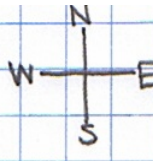
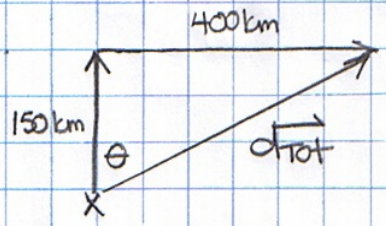
SPH4U - R WS #4



1. a) $\vec{d_1} = 150\text{ km [N]}$
$\vec{d_2} = 400\text{ km [E]}$

$\vec{d_{Tot}} = \vec{d_1} + \vec{d_2}$

$\boxed{\vec{d_{Tot}} = 427\text{ km [N69°E]}}$

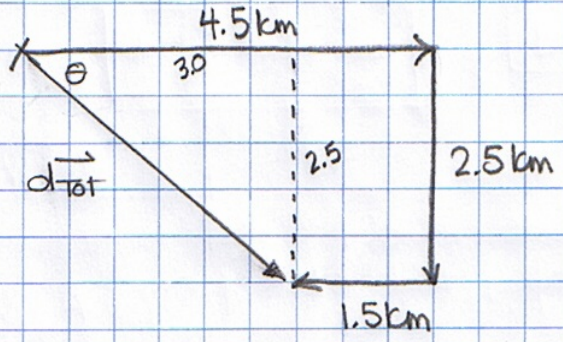


$d_{Tot}^2 = 150^2 + 400^2$
$= 182500$
$d_{Tot} = 427$

$\tan\theta = \frac{400}{150}$
$\theta = 69°$

b) just reverse direction! → 427 km [S69°W]

2.) $d_1 = 4.50\text{ km [E]}$
$d_2 = 2.50\text{ km [S]}$
$d_3 = 1.50\text{ km [W]}$
$t_{Tot} = 2.0\text{ h}$



a) speed = $\frac{\text{distance}}{\text{time}}$

$v_{avg} = \frac{4.5 + 2.5 + 1.5}{2.0}$

$\boxed{v_{avg} = 4.25\text{ km/h}}$

$d_{Tot}^2 = 3^2 + 2.5^2$
$= 15.25$
$d_{Tot} = 3.9051...$

$\tan\theta = \frac{2.5}{3.0}$
$\theta = 40°$

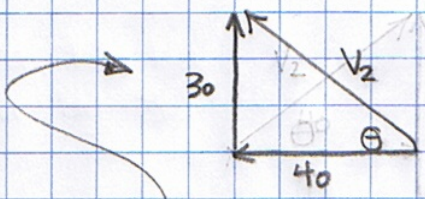
b) velocity = $\frac{\text{displacement}}{\text{time}}$

$\vec{v_{avg}} = \frac{3.9051...}{2.0}$

$\boxed{\vec{v_{avg}} = 1.95\ \frac{\text{km}}{\text{h}}\ [E40°S]}$

3.) $\vec{v_1} = 40\text{ m/s [W]}$
$\vec{a} = 5.0\text{ m/s}^2\text{ [N]}$
$t = 6.0\text{ s}$

a) $\vec{v_2} = \vec{v_1} + \vec{a}t$
$= 40\text{ [W]} + (5\text{ [N]})(6)$
$= 40\text{ [W]} + 30\text{ [N]}$



$\tan\theta = \frac{30}{40}$
$\theta = 37°$

$v_2 = 50\text{ m/s [W37°N]}$

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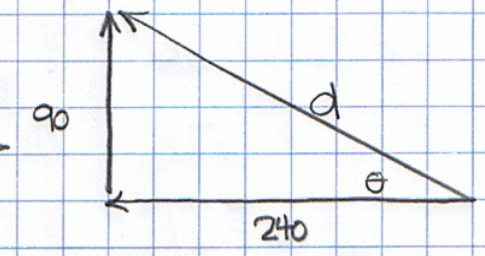
3)b) $d = v_1 t + \frac{1}{2} a t^2$

$= (40[W])(6) + \frac{1}{2}(5[N])(6)^2$

$= 240[W] + 90[N]$



$d^2 = 240^2 + 90^2$ $\tan\theta = \frac{90}{240}$

$d = 256$ $\theta = 21°$

$d = 260$ m [W21° N]

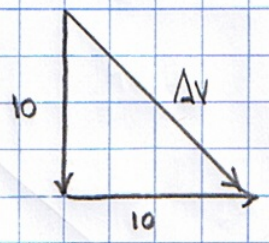
4) $\vec{V_1} = 10$ m/s [W]

$\vec{V_2} = 10$ m/s [S]

$\Delta\vec{V} = \vec{V_2} - \vec{V_1}$

$= 10[S] - 10[W]$

$= 10[S] + 10[E]$



$\Delta V^2 = 10^2 + 10^2$

$\Delta V = 14$ m/s [SE]

