

### Quadratic Equation

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

### Discriminant

$b^2 - 4ac > 0$	2 real roots
$b^2 - 4ac = 0$	1 repeated root
$b^2 - 4ac < 0$	2 imaginary roots

### Supplementary & Complementary Angles

supplementary angles	add up to 180°
complementary angles	add up to 90°

### Pythagorean Theorem

$$a^2 + b^2 = c^2$$

### 45-45-90 triangles

a=b
$c = a\sqrt{2}$ or $b\sqrt{2}$
$c/\sqrt{2} = a$ or $b$

### 30-60-90 triangles

$c = 2b$
$a = b\sqrt{3}$
when a triangle's 3 angles are 30°, 60°, and 90°
a = long leg
b = short leg
c = hypotenuse

### Area of a triangle

$$A\Delta = (1/2)bh$$

### SOH-CAH-TOA

sine	opposite/hypotenuse
cosine	adjacent/hypotenuse
tangent	opposite/adjacent

### csc, sec, cot - the opposite of SOH-CAH-TOA

cosecant	hypotenuse/opposite
secant	hypotenuse/adjacent
cotangent	adjacent/opposite

### Circle Measurements

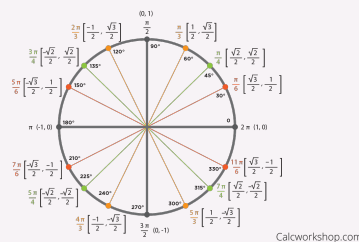
area	$\pi r^2$
diameter	2r
circumference	$2\pi r$ OR $\pi d$
arc length	$\theta r$

r = radius
d = diameter
$\theta$ = angle

### Degrees & Radians

degrees to radians	$\theta \cdot \pi / 180$
radians to degrees	$\theta \cdot 180 / \pi$

### Unit Circle



### Unit Circle values

sin	y
cos	x
tan	y/x
csc	1/y
sec	1/x
cot	x/y

for tan & cot, only use the tops of the fractions

### Coterminal Angles

$$\theta \pm 360^\circ \quad \theta \pm 2\pi$$

### $y = a(\sin) b(x - c) + d$

a	amplitude change
b	period change
c	horizontal change: + = left, - = right
d	vertical change: + = up, - = down
$-\sin(x)$	reflection across x-axis
$\sin(-x)$	reflection across y=axis

### Amplitude & Period

amplitude	vertical
period	horizontal
both always positive	
tan, cos, sec, cot: no amplitude	

### Inverses

$$\sin^{-1}(y) = x \quad \sin(x) = y$$

$$\csc(x) = 1/\sin(x)$$

restricting range: usually I & IV  
except in  $\cos^{-1}$ : I & II

### Reciprocal Identities

$\sin \theta = 1/\csc \theta$	$\csc \theta = 1/\sin \theta$
$\cos \theta = 1/\sec \theta$	$\sec \theta = 1/\cos \theta$
$\tan \theta = 1/\cot \theta$	$\cot \theta = 1/\tan \theta$

### Ratio Identities

$$\tan \theta = \sin \theta / \cos \theta \quad \cot \theta = \cos \theta / \sin \theta$$

### Pythagorean Identities

$$\sin^2 \theta + \cos^2 \theta = 1$$

$$\tan^2 \theta + 1 = \sec^2 \theta$$

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

### Double-Angle Identities

$$\sin 2\theta = 2\sin\theta\cos\theta$$

$$\tan 2\theta = \frac{2\tan\theta}{1-\tan^2\theta}$$

$$\cos 2\theta = \cos^2\theta - \sin^2\theta$$

$$\cos 2\theta = 1 - 2\sin^2\theta$$

$$\cos 2\theta = 2\cos^2\theta - 1$$

### some more identities

$$\sin(a+b) = \sin(a)\cos(b) + \cos(a)\sin(b)$$

$$\sin(a-b) = \sin(a)\cos(b) - \cos(a)\sin(b)$$

$$\cos(a+b) = \cos(a)\cos(b) - \sin(a)\sin(b)$$

$$\cos(a-b) = \cos(a)\cos(b) + \sin(a)\sin(b)$$

$$\tan(a+b) = \frac{\tan(a)+\tan(b)}{1-\tan(a)\tan(b)}$$

$$\tan(a-b) = \frac{\tan(a)-\tan(b)}{1+\tan(a)\tan(b)}$$



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