

Physics 100, Extra Credit #1

Dimensions of Physical Quantities

- a) Length, MASS, AND time are the 3 basic dimensions
- b) Volume is length cubed $\Rightarrow l^3$
- c) speed is distance divided by time $\Rightarrow \frac{l}{t}$
- d) Acceleration (Sorry, you might have to look this up in chapter 2)
is velocity divided by time $\Rightarrow \frac{\frac{l}{t}}{t} = \frac{l}{t} \times \frac{1}{t} = \frac{l}{t^2}$

2.1 Car travels in +x direction with $v_{av} = 6.25 \text{ m/s}$ for 4s.
How far does car go?

$$v_{av} = \frac{\Delta x}{\Delta t} \Rightarrow \Delta x = v_{av} \Delta t = (6.25 \text{ m/s})(4\text{s}) = 25 \text{ m}$$

unit: $\frac{\text{m}}{\text{s}} \cdot \text{s} = \text{m}$

2.3 Normal you drive at 105 km/h for 2h, 20min, but Friday you drive 70 km/h. How much longer?

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The distance is the same for both trip

$$S_{AV} = \frac{d}{\Delta t}$$



$$d = (S_{AV})\Delta t$$

$$S_N = 105 \text{ km/h}$$



NORMAL

$$\Delta t_N = 2 \text{ h}, 20 \text{ min}$$

Can't multiply min by $\frac{\text{km}}{\text{h}}$, so $2 \text{ h} + 20 \text{ min} = 2 \text{ h} + 20 \text{ min} \times \frac{\text{h}}{60 \text{ min}} = 2\frac{1}{3} \text{ h}$

$$d = \left(105 \frac{\text{km}}{\text{h}}\right) \left(2\frac{1}{3} \text{ h}\right) = 245 \text{ km}$$

$$\text{Unit: } \frac{\text{km}}{\text{h}} \cdot \text{h} = \text{km}$$

$$S_F = 70 \text{ km/h}$$



Friday

$$S_F = \frac{d}{\Delta t_F} \Rightarrow \Delta t_F = \frac{d}{S_F} = \frac{245 \text{ km}}{70 \text{ km/h}} = 3.5 \text{ h}$$

How much longer $\Rightarrow 3.5 \text{ h} - 2\frac{1}{3} \text{ h} = 1\frac{1}{6} \text{ h} = \cancel{1 \text{ h}} + \frac{1}{6} \text{ h}$

$$\frac{1}{6} \text{ h} \times \frac{60 \text{ min}}{\text{h}} = 10 \text{ min}$$