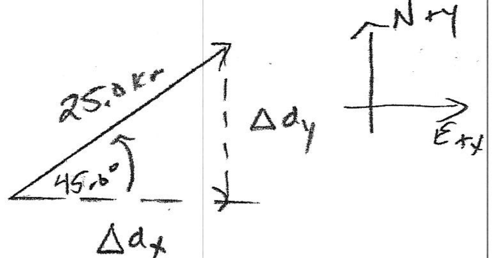
Day 3 P1 pg26, p1-3 pg 28, 53-9 pg 29, P1,2 pg 32 1/6

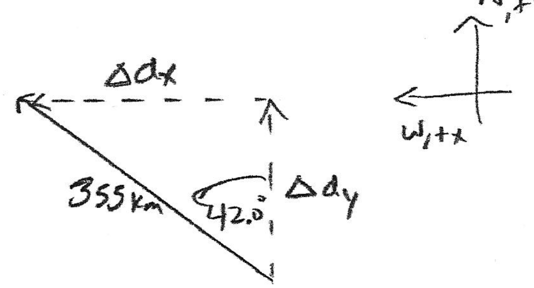
1. a)



$\Delta d_x = 25.0 \cos 45.0^\circ = 17.7\text{ km}$

$\Delta d_y = 25.0 \sin 45.0^\circ = 17.7\text{ km}$

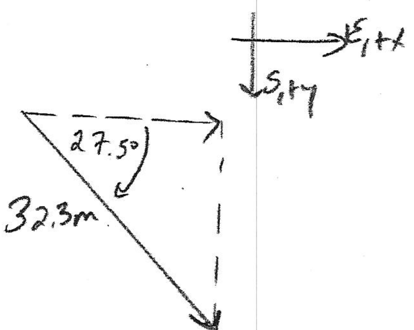
b)



$\Delta d_x = 355 \sin 42.0^\circ = 237.54\text{ km} \approx 238\text{ k.}$

$\Delta d_y = 355 \cos 42.0^\circ = 263.82 \approx 264\text{ km}$

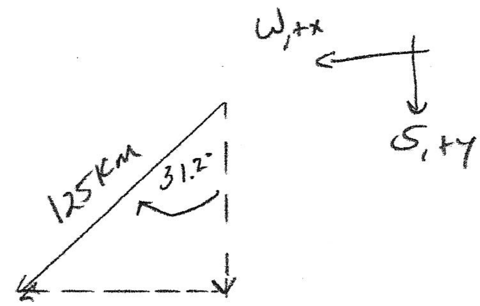
c)



$\Delta d_x = 32.3 \cos 27.5^\circ = 28.6\text{ m}$

$\Delta d_y = 32.3 \sin 27.5^\circ = 14.9\text{ m}$

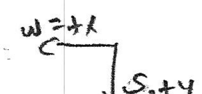
d)



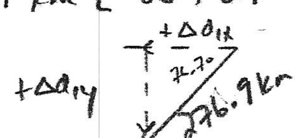
$\Delta d_x = 125 \sin 31.2^\circ = 64.8\text{ km}$

$\Delta d_y = 125 \cos 31.2^\circ = 106.9\text{ km}$

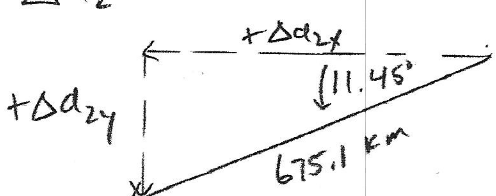
P1-3, pg 28



1. $\Delta \vec{d}_1 = 276.9\text{ km [W 76.70° S]}$



$\Delta \vec{d}_2 = 675.1\text{ km [W 11.45° S]}$



$\Delta \vec{d}_R = ?$

analysis: $\Delta \vec{d}_R = \Delta \vec{d}_1 + \Delta \vec{d}_2$

x dir:

$\Delta d_{Rx} = \Delta d_{1x} + \Delta d_{2x}$

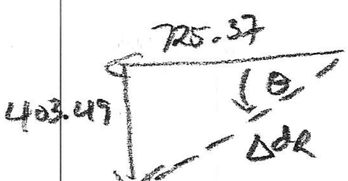
$= 276.9 \cos 76.70 + 675.1 \cos 11.45^\circ$

$= 725.37\text{ km}$

$\Delta d_{Ry} = \Delta d_{1y} + \Delta d_{2y}$

$= 276.9 \sin 76.70 + 675.1 \sin 11.45^\circ$

$= 403.49\text{ km}$



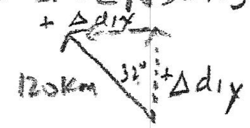
$\Delta d_R = \sqrt{725.37^2 + 403.49^2}$