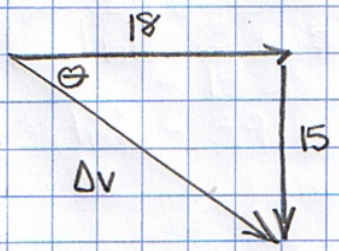
5) $\vec{V_1} = 15$ m/s [N]

$\vec{V_2} = 18$ m/s [E]

$\Delta\vec{V} = \vec{V_2} - \vec{V_1}$

$= 18[E] - 15[N]$

$= 18[E] + 15[S]$



$\Delta V^2 = 18^2 + 15^2$

$\Delta V = 23.43...$

$\tan\theta = \frac{15}{18}$

$\theta = 40°$

$\Delta\vec{V} = 23$ m/s [E 40° S]

6) a) $\vec{V_1} = 32$ km/h [N]

$\vec{V_2} = 32$ km/h [W]

$t = 3.0$ s

$\Delta V = 32[W] - 32[N]$

$= 32[W] + 32[S]$

$\Delta V = 45$ km/h [SW]

b) $\vec{a_{avg}} = \frac{\Delta V}{t}$

$= \frac{45.25...\ [SW]}{3.0}$

$\vec{a_{avg}} = 15\ \frac{\text{km/h}}{\text{s}}$ [SW]

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Post 3B

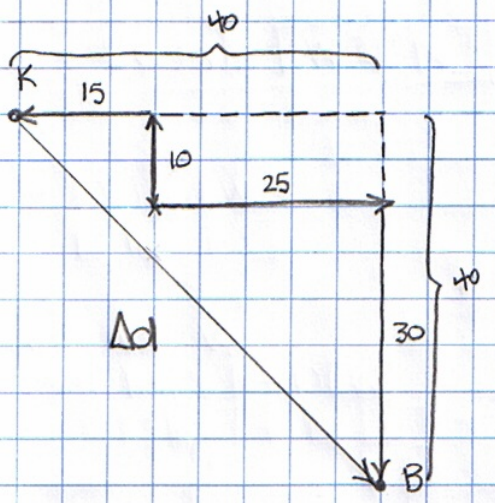
7.) $\vec{V_1} = 1000\ km/h\ [W]$
$\vec{V_2} = 1000\ km/h\ [E]$
$t = 80s$

$\Delta\vec{V} = \vec{V_2} - \vec{V_1}$
$= 1000\ [E] - 1000\ [W]$
$= 1000\ [E] + 1000\ [E]$
$\Delta\vec{V} = 2000\ km/h\ [E]$

$\vec{a} = \frac{\Delta\vec{V}}{t}$
$= \frac{2000\ [E]}{80}$

$\boxed{a = 25\ km/h/s\ [E]}$

8.)

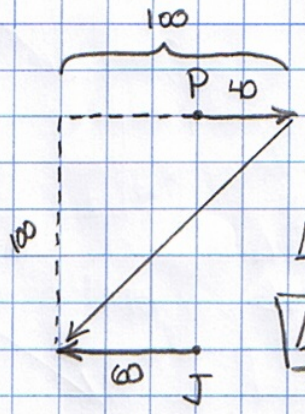


$\Delta d^2 = 40^2 + 40^2$

$\boxed{\Delta d = 57\ m\ [SE]}$

9.) Jim West @ 3.00 m/s for 20s
↳ $d_J = 60\ m\ [W]$

Paul East @ 2.00 m/s for 20s
↳ $d_P = 40\ m\ [W]$

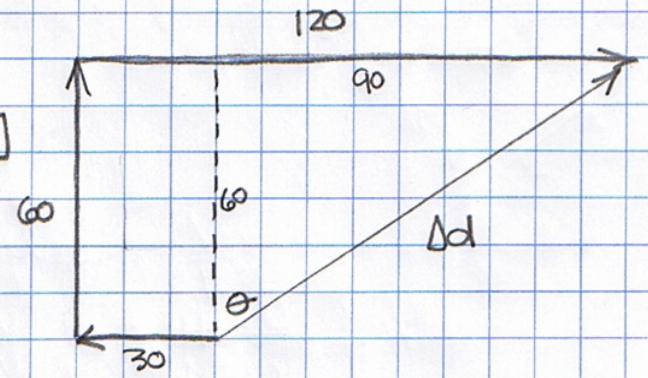


$\Delta d^2 = 100^2 + 100^2$

$\boxed{\Delta d = 141\ m\ [SW]}$

10.) 2 m/s [W] for 15s → $d = 30\ m\ [W]$
3 m/s [N] for 20s → $d = 60\ m\ [N]$
4 m/s [E] for 30s → $d = 120\ m\ [E]$

$\boxed{\Delta d = 108\ m\ [N56°E]}$



$\Delta d^2 = 60^2 + 90^2$

$\Delta d = 108\ m$

$\tan\theta = \frac{90}{60}$

$\theta = 56°$