

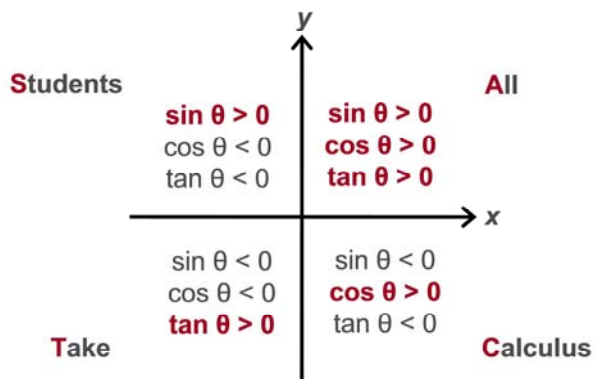
## 09: Basic Trigonometry

### Key Terms

- **Domain:** the set of possible values of  $\theta$ ; input.
- **Fundamental period:** the smallest interval over which a periodic function repeats itself.
- **Period:** any interval over which a function repeats itself.
- **Periodic function:** a function that repeats itself at regular intervals.
- **Quadrant:** one of four sections the coordinate plane is divided into by its axes.
- **Range:** the set of possible values of  $f(\theta)$ ; output.
- **Reference angle:** given angle  $\theta$ , the acute angle between the terminal side of  $\theta$  and the  $x$ -axis.
- **Right triangle:** a geometric figure having three sides and three angles with exactly one angle with a measure of  $90^\circ$ .
- **Trigonometric identity:** a relation between two or more trigonometric functions.
- **Unit circle:** a circle of radius one centered at the origin.

### Signs of Trigonometric Functions

The quadrant a standard angle lies in tells the sign of the trigonometric function values.



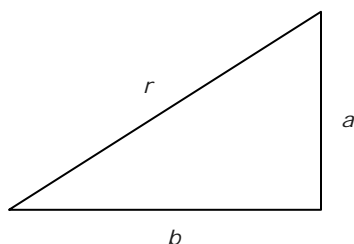
Use the first letters of "All Students Take Calculus" to remember:

- **All** trigonometric functions are positive in Quadrant I.
- **Sine** (and cosecant) are positive in Quadrant II.
- **Tangent** (and cotangent) are positive in Quadrant III.
- **Cosine** (and secant) are positive in Quadrant IV.

### Pythagorean Theorem

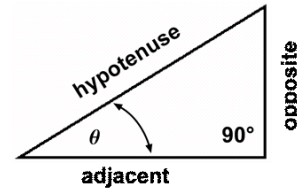
The **Pythagorean theorem** states that the square of the length of the hypotenuse,  $r$ , is equal to the sum of the squares of the lengths of the two legs of a right triangle,  $a$  and  $b$ .

$$r^2 = a^2 + b^2$$



### Trigonometric Function Ratios

The six trigonometric functions can be defined as ratios of the lengths of the sides of a right triangle.



$$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\csc \theta = \frac{\text{hypotenuse}}{\text{opposite}}$$

$$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

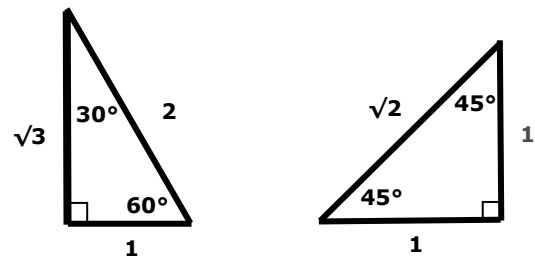
$$\sec \theta = \frac{\text{hypotenuse}}{\text{adjacent}}$$

$$\tan \theta = \frac{\text{opposite}}{\text{adjacent}}$$

$$\cot \theta = \frac{\text{adjacent}}{\text{opposite}}$$

Use "SOHCAHTOA" to remember the primary ratios.

### Common Angles of Trigonometry



Angle $\theta$	$\sin \theta$	$\cos \theta$	$\tan \theta$
$30^\circ$ (or $\pi/6$ )	$1/2$	$\sqrt{3}/2$	$\sqrt{3}/3$
$45^\circ$ (or $\pi/4$ )	$\sqrt{2}/2$	$\sqrt{2}/2$	1
$65^\circ$ (or $\pi/3$ )	$\sqrt{3}/2$	$1/2$	$\sqrt{3}$

### Trigonometric Identities

#### • Reciprocal Identities

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

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

#### • Quotient Identities

$$\tan \theta = \frac{\sin \theta}{\cos \theta} \quad \text{AND} \quad \cot \theta = \frac{\cos \theta}{\sin \theta}$$

#### • Pythagorean Identities

$$\sin^2 \theta + \cos^2 \theta = 1 \quad 1 + \tan^2 \theta = \sec^2 \theta$$

$$1 + \cot^2 \theta = \csc^2 \theta$$

#### • Cofunction Identities

$$\sin(90^\circ - \theta) = \cos \theta \quad \csc(90^\circ - \theta) = \sec \theta$$

$$\cos(90^\circ - \theta) = \sin \theta \quad \sec(90^\circ - \theta) = \csc \theta$$

$$\tan(90^\circ - \theta) = \cot \theta \quad \cot(90^\circ - \theta) = \tan \theta$$

How to Use This Cheat Sheet: These are the key concepts related this topic. Try to read through it carefully twice then write it out on a blank sheet of paper. Review it again before the exam.