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Vectors, addition and components

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

Result	Formula	Units or note
Magnitude	|a| = sqrt(a1^2 + a2^2 + a3^2) Valid when: components along perpendicular axes	same unit as the components
Unit vector	a-cap = a/|a| Valid when: a is not the zero vector	dimensionless
Vector between points	PQ = OQ - OP = (q1 - p1, q2 - p2, q3 - p3) Valid when: P and Q given by position vectors from the same origin	length
Resultant of two vectors	R^2 = A^2 + B^2 + 2AB cos(theta); tan(phi) = B sin(theta)/(A + B cos(theta)) Valid when: tails together; theta is the angle between the vectors; phi is measured from A	same as A and B
Section formula (internal, m : n)	OR = (n a + m b)/(m + n) Valid when: P divides AB internally with AP : PB = m : n	length
Section formula (external, m : n)	OR = (m b - n a)/(m - n) Valid when: P divides AB externally with AP : PB = m : n and m not equal to n	length
Centroid of a triangle	(a + b + c)/3 Valid when: a, b, c are position vectors of the vertices	length
Direction cosines	l = a1/|a|, m = a2/|a|, n = a3/|a|; l^2 + m^2 + n^2 = 1 Valid when: a is non-zero; l, m, n are cosines of angles with the x, y, z axes	dimensionless
Parallel and collinear test	a parallel b if a = t b, that is a1 b2 = a2 b1, a2 b3 = a3 b2, a1 b3 = a3 b1 (ratios a1/b1 = a2/b2 = a3/b3 when no component is zero); A, B, C collinear if AB = t AC Valid when: vectors non-zero; the ratio form needs no component of b to be zero	dimensionless

Full lesson with worked examples:
https://www.engineeringrise.in/learn/learn/jee-main/mathematics/vector-algebra/vectors-addition-and-components

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