HW # 1 solution

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7) I am standing at the post office. Lisa is off to my left (2mi). Now she's off to my right (3mi). Shortest distance b/w these two pts is 5mi.

(some number) (+ or − or $\hat{i}\ \hat{j}\ \hat{k}$ or $\hat{x}\ \hat{y}\ \hat{z}$ etc)
Displacement: distance + direction.

The problem stated that increasing x is east. Lisa is now more east than she was. So displacement must be positive. If Lisa stayed put her displacement is zero

Displacement is: +5mi or 5mi

(insert final position) (insert initial position)

$$\Delta x = x_f - x_i$$
$$= 3mi - (-2mi)$$

8) The guard is walking 110m (nearly a football field) and it takes 4min (240s). How far does the guard walk per minute? $\frac{11}{24}$ m/s or $\frac{55}{2}\frac{m}{min}$. speed is just a fraction relating distance and time.

12) $\frac{\Delta x}{\Delta t} = \frac{3m-(-12m)}{10s-0s} = \frac{15m}{10s} = +\frac{3}{2}$ m/s

note the components of velocity

$+$, $\frac{3}{2}$, $\frac{m}{s}$

what direction — how big — meter stick and the tick of a clock.
why are these important?

13) $\frac{\Delta x}{\Delta t} = \frac{x_f - x_i}{t_f - t_i} = 0.35 m/s$ $\quad \frac{7.3m - 2.1m}{\frac{0.35m}{s}} \cdot \frac{\frac{s}{m}}{\frac{s}{m}} = \frac{7.3s - 2.1s}{0.35} = 15s$

15) a. $8.0\ in \cdot 0.025 \frac{m}{in} = 0.20m$

b. $66 \cdot \frac{ft}{s} \frac{12in}{1f} \frac{1m}{39in} = 20m/s$

c. $60 \frac{mi}{hr} \cdot \frac{hr}{3600s} \cdot \frac{1.6Km}{mi} \cdot \frac{1000m}{Km} = 27m/s$

17) $\frac{1\,mm}{1\,\mu s} = \frac{\frac{1}{1000}m \cdot 1{,}000{,}000}{\frac{1}{1{,}000{,}000}s \cdot 1{,}000{,}000} = 1{,}000\,m$ (3)

(mm ← 1 thousandth of a meter; μs ← 1 millionth of a second)

$\frac{1\,Km}{1\,Ks} = \frac{1000\,m}{1000\,s} = 1\,m/s$ (1)

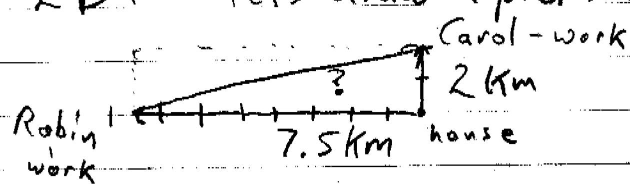
(Km ← 1 thousand meters; Ks ← 1 thousand seconds)

$\frac{1\,cm}{1\,ms} = \frac{\frac{1}{100}m \cdot 1000}{\frac{1}{1000}s \cdot 1000} = 10\,m/s$ (2)

21) $1250\,ft = 1.25 \times 10^3\,ft \times \frac{0.305\,m}{1.00\,ft} = 0.381 \times 10^3_m = 3.81 \times 10^2_m$

3 sig figs
(zero doesn't count usually unless someone says it does)

28) 2D! let's draw a picture.

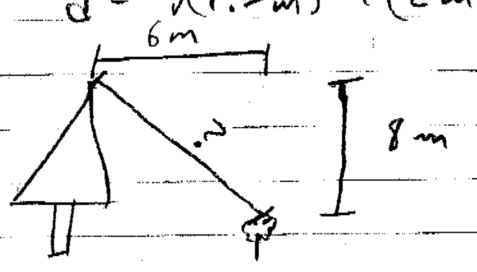


use distance formula: $d = \sqrt{x^2 + y^2}$

note: for 3D $d = \sqrt{x^2 + y^2 + z^2}$
4D $d = \sqrt{x^2 + y^2 + z^2 + w^2}$
etc.

$d = \sqrt{(7.5m)^2 + (2m)^2} = 7.8m$

31)



$d = \sqrt{6m^2 + 8m^2} = 10m$

33) North: +y South: −y East: +x West: −x
displacement: $(0, 130m) + (50m, 0) + (0, -40m) = (50m, 90m)$ →

33 continued) $\sqrt{(50m)^2 + (90m)^2} = 103m$ ← magnitude

direction: $\tan^{-1}\left(\frac{90m}{50m}\right) = 61°$

displacement = (103m, 61°)

$\simeq$ (100m, 61°) ← better answer