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Algebra of complex numbers and conjugates

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

Result	Formula	Units or note
Ordered pair rules	(a, b) + (c, d) = (a + c, b + d); (a, b)(c, d) = (ac - bd, ad + bc)	dimensionless
Imaginary unit	i = (0, 1); i^2 = -1; i^3 = -i; i^4 = 1	dimensionless
Powers of i	i^n depends on n mod 4: 0 gives 1, 1 gives i, 2 gives -1, 3 gives -i Valid when: n is an integer; reduce n modulo 4	dimensionless
Equality	a + ib = c + id iff a = c and b = d Valid when: a, b, c, d are real numbers	dimensionless
Conjugate	z-bar = a - ib; z z-bar = a^2 + b^2; z + z-bar = 2a; z - z-bar = 2ib Valid when: a, b are real numbers	dimensionless
Division	z1/z2 = z1 z2-bar/(c^2 + d^2) for z2 = c + id Valid when: z2 is not zero; c, d are real	dimensionless
Standard values	(1 + i)^2 = 2i; (1 - i)^2 = -2i; (1 + i)/(1 - i) = i; 1/i = -i	dimensionless
Square root	p^2 - q^2 = a; 2pq = b; p^2 + q^2 = sqrt(a^2 + b^2) for sqrt(a + ib) = p + iq Valid when: a, b real; p, q real; take the sign of q from the sign of b	dimensionless

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

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