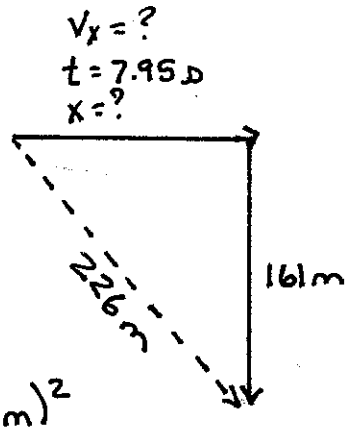
Physics Ch3
WK 3A #1, 3
WK 3B #1, 6
WK 3C #1, 2

WK 3A

#1) Given:
$t = 7.95\text{ D}$ East
$\Delta Y = 161\text{ m}$ South
$D = 226\text{ m}$

Find:
$X = ?$
$V_x = ?$



Soln:

$$V_x = \frac{X}{t}$$

$$d^2 = X^2 + y^2$$

$$X^2 = d^2 - y^2 = (226\text{m})^2 - (161\text{m})^2$$

$\boxed{X = 159\text{ m}}$

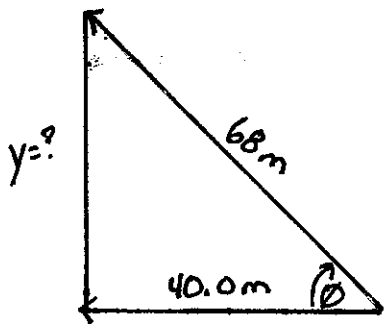
$$V_x = \frac{159\text{m}}{7.95\text{ D}} = \boxed{20.0\text{ m/s}}$$

#3) Given: $\Delta X = 5$ jumps westward
$1\text{ jump} = 8.0\text{ m}$
$d = 68\text{m}$ Northwest

Find: # of North jumps?
$\emptyset = ?$

Soln:

$$(5\text{ jumps})\left(\frac{8.0\text{m}}{\text{jump}}\right) = 40.\text{m}$$



$$d^2 = y^2 + x^2$$
$$y^2 = d^2 - x^2$$
$$y^2 = (68\text{m})^2 - (40.0\text{m})^2$$
$$y = 55\text{m}\left(\frac{1\text{ jump}}{8\text{m}}\right)$$

$\boxed{7\text{ Jumps}}$

$$\emptyset = \tan^{-1}\left(\frac{\Delta X}{\Delta Y}\right) = \tan^{-1}\left(\frac{40.0\text{m}}{55\text{ m}}\right)$$

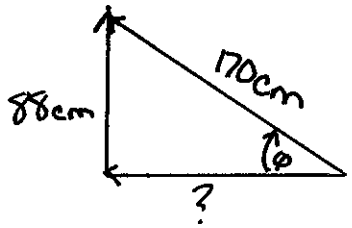
$\boxed{\theta = 36^\circ \text{ west of North}}$

#1) Given: 1 Jump = 33cm
5 jumps Northwest
d = 88cm North

Find: $\Delta x = ?$
$\theta = ?$

Soln:

$$(5\text{ Jumps})\left(\frac{33\text{cm}}{1\text{ Jump}}\right) = 170\text{cm Northwest}$$



$$d^2 = x^2 + y^2$$

$$x^2 = d^2 - y^2 = (170\text{cm})^2 - (88\text{cm})^2$$

$$\boxed{x = 150\text{cm}}$$

#6) Given:
V = 372 Km/h
Δt = 8.7 s Northwest
$\theta = 60.0°$

Find: $x_{east} = ?$
$y_{north} = ?$

Soln:

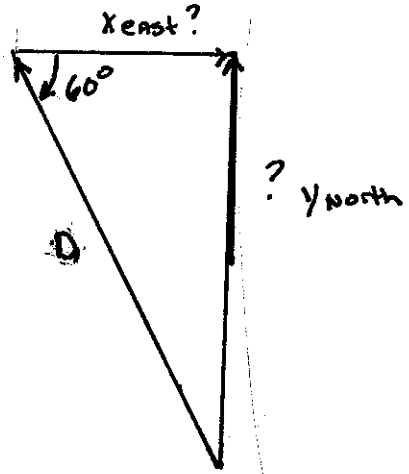
$$V = \frac{D}{\Delta t}$$

$$D = V\Delta t$$

$$= \left(\frac{372\text{ Km}}{h}\right)\left(\frac{1h}{3600s}\right)\left(\frac{8.7s}{1}\right)$$

$$D = .90\text{Km}$$

$$D = 900\text{ m}$$



$$x_{east} = d\cos\theta$$

$$= (900\text{m})\cos 60°$$

$$\boxed{x_{east} = 450\text{m}}$$

$$y_{North} = d\sin\theta$$

$$= 900\text{m}\sin 60°$$

$$\boxed{y_{North} = 780\text{m}}$$

#1) Given: X = 250.0 m EAST
Turns 120.0°
D = 125.0 m Northwest

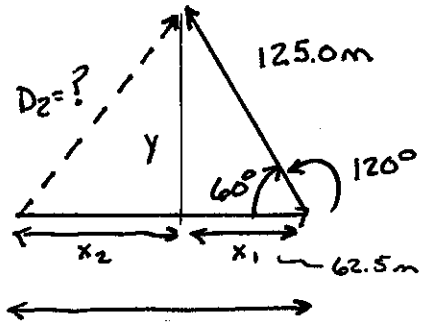
Find: resultant? displacement

Soln:

