

MS.5.1 How to lay out physics calculations - method 1

When answering calculation questions, it is important to lay out the calculation in a certain way to show how you arrive at the answer.

Consider the following worked example:



Worked example

Question: A runner runs at a speed of 1.5 m/s for a time of 1800 s. What distance do they cover?

$$\begin{aligned}
 \text{speed} &= \frac{\text{distance}}{\text{time}} && \leftarrow \text{Equation} \\
 \therefore \text{distance} &= \text{speed} \times \text{time} && \leftarrow \text{Rearrange (if needed)} \\
 &= 1.5 \times 1800 && \leftarrow \text{Insert values} \\
 &= \underline{2700 \text{ m}} && \leftarrow \text{Calculate} \\
 &&& \leftarrow \text{Add unit}
 \end{aligned}$$

This symbol means 'therefore' $\rightarrow$

We can use the acronym **ERICA** to help with remembering the steps required.

1) Answer the following question, laying out your calculation in the same way as the example (above):

Question: A person stands on one foot. The area of their foot is $1.5 \times 10^{-3} \text{ m}^2$. What is their weight (force), if the pressure under the foot is 53 000 Pa?

$$\begin{aligned}
 \text{pressure} &= \frac{\text{force}}{\text{area}} && \leftarrow \text{Equation} \\
 \therefore \underline{\hspace{2cm}} &= \underline{\hspace{2cm}} \times \underline{\hspace{2cm}} && \leftarrow \text{Rearrange} \\
 &= \underline{\hspace{2cm}} \times \underline{\hspace{2cm}} && \leftarrow \text{Insert values} \\
 &= \underline{\hspace{2cm}} && \leftarrow \text{Calculate} \\
 &&& \leftarrow \text{Add unit}
 \end{aligned}$$

Please look at worksheet MS.2 if you need help with rearranging.

2)  Answer the following question, laying out your calculation in the same way as the worked example (above):

Question: A car with a mass of 1200 kg is travelling at a velocity of 10 m/s. What momentum does it have? (momentum = mass $\times$ velocity)

E
R
I
C
A

Note: this step is not needed

3)  Answer the following question, laying out your calculation in the same way as the worked example (above):

Question: A current of 1.5 A flows through a resistor with a resistance of 200 Ω . What is the potential difference across the resistor?

(resistance = $\frac{\text{potential difference}}{\text{current}}$)

E
R
I
C
A

4)  Answer the following question, laying out your calculation in the same way as the worked example (above):

Question: An electric cooker with a power rating of 3000 W is switched on. How long (time) is it switched on for if it transfers 540 000 J of energy?

(power = $\frac{\text{energy}}{\text{time}}$)