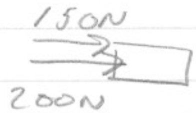
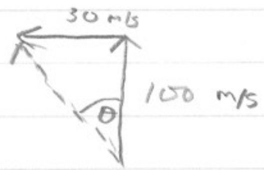
Vector Addition

1. 

$150N + 200N = \underline{350N \text{ E}}$

2. 

$50N - 63N = -13N$ $\underline{13N \text{ Left}}$

3. 

$c^2 = a^2 + b^2$

$= 100^2 + 30^2$

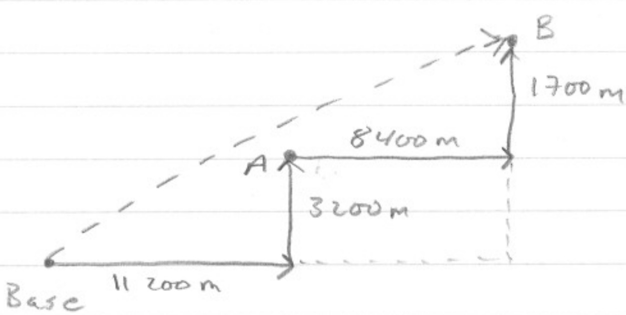
$= 10\,900$

$c = \sqrt{10\,900} = 104.4 \text{ m/s}$

$\tan\theta = \frac{30 \text{ m/s}}{100 \text{ m/s}}$

$\theta = \tan^{-1}\left(\frac{30}{100}\right) = 16.699°$

$\underline{104 \text{ m/s } 17° \text{ W of N}}$

4. 

$11200 + 8400 = 19\,600\text{m}$

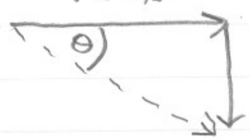
$(19\,600\text{m})^2 + (4900\text{m})^2 = c^2$

$20\,203\text{m} = c$

$\tan\theta = \left(\frac{4900\text{m}}{19600\text{m}}\right)$

$\theta = 14°$

<u>20 203 m 14° above the horizontal towards the East</u>

5. 

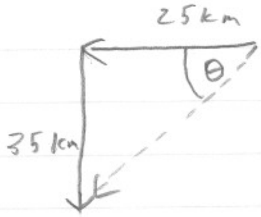
$c^2 = (52\ m/s)^2 + (12\ m/s)^2$

$c = 53.37\ m/s$

$\tan\theta = \dfrac{12\ m/s}{52\ m/s}$

$\theta = 12.99°$

<u>53.4 m/s 13° S of E</u>

6. 

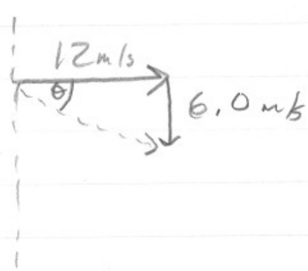
$c^2 = (25\ km)^2 + (35\ km)^2$

$c = 43.01\ km$

$\tan\theta = \left(\dfrac{35\ km}{25\ km}\right)$

$\theta = 54.46°$

<u>43.0 km 54.5° S of W</u>

7. 

$c^2 = (12\ m/s)^2 + (6\ m/s)^2$

$c = 13.4\ m/s$

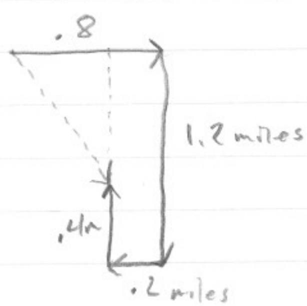
$\tan\theta = \left(\dfrac{6\ m/s}{12\ m/s}\right)$

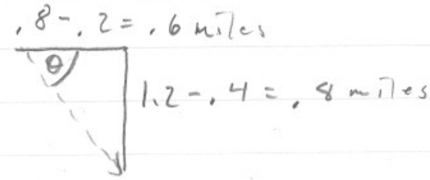
$\theta = 26.6°$

to the shore $= 90 - 26.6 = 63.4°$

<u>13.4 m/s 63.4° with respect to the shore</u>

8. (a) 0.8 miles + 1.20 miles + 0.2 miles + 0.4 miles = <u>2.6 miles</u>

(b) 



$c^2 = (.6)^2 + (.8)^2$

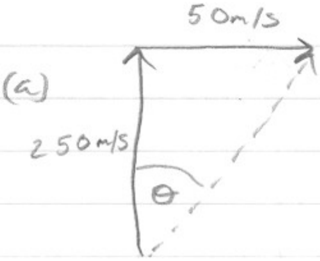
$c = 1$ mile

$\tan\theta = \left(\dfrac{.8}{.6}\right)$

$\theta = 53.1°$

<u>1 mile 53° S of E</u>

9. (a)



$$\tan\Theta = \left(\frac{50\,m/s}{250\,m/s}\right)$$

$$\Theta = 11.3^\circ \text{ E of N}$$

the plane will be pushed this amount

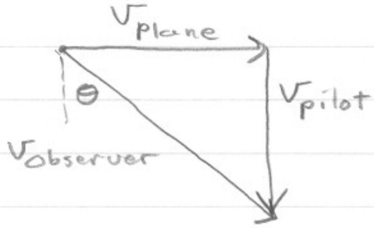
So, the plane must fly at an angle of 11.3° W of N

(b) $c^2 = (50\,m/s)^2 + (250\,m/s)^2$

$c = 254.95$

The plane's speed with respect to the air will be 255 m/s

10.



$$(v_{observer})^2 = (v_{plane})^2 + (v_{pilot})^2$$

$$(v_{plane})^2 = (v_{observer})^2 - (v_{pilot})^2$$

$$v_{plane} = \sqrt{(v_{observer})^2 - (v_{pilot})^2}$$