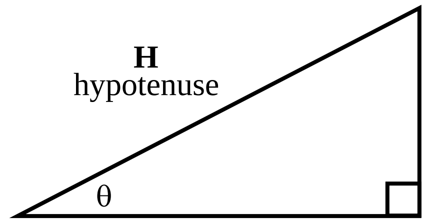
Short Leg $\cdot \sqrt{3}$ = Long leg
Short Leg $\cdot$ 2 = Hypotenuse

6 Trigonometric Ratios: sine cosine tangent cosecant secant cotangent

Acronym to help remember trig ratios: Soh Cah Toa or $\mathbf{S\frac{o}{h}}$ $\mathbf{C\frac{a}{h}}$ $\mathbf{T\frac{o}{a}}$

$\sin\theta = \frac{O}{H}$ $\quad \cos\theta = \frac{A}{H}$ $\quad \tan\theta = \frac{O}{A}$

$\csc\theta = \frac{H}{O}$ $\quad \sec\theta = \frac{H}{A}$ $\quad \cot\theta = \frac{A}{O}$



Fundamental Trigonometric Identities

Reciprocal Identities

$$\sin\theta = \frac{1}{\csc\theta} \qquad \cos\theta = \frac{1}{\sec\theta} \qquad \tan\theta = \frac{1}{\cot\theta}$$

$$\csc\theta = \frac{1}{\sin\theta} \qquad \sec\theta = \frac{1}{\cos\theta} \qquad \cot\theta = \frac{1}{\tan\theta}$$

Quotient Identities

$$\tan\theta = \frac{\sin\theta}{\cos\theta} \qquad \cot\theta = \frac{\cos\theta}{\sin\theta}$$

Pythagorean Identities

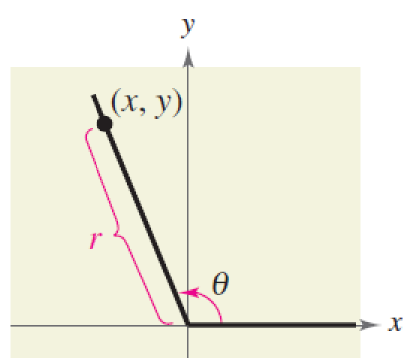
$$\sin^2\theta + \cos^2\theta = 1 \qquad 1 + \tan^2\theta = \sec^2\theta \qquad 1 + \cot^2\theta = \csc^2\theta$$

Method for Remembering Pythagorean Identities: $\sin^2\theta + \cos^2\theta = 1$ is the identity easiest to remember. Notice that the identities $1 + \tan^2\theta = \sec^2\theta$ and $1 + \cot^2\theta = \csc^2\theta$ both start with a 1 plus a ratio with "tan" in its name. The identity with a $\cot\theta$ is followed by a ratio that also starts with a c, $\csc\theta$.

Trigonometric Functions of Any Angle

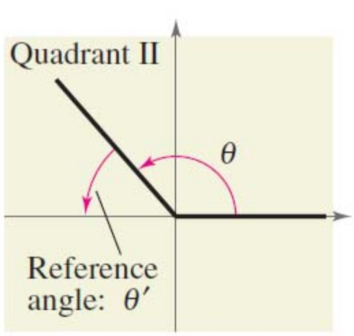
$\sin\theta = \frac{y}{r}$ $\quad \cos\theta = \frac{x}{r}$ $\quad \tan\theta = \frac{y}{x}$

$\csc\theta = \frac{r}{y}$ $\quad \sec\theta = \frac{r}{x}$ $\quad \cot\theta = \frac{x}{y}$

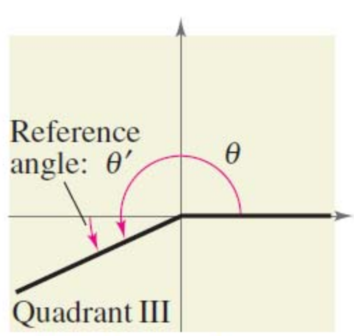


Important:
r is always positive
y is always opposite
x is always adjacent

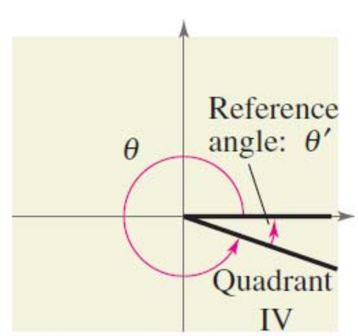
Reference Angle – the acute angle θ' formed by the terminal side and the x-axis.



$\theta' = \pi - \theta$ (radians)
$\theta' = 180° - \theta$ (degrees)



$\theta' = \theta - \pi$ (radians)
$\theta' = \theta - 180°$ (degrees)



$\theta' = 2\pi - \theta$ (radians)
$\theta' = 360° - \theta$ (degrees)