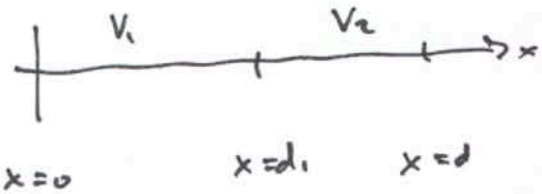
#1 $\rho_1 = 1.36\times10^4\ Kg/m^3$; in terms of g/cm^3, then: $\rho_2 = 1.36\times10^4 \frac{Kg}{m^3} \times$

$$\times \frac{10^3 g}{1 Kg} \times \left(\frac{1m}{10^2 cm}\right)^3 = \frac{1.36\times10^7}{10^6} = 1.36\times10\ g/cm^3 = \boxed{13.6\ g/cm^3 = \rho_2}\ \boxed{E}$$

#2 Average Speed: $v = \frac{d}{T} = \frac{d_1}{T_1} + \frac{d_2}{T_2}$; we know that $d = 300$ mi; $v = 50$ mi/hr; $d_1 = 220$ mi; $d_2 = 80$ mi & $v_1 = 55$ mi/hr

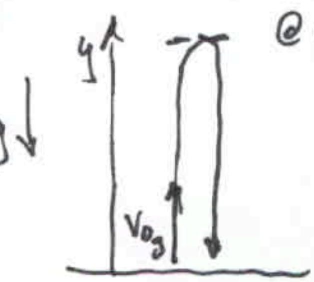


In terms of total time T:

$T = \frac{d_1}{v_1} + \frac{d_2}{v_2} = \frac{d}{v}$, solving for v_2:

$$v_2 = \frac{d_2}{\frac{d}{v} - \frac{d_1}{v_1}} = \boxed{40\ mi/hr}\ \boxed{E}$$

#3



@ $y = y_{max}$, $V_y = 0$. We know that

$y(t) = V_{oy}t - \frac{1}{2}gt^2$ & $V_y(t) = V_{oy} - V_y t$,

then $y(V_y)$ is given by noticing that

$t = (V_{oy} - V)/g$, Substituting this in

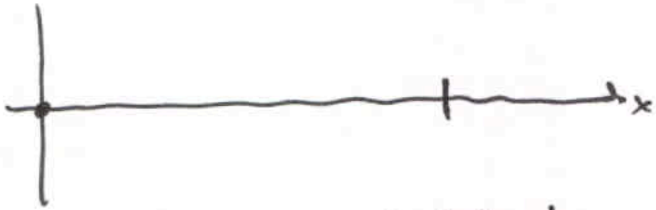
$y(t)$ gives, $y(V_y) = \frac{V_{oy}}{g}(V_{oy} - V_y) - \frac{1}{2}g\left(\frac{V_{oy} - V_y}{g}\right)^2$

Now @ $y = y_{max}$, $V_y = 0 \Rightarrow y_{max} = V_{oy}^2/2g$ & $V'_{oy} = 2V_{oy}$

meaning that $y'_{max} = 4y_{max} = \boxed{400\,m}\ \boxed{E}$

#4 Call $x_c(t)$ = cheetah's displacement & $x_g(t)$ = gazelle's displacement

At $t=0$



$x_c(0)=0$ $\qquad$ $x_g(0)=d$

$x_c(t) = V_c t$ & $x_g(t) = d + V_g t$

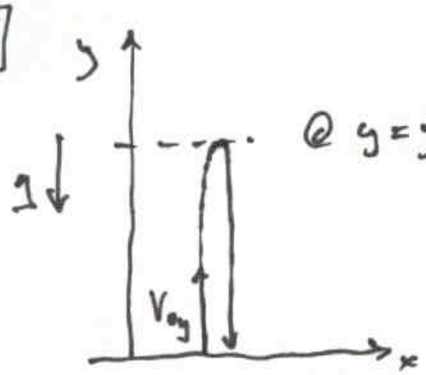
The cheetah gets the prey when

$x_c(t_1) = x_g(t_1)$ @ $t = t_1$.

$$V_c t_1 = d + V_g t_1 \Rightarrow t = \frac{d}{V_c - V_g} = \frac{0.07\,km}{20\,\frac{km}{hr}} = 0.0035\,hr = \boxed{12.6\text{ sec}}$$

