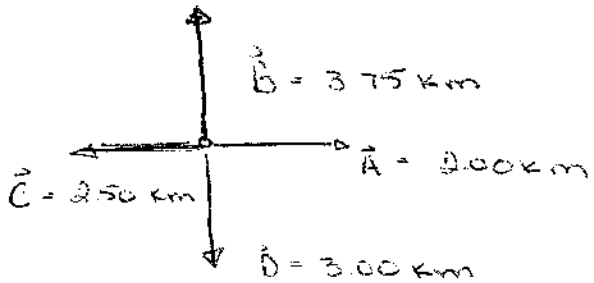
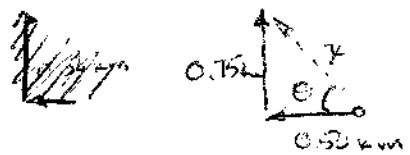
(25)



	X	Y
$\vec{A}$	2.00 km	0
$\vec{B}$	0	3.75 km
$\vec{C}$	-2.50 km	0
$\vec{D}$	0	-3.00 km
	-0.50 km	0.75 km

final vector:



$x^2 = (0.50\text{ km})^2 + (0.75\text{ km})^2$

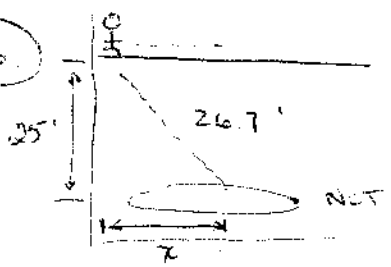
$x = 0.901$ km

final displacement = 0.901 km 56.3° NW

$\tan\theta = \frac{0.75}{0.50} = 1.5$

$\theta = \tan^{-1}(1.5) = 56.3°$

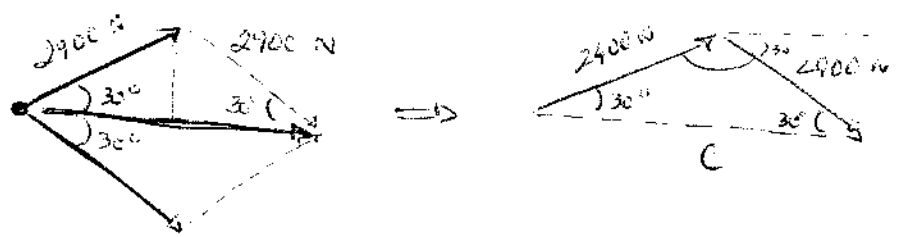
(26)



$(26.7')^2 = (25')^2 + x^2$

$x = 9.4$ ft

(27)

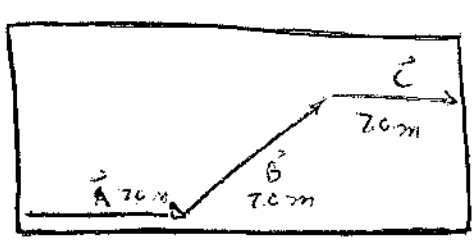


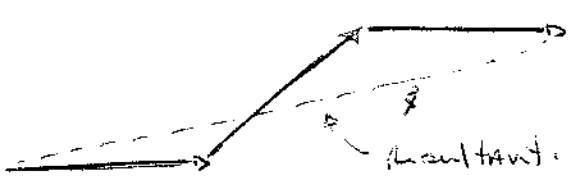
$C^2 = (2400)^2 + (2400)^2 - 2(2400)(2400)\cos(120°)$

$C = 4102\text{ N} = 4.1 \times 10^3\text{ N}$

$\vec{C} = 4.1 \times 10^3$ N directed East

(28)





	X	Y
$\vec{A}$	7.0 km	0
$\vec{B}$	7cos(45)	7sin(45)
$\vec{C}$	7	0
	11.9 km	4.95 km

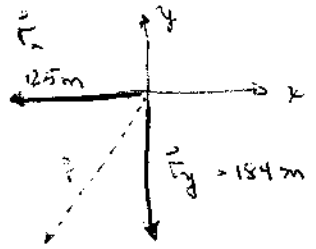
$|\vec{x}| = (11.9)^2 + (4.95)^2$

$= 12.9$ km

$\theta = \tan^{-1}(4.95/11.9) = 22.6°$

$\vec{x} = 12.9$ km 22.6° NE

35.



