

Relative Motion

$$\vec{V}_{pg} = \vec{V}_{pa} + \vec{V}_{ag}$$

↑
to an observer on the ground
(ground speed)
↑
airspeed + heading
↑
Wind

* This requires a vector addition diagram.

PP3

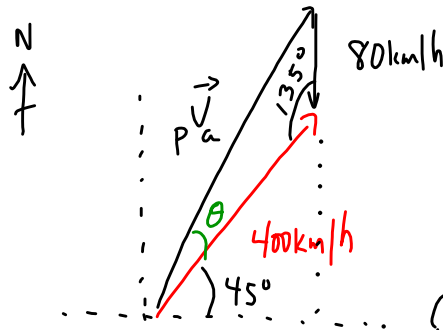
$$\vec{V}_{pg} = \frac{300\text{km [NE]}}{0.75\text{h}} = 400\text{km/h [NE]}$$

$$\vec{V}_{pg} = \vec{V}_{pa} + \vec{V}_{ag}$$

$$\vec{V}_{ag} = 80\text{km/h [S]}$$

$$400\text{km/h [NE]} = \vec{V}_{pa} + 80\text{km/h [S]}$$

$$\vec{V}_{pa} = ?$$



$$c^2 = a^2 + b^2 - 2ab\cos C$$

$$c^2 = 80^2 + 400^2 - 2(80)(400)\cos 135^\circ$$

$$c = 460 \text{ km/h}$$

↑ air speed

$$\frac{a}{\sin A} = \frac{b}{\sin B}$$

$$\frac{80}{\sin \theta} = \frac{460}{\sin 135^\circ}$$

$$\sin \theta = \frac{80(\sin 135)}{460}$$

$$\theta = 7.1^\circ$$

heading: [E52°N]

$$\vec{V}_{pa} = 460\text{km/h [E52°N]}$$

PP4

