Cutnell/Johnson 8 Chapter 1

1-6 $v^n = 2ax$

$$\left(\frac{L}{T}\right)^n = \frac{L}{T^2} \cdot L = \frac{L^2}{T^2} = \left(\frac{L}{T}\right)^2$$

so $n = 2$

1-4 $v = 34 \text{ mph}$

(a) $1 \text{ mile} = 5280 \text{ ft} \times \frac{1 \text{ m}}{3.281 \text{ ft}} = 1609 \text{ m}$

$= 1.6 \text{ km} =$

& $v = 34 \frac{\text{miles}}{\text{hr}} \times \frac{1.6 \text{ km}}{\text{mile}} = 54.4 \text{ km/hr}$

(b) $v = 54.4 \times 10^3 \text{ m/hr} \times \frac{1 \text{ hr}}{60 \times 60 \text{ s}}$

$v \simeq 15 \text{ m/s}$

1-9 (a) $F = ma$

$\frac{ML}{T^2}$ $M\ \frac{L}{T^2}$ ok

(b) $x = \frac{1}{2}at^3$

L $\frac{L}{T^2}T^3 = LT$ NO

(c) $E = \frac{1}{2}mv$

$\frac{ML^2}{T^2}$ $M\ \frac{L}{T}$ NO

(d) $E = max$

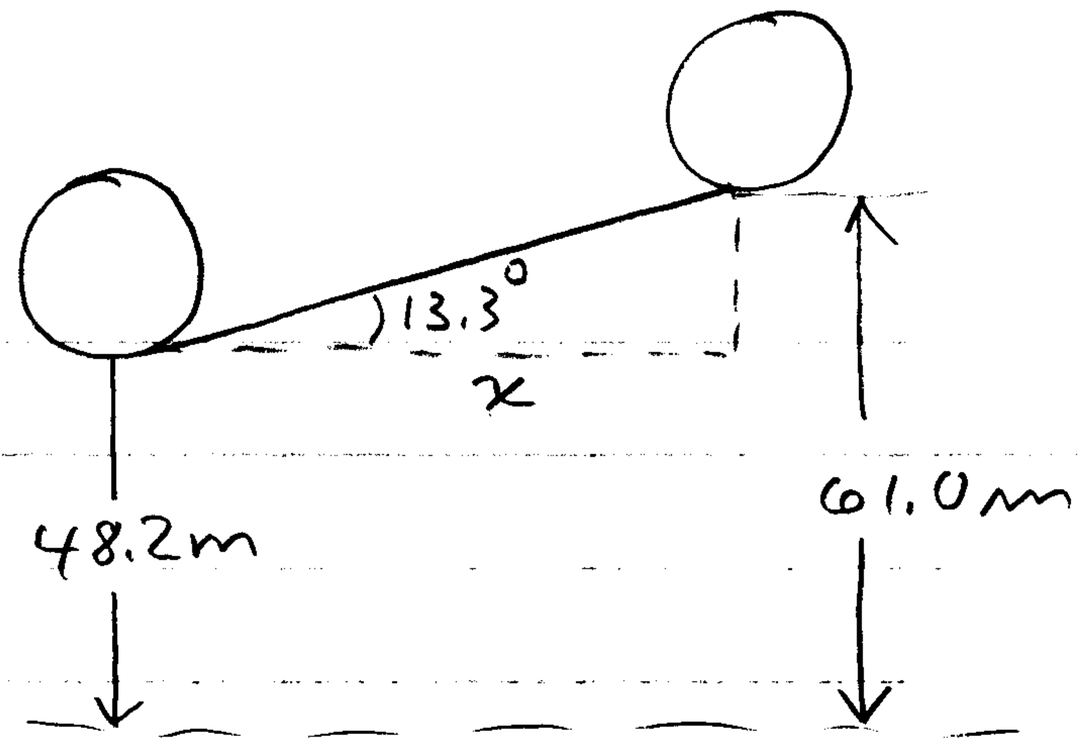
$\frac{ML^2}{T^2}$ $M\ \frac{L}{T^2}L = \frac{ML^2}{T^2}$ ok

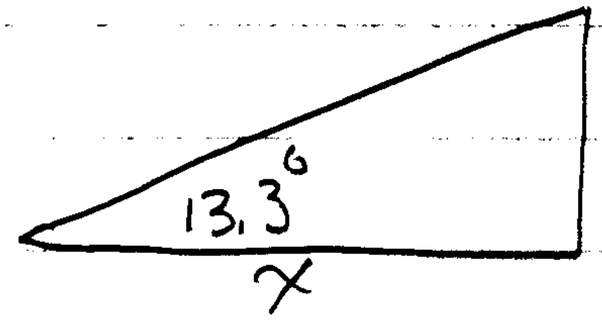
(e) $v = \sqrt{\frac{Fx}{m}}$

$\frac{L}{T}$ $\sqrt{\frac{ML}{T^2}\cdot\frac{L}{M}} = \sqrt{L^2/T^2} = \frac{L}{T}$

