Unit 4 Review - Solutions

Note Title 3/29/2016

1. The resultant of two or more vectors is the sum of those vectors.

2. The original vectors do not disappear; they are just represented in another way.

3. $\underset{65\,N}{\longrightarrow} + \underset{32\,N}{\longleftarrow} = \underset{33\,N}{\longrightarrow}$ or $65\,N + (-32\,N) = 33\,N\ [E]$

4. $\vec{V_p} = 200\ km/hr\ [N]$

a) $\vec{V_g} = ?$ $\vec{V_w} = 50\ km/hr\ [N]$

tailwind, same direction as $\vec{V_p}$

$$\vec{V_g} = \vec{V_p} + \vec{V_w}$$
$$= 200 + 50$$
$$= 250\ km/hr\ [N]$$

b) $\vec{V}_g = ?$ $\vec{V}_w = 50 \text{ km/hr } [S]$

headwind, opposite direction as $\vec{V}_p$

$$\vec{V}_g = 200 + (-50)$$
$$= 150 \text{ km/hr } [N]$$

5. $\vec{V}_b = 5.0 \text{ km/hr } [W]$

$\vec{V}_c = 2.0 \text{ km/hr } [W]$

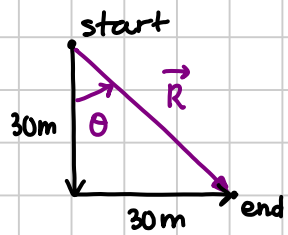
$$\vec{V}_s = \vec{V}_b + \vec{V}_c$$
$$\vec{V}_s = 5.0 + 2.0$$
$$= 7.0 \text{ km/hr } [W]$$

$t = 30 \text{ min} = 0.5 \text{ hr}$

$$\vec{V} = \frac{\vec{d}}{t}$$

$$\vec{d} = \vec{V} \cdot t$$
$$= (7.0)(0.5)$$
$$= 3.5 \text{ km } [W]$$

6.



$R^2 = 30^2 + 30^2$

$R^2 = 1800$

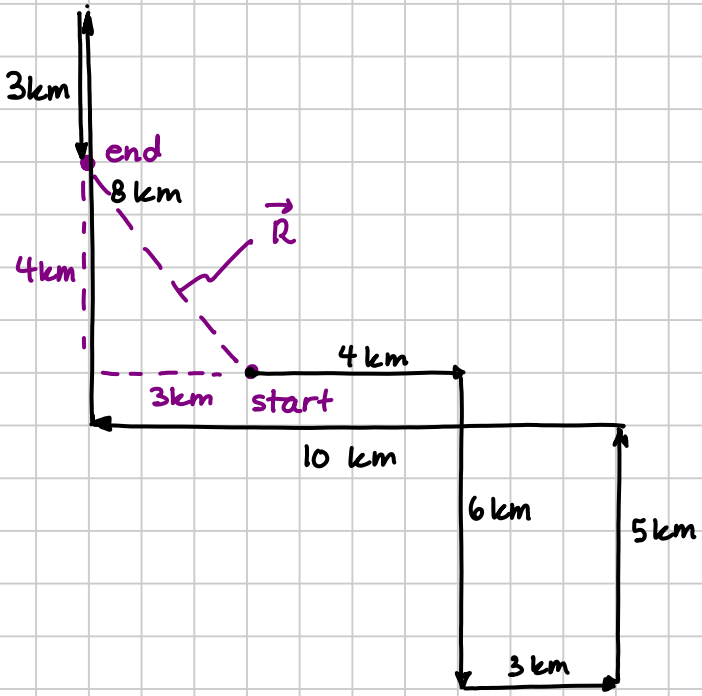
$R = \sqrt{1800}$

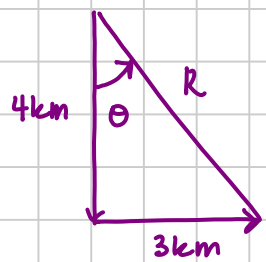
$R = 42.4$ m

$\theta = \tan^{-1}\left(\frac{30}{30}\right) = 45°$

$\vec{R} = 42$ m at 45° E of S

7.





