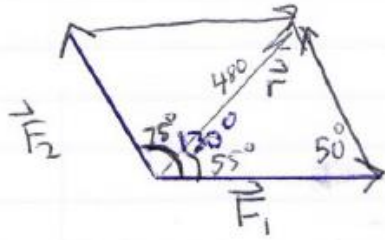


# Chapter 4 Review Exercise

9.



$$\frac{|\vec{F}_1|}{\sin 75^\circ} = \frac{480}{\sin 50^\circ}$$

$$|\vec{F}_1| = \frac{480 \sin 75^\circ}{\sin 50^\circ}$$

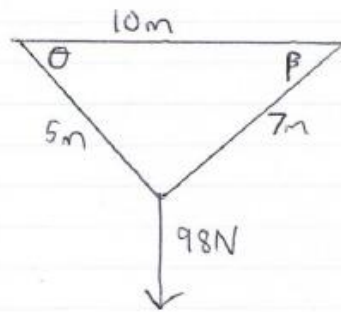
$$|\vec{F}_1| = 605 \text{ N}$$

$$\frac{|\vec{F}_2|}{\sin 55^\circ} = \frac{480}{\sin 50^\circ}$$

$$|\vec{F}_2| = \frac{480 \sin 55^\circ}{\sin 50^\circ}$$

$$|\vec{F}_2| = 513 \text{ N}$$

11.



$$10 \text{ kg} \times 9.8 \text{ N/kg} = 98 \text{ N}$$

$$7^2 = 5^2 + 10^2 - 2(5)(10)\cos\theta$$

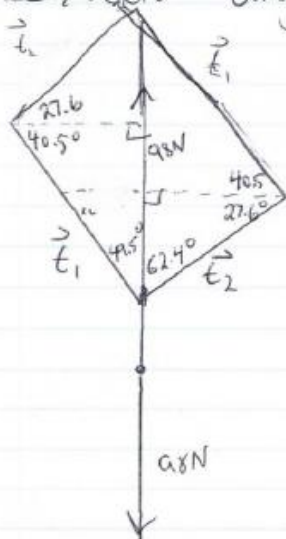
$$\cos\theta = \frac{7^2 - 5^2 - 10^2}{-2(5)(10)}$$

$$\frac{\sin\beta}{5} = \frac{\sin 40.5}{7}$$

$$\theta \approx 40.5^\circ$$

$$\beta \approx 27.6^\circ$$

Force/vector diagram.



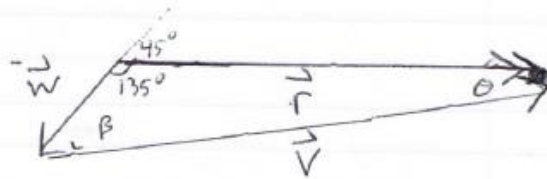
$$\frac{|\vec{T}_1|}{\sin 62.4^\circ} = \frac{98}{\sin 68.1^\circ}$$

$$|\vec{T}_1| \approx 93.6 \text{ N}$$

$$\frac{|\vec{T}_2|}{\sin 49.5^\circ} = \frac{98}{\sin 68.1^\circ}$$

$$|\vec{T}_2| \approx 80.3 \text{ N}$$

12.



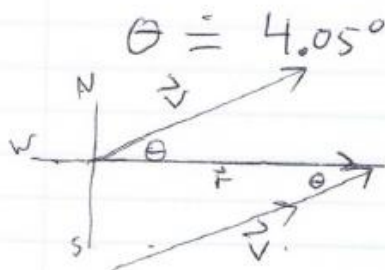
$$\vec{r} = \vec{w} + \vec{v}$$

$$|\vec{w}| = 80 \text{ km/h}$$

$$|\vec{v}| = 800 \text{ km/h}$$

$$\frac{\sin 135^\circ}{800} = \frac{\sin \theta}{80}$$

⊥



a) Plane should head  $\dots$  East, then  $4^\circ$  North.

or North  $86^\circ$  East.

b)

Find  $|\vec{r}|$ .

$$\frac{|\vec{r}|}{\sin 41^\circ} = \frac{800}{\sin 135^\circ}$$

$$\beta = 180 - 135 - 4$$

$$= 41^\circ$$

$$|\vec{r}| = 742 \text{ km/h}$$

$$\text{time} = \frac{800 \text{ km}}{742 \text{ km/h}}$$

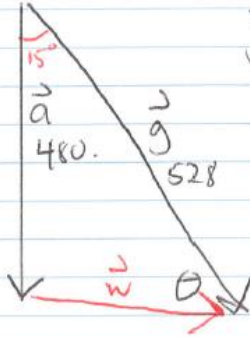
$$= 1.08 \text{ hours or } 1 \text{ hour } 5 \text{ mins}$$

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# 13.

Let  $\vec{a}$  = air speed velocity.  
 $\vec{w}$  = wind velocity.  
 $\vec{g}$  = ground velocity.

$$\vec{g} = \vec{a} + \vec{w}$$



$$|\vec{w}|^2 = 480^2 + 528^2 - 2(480)(528)\cos 15^\circ$$



$$|\vec{w}| \approx 140 \text{ km/h.}$$

$$\frac{\sin \theta}{480} = \frac{\sin 15^\circ}{140} \quad (\text{ambiguous case} \rightarrow \text{use cosine law})$$

↑ although sine law

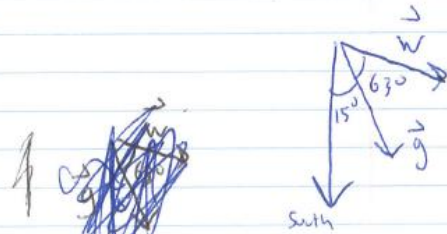
$$\cos \theta = \frac{528^2 + 140^2 - 480^2}{2(528)(140)}$$

works since

$\theta < 90^\circ$  (see below)

$$\cos \theta = \frac{67984}{147840}$$

$$\theta \approx 63^\circ$$



∴ wind direction is  $63 + 15 = 78^\circ$  East of South.

or wind is coming from  $78^\circ$  West of North.