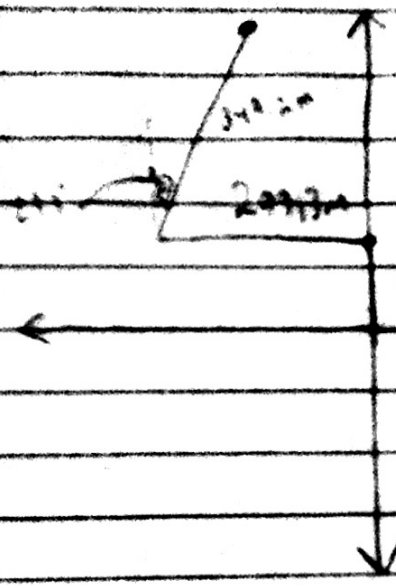
# Mark Exam 1




$0.186\ \text{mi} \times \frac{1.609\ \text{km}}{1\ \text{mi}} = 0.2992\ \text{km}$

$0.299\ \text{km} \times \frac{1000\ \text{m}}{1\ \text{km}} = 299.2\ \text{m}$

$0.217\ \text{mi} \times \frac{1.609\ \text{km}}{1\ \text{mi}} = 0.3492\ \text{km}$

$0.3492\ \text{km} \times \frac{1000\ \text{m}}{1\ \text{km}} = 349.2\ \text{m}$

a. total distance traveled in kilometers?

$100\ \text{m} + 299.2\ \text{m} + 349.2\ \text{m} = 748.5\ \text{m}$

$\boxed{0.7485\ \text{km}}$

b. average speed?

$\text{speed} = \frac{d}{t}$

$\text{speed} = \frac{0.7485\ \text{km}}{12\ \text{min}} = 0.062\ \frac{\text{km}}{\text{min}}$

$0.062\ \frac{\text{km}}{\text{min}} \times \frac{1000\ \text{m}}{1\ \text{km}} = 62\ \frac{\text{m}}{\text{min}}$ $\quad 62\ \frac{\text{m}}{\text{min}} \cdot \frac{1\ \text{min}}{60\ \text{s}} = \boxed{1.033\ \text{m/s}}$

c. total displacement?

find total x and y displacement, then find total displacement.

$y = 100\ \text{m} + 349.2\ \text{m}\cos(21.3^\circ) = 425.3\ \text{m}$

$x = -299.3\ \text{m} + 349.2\ \text{m}\sin(21.3^\circ) = -172.5\ \text{m}$

$\text{total displacement} = \sqrt{425.3\ \text{m}^2 + (-172.5\ \text{m})^2}$

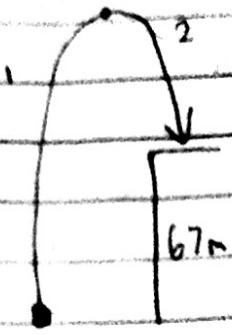
$180880\ \text{m} + 29756\ \text{m}$

$\sqrt{210636\ \text{m}}$

$\boxed{459.0\ \text{m}}$

2.

| Known | Unknown |
|---|---|
| $t_1 = 7.4\,s$ | $t$ |
| $a = -9.8\,m/s^2$ | $y - y_0$ |
| $V_{0_1} = 0\,m/s$ | |




a. max height

1.

$V_1 = V_{0_1} + at_1$

$+V_{0_1} = (+9.8\,m/s^2)(7.4\,s)$

$V_{0_1} = 72.52\,m/s$

$y - y_0 = V_{0_1}t_1 + \frac{1}{2}at_1^2$

$y - y_0 = (72.52\,m/s)(7.4\,s) + \frac{1}{2}(-9.8\,m/s^2)(7.4\,s)^2$

$y - y_0 = 536.6\,m + (-268.3\,m)$

$\boxed{y - y_0 = 268.3\,m}$

b. Total time

2.

| Known |
|---|
| $V_0 = 0$ |
| $a = -9.8$ |
| $y - y_0 = -201.3\,m$ |

$y - y_0 = V_{0_2}t_2 + \frac{1}{2}at_2^2$

$y - y_0 = \frac{1}{2}at_2^2$

$\frac{2(y - y_0)}{a} = t_2^2$

$\frac{+402.6\,m}{+9.8\,m/s^2} = t_2^2$

$41.085^2 = t_2^2$

$t_2^2 = \sqrt{41.08}$ $\quad t_2 = 6.41\,s$

$6.4 + 7.4 = \boxed{13.8\,s}$

Car 1 = 148 mph
Car 2 = 163 mph

3.


