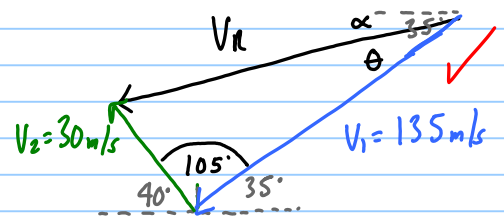
A plane flies that can fly with an airspeed of135 m/s points towards a heading of 35° S of W. A 30 m/s wind blows at 40° N of W. What is the total velocity of the plane relative to the ground?

# 2 Solutions

## ① Trig Method




$$V_R^2 = V_1^2 + V_2^2 - 2V_1V_2\cos 105°$$

$$V_R = \sqrt{135^2 + 30^2 - 2(135)(30)\cos 105}$$

$$= 146 \text{ m/s}$$

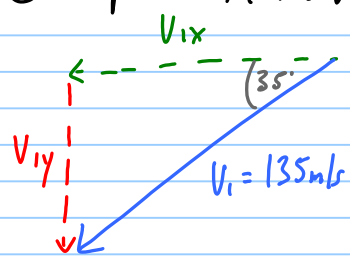
$$\frac{\sin\theta}{30} = \frac{\sin 105}{145.68}$$

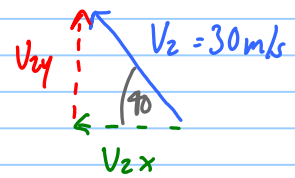
$$\theta = 11.5°$$

$$\alpha = 35° - 11.5°$$

$$= 23.5° \text{ (S of W)}$$

## ② Component Method




$$V_{1x} = 135\cos 35° = -110.59 \text{ m/s}$$

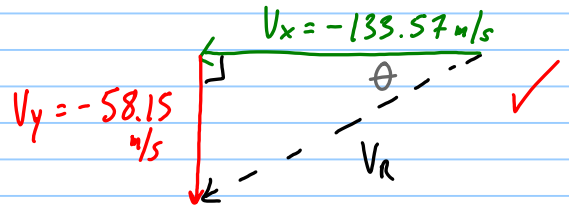
$$V_{1y} = 135\sin 35° = -77.43 \text{ m/s}$$

$$V_{2x} = 30\cos 40 = -22.98 \text{ m/s}$$

$$V_{2y} = 30\sin 40 = 19.28 \text{ m/s}$$

$$\sum V_x = V_{1x} + V_{2x} = -110.59 - 22.98 = -133.57 \text{ m/s}$$

$$\sum V_y = V_{1y} + V_{2y} = -77.43 + 19.28 = -58.15 \text{ m/s}$$




$$V_R = \sqrt{V_x^2 + V_y^2} = \sqrt{(-133.57)^2 + (-58.15)^2} = 146 \text{ m/s}$$

$$\theta = \tan^{-1}\left(\frac{58.15}{133.57}\right) = 23.5° \text{ S of W}$$