7.) Which of the following are vector quantities and which are scalar quantities?(a) your age (b) acceleration (c) velocity (d) speed (e) mass

8.) Given the following vectors, create head to tail models and find the resultant magnitude and direction. the arrows are not perfect but use the corner that they are closest to

E − G

E

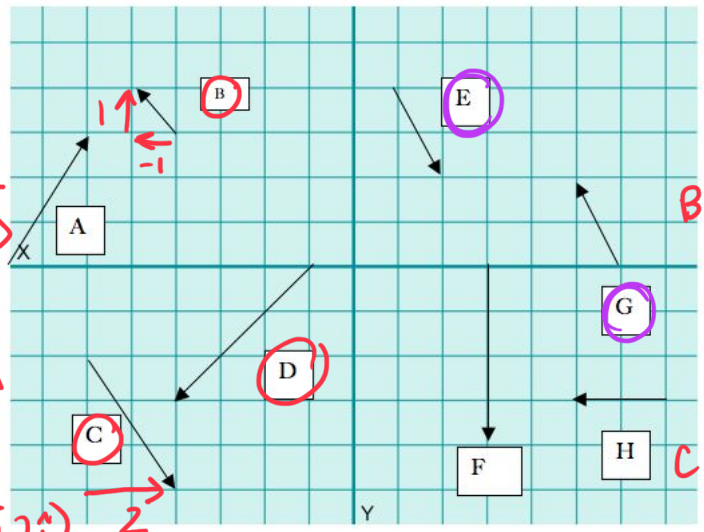
$\langle \hat{i} - 2\hat{j} \rangle$

G

$-\hat{i} + 2\hat{j}$

−G

$-(-\hat{i} + 2\hat{j})$



B

x	y
-1	1

B: $\langle -\hat{i} + \hat{j} \rangle$

C

x	y
2	-3

C: $\langle 2\hat{i} - 3\hat{j} \rangle$

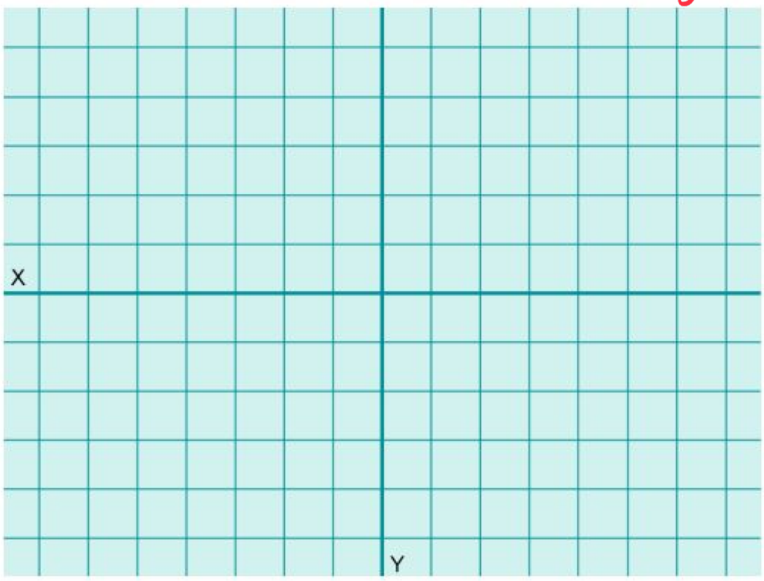
a) A + B $\langle \hat{i} - 2\hat{j} \rangle$

