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Modulus, argument and polar form

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

Result	Formula	Units or note
Polar form	z = r(cos t + i sin t); r = sqrt(x^2 + y^2); cos t = x/r; sin t = y/r Valid when: z is non-zero; x, y real	r in axis units; t in radians or degrees
Principal argument by quadrant	a = arctan(|y|/|x|); Q1: a; Q2: pi - a; Q3: -(pi - a); Q4: -a Valid when: z non-zero and off the axes; principal argument in (-pi, pi]	radians (or degrees with 180 for pi)
Product and quotient	|z1 z2| = |z1||z2|; arg(z1 z2) = arg z1 + arg z2; arg(z1/z2) = arg z1 - arg z2 (mod 2 pi) Valid when: z1, z2 non-zero; add or subtract multiples of 2 pi to reach the principal value	modulus: axis units; argument: radians or degrees
Power, conjugate, reciprocal	|z^n| = |z|^n; arg(z^n) = n arg z; arg(z-bar) = -arg z; arg(1/z) = -arg z Valid when: z non-zero; n an integer; reduce the result mod 2 pi	radians or degrees
Standard values	1 + i = sqrt(2)(cos 45 + i sin 45); 1 + i sqrt(3) = 2(cos 60 + i sin 60); (1 + i)/(1 - i) = i	dimensionless; angles in degrees
Perpendicular and collinear tests	arg(z1/z2) = +/- pi/2 for perpendicular vectors; z1 z2-bar real for collinear with the origin Valid when: z1, z2 non-zero complex numbers	n/a (condition)

Full lesson with worked examples:
https://www.engineeringrise.in/learn/learn/jee-main/mathematics/complex-numbers-and-quadratic-equations/modulus-argument-and

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