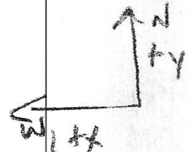
$= 830.0\text{ km}$

$\theta = \tan^{-1}\left(\frac{403.49}{725.37}\right) = 29.09^\circ$

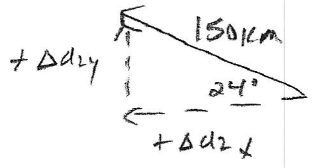
$\therefore \boxed{\Delta \vec{d}_R = 830.0\text{ km [W 29.09° S]}}$

2) $\Delta\vec{d}_1 = 120\text{ km } [N\,32°W]$





$\Delta\vec{d}_2 = 150\text{ km } [W\,24°N]$



$\Delta\vec{d}_R = ?$

analysis: $\Delta\vec{d}_R = \Delta\vec{d}_1 + \Delta\vec{d}_2$

x dir: $\Delta d_{Rx} = \Delta d_{1x} + \Delta d_{2x}$

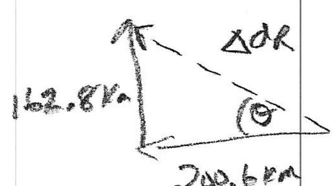
$= 120\sin 32° + 150\cos 24°$

$= 200.6$ km.

y dir: $\Delta d_{Ry} = \Delta d_{1y} + \Delta d_{2y}$

$= 120\cos 32° + 150\sin 24°$

$= 162.8$ km

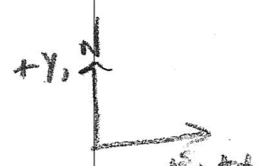


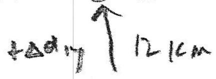
$\Delta d_R = \sqrt{200.6^2 + 162.8^2} = 258.4$ km

$\theta = \tan^{-1}\left(\frac{162.8}{200.6}\right) = 39.1°$

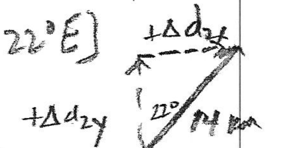
$\boxed{\Delta\vec{d}_R = 260\text{ km } [W\,39°N]}$ (to 2 sig digs)

3) $\Delta\vec{d}_1 = 12\text{ km } [N]$

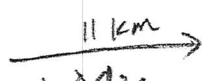




$\Delta\vec{d}_2 = 14\text{ km } [N\,22°E]$



$\Delta\vec{d}_3 = 11\text{ km } [E]$



x dir:

$\Delta d_{Rx} = \Delta d_{1x} + \Delta d_{2x} + \Delta d_{3x}$

$= 0 + 14\sin 22° + 11$

$= 16.24$ km

y dir:

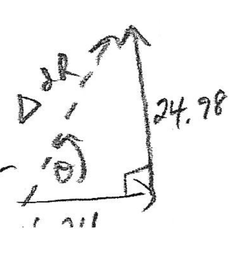
$\Delta d_{Ry} = \Delta d_{1y} + \Delta d_{2y} + \Delta d_{3y}$

$= 12 + 14\cos 22° + 0$

$= 24.98$ km

$\Delta\vec{d}_R = ?$

analysis: $\Delta\vec{d}_R = \Delta\vec{d}_1 + \Delta\vec{d}_2 + \Delta\vec{d}_3$

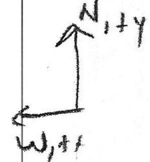


$\Delta d_R = \sqrt{16.24^2 + 24.98^2} = 29.8$ km.

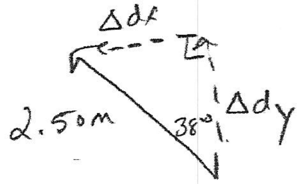
$\theta = \tan^{-1}\left(\frac{24.98}{16.24}\right) = 56.96°$

$\therefore \Delta\vec{d}_R = 30.\text{ km } [E\,57°N]$

pg 29 S3-9



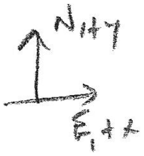
3) $\Delta \vec{d} = 2.50\text{m}\ [N38.0°W]$