ok

1-18





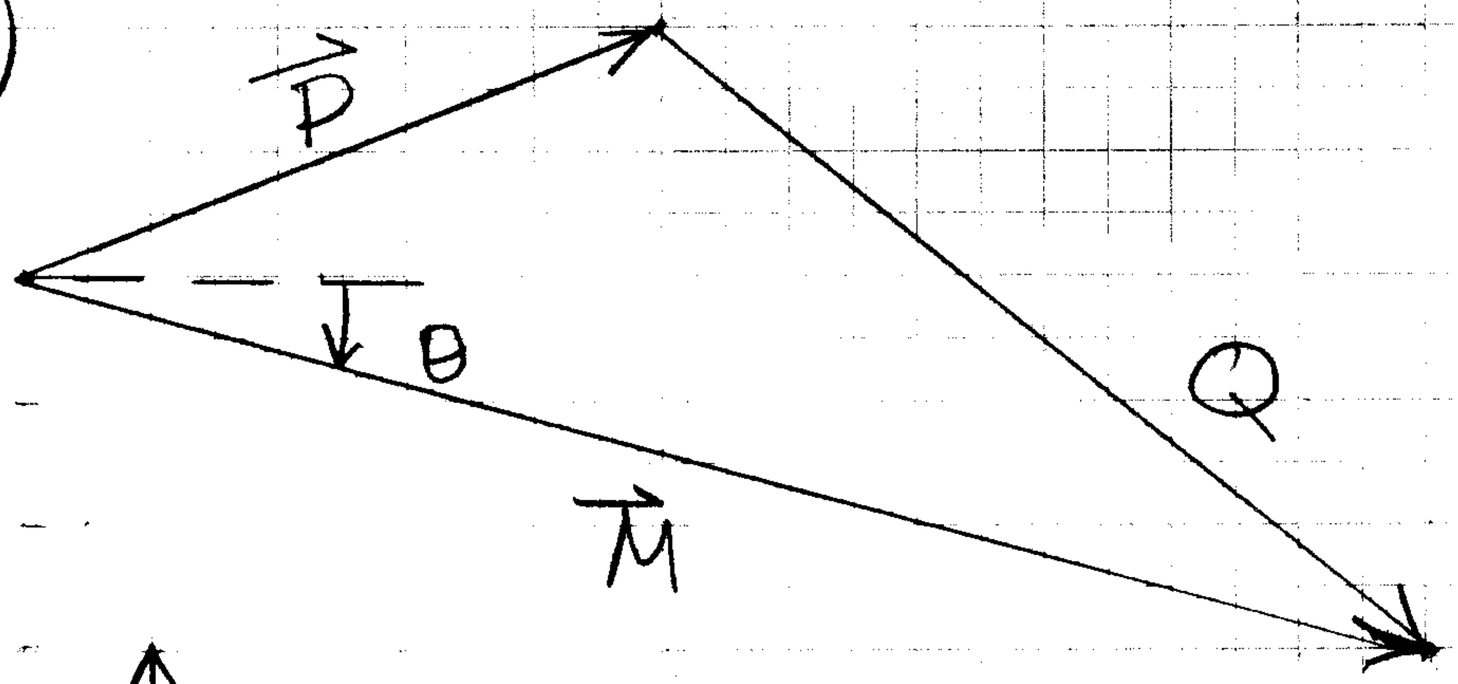
61.0 − 48.2
= 12.8m

$$\tan 13.3 = \frac{12.8}{x}$$

$$x = \frac{12.8}{\tan 13.3} = \frac{12.8}{0.23}$$

$$x = 54.1\ m$$

(a)



