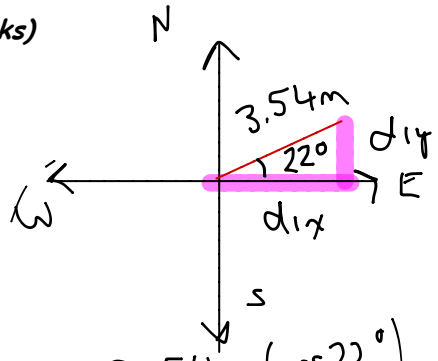
Quiz #4 – Adding Vectors using component method

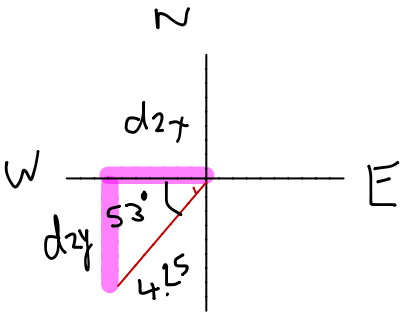
Name: _____

Show all of your work in the space provided.
Round final answer to the correct number of significant digits.

/ 12	A2.3	**I can solve problems involving linear motion using a scale diagram and vector components.**

1. A paper airplane travels 3.54 m[E 22° N] and then gets caught by a wind gust and travels 4.25 m [W 53° S]. Using the component method, determine the displacement of the paper airplane. ***(12 marks)***





$d_{1x} = 3.54m(\cos 22^\circ)$
$= 3.28m\,[E]$

$d_{1y} = 3.54 \sin 22^\circ$
$= 1.33m\,[N]$

$d_{2x} = 4.25 \cos 53^\circ$
$d_{2x} = 2.56m\,[W]$

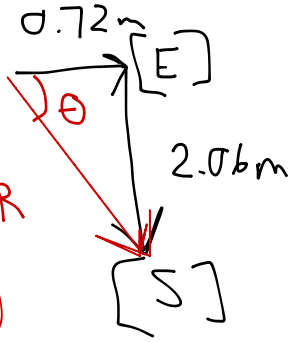
$d_{2y} = 4.25 \sin 53^\circ$
$= 3.39m\,[S]$

$\vec{d}_{Rx} = d_{1x} + d_{2x}$
$= 3.28m[E] + 2.56m[W]$
$= 3.28m[E] - 2.56m[E]$
$\vec{d}_{Rx} = 0.72m\,[E]$

$\vec{d}_{Ry} = d_{1y} + d_{2y}$
$= 1.33m[N] + 3.39m[S]$
$= -1.33m[S] + 3.39m[S]$
$\vec{d}_{Ry} = 2.06m\,[S]$

$|\vec{d}_{RT}| = \sqrt{0.72^2 + 2.06^2}$
$|\vec{d}_{RT}| = 2.18m$

$\tan\theta = \frac{2.06}{0.72}$ $\vec{d}_R$
$\theta = \tan^{-1}\left(\frac{2.06}{0.72}\right)$
$\theta = 71^\circ$



$\therefore \vec{d}_{RT} = 2.18m\,[E\,71^\circ S]$

Pg. 53 #30

Given: $\vec{d}_1 = 45\text{ km [W]}$
$\vec{d}_2 = 15\text{ km [E]}$

$\Delta t = 1.2\text{ h}$

Required: $\vec{v}\ (\text{m/s})$

Analysis: $\vec{v} = \dfrac{\vec{d}_2 - \vec{d}_1}{\Delta t}$

$\vec{d}_1 = 45\text{ km [W]}$
$= 45\,000\text{ m [W]}$

$\vec{d}_2 = 15\text{ km [E]}$
$= 15\,000\text{ m [E]}$

$\Delta t = 1.2\text{ h}$
$= 1.2 \times 60 \times 60$
$= 4320\text{ s}$

$\vec{v} = \dfrac{\vec{d}_2 - \vec{d}_1}{\Delta t}$

$= \dfrac{15\,000\text{ m [E]} - 45\,000\text{ m [W]}}{4320\text{ s}}$

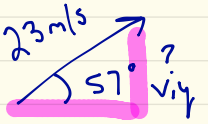
$= \dfrac{15\,000\text{ m [E]} + 45\,000\text{ m [E]}}{4320\text{ s}}$

$= \dfrac{60\,000\text{ m [E]}}{4320\text{ s}}$

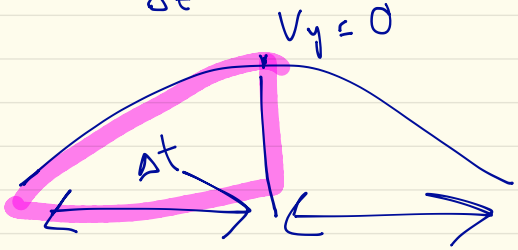
$\vec{v} = 13.9\text{ m/s [E]}$

$\vec{v} = 14\text{ m/s [E]}$

Pg 89 #7.



V_{iy} V_{ix}
a_y Δt
V_{2y} dx
Δd_y
Δt



$\vec{V}_{iy} = 23\ m/s(\sin 57^\circ)$

$\vec{V}_{iy} = 19.3\ m/s\ [\uparrow]$

$\vec{V}_{2y} = 0\ m/s$

$\vec{a}_y = -9.8\ m/s^2$

$\uparrow +$

$\vec{V}_{2y} = \vec{V}_{iy} + a_y \Delta t$

$0\ m/s = 19.3\ \frac{m}{s} + \left(-9.8\ \frac{m}{s^2}\right)\Delta t$

$0 = 19.3\ m/s - 9.8\ m/s^2\ \Delta t$

$-19.3\ m/s = -9.8\ \frac{m}{s^2}\ \Delta t$

$\frac{-19.3\ m/s}{-9.8\ m/s^2} = \Delta t$

$\Delta t = 1.98\ s$

$\therefore 1.97\ s \times 2 =$ total time of flight

$= 3.93\ s \doteq 3.9\ s$

Pg. 90 #8.

$11\frac{m}{s}(\sin 60^\circ) = 9.53\frac{m}{s}\uparrow$

$v_{2y} = v_{1y} + a\Delta t$

$0 = 9.53 + (-9.8 m/s^2)\Delta t$

$-9.53 = -9.8\Delta t$

$-9.53/-9.8 = \Delta t$