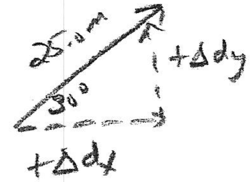


$\Delta d_x = 2.50 \sin 38° = 1.54\text{m}$

$\Delta d_y = 2.50\ \cos 38° = 1.97\text{m}$

4) $\Delta \vec{d} = 25.0\text{m}\ [E\ 30.0°N]$





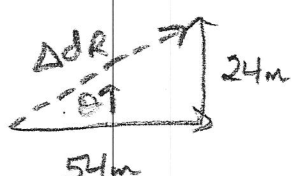
$\Delta d_x = 25.0 \cos 30° = 21.7\text{ m}$

$\Delta d_y = 25.0 \sin 30° = 12.5\text{ m}$

5) $\Delta d_x = 54\text{m}\ [E]$

$\Delta d_y = 24\text{m}\ [N]$

$\Delta \vec{d}_R = ?$

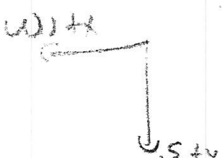


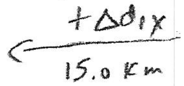
$\Delta d_R = \sqrt{24^2 + 54^2} = 59.09\text{ m}$

$\theta = \tan^{-1}\left(\frac{24}{54}\right) = 23.96°$

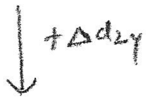
$\therefore \Delta \vec{d}_R = 59\text{m}\ [E\ 24°N]$

6) $\Delta \vec{d}_1 = 15.0\text{km}\ [W]$

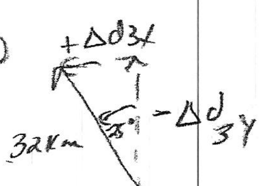




$\Delta \vec{d}_2 = 45.0\text{km}\ [S]$



$\Delta \vec{d}_3 = 32\text{km}\ [N25°W]$



$\Delta \vec{d}_R = ?$

Analysis: $\Delta \vec{d}_R = \Delta \vec{d}_1 + \Delta \vec{d}_2 + \Delta \vec{d}_3$

x dir:

$\Delta d_{Rx} = \Delta d_{1x} + \Delta d_{2x} + \Delta d_{3x}$

$= 15.0 + 0 + 32 \sin 25$

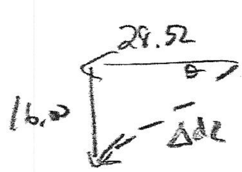
$= 28.52$

y dir

$\Delta d_{Ry} = \Delta d_{1y} + \Delta d_{2y} + \Delta d_{3y}$

$= 0 + 45.0 - 32 \cos 25°$

$= 16.00$

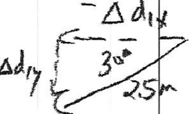


$\Delta d_R = \sqrt{28.52^2 + 16.00^2} = 32.7\text{ km}$

$\theta = \tan^{-1}\left(\frac{16.00}{28.52}\right) = 29.3°$

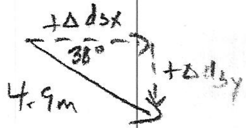
[W 29° S]

7] $\Delta\vec{d}_1 = 2.5\text{m}\,[W\,30.0^\circ S]$

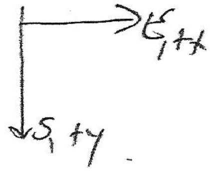


$\Delta\vec{d}_2 = 3.6\text{ m}\,[S]$ 3.6m $+\Delta d_{2y}$

$\Delta\vec{d}_3 = 4.9\text{m}\,[E\,38.0^\circ S]$



$\Delta\vec{d}_R = \Delta\vec{d}_1 + \Delta\vec{d}_2 + \Delta\vec{d}_3$



x dir

$\Delta d_{Rx} = \Delta d_{1x} + \Delta d_{2x} + \Delta d_{3x}$

$= -2.5\cos 30 + \cancel{0} + 4.9\cos 38^\circ$

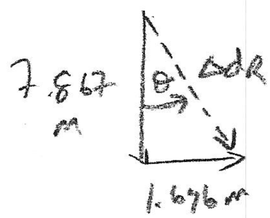
$= 1.696\text{ m}$

y dir

$\Delta d_{Ry} = \Delta d_{1y} + \Delta d_{2y} + \Delta d_{3y}$

$= 2.5\sin 30 + 3.6 + 4.9\sin 38^\circ$

$= 7.867\text{ m}$

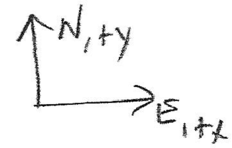


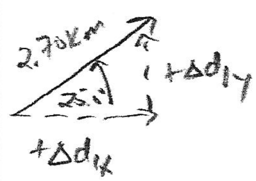
$\Delta d_R = \sqrt{1.696^2 + 7.867^2} = 8.048\text{m}$