$\vec{r} = -125\text{m}\,\hat{i} - 184\text{m}\,\hat{j}$

$|\vec{r}| = \left[(-125)^2 + (-184)^2\right]^{1/2}$

$= 222\text{ m}$

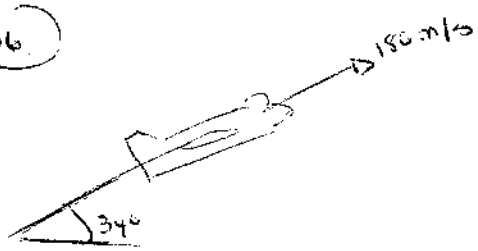
x	y
-125m	-184m

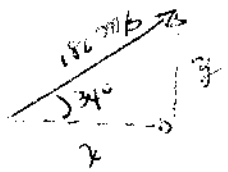
$\vec{r} =$

$\theta = \tan^{-1}\left(\frac{-184}{-125}\right) = 55.8°$

So $\vec{r} = 222 \times 10^2\text{m}$ $55.8°$ SE

(36)





Snap it off

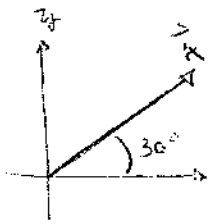
$V_x = 180\text{ m/s}\cos(34) = 149.2\text{ m/s}\,\hat{i}$

$V_y = 180\text{ m/s}\sin(34) = 100.7\text{ m/s}\,\hat{j}$

Shadow moves 150 m/s along ground

(37)

A



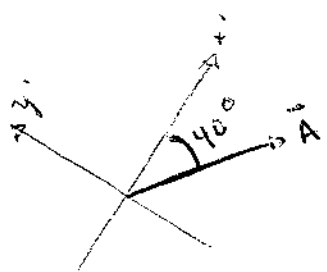
$|\vec{A}| = 750\text{ units} = 750\text{ u}$

Snap it off $\vec{A}_x = 750\text{ u}\cos(30) = 650 \times 10^2\text{ u}\,\hat{i}$

$\vec{A}_y = 750\text{ u}\sin(30) = 375 \times 10^2\text{ u}\,\hat{j}$

(a) $\vec{A} = 650 \times 10^2\text{ u}\,\hat{i} + 375 \times 10^2\text{ u}\,\hat{j}$

(b)

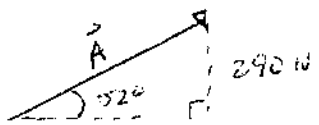


Snap it off. $\vec{A}_{x'} = 750\text{ u}\cos(-40)\,\hat{i} = 575 \times 10^2\text{ u}\,\hat{i}$

$\vec{A}_{y'} = 750\text{ u}\sin(-40)\,\hat{j} = -482 \times 10^2\text{ u}\,\hat{j}$

$\vec{A} = 575 \times 10^2\text{ u}\,\hat{i} - 482 \times 10^2\text{ u}\,\hat{j}$

(38)



(a) $A_y = |\vec{A}| \sin(52)$

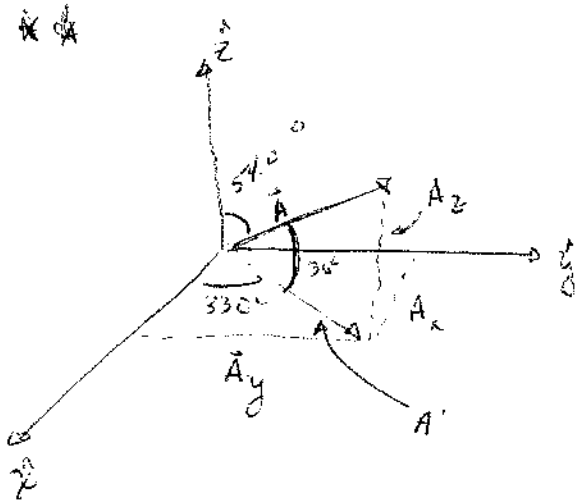
$\frac{290\ N}{\sin(52)} = |A| = 3.7 \times 10^2\ N$

(b) $A_x = |\vec{A}| \cos(52)$

$= 3.68 \times 10^2 N \cos(52) = 2.3 \times 10^2 N$

$A_x = 2.3 \times 10^2 N$

(39) ** *



1st, find component A' located in x-y plane. the Angle between $\vec{A}$ & the x-y plane is 36°

