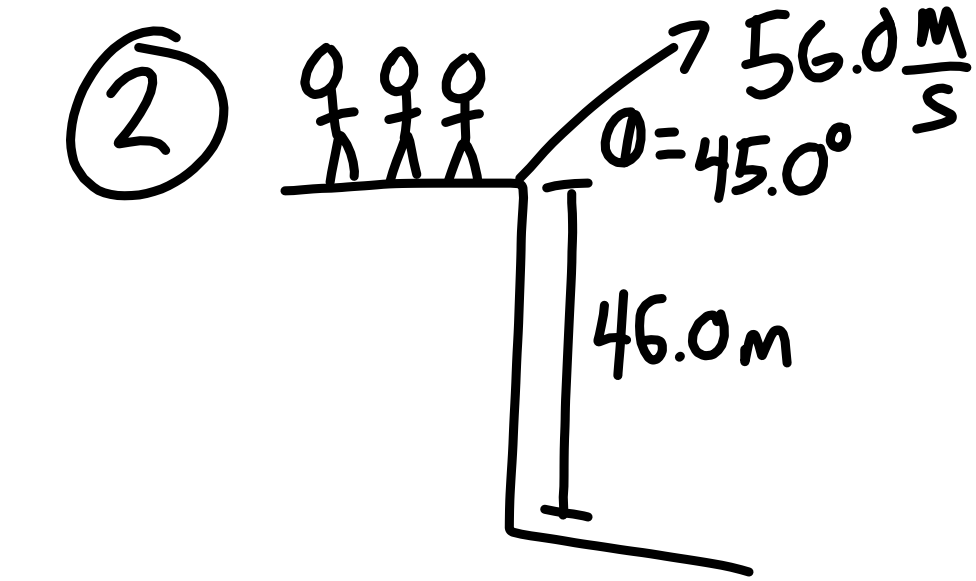
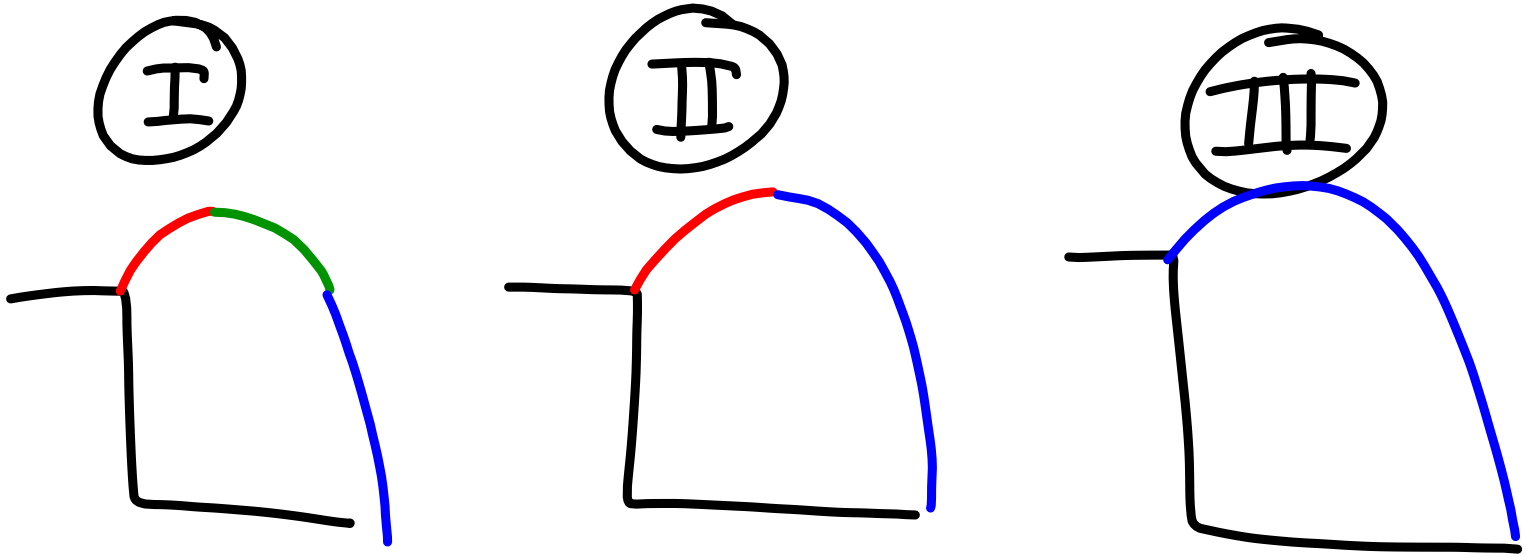

2
56.0 m/s
θ=45.0°
46.0 m


I
II
III

(I) $v_i = 56.0 \frac{m}{s}$

$v_{iy} = v_i \sin(45) = 39.59 \frac{m}{s}$

$v_{ix} = v_i \cos(45) = 39.59 \frac{m}{s}$

y

0

$v_f = v_i + at$

$0 = v_i + at$

$\frac{-v_i}{a} = t$

$\frac{-39.59}{-9.81} = t$

$t = 4.036 \text{ s}$

to apex

$4.036 \times 2 = 8.072\ s$

y to launch height

$d = v_i t + \frac{1}{2} a t^2$

$-46 = -39.59t + \frac{1}{2}(-9.81)t^2$

↳ graph: $t = 1.030\ s$

$t_f = 1.030 + 8.072 = 9.102 \approx$

$\boxed{9.10\ s}$

b) $d = v_i t + \cancel{\frac{1}{2} a t^2}^{0}$ (x)

