Trigonometry Formula Sheet

Right triangle trigonometry

Sine	**sin(angle) = opposite / hypotenuse**
Cosine	**cos(angle) = adjacent / hypotenuse**
Tangent	**tan(angle) = opposite / adjacent**
Side lengths	**$a^2 + b^2 = c^2$**

Choose the acute angle before naming the legs. In the side rule, c is the hypotenuse.

Quadrant I values

30°	**π/6: (√(3)/2, 1/2), tan = √(3)/3**
45°	**π/4: (√(2)/2, √(2)/2), tan = 1**
60°	**π/3: (1/2, √(3)/2), tan = √(3)**

Read radians, then (cos t, sin t), then tan t.

Pythagorean and reciprocal forms

Fundamental identity	**$\sin^2(t) + \cos^2(t) = 1$**
Divide by $\cos^2(t)$	**$1 + \tan^2(t) = \sec^2(t)$**
Divide by $\sin^2(t)$	**$1 + \cot^2(t) = \csc^2(t)$**
Quotient	**tan(t) = sin(t)/cos(t)**

sec = 1/cos, csc = 1/sin and cot = cos/sin where defined.

Sum and difference of angles

Sine	**sin(a + b) = sin a cos b + cos a sin b**
Cosine	**cos(a + b) = cos a cos b − sin a sin b**

Tangent, p = tan a, q = tan b

tan(a + b) = (p + q)/(1 − pq)

For a difference, replace b with −b. Use tangent only where all terms are defined.

Double and half angles

Double sine	**sin(2t) = 2 sin t cos t**
Double cosine	**$\cos(2t) = 1 - 2\sin^2(t)$**
Half sine squared	**$\sin^2(t/2) = (1 - \cos t)/2$**
Half cosine squared	**$\cos^2(t/2) = (1 + \cos t)/2$**

For the unsquared half-angle values, select the sign from the quadrant of t/2.

Non-right triangle laws

Sine law	**a/sin A = b/sin B = c/sin C**
Cosine law	**$c^2 = a^2 + b^2 - 2ab\cos C$**
Area from two sides	**K = ½ ab sin C**

Each capital angle is opposite its lowercase side.

With two sides and a nonincluded angle, check for zero, one or two triangles.

Inverse trig principal values

Arcsine	**−π/2 ≤ asin(x) ≤ π/2**
Arccosine	**0 ≤ acos(x) ≤ π**
Arctangent	**−π/2 < atan(x) < π/2**

Sine and cosine inverses take inputs from −1 to 1. Arctangent takes any real input.

Graph a sinusoid

Model	**y = A sin(B(x − h)) + k**
Amplitude	**|A|**
Period, B != 0	**2π/|B|**
Phase shift and midline	**x shift h, y = k**

The period formula uses radians. A negative A reflects the wave across its midline.