Car 1

$148 \frac{mi}{hr} \times \frac{1 hr}{60 min} = 2.5 \frac{mi}{min} \times \frac{1 min}{60 s} = 0.041 \frac{mi}{s}$

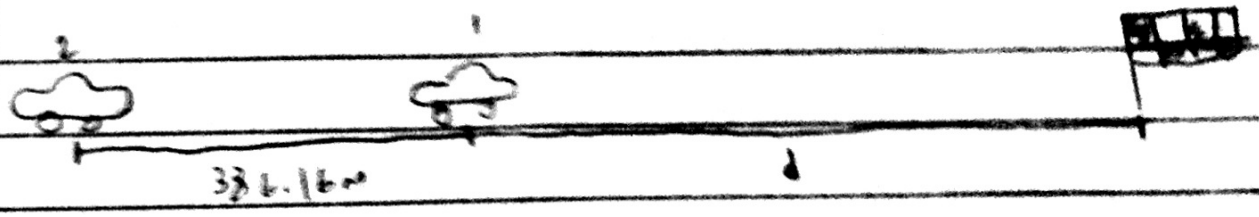
$0.041 \frac{mi}{s} \times \frac{1 km}{0.62 mi} = 0.066 \frac{km}{s} \times \frac{1000 m}{1 km} = \boxed{66.1 m/s}$

Car 2

$163 \frac{mi}{hr} \times \frac{1.609 km}{1 mile} \times \frac{1000 m}{1 km} = 262263 \frac{m}{hr}$

$262263 \frac{m}{hr} \times \frac{1 hr}{60 min} \times \frac{1 min}{60 s} = \boxed{72.9 m/s}$

$0.24 miles \times \frac{1.609 km}{1 mile} \times \frac{1000 m}{1 km} = \boxed{386.16 m}$




Car 1 - 66.1 m/s
Car 2 - 72.9 m/s

$72.9 m/s - 66.1 m/s = 6.8 m/s$

$6.8 m/s = \frac{386.16 m}{t}$ $\quad t = \frac{386.16 m}{6.8 m/s}$

$\boxed{t = 56.8 s}$

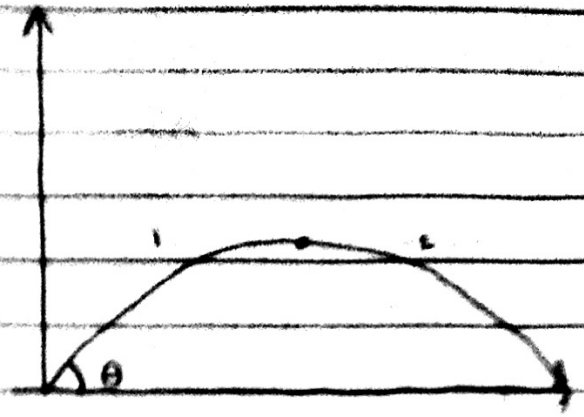
$66.1 m/s = \frac{d}{56.8 s}$

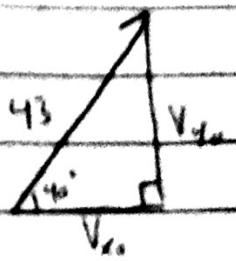
$d = 66.1 m/s \cdot 56.8 s$

$\boxed{d = 3754.5 m}$

* bus example if

4.