D

$-3\hat{i} - 3\hat{j}$

E

$\hat{i} - 2\hat{j}$



Magnitude = _____ Direction = _____

b) $\boxed{\text{B + C}}$

vectors

$B: \langle -\hat{i} + \hat{j} \rangle$

$+ \; C: \langle 2\hat{i} - 3\hat{j} \rangle$

Tot: $\hat{i} - 2\hat{j}$

$r = \sqrt{x^2 + y^2}$

$\sqrt{(1)^2 + (-2)^2}$

$\sqrt{1+4} = \sqrt{5}$

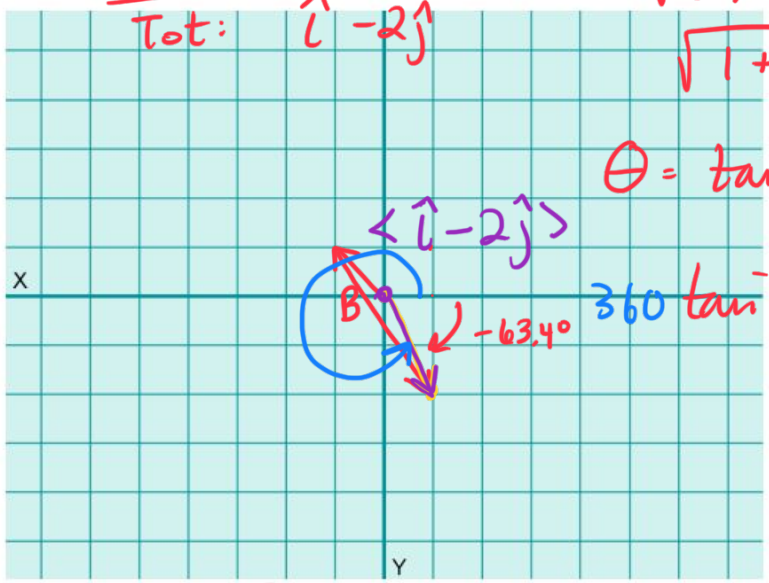
$\theta = \tan^{-1} \frac{y}{x}$

$\tan^{-1}\left(\frac{-2}{1}\right)$

$= -63.4°$

$360 - 63.4$

$296.6°$



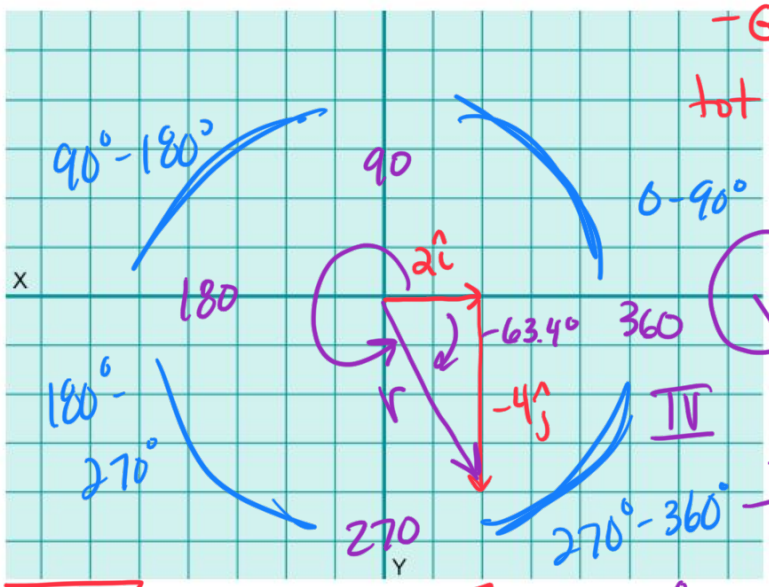
Magnitude = $\sqrt{5}$ Direction = $296.6°$

c) E - G

$E = \langle \hat{i} - 2\hat{j} \rangle$

$-G \langle \hat{i} - 2\hat{j} \rangle$

tot $\langle 2\hat{i} - 4\hat{j} \rangle$



360.0
$- \; 63.4$
$296.6°$

$\boxed{\text{Magnitude}}$ = $\sqrt{20}$ or $2\sqrt{5}$ $\boxed{\text{Direction}}$ = $296.6°$