$d = (39.59)(9.01) = 360.3 \approx$

360. m

(II)

time to apex = 4.036 s

$v_f = v_i + at$

$d = v_i t + \frac{1}{2}at^2$

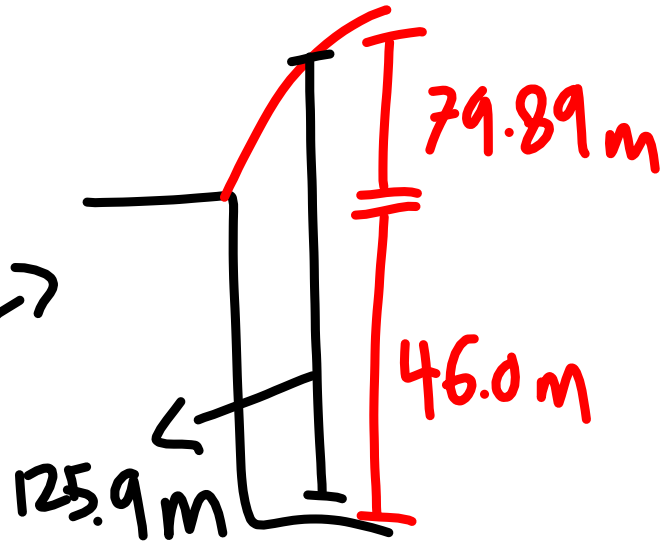
$v_F^2 = v_i^2 + 2ad$ ($v_f = 0$)

y

$0 = v_i^2 + 2ad$

$\frac{-v_i^2}{2a} = d$

$\frac{-39.59^2}{2(-9.81)} = d = 79.89\ m$

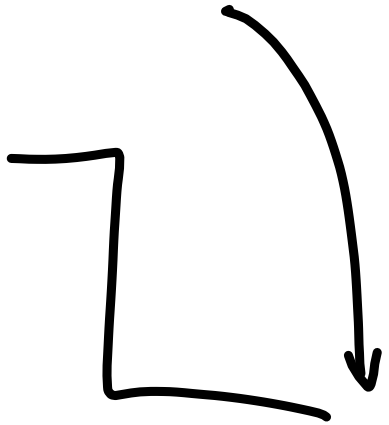


Y

$d = v_1 t + \frac{1}{2} a t^2$ ($v_1 = 0$)

$-125.9 = \frac{1}{2}(-9.81)t^2$

$\sqrt{\frac{-125.9}{-4.905}} = t = 5.066\,s$



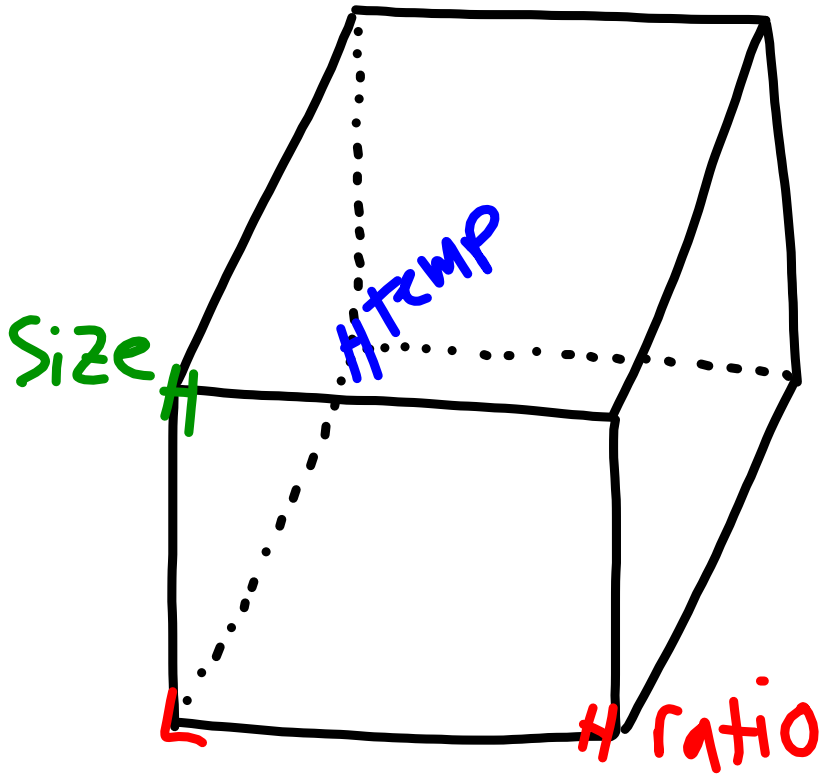
$$t_t = 4.036 + 5.066 = 9.102 \approx$$

$$\boxed{9.10\ s}$$

III $\quad X = X_0 + v_{0t} + \frac{1}{2}at^2$

lands ↑ Start ↑

Corner Cases



8 combinations

2^3

Mass Transfer Equation

$$\frac{C(t)}{C_{sat}} = 1 - e^{-kt}$$

$$\frac{C(t)}{C_{sat}} - 1 = -e^{-kt}$$

$$1 - \frac{C(t)}{C_{sat}} = e^{-kt}$$

$$1 - \frac{C(t)}{C_{sat}} = e^{-kt}$$

$$\ln\left(1 - \frac{C(t)}{C_{sat}}\right) = \ln\left(e^{-kt}\right)$$

$$\ln\left(1 - \frac{C(t)}{C_{sat}}\right) = -kt$$

$$\frac{\ln\left(1 - \frac{C(t)}{C_{sat}}\right)}{-t} = k$$