$\theta = \tan^{-1}\left(\frac{1.696}{7.867}\right) = 12.2^\circ$

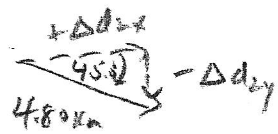
$\therefore \boxed{\Delta\vec{d}_R = 8.0\text{m}\,[S\,12^\circ E]}$

8] $\Delta\vec{d}_1 = 2.70\text{km}\,[E\,25.0^\circ N]$





$\Delta\vec{d}_2 = 4.80\text{km}\,[E\,45.0^\circ S]$



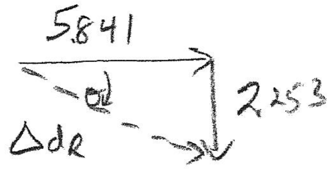
$\Delta\vec{d}_R = ?$

analysis: $\Delta\vec{d}_R = \Delta\vec{d}_1 + \Delta\vec{d}_2$

x dir: $\Delta d_{Rx} = \Delta d_{1x} + \Delta d_{2x}$

$= 2.70\cos 25.0^\circ + 4.80\cos 45.0^\circ$

$= 5.841\text{ km}$



$\Delta d_R = \sqrt{5.841^2 + 2.253^2}$

$= 6.26\text{ km}$

y dir: $\Delta d_{Ry} = \Delta d_{1y} + \Delta d_{2y}$

$= 2.70\sin 25.0 - 4.80\sin 45.0^\circ$

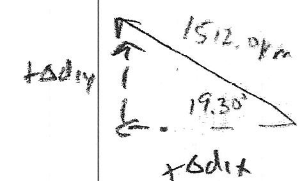
$= -2.253$

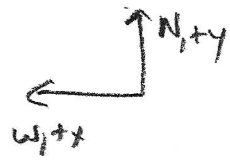
$\theta = \tan^{-1}\left(\frac{2.253}{5.841}\right) = 21.093^\circ$

$\therefore \boxed{\Delta\vec{d}_R = 6.26\text{km}\,[E\,21.1^\circ S]}$

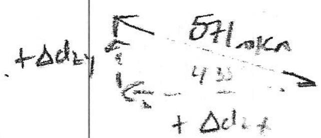
9)

$\Delta\vec{d}_1 = 1512.0\text{km}\ [W\ 19.30°N]$

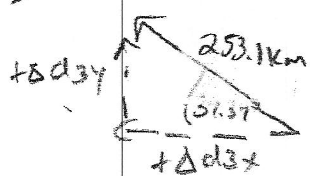




$\Delta\vec{d}_2 = 571.0\text{km}\ [W\ 4.35°N]$



$\Delta\vec{d}_3 = 253.1\text{km}\ [W\ 39.39°N]$



$\Delta\vec{d}_R = ?$

analysis: $\Delta\vec{d}_R = \Delta\vec{d}_1 + \Delta\vec{d}_2 + \Delta\vec{d}_3$

x dir:

$\Delta d_{Rx} = \Delta d_{1x} + \Delta d_{2x} + \Delta d_{3x}$

$= 1512.0\cos 19.30 + 571.0\cos 4.35 + 253.1\cos 39.39$

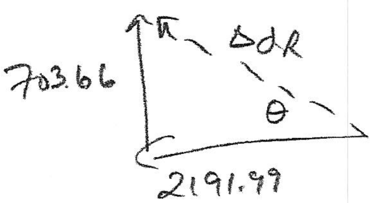
$= 2191.99\ \text{km}$

y dir:

$\Delta d_{Ry} = \Delta d_{1y} + \Delta d_{2y} + \Delta d_{3y}$

$= 1512\sin 19.30 + 571.0\sin 4.35 + 253.1\sin 39.3$

$= 703.66\ \text{Km}$



$\Delta d_R = \sqrt{2191.99^2 + 703.66^2} = 2,302.16$

$\theta = \tan^{-1}\left(\frac{703.66}{2191.99}\right) = 17.797°$

$\therefore \Delta\vec{d}_R = 2,302.2\ \text{km}\ [W\ 17.8°N]$

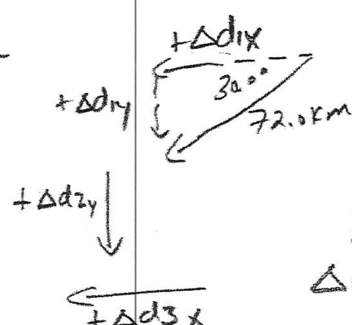
Practice 1,2 pg 32

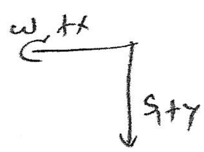
1. $\Delta\vec{d}_1 = 72.0\text{km}\ [W\ 30.0°S]$