r $\qquad \theta$

$\theta = \tan^{-1}\left(\frac{y}{x}\right)$

$\tan^{-1}\left(\frac{-4}{2}\right) = -63.4°$

$r = \sqrt{x^2 + y^2}$

$= \sqrt{(2)^2 + (-4)^2} = \sqrt{4+16} = \sqrt{20} = 2\sqrt{5}$

d) D + E

D: $\langle -3\hat{i} - 3\hat{j} \rangle$

E: $\langle \hat{i} - 2\hat{j} \rangle$

total: $\langle -2\hat{i} - 5\hat{j} \rangle$

$r = \sqrt{x^2 + y^2}$

$\sqrt{(-2)^2 + (-5)^2}$

$\sqrt{4 + 25}$

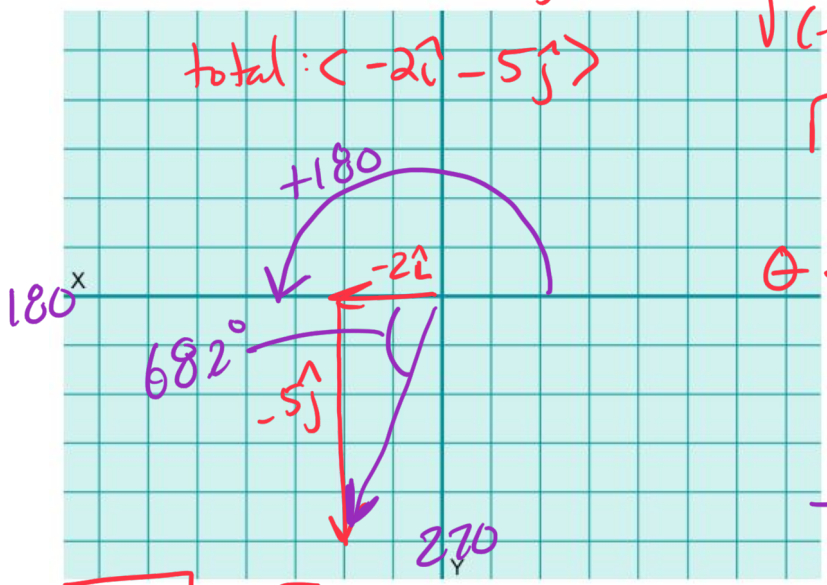
$\sqrt{29}$

$\theta = \tan^{-1}\left(\frac{-5}{-2}\right)$

$= 68.2$

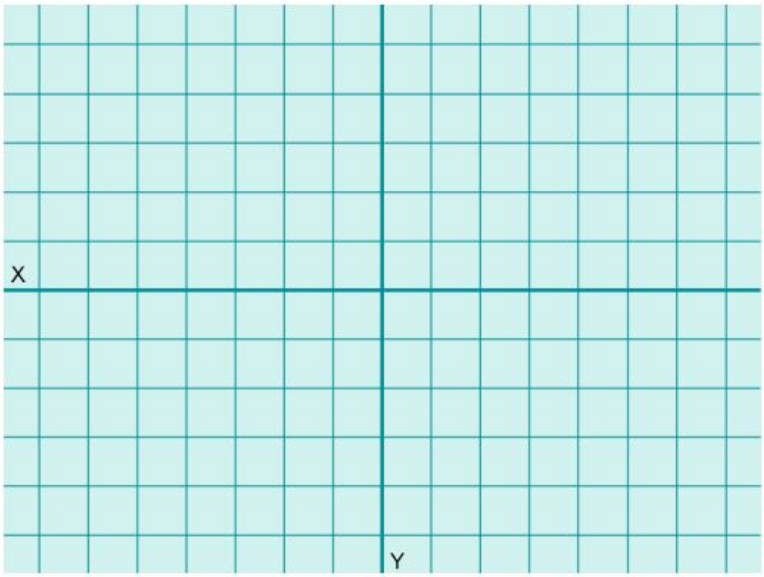
$+ 180$

248



Magnitude = $\sqrt{29}$ Direction = 248°

e) A - C



Magnitude = _____ Direction = _____

M-6P General Physics Week 15 1/8

Sum of Vectors:

A: $\langle \boxed{2.0\hat{i}} + \boxed{3.0\hat{j}} \rangle$ B: $\langle \boxed{4.0\hat{i}} - \boxed{5.0\hat{j}} \rangle$

