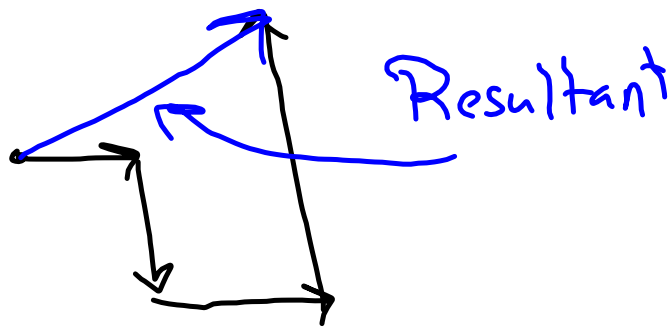


Physics 112  
Vectors



- Can add in any order as long as tip to tail.
- Resultant is a vector from the tail of the first to the tip of the last.



- When we subtract vectors we change the subtract to an add, and change the direction of the vector being subtracted.



3m East - 4m North

3m East + 4m South



$$1. \vec{V}_A = 9.0 \text{ m E } 30 \text{ N}$$

$$\vec{V}_B = 11.0 \text{ m W } 70 \text{ S}$$

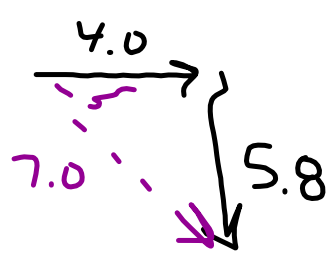
$$a) \vec{V}_A + \vec{V}_B$$

$$b) \vec{V}_A - \vec{V}_B$$

$$c) \vec{V}_B - \vec{V}_A$$

a)  $\vec{V}_A + \vec{V}_B$

7.8  $\rightarrow$   $\uparrow$  4.5 +  $\leftarrow$  3.8  $\downarrow$  10.3

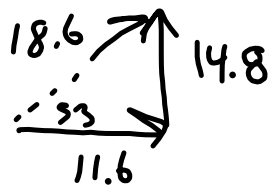


7.0 m ESSS

b)  $\vec{V}_A - \vec{V}_B$

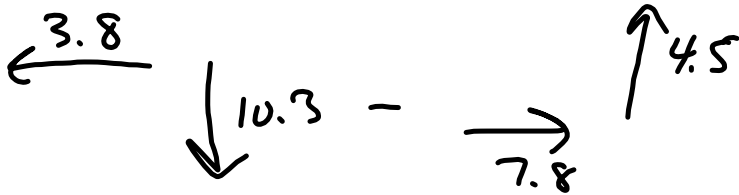
$\begin{matrix} 7.8 \\ \rightarrow \end{matrix} \quad \begin{matrix} \uparrow 4.5 \\ \end{matrix} - \begin{matrix} 3.8 \\ \leftarrow \end{matrix} \quad \begin{matrix} \downarrow 10.3 \\ \end{matrix}$

$\begin{matrix} 7.8 \\ \rightarrow \end{matrix} \quad \begin{matrix} \uparrow 4.5 \\ \end{matrix} + \begin{matrix} 3.8 \\ \rightarrow \end{matrix} \quad \begin{matrix} \uparrow 10.3 \\ \end{matrix}$



18.6m E S 3 N

c)  $\vec{V}_B - \vec{V}_A$



18.6 m W S 3 S

$$2. \vec{v}_A = 3\text{m West}$$

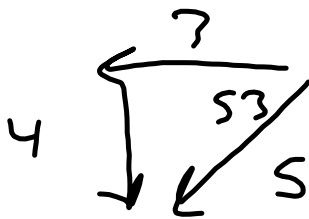
$$\vec{v}_B = 4\text{m South}$$

Add a) graphically

b) mathematically



a)



5m W 53 S

graphically

Scale 1cm = 1m  
use protractor.

