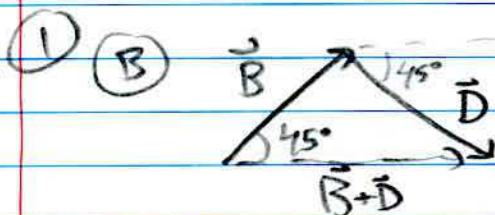


Version A

Quiz 2 Solutions



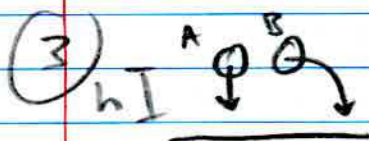
$$\begin{aligned}(\vec{B} + \vec{D})_y &= 0 \hat{j} \\ (\vec{B} + \vec{D})_x &= (B_x + D_x) \hat{i} \\ &= (|B| \cos 45^\circ + |D| \cos 45^\circ) \hat{i}\end{aligned}$$

w/  $|A| = |B| = |C| = |D|$

so  $\vec{B} + \vec{D} = (|C| \frac{\sqrt{2}}{2} + |C| \frac{\sqrt{2}}{2}) \hat{i} = \sqrt{2} |C| \hat{i} = \sqrt{2} \vec{C}$

$\therefore \vec{B} + \vec{D} = \sqrt{2} \vec{C} \rightarrow \vec{B} + \vec{D} - \sqrt{2} \vec{C} = 0$

②  $\vec{A} - 2\vec{B} = (A_x - 2B_x) \hat{i} + (A_y - 2B_y) \hat{j}$   
 $= (1m) \hat{j}$



$a_y = -g$  for both

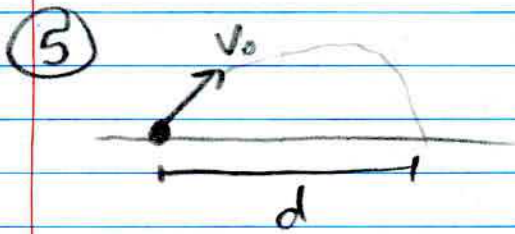
$$\begin{aligned}y_f - y_0 &= v_{0y} t - \frac{1}{2} g t^2 \\ 0 - h &= -\frac{1}{2} g t^2 \text{ so } t = \sqrt{\frac{2h}{g}} \text{ for both}\end{aligned}$$

$\therefore$  same time for both  
( $t_A = t_B$ )

④  $\frac{150 \text{ km}}{\text{hr}} = 41.7 \text{ m/s}$

y)  $y - y_0 = v_{0y} t - \frac{1}{2} g t^2$   
 $t = \sqrt{\frac{2h}{g}} = 10 \text{ s}$

x)  $x - x_0 = d = v_{0x} t + \frac{1}{2} a_x t^2$   
 $d = (41.7 \text{ m/s})(10 \text{ s})$   
 $= 417 \text{ m}$

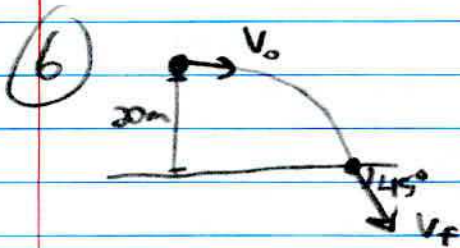


$$y) \quad y - y_0 = v_{0y}t + \frac{1}{2}a_y t^2$$

$$0 = (20 \text{ m/s})t - (4.9 \text{ m/s}^2)t^2$$

$$t = 4.08 \text{ s}$$

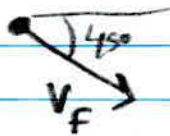
$$x) \quad d = v_{0x}t = (30 \text{ m/s})(4.08 \text{ s}) \approx 120 \text{ m}$$



$$y) \quad v_{fy}^2 = v_{0y}^2 + 2a_y(y_f - y_0)$$

$$v_{fy}^2 = 2(-g)(-h)$$

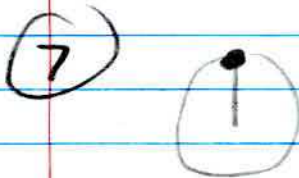
$$|v_{fy}| = 19.8 \text{ m/s}$$



$$|v_{fy}| = |v_f| \sin 45^\circ \rightarrow |v_f| = 28 \text{ m/s}$$

$$\text{so } |v_{fx}| = |v_f| \cos 45^\circ = 19.8 \text{ m/s}$$

$$x) \quad v_{fx}^2 = v_{0x}^2 + 2a_x(x_f - x_0) \quad \text{so } |v_{fx}| = |v_{0x}| \approx 20 \text{ m/s}$$



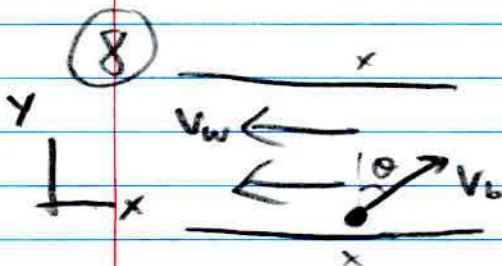
$$R = 1.5 \text{ m}$$

$$a_c = \frac{v^2}{R}$$

$$T = 0.5 \text{ s}$$

$$v = \frac{2\pi R}{T} = 18.8 \text{ m/s}$$

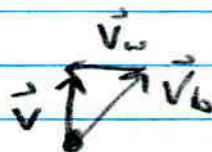
$$a_c = 240 \text{ m/s}^2$$



$$\text{so we want } \underline{\Delta x = 0}$$

$$\text{so } v_{bx} - v_w = 0$$

$$|v_b| \sin \theta = |v_w|$$



$$\theta = \sin^{-1}\left(\frac{9}{10}\right) = 30^\circ \text{ E of N}$$