EngineeringRise

Matrices and their algebra

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

Result	Formula	Units or note
Order of a product	(m x n)(n x p) gives m x p Valid when: columns of the first equal rows of the second	dimensionless
Entry of a product	(AB)(i,j) = sum over t of a(i,t) b(t,j) Valid when: A is m x n and B is n x p	dimensionless
Transpose of a product	(AB)^T = B^T A^T Valid when: product defined (conformable matrices)	dimensionless
Symmetric and skew parts	A = (A + A^T)/2 + (A - A^T)/2 Valid when: square matrix A	dimensionless
Trace rules	tr(A + B) = tr A + tr B; tr(AB) = tr(BA); tr(A^T A) = sum of squares of entries Valid when: square matrices; for tr(AB) = tr(BA) both products defined	dimensionless
Square of a sum	(A + B)^2 = A^2 + AB + BA + B^2 Valid when: square matrices of the same order	dimensionless
Identity plus nilpotent	If N^2 = 0: (I + N)^n = I + nN Valid when: N^2 = 0, N square	dimensionless
Free entries	n x n symmetric: n(n+1)/2; skew-symmetric: n(n-1)/2 Valid when: n x n matrix	dimensionless

Full lesson with worked examples:
https://www.engineeringrise.in/learn/learn/jee-main/mathematics/matrices-and-determinants/matrices-and-their-algebra

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