

Units and dimensions of sums and products

Starter

- Find the dimensions of quantities measured in these units:
(a) kg ms^{-2} (b) N ms^{-1} (c) J s^2
- Show that the formula $\frac{1}{2}mv = mgh$ must be wrong.

Notes

You can only **add or subtract** quantities that have the **same dimensions**.

The sum or difference of quantities with the same dimensions will result in a quantity with the same dimensions.

For **products or quotients**, we **multiply or divide the dimensions**.

E.g. 1 Show that the formula $s = ut + \frac{1}{2}at^2$ is dimensionally consistent.

Working:

$$\begin{aligned} [s] &= \text{L} \\ [ut] &= \text{LT}^{-1} \times \text{T} = \text{L} \\ \left[\frac{1}{2}at^2 \right] &= \text{LT}^{-2} \times \text{T}^2 = \text{L} \end{aligned}$$

Since all three parts of the formula have the same dimensions, the formula is dimensionally correct.

E.g. 2 Check the dimensional accuracy of these formulae:

(a) $Fs = mv - mu$ (b) $Ft(u + v) = v^2 - u^2$

Video: [Dimensional consistency](#)

[Solutions to Starter and E.g.s](#)

Exercise

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Summary

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For products or quotients, we multiply or divide the dimensions.