$\vec{M} = \vec{P} + \vec{Q}$

Scale ↕ 4cm

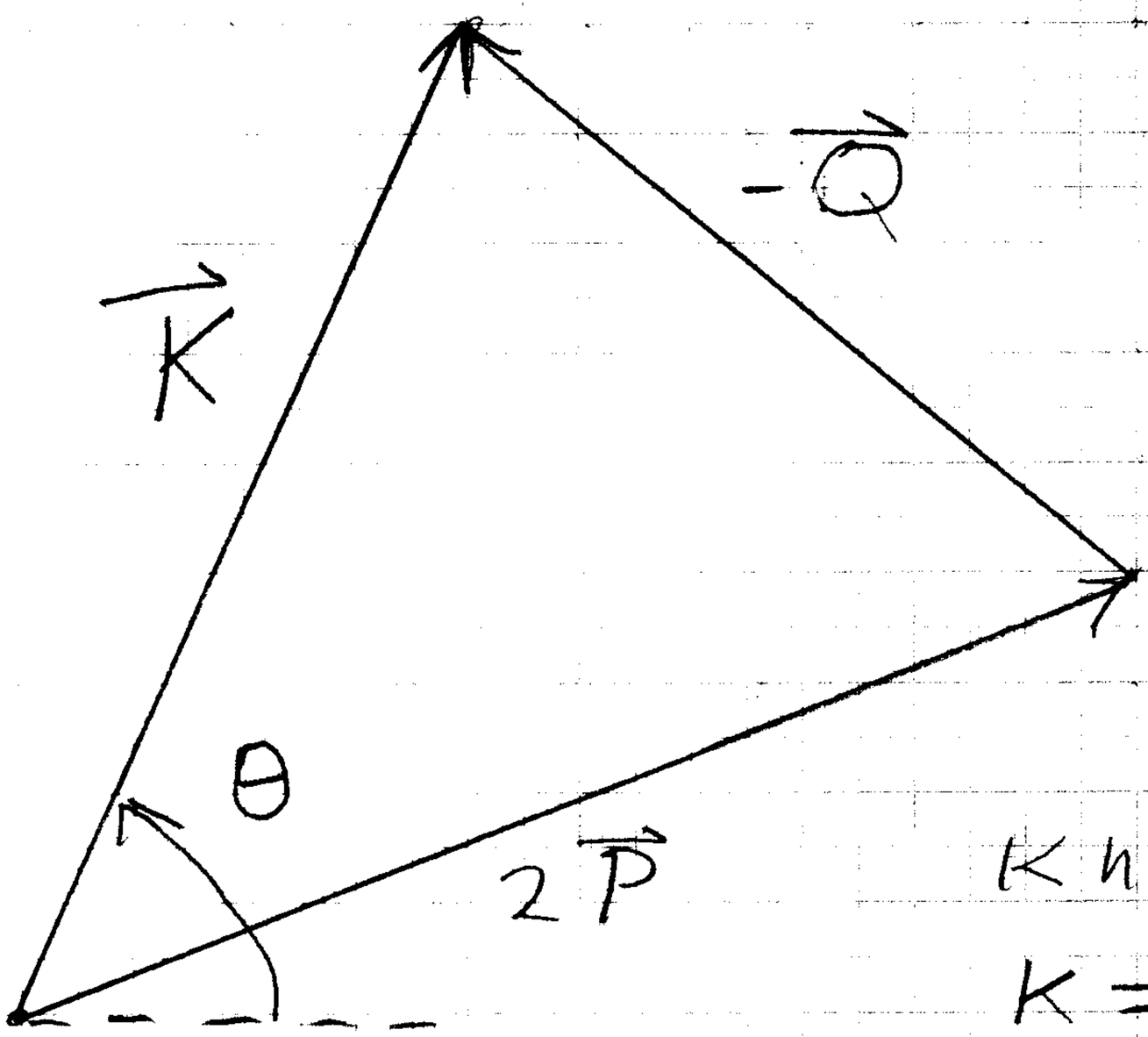
M has 3 vertical divisions x 11 horizontal

$\sqrt{3^2 + 11^2} = 11.4$ divisions × 4cm/div

$M = 45.6$ cm

Measure θ with protractor $\cong 15^0$

(b)



