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Trigonometric functions and identities

Formulas and units, JEE Main. Status: Reviewed on 2026-11-20.

Result	Formula	Units or note
Basic identities	sin^2 t + cos^2 t = 1; 1 + tan^2 t = sec^2 t; 1 + cot^2 t = cosec^2 t Valid when: angle where each function is defined (cosec, cot, sec, tan undefined at some angles)	dimensionless
Compound angles	sin(A +/- B) = sin A cos B +/- cos A sin B; cos(A +/- B) = cos A cos B -/+ sin A sin B; tan(A +/- B) = (tan A +/- tan B)/(1 -/+ tan A tan B) Valid when: all angles A, B for sin and cos; tan only where all tangents are defined and tan A tan B is not 1	angles in radians or degrees
Double and triple angle	sin 2A = 2 sin A cos A; cos 2A = 2 cos^2 A - 1 = 1 - 2 sin^2 A; tan 2A = 2 tan A/(1 - tan^2 A); sin 3A = 3 sin A - 4 sin^3 A; cos 3A = 4 cos^3 A - 3 cos A Valid when: angles where each side is defined; tan 2A needs tan A defined and A not 45 degrees	angles in radians or degrees
Sum to product	sin C + sin D = 2 sin((C + D)/2) cos((C - D)/2); cos C + cos D = 2 cos((C + D)/2) cos((C - D)/2); cos C - cos D = -2 sin((C + D)/2) sin((C - D)/2) Valid when: all angles C, D	angles in radians or degrees
Product to sum	2 sin A cos B = sin(A + B) + sin(A - B); 2 cos A cos B = cos(A + B) + cos(A - B); 2 sin A sin B = cos(A - B) - cos(A + B) Valid when: all angles A, B	angles in radians or degrees
Range of a sin x + b cos x	R = sqrt(a^2 + b^2); minimum -R, maximum R Valid when: a, b real constants and x any real angle	same units as a and b
General solutions	sin x = sin a: x = n pi + (-1)^n a; cos x = cos a: x = 2 n pi +/- a; tan x = tan a: x = n pi + a Valid when: n is any integer; angles in radians	radians; n is an integer
Standard values	sin 15 = (sqrt(6) - sqrt(2))/4; cos 15 = (sqrt(6) + sqrt(2))/4; sin 18 = (sqrt(5) - 1)/4; cos 36 = (sqrt(5) + 1)/4 Valid when: exact values for angles in degrees	dimensionless; angles in degrees

Full lesson with worked examples:
https://www.engineeringrise.in/learn/learn/jee-main/mathematics/trigonometry/trigonometric-functions-and-identities

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