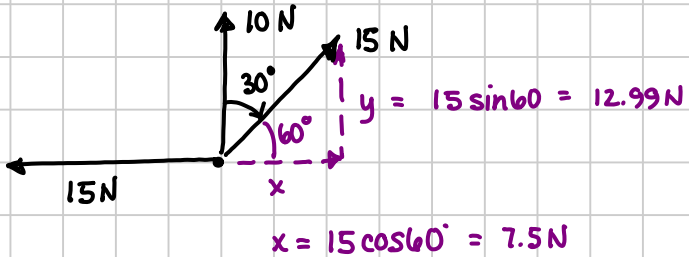
$R = \sqrt{4^2 + 3^2} = 5$ km

$\theta = \tan^{-1}(3/4) = 37°$

$\vec{R} = 5$ km at 37° E of S

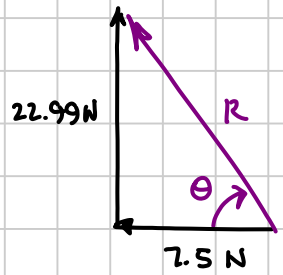
or 53° S of E

8.



x - comp : $7.5 + (-15) = -7.5\ N$

y - comp : $10 + 12.99 = 22.99\ N$



$R = \sqrt{(7.5)^2 + (22.99)^2}$

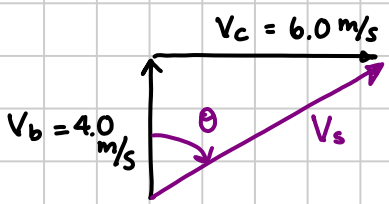
$= 24.2\ N$

$\theta = \tan^{-1}\left(22.99/7.5\right) = 72°$

$\vec{R} = 24\ N$ at $72°$ N of W

or $18°$ W of N

9.



a) $\theta = \tan^{-1}\left(6.0/4.0\right) = 56°$

56° E of N or 34° N of E

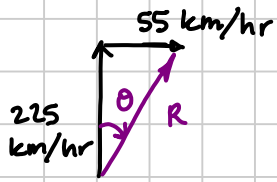
b) $t = \dfrac{\vec{d}}{\vec{v}} = \dfrac{360}{4.0} = 90\ sec$

c) $\vec{d} = \vec{v} \cdot t$

$= (6.0)(90) = 540\ m$

d) same time (90 sec)

10.



$R = \sqrt{(55)^2 + (225)^2}$

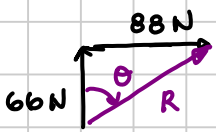
$= 231.6\ km/hr$

$\theta = \tan^{-1}\left(55/225\right) = 14°$

$\vec{R} = 230\ km/hr$ at $14°$ E of N

or $76°$ N of E

11.



$R = \sqrt{(66)^2 + (88)^2}$

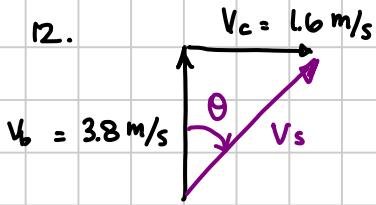
$= 110\ N$

$\theta = \tan^{-1}\left(88/66\right) = 53°$

$\vec{R} = 110\ N$ at $53°$ E of N

or $37°$ N of E

12.



a) $V_s = \sqrt{(1.6)^2 + (3.8)^2}$
$= 4.1$ m/s

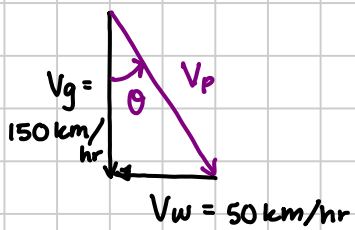
$\theta = \tan^{-1}\left(1.6/3.8\right) = 23°$

$\vec{V}_s = 4.1$ m/s at 23° E of N
or 67° N of E

b) $t = \dfrac{\vec{d}}{\vec{V}} = \dfrac{240}{3.8} = 63$ sec

c) $\vec{d} = \vec{V} \cdot t = (1.6)(63) = 101$ m

13.