$\vec{K} = 2\vec{P} - \vec{Q}$

$= 2\vec{P} + (-Q)$

$-\vec{Q}$ is a vector having the same mag. as Q but in opposite direction

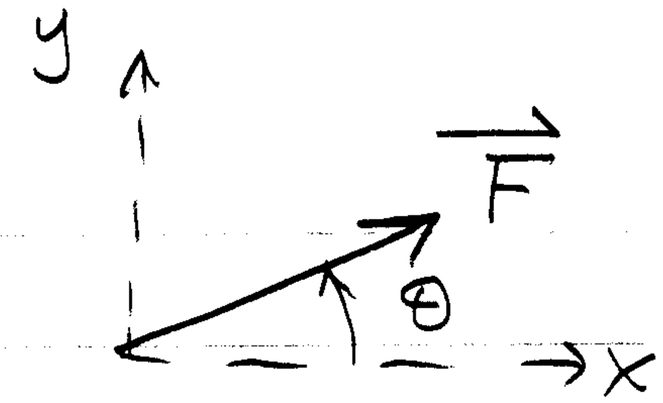
K has 9×4 divisions

$K = 9.85$ div × 4cm/div

$= 39.4$ cm

$\theta \cong 67^\circ$

1-38



$F_x = 150\,N$

$F_y = 130\,N$

(a) $F = \sqrt{F_x^2 + F_y^2}$

$= \sqrt{39400}$

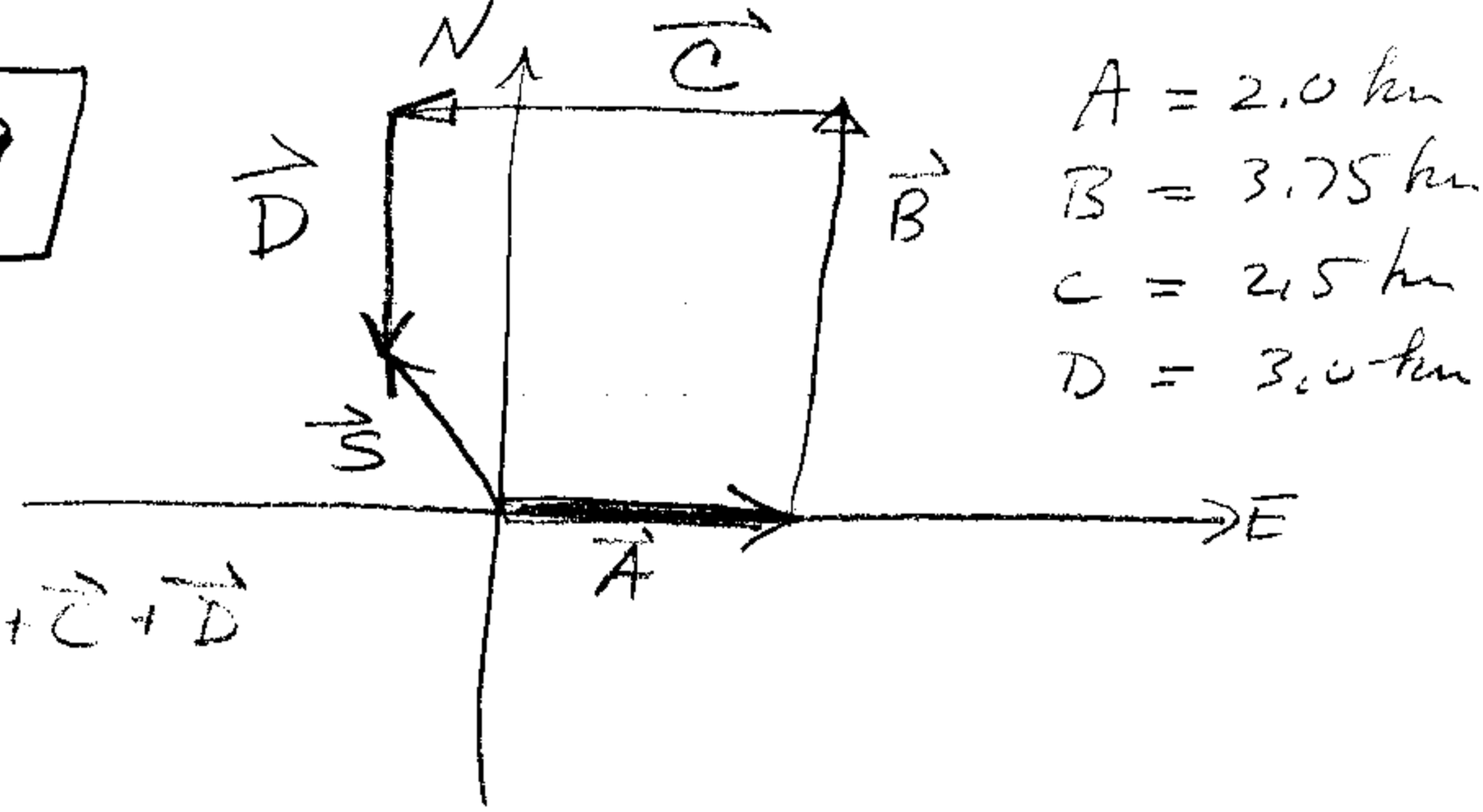
$= \underline{198.5\,N}$

(b) $\tan\theta = F_y/F_x = 130/150$

$= 0.866$

$\theta = 41^\circ$

1-49



$A = 2.0$ km
$B = 3.75$ km
$C = 2.5$ km
$D = 3.0$ km

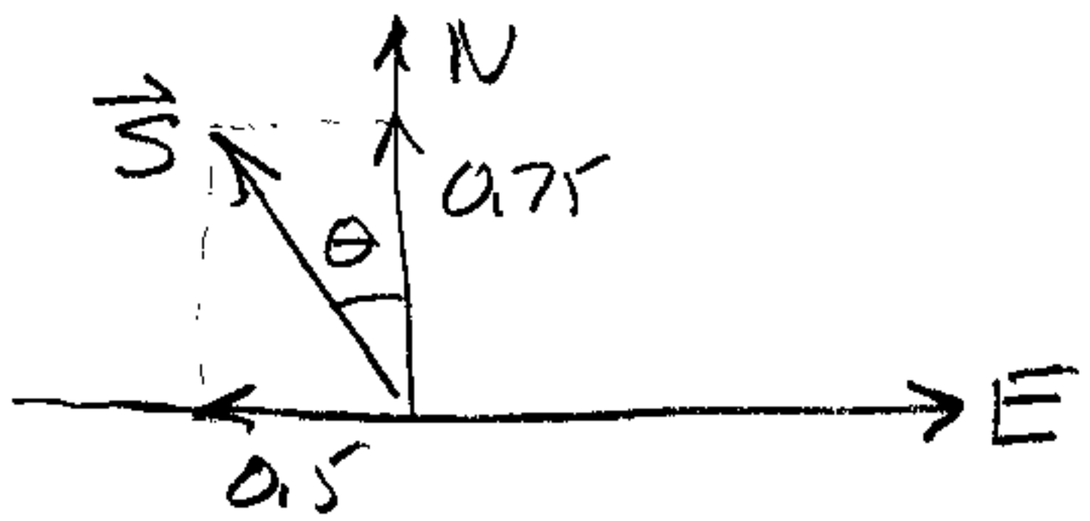
$\vec{S} = \vec{A} + \vec{B} + \vec{C} + \vec{D}$