$\boxed{B}$

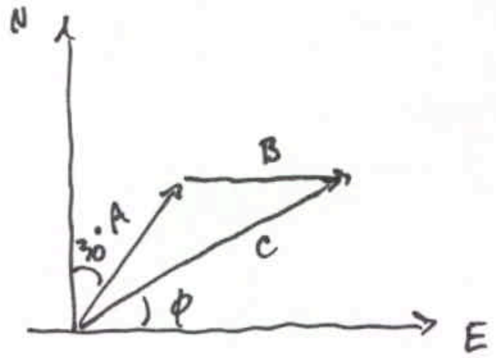
#5



@ $y = y_{max}$, $V_y = 0$. From #3, $y_{max} = V_{0y}^2/2g$, then

$$V_0 = \sqrt{2 y_{max} g} = \boxed{5.6\ m/s} \quad \boxed{A}$$

#6



$\vec{A} = \vec{B} + \vec{C} \Leftrightarrow$ $A_x + B_x = C_x$
$A_y + B_y = C_y$

$A_x = 15\sin(30^\circ)\,Km = 15/2\,Km$

$A_y = 15\cos(30^\circ)\,Km = 15\sqrt{3}/2\,Km$

$B_x = 30Km$

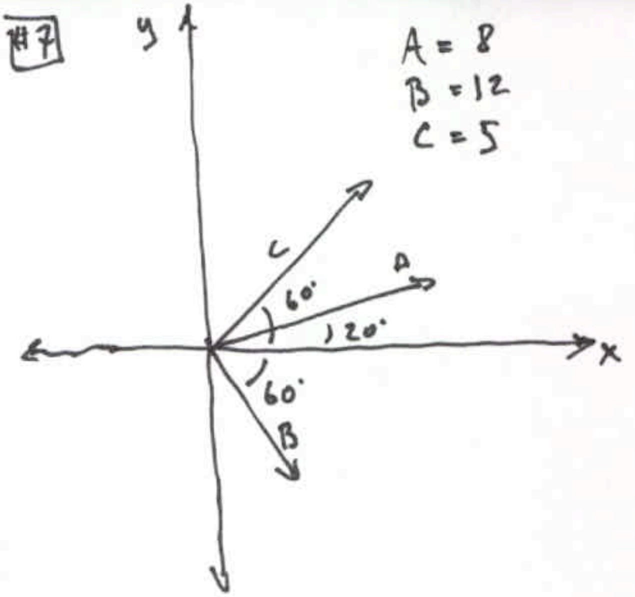
$B_y = 0Km$

Then adding them up gives: $C_x = 37.5Km$ & $C_y = 13\,Km$

$$C = (C_x^2 + C_y^2)^{1/2} = 39.7\,Km \quad \boxed{B}$$

#7

$A = 8$
$B = 12$
$C = 5$



From #6, add the components of each vector: $\vec{D} = \vec{A} + \vec{B} + \vec{C}$

$D_x = A\cos(20°) + B\cos(60°) + C\cos(60°)$
$D_y = A\sin(20°) + C\sin(60°) - B\sin(60°)$

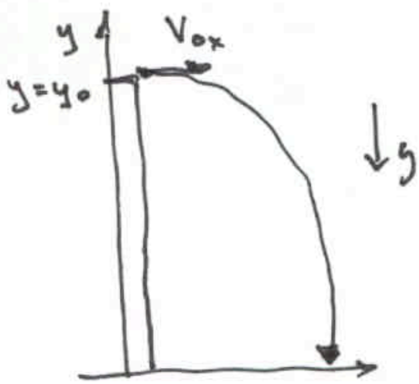
$D_x = 16.01$
$D_y = -3.326$

$D = \sqrt{D_x^2 + D_y^2} = 16.359 = 16.36$

$= \boxed{16.4}$

$\boxed{E}$

#8



$ma = -mg \Rightarrow a = -g$, then

$y(t) = y_0 - \frac{1}{2} g t^2$, solving y_0 given that when it hits the bottom $y(T) = 0$ @ time T:

$y(T) = y_0 - \frac{1}{2} g T^2 = 0 \Rightarrow$

$T = (2y_0/g)^{1/2}$; $y_0 = \frac{1}{2} g T^2 = 90.6\text{m}$

$= \boxed{91\text{m}}$

$\boxed{D}$