

## Quiz 4b

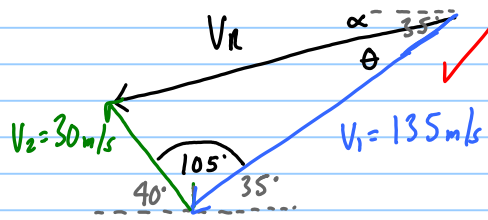
Note Title

25/09/2011

A plane flies that can fly with an airspeed of 135 m/s points towards a heading of  $35^\circ$  S of W. A 30 m/s wind blows at  $40^\circ$  N of W. What is the total velocity of the plane relative to the ground?

## 2 Solutions

### ① Trig Method



$$V_R^2 = V_1^2 + V_2^2 - 2V_1V_2 \cos 105^\circ \quad \checkmark$$

$$V_R = \sqrt{135^2 + 30^2 - 2(135)(30) \cos 105}$$
$$= 146 \text{ m/s} \quad \checkmark$$

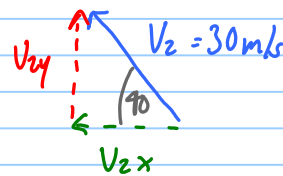
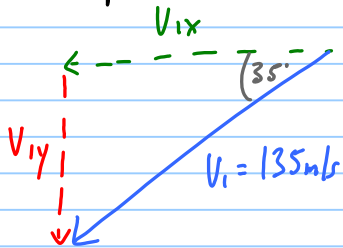
$$\frac{\sin \theta}{30} = \frac{\sin 105}{145.68}$$

$$\theta = 11.5^\circ \quad \checkmark$$

$$\alpha = 35^\circ - 11.5^\circ$$

$$= 23.5^\circ \quad \checkmark \text{ (S of W)}$$

### ② Component Method



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

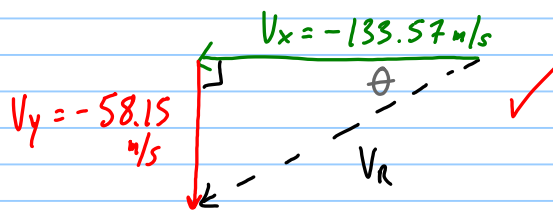
$$V_{2x} = 30 \cos 40^\circ = -22.98 \text{ m/s}$$

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

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

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

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



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

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