

Given on test day: memorize anyway

- ✓ **SOHCAHTOA:** $\sin \theta = \frac{\text{opp}}{\text{hyp}}$, $\cos \theta = \frac{\text{adj}}{\text{hyp}}$
- ✓ $\tan \theta = \frac{\text{opp}}{\text{adj}} = \frac{\sin \theta}{\cos \theta}$
- ✓ $\sin^2 \theta + \cos^2 \theta = 1$
- ✓ $\csc \theta = \frac{1}{\sin \theta}$, $\sec \theta = \frac{1}{\cos \theta}$
- ✓ $\cot \theta = \frac{1}{\tan \theta} = \frac{\cos \theta}{\sin \theta}$
- ✓ 30° - 60° - 90° sides $1 : \sqrt{3} : 2$
- ✓ 45° - 45° - 90° sides $1 : 1 : \sqrt{2}$
- ✓ **Everything else here is not given:** memorize it

Right triangles

- ✓ **Trig ratios are ratios:** $\tan M = \frac{12}{5}$ could be sides 12 and 5, or 24 and 10
- ✓ Similar triangles share every trig ratio; find the third side with a triple ($5 : 12 : 13$)
- ✓ Sine and cosine lie between -1 and 1 : eliminate any choice outside it
- ✓ **Angle of elevation:** up from the horizontal; **depression:** down from a horizontal you draw
- ✓ Draw the triangle and label it from the angle asked about

Radians

- ✓ π radians $= 180^\circ$
- ✓ Degrees to radians: multiply by $\frac{\pi}{180}$
- ✓ Radians to degrees: multiply by $\frac{180}{\pi}$
- ✓ Each 30° is $\frac{\pi}{6}$; each 45° is $\frac{\pi}{4}$
- ✓ Angles repeat every 2π : $\cos 3\pi = \cos \pi = -1$

The unit circle

About 2 of the 40 math questions, usually among the hardest: learn the rest first. Radius 1, centered at the origin: the point at angle θ is $(\cos \theta, \sin \theta)$

Angle	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$
Degrees	0°	30°	45°	60°	90°
cos	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
sin	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
tan	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	undefined

- ✓ **Quadrantal angles:** $\frac{\pi}{2}$ is $(0, 1)$, π is $(-1, 0)$, $\frac{3\pi}{2}$ is $(0, -1)$
- ✓ **All Students Take Calculus:** positive in quadrant I, all; II, sine; III, tangent; IV, cosine
- ✓ **Mirror images** share values but for sign: $\frac{\pi}{6}$ and $\frac{5\pi}{6}$, $\frac{\pi}{4}$ and $\frac{7\pi}{4}$
- ✓ Complementary angles swap sine and cosine: $\sin 30^\circ = \cos 60^\circ$

Sine and cosine graphs

- ✓ $f(x) = a \sin b(x - c) + d$, and the same for cosine
- ✓ **Amplitude** $|a|$: from the midline to a peak
- ✓ **Period** $\frac{2\pi}{b}$: the length of one full wave
- ✓ **Phase shift** c : $x - \pi$ moves the wave π to the right
- ✓ **Vertical shift** d : up or down