$\Delta\vec{d}_2 = 48.0\text{km}\ [S]$

$\Delta\vec{d}_3 = 150.0\text{km}\ [W]$

$\Delta t = 2.5\text{h}$





$\Delta\vec{d}_R = ?\quad \vec{v}_{av} = ?\quad v_{av} = ?$

analysis

$\Delta\vec{d}_R = \Delta\vec{d}_1 + \Delta\vec{d}_2 + \Delta\vec{d}_3$

$\vec{v}_{avg} = \frac{\Delta\vec{d}_R}{\Delta t}$, $\quad v_{av} = \frac{\Delta d}{\Delta t}$

x dir

$\Delta d_{Rx} = \Delta d_{1x} + \Delta d_{2x} + \Delta d_{3x}$

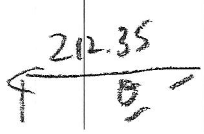
$= 72.0\cos 30.0° + \emptyset + 150.0$

$= 212.35\ \text{km}$

y dir $\quad \Delta d_{Ry} = \Delta d_{1y} + \Delta d_{2y} + \Delta d_{3y}$

$= 72.0\sin 30 + 48.0 + \emptyset$

$= 84.0\ \text{km}$



$\Delta\vec{d}_R = 228.36\ \text{km}\ [W21.6°S]$

b) $\vec{v}_{av} = \frac{\Delta \vec{d}_R}{\Delta t} = \frac{228.36\text{ km [W21.6°S]}}{2.5\text{ h}}$ $= 91.3\text{ km/h [W 21.6°S]}$

$\simeq 91.\text{ km/h [W22°S]}$

$V_{av} = \frac{\Delta d_T}{\Delta t} = \frac{(72.0 + 48.0 + 150.0)\text{ km}}{2.5\text{ h}} = \frac{270.0\text{ km}}{2.5\text{ h}} = 108\text{ km/h}$

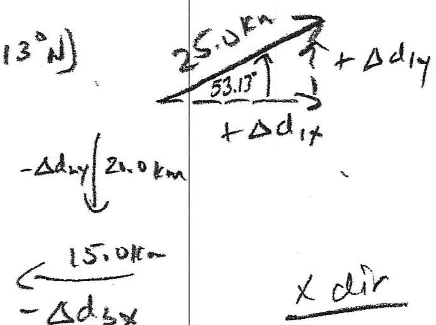
$\simeq 1.1 \times 10^2\text{ km/h}$

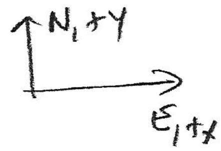
P2) $\Delta \vec{d}_1 = 25.0\text{ km [E 53.13°N]}$

$\Delta \vec{d}_2 = 20.0\text{ km [S]}$

$\Delta \vec{d}_3 = 15.0\text{ km [W]}$

$\Delta t = 12\text{ h}$





$\Delta \vec{d}_R$? $\vec{v}_{av}$? V_{av}?

analysis: $\Delta \vec{d}_R = \Delta \vec{d}_1 + \Delta \vec{d}_2 + \Delta \vec{d}_3$

x dir

$\Delta d_{Rx} = \Delta d_{1x} + \Delta d_{2x} + \Delta d_{3x}$

$= 25.0 \cos 53.13° + \emptyset - 15.0\text{ km}$

$= 0.000036 \simeq 0.00$

y dir

$\Delta d_{Ry} = \Delta d_{1y} + \Delta d_{2y} + \Delta d_{3y}$

$= 25.0 \sin 53.13 - 20.0 + \emptyset$

$= -0.000027 \simeq 0.00$

$\boxed{\Delta \vec{d}_R = 0.0\text{ km}}$

b) $\vec{v}_{av} = \frac{\Delta \vec{d}_R}{\Delta t} = \frac{0.0\text{ km}}{12.\text{ h}} = \emptyset\text{ km/h}$

b) $V_{av} = \frac{\Delta d_T}{\Delta t} = \frac{25.0 + 20.0 + 15.0}{12\text{ h}} = \frac{60.\text{ km}}{12\text{ h}} = 5.0\text{ km/h}$

c) Since the elk ended up returning to his original spot, there is no resultant displacement and average velocity is zero. Average speed is not dependent on direction.