A+B $\langle 6.0\hat{i} - 2.0\hat{j} \rangle$

resultant $r = \sqrt{x^2+y^2} = \sqrt{(6)^2+(-2)^2}$

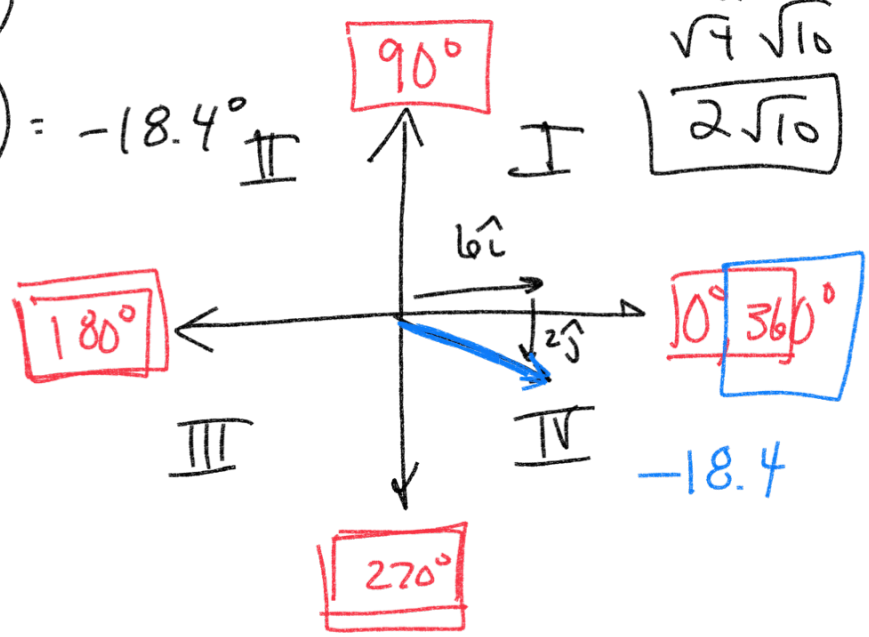
$\sqrt{36+4} = \sqrt{40}$

$\sqrt{4}\sqrt{10}$

$\boxed{2\sqrt{10}}$

$\theta = \tan^{-1}\left(\frac{y}{x}\right)$

$\tan^{-1}\left(\frac{-2}{6}\right) = -18.4°$



-18.4

$$\begin{array}{r} 360.0 \\ -18.4 \\ \hline 341.6° \end{array}$$

$\boxed{(2\sqrt{10}, 341.6°)}$

mag, dir

$d_1 : \langle 15\hat{i} + 30\hat{j} + 12\hat{k} \rangle$

$d_2 : \langle 23\hat{i} + 14\hat{j} + 5.0k \rangle$

$d_3 : \langle 13\hat{i} + 15\hat{j} \rangle$

$$\langle 51\hat{i} + 59\hat{j} + 17k \rangle$$

Magnitude / Resultant ?

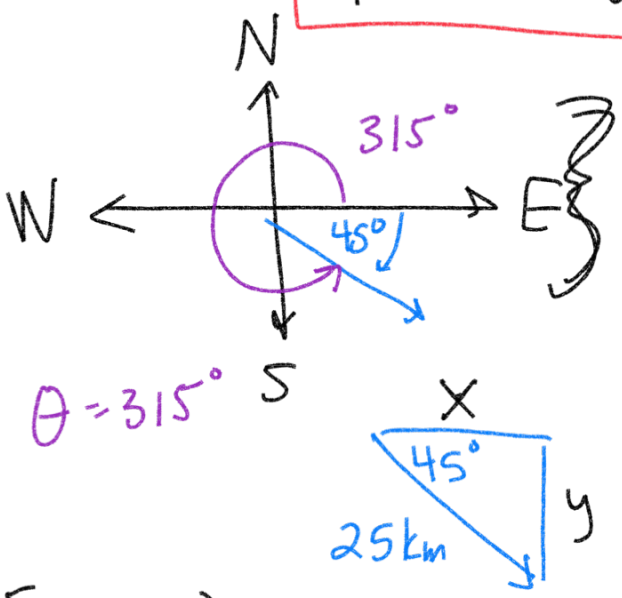
$$r = \sqrt{x^2 + y^2 + z^2} = \sqrt{(51)^2 + (59)^2 + (17)^2}$$

