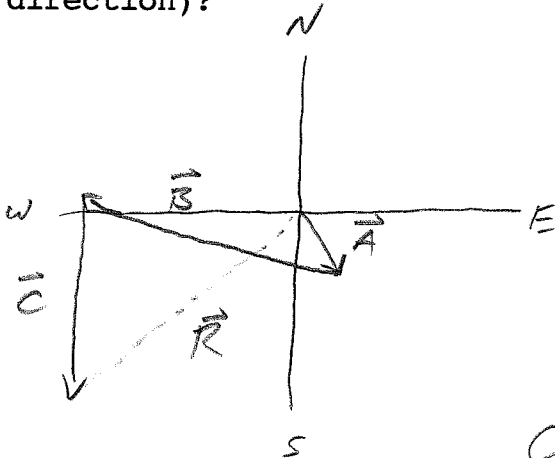


Quiz #3A

Clearly indicate (with a box) your answers to the following questions. SHOW ALL WORK.

1. A car travels 33.7 miles in a direction 73.0° South of East, then 88.2 miles in a direction 23.2° North of West, then 67.5 miles due South. What is the resulting displacement (magnitude and direction)?



$$A_x = 33.7 \cos 73^\circ = 9.85$$

$$A_y = -33.7 \sin 73^\circ = -32.2$$

$$B_x = -88.2 \cos 23.2^\circ = -81.07$$

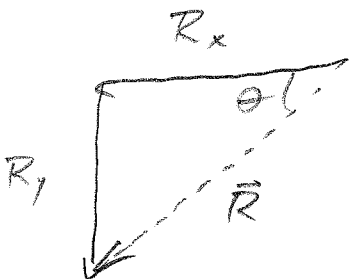
$$B_y = 88.2 \sin 23.2^\circ = 34.75$$

$$C_x = 0$$

$$C_y = -67.5$$

$$A_x + B_x + C_x = -71.22$$

$$A_y + B_y + C_y = -64.95$$



$$|\vec{R}| = \sqrt{(71.22)^2 + (64.95)^2}$$

$$= \boxed{96.4 \text{ miles}}$$

$$\theta = \tan^{-1}\left(\frac{64.95}{71.22}\right)$$

$$= \boxed{42.4^\circ \text{ S of W}}$$

2. Starting from rest, a block slides 2.5 meters down an elevated, frictionless ramp at an angle of 24° below the horizontal with an acceleration of 4.0 meters/sec^2 parallel to the ramp. After flying off the end of the ramp, the block lands on the floor 6.2 meters away, horizontally, from the end of the ramp. How high off the ground is the block the instant it leaves the ramp?

Ramp

$$\Delta s = 2.5 \text{ m}$$

$$v_0 = 0$$

$$v = ?$$

$$a = 4.0 \text{ m/s}^2$$

$$t = ?$$

$$v^2 = v_0^2 + 2a\Delta x$$

$$= 0^2 + 2(4)(2.5)$$

$$v = 4.47 \text{ m/s}$$

Free Fall

$$\Delta x = 6.2$$

$$v_{0x} = 4.47 \cos 24 = 4.09 \text{ m/s}$$

$$v_x = 4.09 \text{ m/s}$$

$$a_x = 0$$

$$t =$$

$$\Delta x = v_0 t + \frac{1}{2} a t^2$$

$$6.2 = 4.09 t + 0$$

$$t = 1.52 \text{ s}$$

$$\Delta y = ?$$

$$v_{0y} = -4.47 \sin 24 = -1.82 \text{ m/s}$$

$$v_y = ?$$

$$a_y = -9.8 \text{ m/s}^2$$

$$t = 1.52$$

$$\Delta y = v_{0y} t + \frac{1}{2} a_y t^2$$

$$\Delta y = (-1.82)(1.52) - 4.9(1.52)^2$$

$$= \boxed{-14.1 \text{ m}}$$