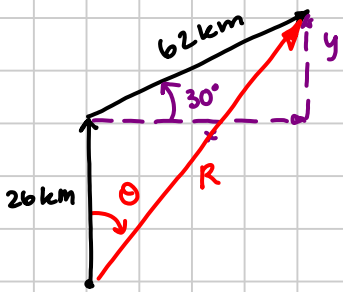
$\vec{V}_g = \dfrac{450}{3.00} = 150$ km/hr

$\theta = \tan^{-1}\left(50/150\right) = 18°$

$V_p = \sqrt{(150)^2 + (50)^2}$
$= 158$ km/hr

$\vec{V}_p = 160$ km/hr at 18° E of S

14.



$x = 62\cos 30^\circ = 53.69$

$y = 62\sin 30^\circ = 31 + 26 = 57$

$R = \sqrt{(57)^2 + (53.69)^2}$

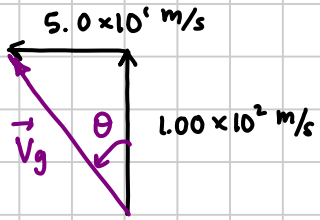
$= 78.3 \text{ km}$

$\theta = \tan^{-1}\left(57/53.69\right) = 47^\circ \text{ N of E}$

$\vec{d} = 78 \text{ km at } 47^\circ \text{ N of E}$

or 43° E of N

15.



$V_g = \sqrt{(100)^2 + (50)^2}$

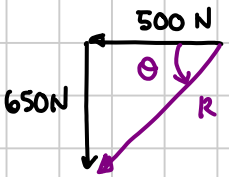
$= 112 \text{ m/s}$

$\theta = \tan^{-1}\left(50/100\right) = 27^\circ$

$\vec{V_g} = 112 \text{ m/s at } 27^\circ \text{ W of N}$

or 63° N of W

16.



$R = \sqrt{(500)^2 + (650)^2}$

$= 820 \text{ N}$

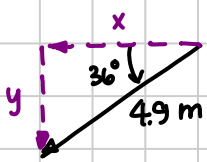
$\theta = \tan^{-1}\left(650/500\right)$

$= 52^\circ$

$\vec{R} = 820\text{N at } 52^\circ \text{ S of W}$

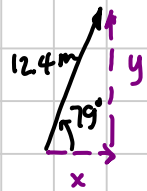
or 38° W of S

17. 4.9 m at 36° S of W + 12.4 m at 79° N of E



$x = 4.9\cos 36° = 3.96 \leftarrow$

$y = 4.9\sin 36° = 2.88 \downarrow$

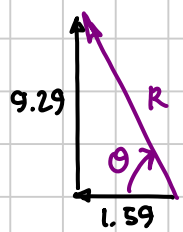


$x = 12.4\cos 79° = 2.37 \rightarrow$

$y = 12.4\sin 79° = 12.17 \uparrow$

x-comp : $-3.96 + 2.37 = -1.59$ or $1.59 \leftarrow$

y-comp : $-2.88 + 12.17 = 9.29 \uparrow$



$R = \sqrt{(9.29)^2 + (1.59)^2}$

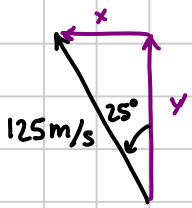
$= 9.43$ m

$\theta = \tan^{-1}\left(9.29/1.59\right) = 80°$

$\vec{R} = 9.4$ m at 80° N of W

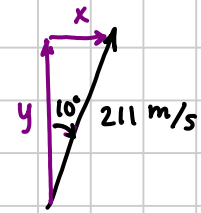
or 10° W of N

18. 125 m/s at 25° W of N — 211 m/s at 10° E of N



$x = 125\sin 25° = 52.83 \leftarrow$

$y = 125\cos 25° = 113.29 \uparrow$

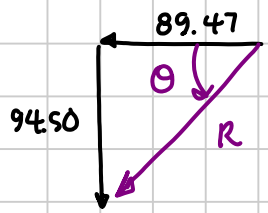


$x = 211\sin 10° = 36.64 \rightarrow$

$y = 211\cos 10° = 207.79 \uparrow$

x-comp $= -52.83 + (-36.64) = -89.47$ or $89.47 \leftarrow$

y-comp $= 113.29 + (-207.79) = -94.50$ or $94.50 \downarrow$



$R = \sqrt{(89.47)^2 + (94.50)^2}$

$= 130.1$

$\theta = \tan^{-1}\left(94.5/89.47\right)$

$= 47°$

$\vec{R} = 130$ m/s at 47° S of W

or 43° W of S