3. A car moving East at 15.0 m/s turns and heads north at 11.0 m/s. It takes 1.5 seconds to make the turn. Determine the acceleration while making the turn.

$$a = \frac{V_2 - V_1}{t} = \frac{11.0 \text{ m/s North} - 15.0 \text{ m/s East}}{1.5 \text{ seconds}}$$



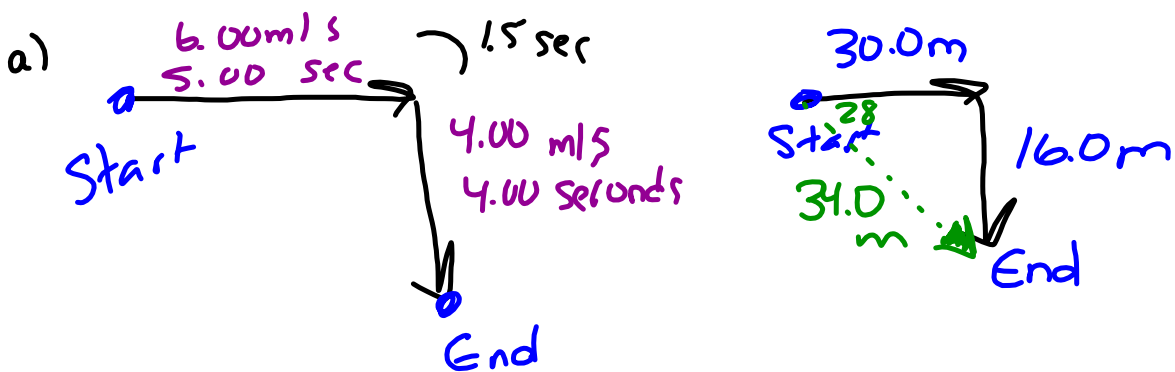
$$= \frac{11.0 \text{ m/s North} + 15.0 \text{ m/s West}}{1.5 \text{ seconds}}$$

$$= \frac{18.6 \text{ m/s W } 36 \text{ N}}{1.5 \text{ seconds}}$$

$$a = 12.4 \text{ m/s}^2 \text{ W } 36 \text{ N}$$

4. A dog runs East at  $6.00 \text{ m/s}$  for  $5.00 \text{ seconds}$ . It rounds a corner and heads South at  $4.00 \text{ m/s}$  for  $4.00 \text{ seconds}$ . The turn took  $2.0 \text{ seconds}$ .

- a) Sketch the situation
- b) overall distance travelled
- c) overall displacement
- d) Average speed
- e) Average velocity
- f) Acceleration taking the turn.



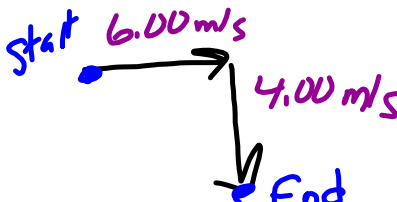
b) distance = 30.0 m + 16.0 m = 46.0 m

c) displacement = 34.0 m E 28 S

d) speed =  $\frac{\text{distance}}{\text{time}} = \frac{46.0 \text{ m}}{10.5 \text{ sec}} = 4.38 \text{ m/s}$

e) velocity =  $\frac{\text{displacement}}{\text{time}} = \frac{34.0 \text{ E } 28 \text{ S}}{10.5 \text{ sec}} = 3.24 \text{ m/s E } 28 \text{ S}$

f)  $a = \frac{v_2 - v_1}{t}$



$= \frac{4.00 \text{ m/s South} - 6.00 \text{ m/s East}}{1.5 \text{ sec}}$

$= \frac{4.00 \text{ m/s South} + 6.00 \text{ m/s West}}{1.5 \text{ sec}}$

$= \frac{7.21 \text{ m/s W } 34 \text{ S}}{1.5 \text{ sec}}$

$a = 4.81 \text{ m/s}^2 \text{ W } 34 \text{ S}$