Canceled Vectors in any ORDER

$\vec{A} + \vec{C} = 0.5$ km W

$\vec{B} + \vec{D} = 0.75$ km N

So $\vec{S}$ is 0.75 km N, 0.5 km W



$S = \sqrt{(0.5)^2 + (0.75)^2} = \underline{0.9 \text{ km}}$

$\tan\theta = \frac{0.5}{0.75} \Rightarrow \underline{\theta = 33.7^\circ}$ W of N

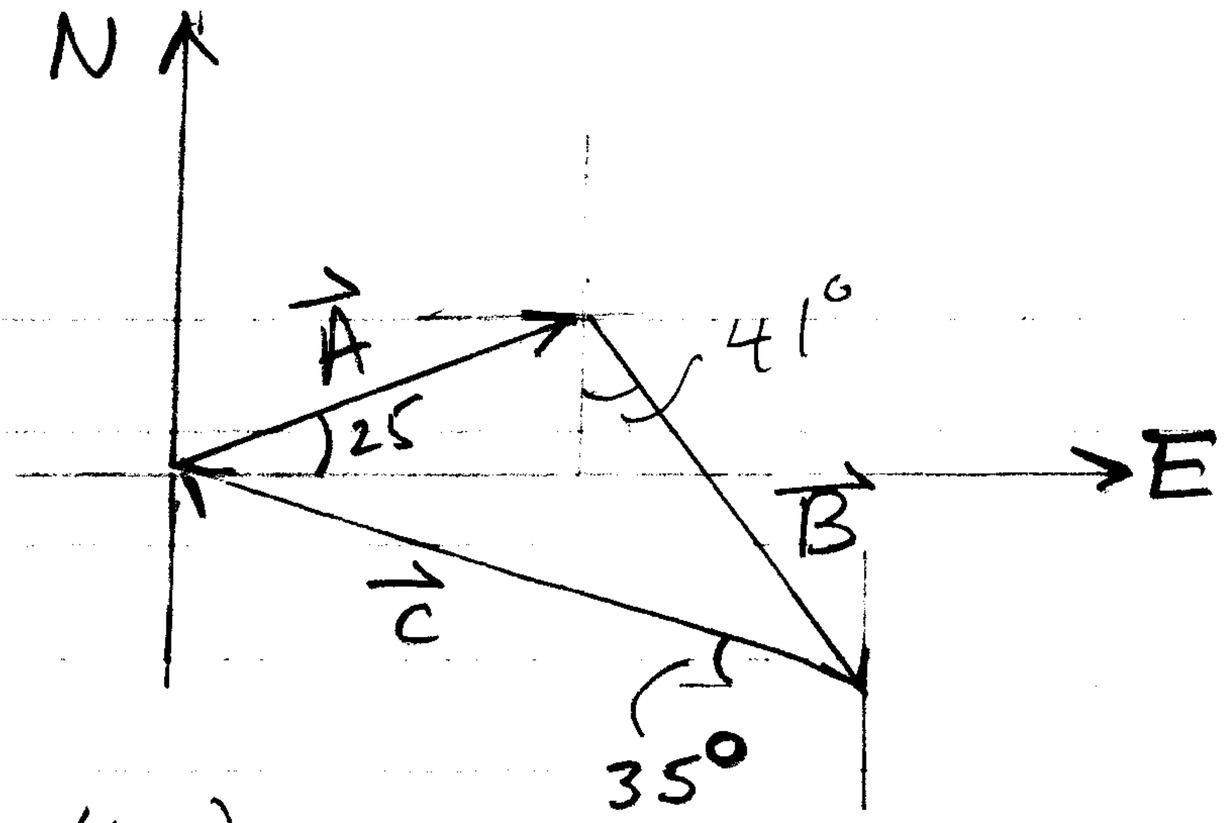
or $90 - 33.7$

$\underline{56.3^\circ}$ N of W

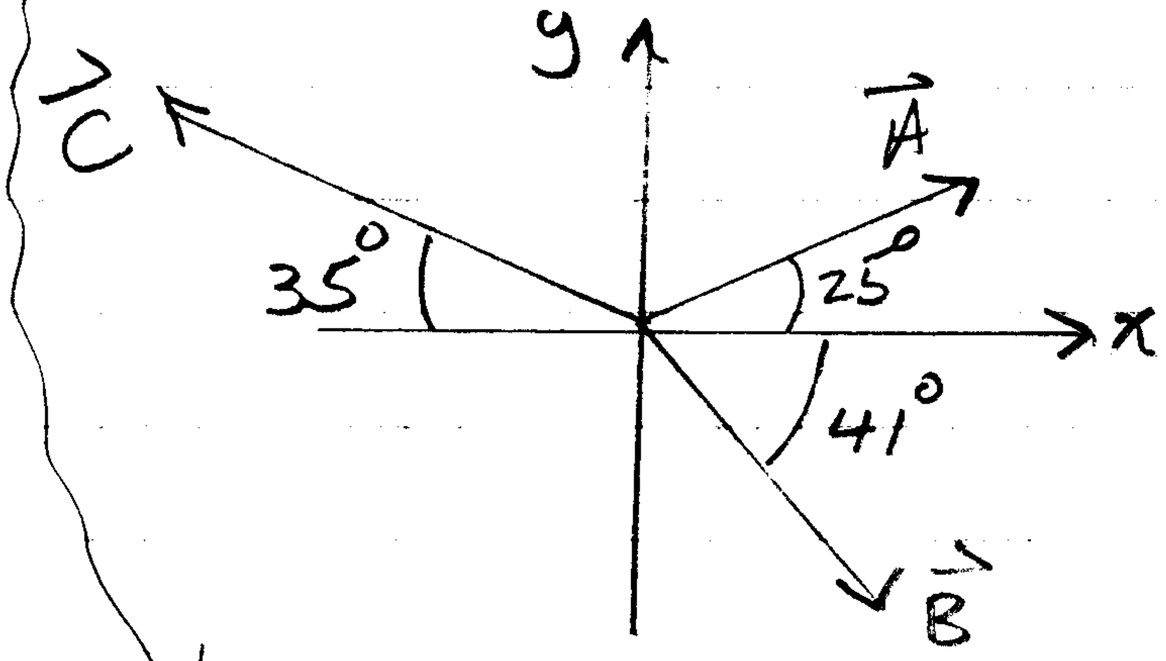
1-54

$\vec{A}+\vec{B}+\vec{C}+\vec{D}=0$

