NOTATION · CHEAT SHEET

Matrix Notation at a Glance

The marks from the notation cards across the matrix pages: how each is read and what it means. Every group links to the full card on its page.

MATRIX OPERATIONS

$A = (a_{ij})$	**A WITH ENTRIES A I J** Capital for the matrix, a_{ij} for one entry: row first, column second.
AB	**A TIMES B** Product written with no sign; needs $(m \times n)(n \times p)$.
A^T	**A TRANSPOSE** Rows and columns swapped: $(A^T)_{ij} = a_{ji}$.

INVERSE

A^{-1}	**A INVERSE** The matrix with $AA^{-1} = A^{-1}A = I$.
A/B	**NOT DEFINED** No matrix division: AB^{-1} and $B^{-1}A$ differ.
$(AB)^{-1} = B^{-1}A^{-1}$	**THE ORDER REVERSES** Undo the last step first.

RANK

$\operatorname{rank}(A)$	**THE RANK OF A** The number of independent columns, which equals the number of independent rows.
$\min(m, n)$	**THE CAP ON THE RANK** $\operatorname{rank}(A) \leq \min(m, n)$; full rank when it reaches it.

TRACE

$\operatorname{tr}(A)$	**THE TRACE OF A** The sum of the diagonal entries a_{ii}.
$\operatorname{tr}(AB) = \operatorname{tr}(BA)$	**UNCHANGED BY ROTATING FACTORS** Rotations only: $\operatorname{tr}(ABC)$ need not equal $\operatorname{tr}(BAC)$.
$\langle A, B \rangle_F$	**THE FROBENIUS INNER PRODUCT** Equals $\operatorname{tr}(A^T B)$: entries multiplied in pairs, then summed.

SAME MARKS, DIFFERENT JOB

A^T	A label, not a power: T is not a number.
A^{-1}	The inverse matrix, not $\frac{1}{A}$, which has no meaning.
a_{23} vs a_{32}	Row 2, column 3 against row 3, column 2: different entries.