So $|\vec{A}'| = |\vec{A}| \cos(36^\circ)$

$= 475\ N \cos(36^\circ)$

$|A'| = 3.84 \times 10^2\ N$

$|\vec{A}_z| = |\vec{A}| \sin(36.0)$

$= 475\ N \sin(36.0)$

$= 2.79 \times 10^2\ N$

$|\vec{A}_x| = |\vec{A}'| \cos(33)$

$= 3.84 \times 10^2 N \cos(33)$

$= 3.22 \times 10^2\ N$

$|\vec{A}_y| = |\vec{A}'| \sin(33)$

$= 3.84 \times 10^2 N \sin(33)$

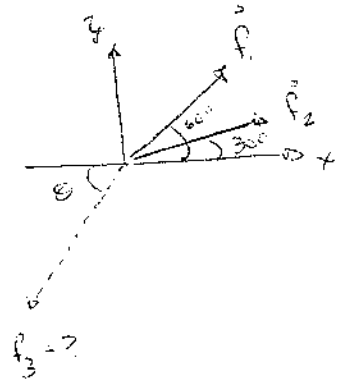
$= 2.09 \times 10^2 N$

Self check

$|\vec{A}|^2 = |\vec{A}_x|^2 + |\vec{A}_y|^2 + |\vec{A}_z|^2$

$(475)^2 = (279)^2 + (322)^2 + (209)^2$ ✓ OK

(46)



$$\vec{F}_{TOTAL} = \vec{f}_1 + \vec{f}_2 + \vec{f}_3 = 0$$

So we are going to break up $\vec{f}_1$ & $\vec{f}_2$ into parts. Swap it off!

$$\vec{f}_1 = 166\,N\cos(60)\,\hat{x} + 166\,N\sin(60)\,\hat{y}$$
$$= 83\,N\,\hat{x} + 144\,N\,\hat{y}$$
$$\vec{f}_2 = 284\,N\cos(30)\,\hat{x} + 284\,N\sin(30)\,\hat{y}$$
$$= 246\,N\,\hat{x} + 142\,N\,\hat{y}$$

$$\vec{F}_{TOTAL} = 0 = (83\,N + 246\,N)\,\hat{x} + (144\,N + 284\,N)\,\hat{y} + \vec{f}_3$$
$$0 = 329\,N\,\hat{x} + 428\,N\,\hat{y} + \vec{f}_3$$

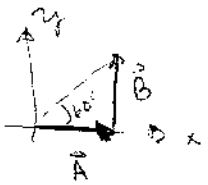
So, by inspection we see: $\vec{f}_3 = -329\,N\,\hat{x} - 428\,N\,\hat{y}$ to cancel

$$|\vec{f}_3| = \left[(-329)^2 + (-428)^2\right]^2 = 540\,N$$

$$\theta = \tan^{-1}\left(f_x/f_y\right) = \tan^{-1}\left(-428\,N/329\,N\right) = 52.5^\circ \quad (52.45^\circ)$$

$$\vec{f}_3 = 540\,N \text{ @ } 52^\circ \text{ SE}$$

(47)



$|\vec{A}| = 6$ u but know $\tan(60) = \frac{x}{6}$

$|\vec{B}| = ?$

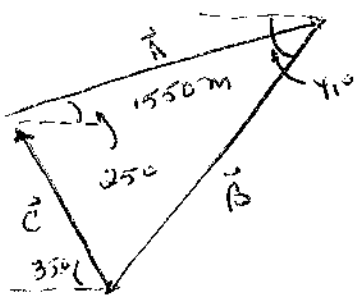
So, $x = 6\tan(60)$

$= 10.4$ units

$$\vec{A} + \vec{B} = 6u\,\hat{x} + 10.4u\,\hat{y}$$
$$= \left[6^2 + (10.4)^2\right]^{1/2} 60\,NE$$
$$= 12u\ 60^\circ\ NE \quad \text{(3 Sig Figs)}$$

48.

Tough! look at x & y components



	x	y
$\vec{A}$	1550 cos(25)	1550 sin(25)
$\vec{B}$	− B cos(41)	− B sin(41)
$\vec{C}$	− C cos(35)	+ C sin(35)
	0	0

We know both columns must add to zero so

i $1550\cos(25) - B\cos(41) - C\cos(35) = 0$

ii $1550\sin(25) - B\sin(41) + C\sin(35) = 0$

} 2 equations w/ 2 unknowns

from i $1405 - 0.7547B - 0.8192C = 0$

iii $$C = \frac{1405 - 0.7547B}{0.8192} = 1715 - 0.9213B$$

from ii $655.1 - 0.6561B + 0.5736C = 0$

Put in iii $655.1 - 0.6561B + 0.5736(1715 - 0.9213B) = 0$

$1638 - 1.1845B = 0$

$|\vec{B}| = 1384\ m$

$|B| = 1380\ m$ 3 Sig. Figs.

$|\vec{C}| = C = 1715 - 0.9213B$

$= 1715 - 0.9213(1380\ m)$

$= 443.6\ m$

$|\vec{C}| = 444\ m$ 3 Sig Figs