(back to start)



Redraw vectors at (0,0)



E is x

N is y

Given A = 1550 m

Must have : $A_x + B_x + C_x + D_x = 0$, $A_y + B_y + C_y + D_y = 0$

$A_x = A\cos 25 = 1405$, $A_y = A\sin 25 = 655$

$B_x = B\sin 41 = 0.66B$, $B_y = -B\cos 41 = -0.75B$

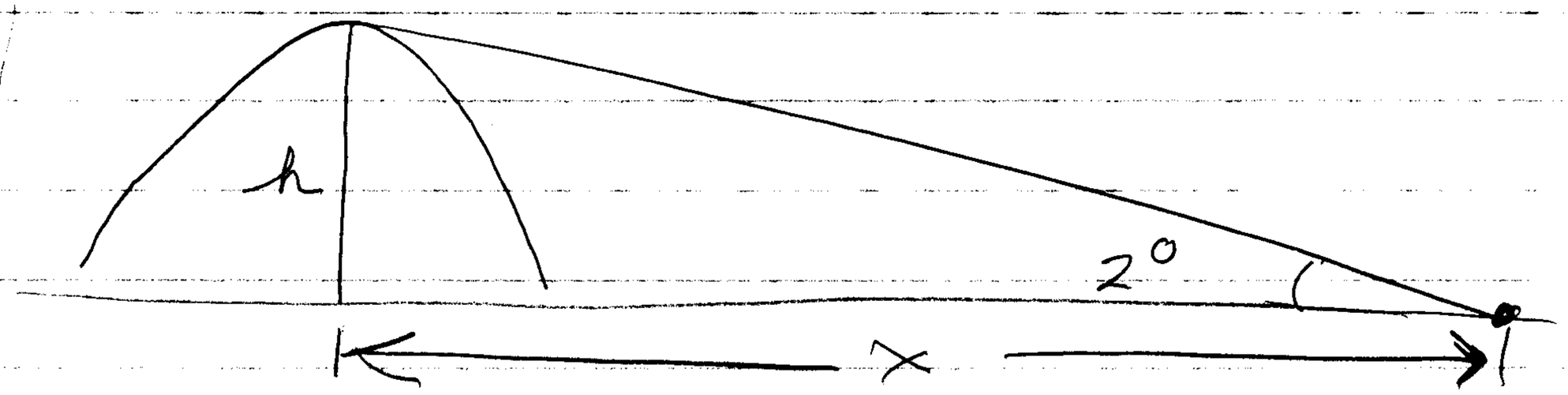
$C_x = -C\cos 35 = -0.82C$, $C_y = C\sin 35 = 0.57C$.

$$\begin{cases} 1405 + 0.66B - 0.82C = 0 \\ 655 - 0.75B + 0.57C = 0 \end{cases}$$ 2 equations in 2 unknowns B & C.

