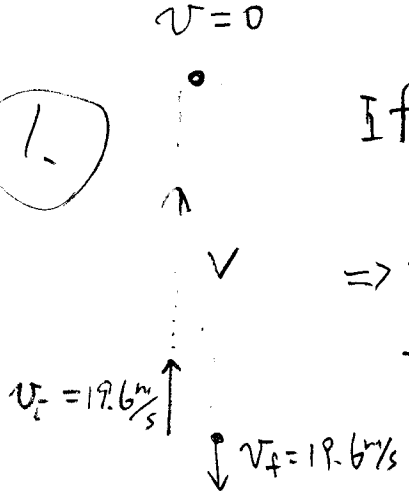
Physics 1A 1a) Quiz 1 Solution:



1. If total time elapsed is T

$\Rightarrow$ the time rock is thrown to top ($v=0$) $= \frac{T}{2}$

$\Rightarrow$ time from top ($v=0$) to the original point is also $\frac{T}{2}$

use $\boxed{v_x^2 = v_{ox}^2 + 2 a_x \Delta x}$

$0 = 19.6^2 + 2(-9.8)\Delta x$

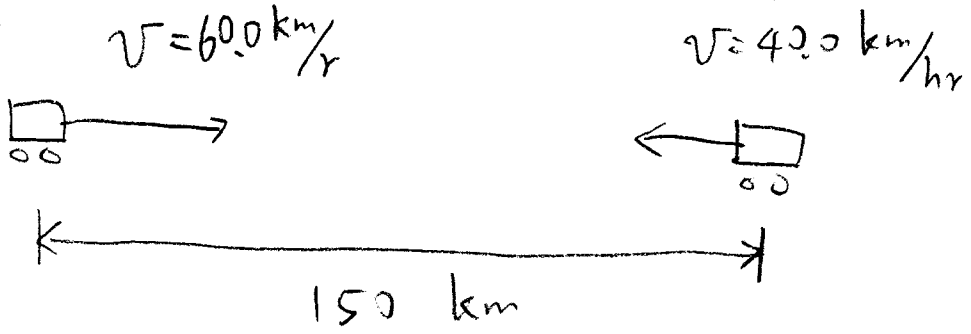
$\Delta x = 19.6 \ (m)$

use $\boxed{\Delta x = \frac{1}{2}(v_{ox} + v_x) t}$

$19.6 = \frac{1}{2}(19.6 + 0)\frac{T}{2}$

$T = 4$ choose (a)

(2.)

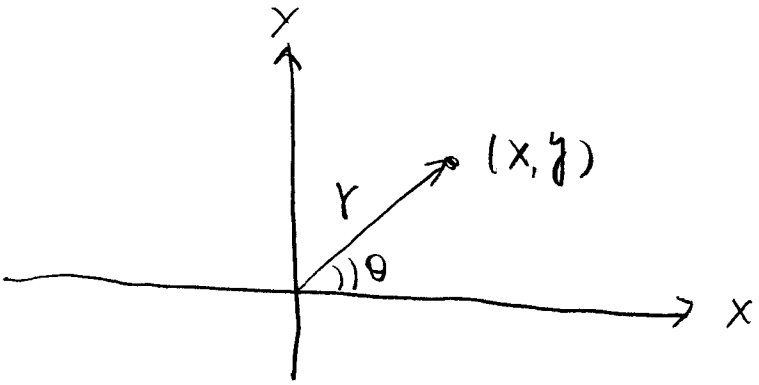


in t hours they meet

$$60t + 40t = 150 \quad \Rightarrow \quad t = 1.5 \text{ (hr)}$$

choose (d)

(3)



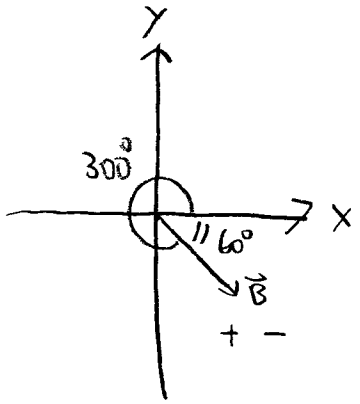
$x = r\cos\theta$

$y = r\sin\theta$

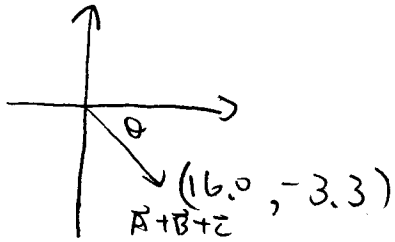
$\vec{A} = (8\cos 20^\circ, 8\sin 20^\circ)$