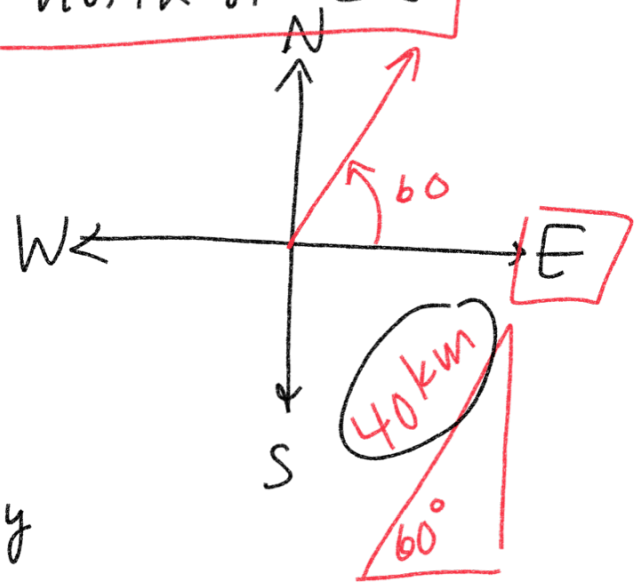
$$\sqrt{6371} = 79.8$$

Hiker

$\boxed{25\text{ km} \quad 45^\circ \text{ south of east}}$

$\boxed{40\text{ km} \quad 60^\circ \text{ north of east}}$





$25(\cos 45^\circ) = \left(\frac{x}{25}\right)25$

$x = 25\cos 45^\circ$

$= 17.7\text{ km}$

$25(\sin 45^\circ) = \left(\frac{y}{25}\right)25$

$y = 25\sin 45$

$= -17.7\text{ km}$

$x = r\cos\theta$

$= 25\cos(315)$

$\boxed{17.7\text{ km}}$

$y = r\sin\theta$

$25\sin(315)$

$\boxed{-17.7\text{ km}}$

$x = r\cos\theta$

$40\cos 60$

$\boxed{20\text{ km}}$

$y = r\sin\theta$

$40\sin 60^\circ$

$\boxed{34.6\text{ km}}$

tot x : 17.7 km + 20 km = 37.7 km

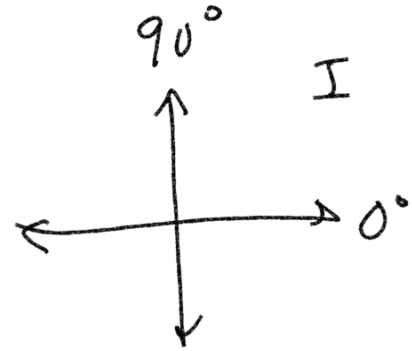
tot y : −17.7 km + 34.6 km = 16.9 km

tot x : 17.7 km + 20 km = 37.7 km

tot y : −17.7 km + 34.6 km = 16.9 km

$$r = \sqrt{x^2 + y^2} = \sqrt{(37.7)^2 + (16.9)^2}$$

$$= \boxed{41.3 \text{ km}}$$



$$\theta = \tan^{-1}\left(\frac{y}{x}\right)$$

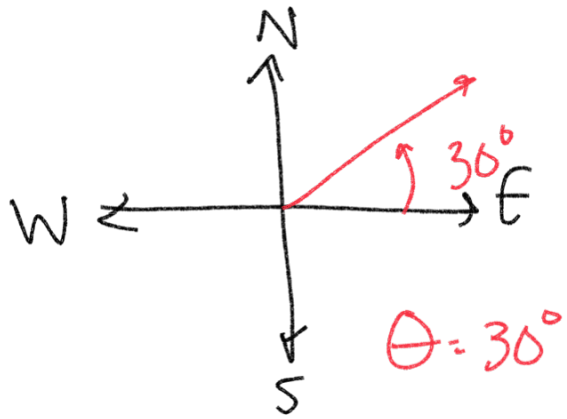
$$\tan^{-1}\left(\frac{16.9}{37.7}\right) = \boxed{24.1^\circ}$$

$$\boxed{41.3 \text{ km}, \ 24^\circ \text{ N of E}}$$

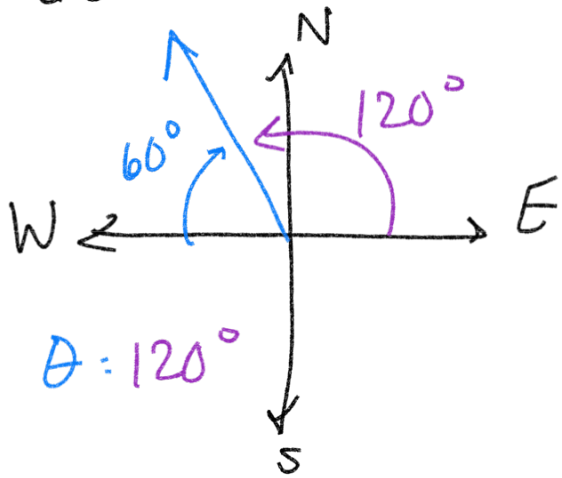
① 4 km 30° North of East

② 6 km 60° North of West

30° N of E



60° N of W



$\boxed{x}$: $r\cos\theta + r\cos\theta$

① $4\cos 30° + ② \; 6\cos 120°$

$3.5 + -3 = \boxed{0.5}$

$\boxed{y}$: $r\sin\theta + r\sin\theta$

① $4\sin 30° \quad ② \; 6\sin 120$

$2 + 5.2 = \boxed{7.2}$

$r = \sqrt{x^2 + y^2} = \sqrt{(0.5)^2 + (7.2)^2} = \boxed{7.2}$

$\theta = \tan^{-1}\left(\frac{7.2}{0.5}\right) = 86°$ $\boxed{7.2, 86°}$