Solve equations

$$\begin{cases} B = 5628\ m \\ C = 6256\ m \end{cases}$$

1-57



$h = 192\,m$

$\tan 2^\circ = h/x \Rightarrow x = h/\tan 2$

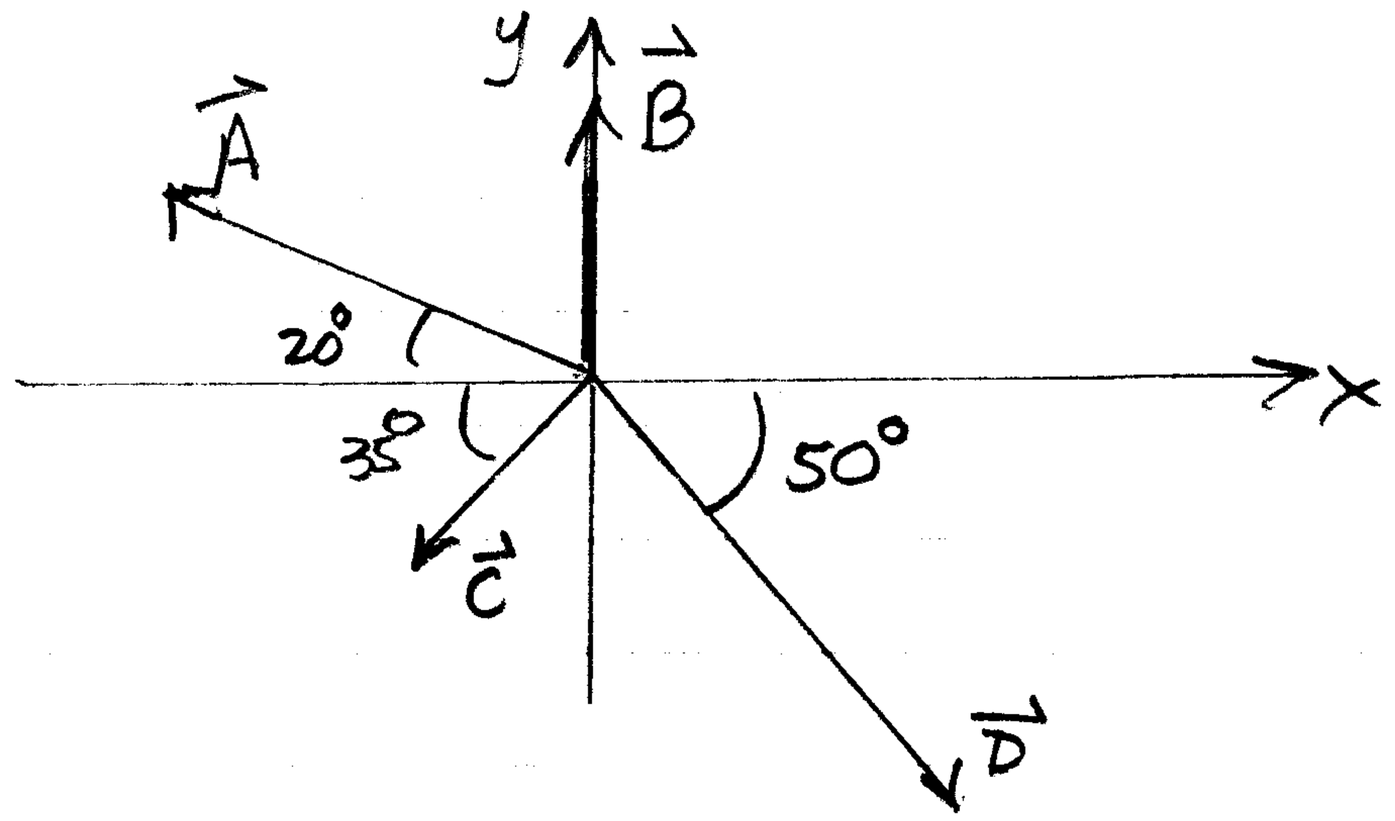
$x = 192/\tan 2$

$= 5498\,m$

or $\approx 5.5\,km$

1-62

$A = 16m$
$B = 11m$
$C = 12m$
$D = 26m$



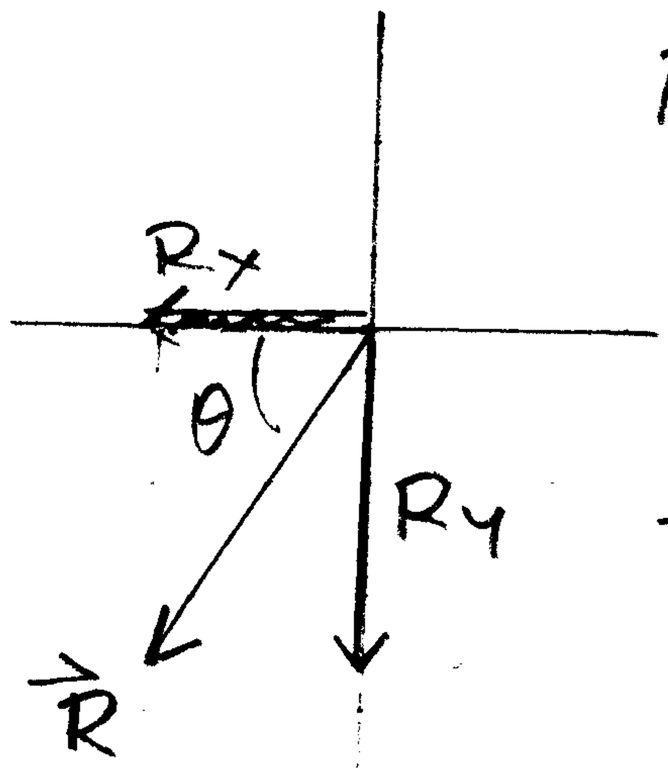
$$\vec{R} = \vec{A} + \vec{B} + \vec{C} + \vec{D} = \vec{R}_x + \vec{R}_y$$

$$R_x = A_x + B_x + C_x + D_x$$
$$R_y = A_y + B_y + C_y + D_y$$

$A_x = -A\cos 20^\circ = -15m$, $A_y = A\sin 20^\circ = 5.5m$
$B_x = 0$, $B_y = 11$
$C_x = -C\cos 35^\circ = -9.8m$, $C_y = -C\sin 35 = -6.9$
$D_x = D\cos 50 = 16.7$, $D_y = -D\sin 50 = -20$