$\vec{B} = (+12\cos 60^\circ, -12\sin 60^\circ)$

$\vec{C} = (5\cos 60^\circ, 5\sin 60^\circ)$



$\vec{A}+\vec{B}+\vec{C} = (16.0, -3.3)$

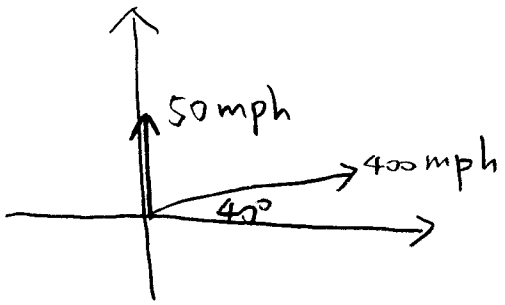


$\theta = \tan^{-1}\left(\frac{3.3}{16.0}\right)$

$\cong 12^\circ$

choose (d)

4.



$\vec{v}_{wind} = 50\,\hat{j}$

$\vec{v}_{plane} = 400\cos 40^\circ\,\hat{i} + 400\sin 40^\circ\,\hat{j}$

$\vec{v} = \vec{v}_{plane} + \vec{v}_{wind} = 400\cos 40^\circ\,\hat{i} + (50 + 400\sin 40^\circ)\,\hat{j}$

$|v| = \sqrt{(400\cos 40^\circ)^2 + (50 + 400\sin 40^\circ)^2}$

$\cong 434$ mph choose (C)

5.

The time t_1 to travel 40 km at $80\,km/hr$ is

$t_1 = \frac{40}{80} = \frac{1}{2}$ (hr)

Similarly, the time t_2 to travel 40km at $40\,km/hr$ is

$t_2 = \frac{40}{40} = 1$ (hr)

$\text{average speed} = \frac{\text{total displacement}}{\text{total time}} = \frac{40+40}{1+\frac{1}{2}} \cong 53\,(km/hr)$

choose (d)

(6.) The time for the bullet to hit the target is

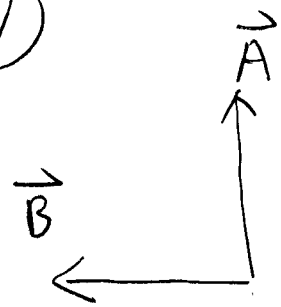
$$t = \frac{20\,(m)}{100\,(m/s)} = \frac{1}{5}\,(sec)$$

The vertical distance d bullet drops is, by using $\boxed{\Delta X = V_{ox}t + \frac{1}{2}a_x t^2}$

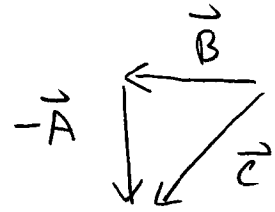
$$d = 0 \cdot \frac{1}{5} + \frac{1}{2}(9.8)\left(\frac{1}{5}\right)^2$$

$$= 0.196\ (m) \quad \text{choose (b).}$$

(7)



$$\vec{C} = \vec{B} - \vec{A} = \vec{B} + (-\vec{A})$$



choose (d,)

(8.) If t_1 is the time for the dropped rock to reach the ground, by using $\boxed{\Delta x = V_{ox}t + \frac{1}{2}a_x t^2}$

$$300 = 0 \cdot t_1 + \frac{1}{2}(9.8)t_1^2$$

Similarly for the thrown rock,

$$300 = 17 \cdot t_2 + \frac{1}{2}(9.8)\, t_2^2$$

$$\Rightarrow \quad t_1 \cong 7.82 \qquad t_2 \approx 6.28$$

$$t_1 - t_2 \cong 1.54 (\text{sec}) \qquad \text{choose (a)}$$

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1 (a)
2 (d)
3 (d)
4 (c)
5 (d)
6 (b)
7 (d)
8 (a)