Unit 4 · Trigonometric Functions Cheat Sheet

Unit 4 focus: angles, radians, the unit circle and graphs

1 DEGREES AND RADIANS

Multiply by $\frac{\pi}{180}$ or $\frac{180}{\pi}$.

Example: Convert 150° and $\frac{5\pi}{4}$.

150° · π ÷ 180: $\frac{5\pi}{6}$

Answer: $\frac{5\pi}{6}$ **and 225°**

2 UNIT CIRCLE VALUES

θ	cos θ · sin θ
0	1 · 0
$\frac{\pi}{6}$	$\frac{\sqrt{3}}{2} \cdot \frac{1}{2}$
$\frac{\pi}{4}$	$\frac{\sqrt{2}}{2} \cdot \frac{\sqrt{2}}{2}$
$\frac{\pi}{3}$	$\frac{1}{2} \cdot \frac{\sqrt{3}}{2}$
$\frac{\pi}{2}$	0 · 1

ASTC: All, Sin, Tan, Cos positive in quadrants I–IV.

3 REFERENCE ANGLES

Use the reference angle, then the quadrant sign.

Example: $\cos\frac{2\pi}{3}$

Reference: $\frac{\pi}{3}$, quadrant II (cos −)

Answer: $-\frac{1}{2}$

4 SINUSOID GRAPHS

$y = A\sin(B(x-C)) + D$	Meaning
|A|	amplitude
$\frac{2\pi}{B}$	period
C	phase shift
D	midline y = D

$y = 3\sin 2x - 1$: amplitude 3, period π, midline y = −1.

5 ARC LENGTH AND SECTOR AREA

$s = r\theta$, $A = \frac{1}{2}r^2\theta$ (θ in radians).

Example: r = 6, $\theta = \frac{\pi}{3}$

Arc: $6 \cdot \frac{\pi}{3}$

Area: $\frac{1}{2}(36)\frac{\pi}{3}$

Answer: $s = 2\pi$, $A = 6\pi$

6 QUICK REMINDERS & COMMON MISTAKES

✓ Do remember

- Check degree/radian mode.
- tan θ = $\frac{\sin\theta}{\cos\theta}$.
- Period of tan is π, not 2π.

✗ Common mistakes

- Period of sin 2x = 4π: π
- s = rθ with θ in degrees: radians
- cos 120° = ½: −½ (quadrant II)

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More practice: inverse trig functions, identities and trig equations

1 INVERSE TRIG RANGES

Function	Range
$\sin^{-1} x$	$[-\frac{\pi}{2}, \frac{\pi}{2}]$
$\cos^{-1} x$	[0, π]
$\tan^{-1} x$	$(-\frac{\pi}{2}, \frac{\pi}{2})$

$\cos^{-1}(-\frac{1}{2}) = \frac{2\pi}{3}$

2 FUNDAMENTAL IDENTITIES

Type	Identity
Pythagorean	$\sin^2\theta + \cos^2\theta = 1$
	$1 + \tan^2\theta = \sec^2\theta$
Reciprocal	$\csc\theta = \frac{1}{\sin\theta}$, $\sec\theta = \frac{1}{\cos\theta}$
Even/odd	cos(−θ) = cos θ, sin(−θ) = −sin θ

3 SUM AND DOUBLE-ANGLE

Formula	Expansion
sin(A ± B)	sin A cos B ± cos A sin B
cos(A ± B)	cos A cos B ∓ sin A sin B
sin 2θ	2 sin θ cos θ
cos 2θ	$\cos^2\theta - \sin^2\theta = 1 - 2\sin^2\theta$

4 VERIFYING AN IDENTITY

Work one side; rewrite in sines and cosines.

Example: $\tan\theta\cos\theta = \sin\theta$
Rewrite: $\frac{\sin\theta}{\cos\theta} \cdot \cos\theta$
Answer: sin θ ✓

5 SOLVING TRIG EQUATIONS

Isolate the trig function; find ALL solutions in [0, 2π).

Example: $2\sin\theta - 1 = 0$
sin θ = ½: quadrants I and II
Answer: $\theta = \frac{\pi}{6}, \frac{5\pi}{6}$

6 CHECK YOURSELF

- Did I find every solution in the interval?
- Is my inverse-trig answer in the right range?
- Did I keep θ in radians where needed?
- Did I avoid dividing by a trig function (losing solutions)?