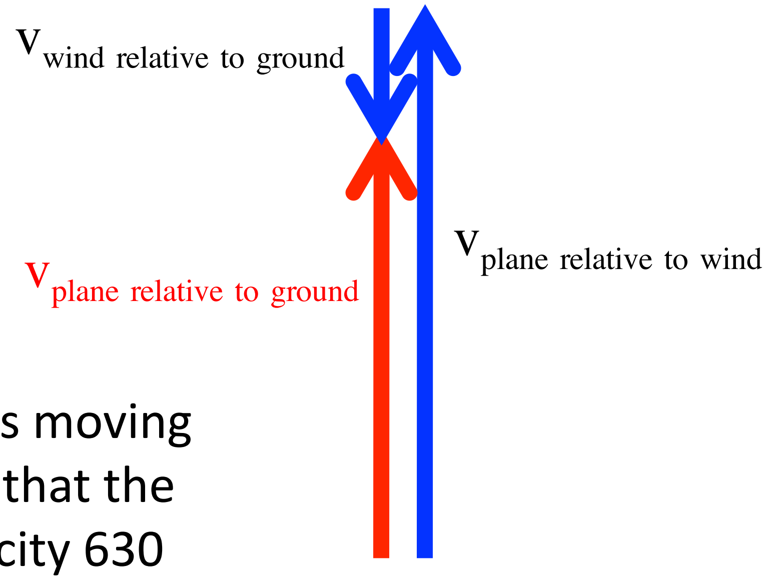
Problem 4.37



The plane's speed is given relative to the wind it is traveling through. That number is 630 km/hr.

a.) In this part, the wind, *relative to the ground*, is moving at 35 km/hr southward. Apparently, that means that the plane, relative to the ground is moving with velocity 630 km/hr - 35 km/hr = 595 km/hr. The time it takes to go 750 km at that ground speed is:

$$\Delta t = \frac{L}{v_1}$$

$$= \frac{(750.\ \text{km})}{(595\ \text{km/hr})}$$

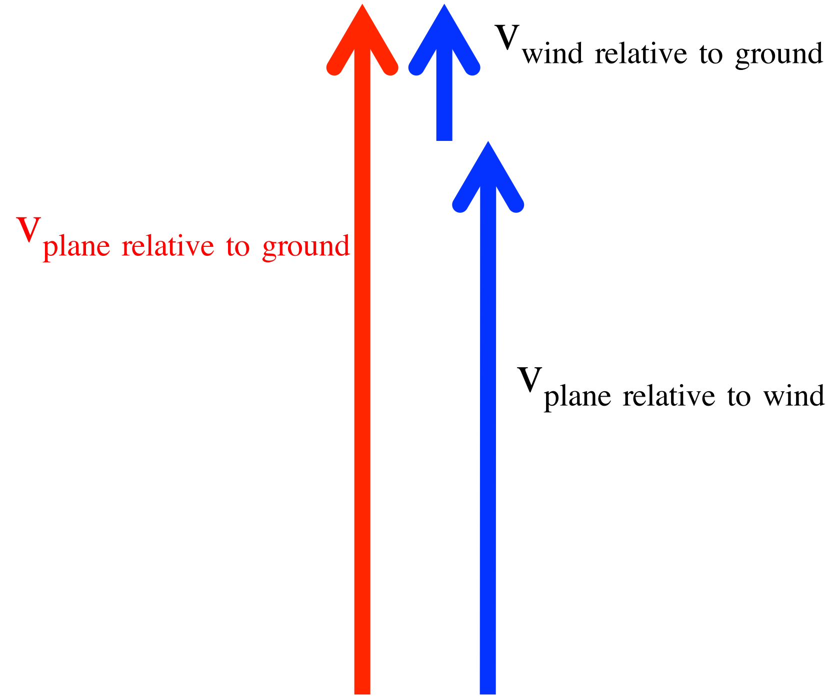
$$= 1.26\ \text{hrs}$$

b.) In this part, the wind, *relative to the ground*, is moving at 35.0 km/hr northward. That means that the plane, relative to the ground is moving with velocity 630 km/hr + 35.0 km/hr = 665 km/hr. The time it takes to go 750 km at that ground speed is:

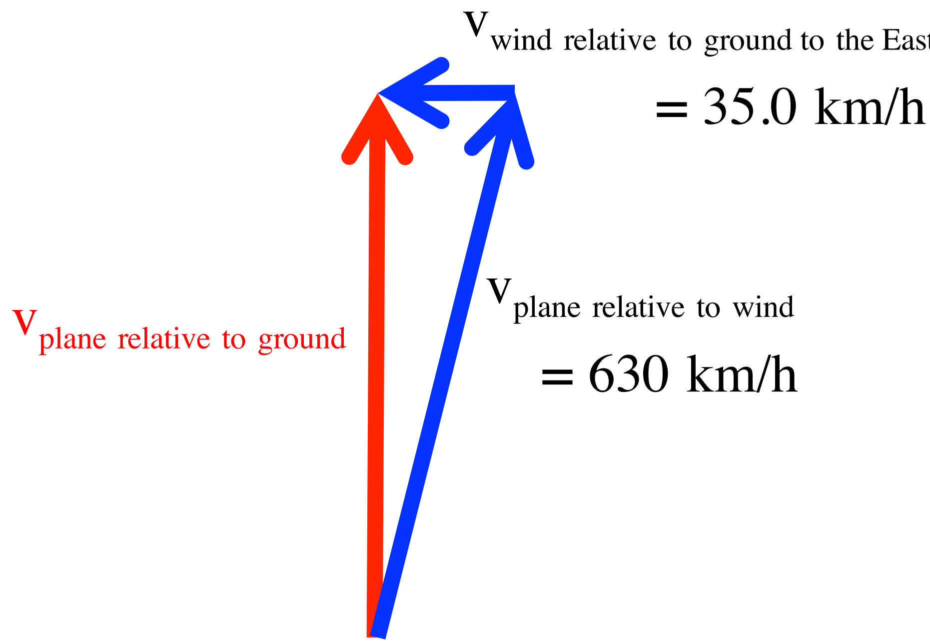
$$\Delta t = \frac{L}{v_1}$$

$$= \frac{(750.\ \text{km})}{(665\ \text{km/hr})}$$

$$= 1.13\ \text{hrs}$$



c.) In this part, the wind, *relative to the ground*, is moving at 35 km/hr across the plane's path. Now we are talking two-dimensional vectors (see sketch). This gets a little tricky as we need to remember that the plane must orient itself so that the crosswind pushes it toward its destination to the north (again, see sketch). In this case, the magnitude of the velocity of the plane, relative to the ground, will be:



$$v_{\text{plane relative to ground}} = \sqrt{(630 \text{ km/hr})^2 - (35.0 \text{ km/hr})^2}$$
$$= 629 \text{ km/hr}$$

The time it will take for the plane to reach its destination in this case will be:

$$\Delta t = \frac{L}{v_1}$$

$$= \frac{(750.\ \text{km})}{(629\ \text{km/hr})}$$

$$= 1.19\ \text{hrs}$$