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Complex numbers and the Argand plane

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

Result	Formula	Units or note
Modulus and conjugate	|z|^2 = z z-bar = x^2 + y^2; |z1 z2| = |z1||z2|; |z1/z2| = |z1|/|z2| Valid when: z1, z2 complex; z2 non-zero for the quotient	distance (same as the axes)
Conjugate	z-bar = x - iy; z + z-bar = 2x; z - z-bar = 2iy; z real iff z = z-bar Valid when: x, y are real	dimensionless
Distance between points	|z1 - z2| = sqrt((x1 - x2)^2 + (y1 - y2)^2) Valid when: points z1 = x1 + i y1, z2 = x2 + i y2 in the plane	distance (same as the axes)
Simple loci (applications)	|z - a| = r circle; |z - a| = |z - b| perpendicular bisector Valid when: a, b fixed complex numbers, r > 0, a differs from b	distance
Extreme modulus on a circle	on |z - c| = r: |z| ranges from |c| - r to |c| + r (origin outside) Valid when: |c| >= r, so the origin lies outside or on the circle	distance
Powers of i	i^2 = -1; i^3 = -i; i^4 = 1; reduce the exponent modulo 4 Valid when: n is an integer; reduce n modulo 4	dimensionless

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

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