$X_1 = d \cos \phi$

$= (125.0\,m) \cos 60.0°$

$X_1 = 62.5\,m$



$X_{Total} = 250.0\,m$

$X_{Total} = X_1 + X_2$

$X_2 = X_{Total} - X_1 = 250.0m - 62.5m$

$X_2 = 187.5\,m$

$D_2^2 = X_2^2 + Y^2$

$= (187.5\,m)^2 + (108m)^2$

$\boxed{D_2 = 216\,m}$

$y = d \sin \phi$

$= (125.0\,m) \sin 60.0°$

$y = 108m$

$\theta = \text{TAN}^{-1} \frac{\Delta Y}{\Delta X} = \text{TAN}^{-1} \left(\frac{108m}{187.5m} \right)$

$\boxed{\phi = 29.9°\ \text{North of EAST}}$

or Law of Cosine

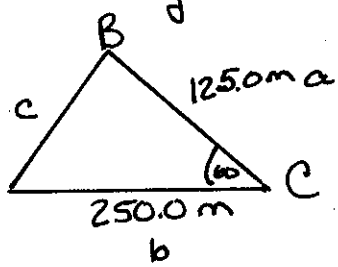
$c^2 = a^2 + b^2 - 2ab \cos C$

$C^2 = (125.0\,m)^2 + (250.0\,m)^2 - 2(125.0\,m)(250.0m) \cos 60.0°$

$\boxed{C = 217\,m}$ Difference due to Rounding

$\phi_A = \cos^{-1} \left(\frac{A^2 - C^2 - b^2}{-2cb} \right)$

$= \cos^{-1} \left(\frac{(125.0\,m)^2 - (250.0\,m)^2 - (217m)^2}{-2(217m)(250.0m)} \right)$ A



$\boxed{\phi = 30.0°\ \text{North of EAST}}$

#2) Given:

$V = 3.53 \times 10^3$ Km/h

1st $20.0\text{ s} = t$

@ 15.0° Above horizontal

2nd $\Delta t = 10.0\text{ s}$

@ 35.0° Above horizontal

Find: Final Ø

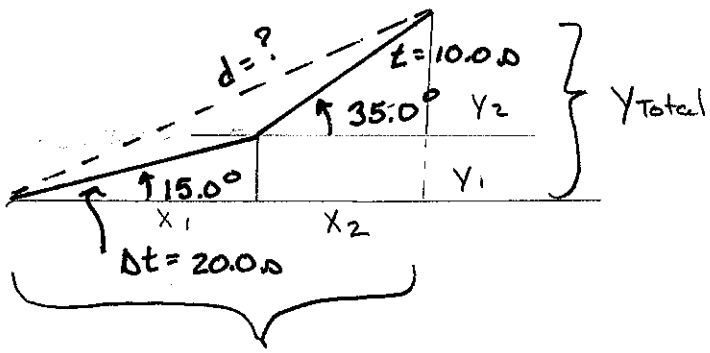
$\Delta X = ?$

$\Delta y = ?$

Soln:

$Y_{Total} = Y_1 + Y_2$

$X_{Total} = X_1 + X_2$



Distance 1

$$D_1 = \left(\frac{3.53\times10^3\text{Km}}{\text{h}}\right)\left(\frac{1\text{h}}{3600\text{s}}\right)\left(\frac{20.0\text{s}}{1}\right) = 19.6\text{ Km}$$

Distance 2

$$D_2 = \left(\frac{3.53\times10^3\text{Km}}{\text{h}}\right)\left(\frac{1\text{h}}{3600\text{s}}\right)\left(\frac{10.0\text{s}}{1}\right) = 9.81\text{Km}$$

$Y_{Total} = D_1 \sin\theta_1 + D_2 \sin\theta_2 = 19.6\text{Km}\sin 15.0^\circ + 9.81\text{km}\sin 35.0^\circ$

$= 5.07\text{Km} + 5.63\text{ Km}$

$\boxed{Y_{Total} = 10.70\text{Km}}$

$X_{Total} = D_1\cos\theta_1 + D_2\cos\theta_2 = 19.6\text{Km}\cos 15.0^\circ + 9.81\text{ km}\cos 35.0^\circ$

$= 18.9\text{Km} + 8.04\text{ km}$

$\boxed{X_{Total} = 26.9\text{Km}}$

$\theta = \tan^{-1}\left(\frac{Y_{Total}}{X_{Total}}\right)$

$= \tan^{-1}\left(\frac{10.7\text{Km}}{26.9\text{Km}}\right)$

$\boxed{\theta = 21.7^\circ \text{ above the horizontal}}$

$d^2 = \Delta X_T^2 + \Delta Y_T^2$

$\boxed{d = 28.9\text{ Km}}$