$R_x = -15 + 0 - 9.8 + 16.7 = -8.1m$

$R_y = 5.5 + 11 - 6.9 - 20 = -10.4m$

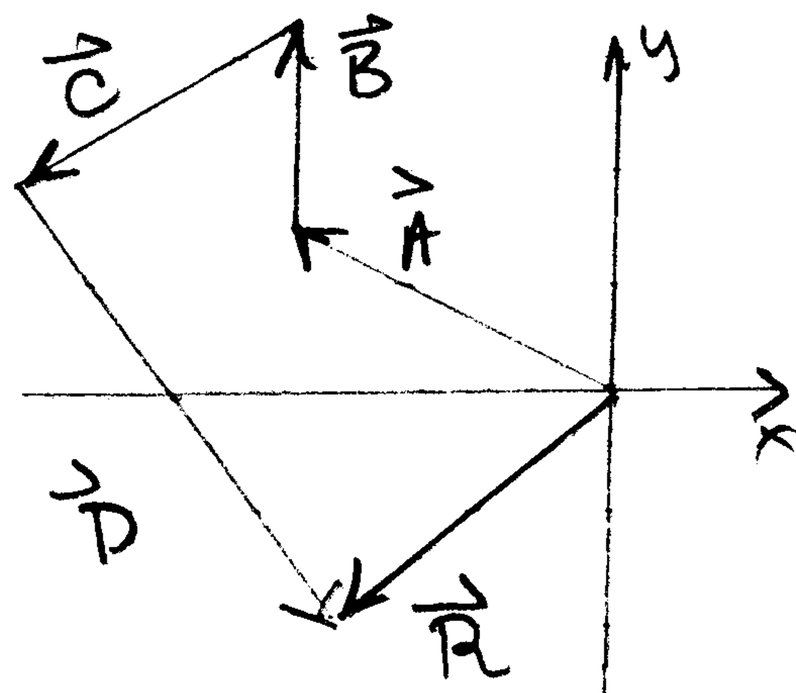


$$R = \sqrt{R_x^2 + R_y^2}$$

$= 13.2m$

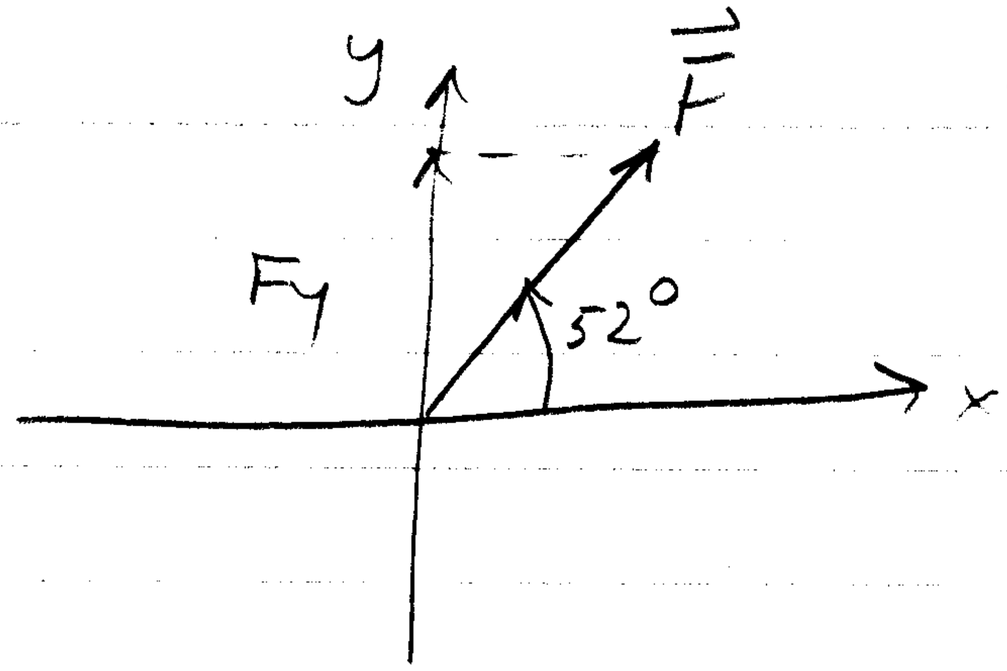
$\tan\theta = \frac{R_y}{R_x} = 1.28$

$\theta = 52^\circ$



SKETCH

1-64



Given:
Fy and angle.

$F_y = 290\ N$

$F_y = F \sin 52^\circ = F\ (0.79)$

$F = 290 / 0.79 = \underline{368\ N}$

$F_x = F \cos 52^\circ = \underline{227\ N}$

N.B. $\sqrt{F_x^2 + F_y^2} = \underline{368\ N}$