

Dimensional Formulae and Dimensional Equations

Mastering the syntax of physical base quantities.

DIMENSIONAL FORMULA SYNTAX

A precise expression of a derived quantity in terms of base quantities.

$$\text{Velocity } [v] = [M^0 L^1 T^{-1}]$$

Dimensional Brackets
(Code Block)
Base Quantity Symbols
(Variables)
Powers
(Exponents)

DIMENSIONAL EQUATION SYNTAX

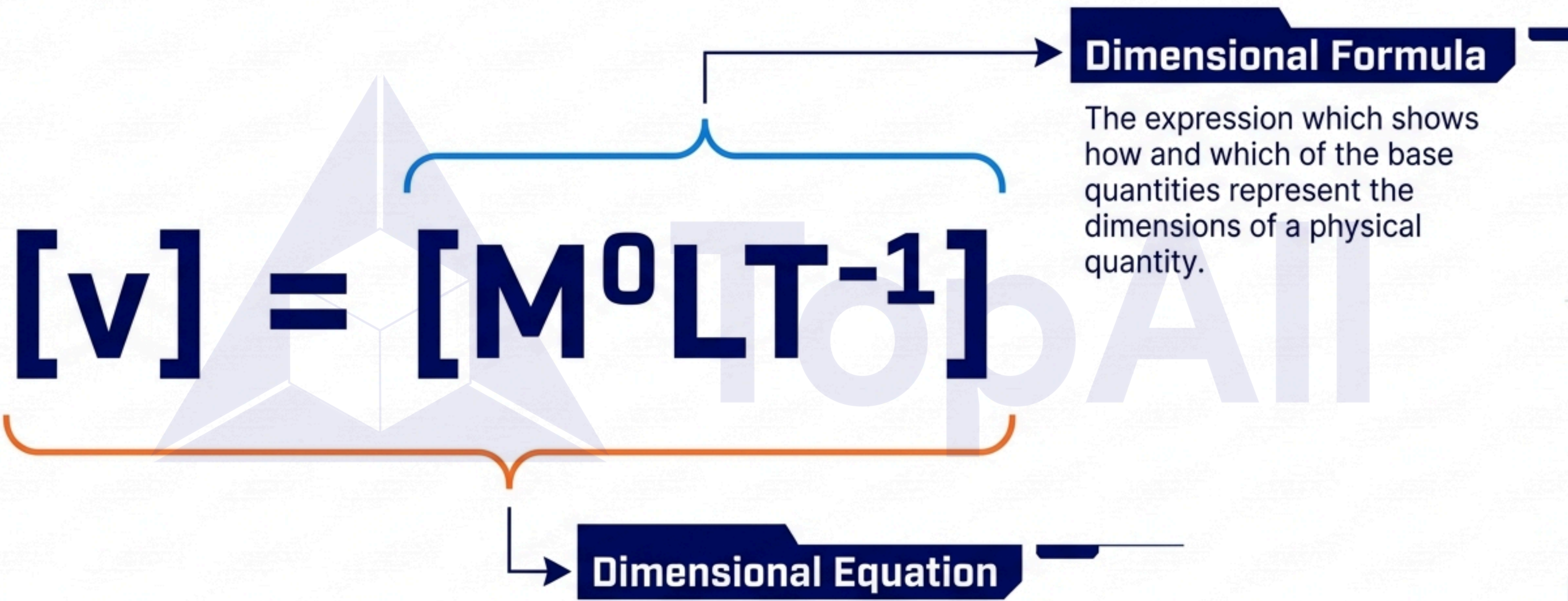
An equation equating the physical quantity to its dimensional formula.

$$[F] = [M^1 L^1 T^{-2}]$$

Physical Quantity
(Function Name)
Dimensional Formula
(Return Value)

Used for checking correctness, deriving relationships, and converting units.
Strict adherence to base quantity syntax is mandatory.

ANATOMY MODEL: DIMENSIONAL EQUATION DISSECTION


$$[v] = [M^0 L T^{-1}]$$

Dimensional Formula

The expression which shows how and which of the base quantities represent the dimensions of a physical quantity.

Dimensional Equation

The equation obtained by equating a physical quantity with its dimensional formula.



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$$E=mc^2$$



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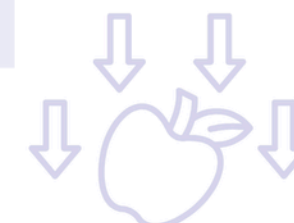
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DIMENSIONAL EQUATION EXAMPLES

Volume

$$[V] = [M^0 L^3 T^0]$$

Speed

$$[v] = [M^0 L T^{-1}]$$

Force

$$[F] = [M L T^{-2}]$$

Mass Density

$$[\rho] = [M L^{-3} T^0]$$

Trap Alert!

Never drop the zero-power terms — **$[L^3]$** alone is an incomplete dimensional formula for volume; it must read **$[M^0L^3T^0]$** .

Based on the strict rules of dimensional equations, which of the following is the correct representation for the mass density of an object?

- ✗ ☐ $[\rho] = M L^{-3}$
- ✗ ☐ $[\rho] = [L^{-3}]$
- ✓ ☒ $[\rho] = [M L^{-3} T^0]$
- ✗ ☐ $[M L^{-3} T^0]$



An equation must equate the quantity symbol $[\rho]$ with the full formula, including zero powers like T^0 .



Key Takeaway

A dimensional formula is the complete recipe of base-quantity powers — write every power, including the zeros.



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