$V_{x0} = 43\ m/s\ \cos(40°) = 32.9\ m/s$

$V_{y0} = 43\ m/s\ \sin(40°) = 27.6\ m/s$

$V_y = V_{0y} + a_y t$

$-V_{0y} = a_y t$

$t = \frac{-V_{0y}}{a_y}$

$t = \frac{27.6\ m/s}{9.8\ m/s^2}$ 2.82 s $\times 2 =$ 5.64 $= t$

$t = 5.64\ s$

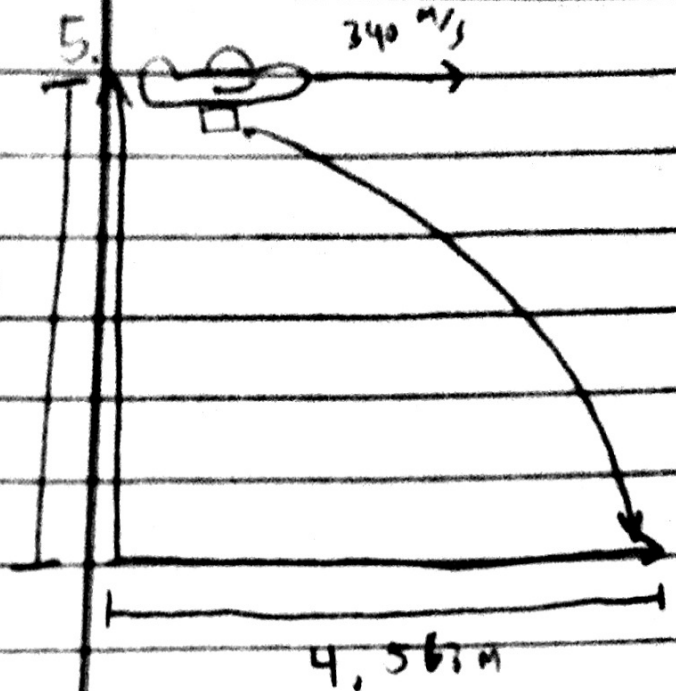
How far?

$X - X_0 = V_{0x} t$

$X - X_0 = 32.9\ m/s\ (5.64\ s)$

$X - X_0 = 185.6\ m$

5.




Known

$a_x = 0\ m/s^2$

$a_y = -9.8\ m/s^2$

$V_{0y} = 0\ m/s$

$V_{0x} = 346\ m/s$

$X - X_0 = 4,563m$

$t = 13.4s$

$X - X_0 = V_{0x} t$

$t = \frac{X - X_0}{V_{0x}}$ $\quad t = \frac{4563m}{340\ m/s}$

$\boxed{t = 13.4s}$

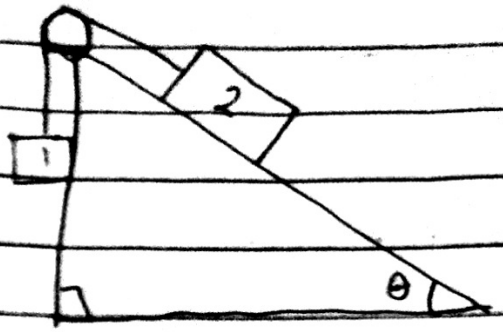
$Y - Y_0 = V_{0y} t + \frac{1}{2} a_y t^2$

$Y - Y_0 = \frac{1}{2} a_y t^2$

$Y - Y_0 = \frac{1}{2} (-9.8\ m/s^2)(13.4s)^2$

$\boxed{Y - Y_0 = 879.8m}$

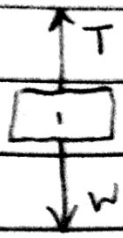
6.

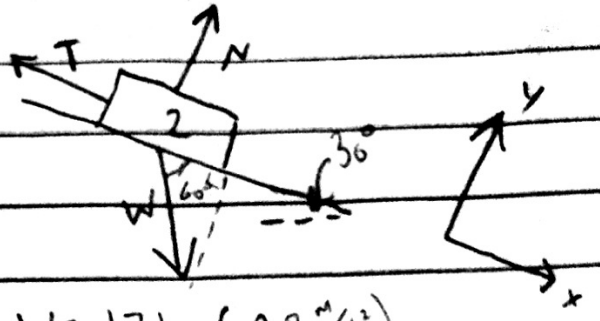



$m_1 = ?$

$m_2 = 17\ kg$

$\theta = 30°$




$W = 17\ kg\ (9.8\ m/s^2)$

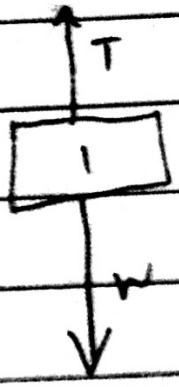
$W = 166.6\ N$

$N = W_y$

$T = W_x$

$W_x = 166.6N\ Cos(60°) = 83.3N = T$

$W_y = 166.6N\ Sin(60°) = 144.3N = N$




$T = W$

$W = 83.3N$

$W = m_1 a$

$83.3N = m_1(9.8\ m/s^2)$

$\frac{83.3N}{9.8\ m/s^2} = m_1$

$\boxed{m_1 = 8.5\ kg}$