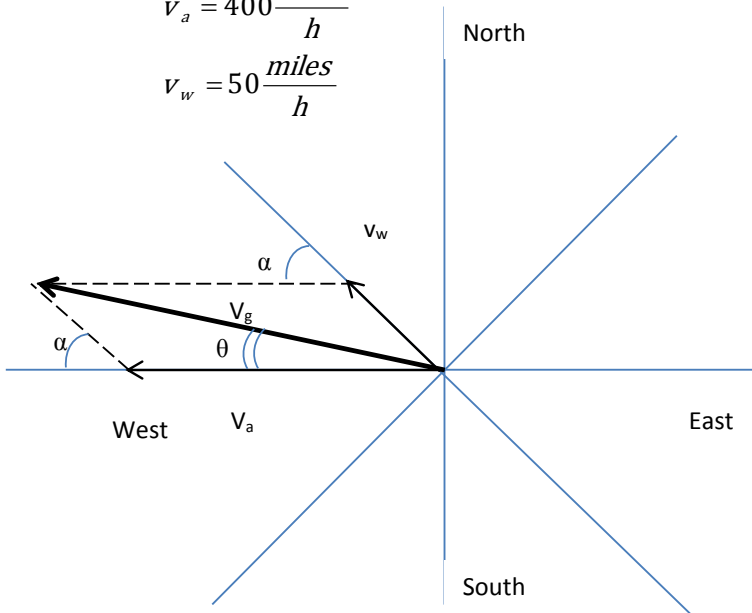# Answer on Question#37682-Physics-Mechanics

An airplane heads west at 400 miles per hour in a 50 mile per hour northwest wind. Find the ground speed and the bearing of the airplane.

***Solution***

$$v_a = 400 \frac{miles}{h}$$

$$v_w = 50 \frac{miles}{h}$$



The angle between west and northwest directions is $\alpha = 45°$. From hence, according the cosine theorem of triangle the ground speed of airplane is

$$v_g^2 = v_a^2 + v_w^2 - 2v_a v_w \cos(180° - \alpha) \Rightarrow$$

$$v_g^2 = v_a^2 + v_w^2 + 2v_a v_w \cos(\alpha) \Rightarrow$$

$$v_g = 436.9 \frac{km}{h}$$

The bearing of the airplane we can find from sine law

$$\frac{v_w}{\sin(\theta)} = \frac{v_g}{\sin(180° - \alpha)}$$

$$\sin\theta = \frac{v_w \sin\alpha}{v_g} = 0.08$$

$$\theta \approx 4.6°$$

***Answer:***

$$v_g = 436.9 \frac{km}{h}$$

$$\theta \approx 4.6°$$