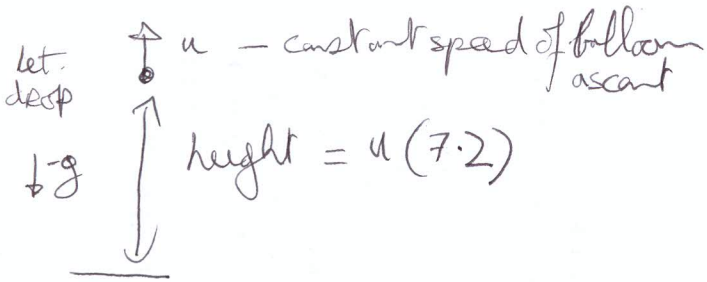
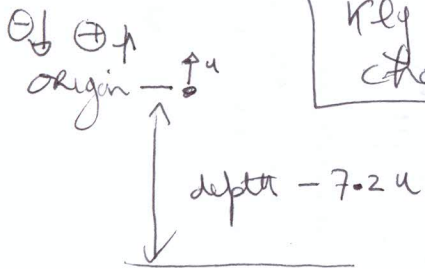


H192(a)



key where to choose origin



$s$  = distance above / below origin

$$s = ut + \frac{1}{2}at^2$$

$$s_{\text{subground}} = u(9) - \frac{1}{2}(9.8)t^2$$

$$s_{\text{subground}} = 9u - 396.9$$

when looking from the ground

$7.2u$  below origin  $\Rightarrow$

$$-7.2u = 9u - 396.9$$

$$-16.2u = -396.9$$

$$\Rightarrow u = 24.5 \text{ m/s}$$

$$\therefore \text{height} = 7.2(24.5) = 176.4 \text{ m}$$

$$\textcircled{1}, \textcircled{2} \Rightarrow t_2 = 9 - 2\left(\frac{u}{9.8}\right) = 9 - \frac{u}{4.9}$$

$$\therefore 7.2u = u\left(9 - \frac{u}{4.9}\right) + 4.9\left(9 - \frac{u}{4.9}\right)^2$$

$$7.2u = 9u - \frac{u^2}{4.9} + 4.9\left(81 - \frac{18u}{4.9} + \frac{u^2}{(4.9)^2}\right)$$

$$7.2u = 9u - \frac{u^2}{4.9} + 4.9(81) - 18u + \frac{u^2}{4.9}$$

$$\Rightarrow 7.2u = -9u + 396.9$$

$$\Rightarrow 16.2u = 396.9$$

$$\Rightarrow u = \frac{396.9}{16.2} = 24.5$$

$$\therefore \text{height} = 7.2(24.5) = 176.4 \text{ m}$$

1992(b)

$$(i) \quad s_p = 1(t) + 0.5(5)t^2$$

$$s_q = 11(t) + 0.5(4)t^2$$

$$s_p + 25.5 = s_q$$

$$t^2 - 20t + 51 = 0$$

$$(t-3)(t-17) = 0$$

$$t = 3 \text{ or } t = 17$$

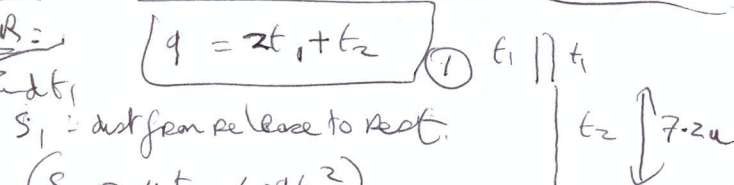
$$(ii) \quad \text{distance} = s_q - s_p - 25.5$$

$$= 10t - 0.5t^2 - 25.5$$

$$\frac{d(\text{distance})}{dt} = 10 - t$$

$$= 0 \text{ when } t = 10$$

$$\text{Maximum distance} = 10(10) - 0.5(100) - 25.5 = 24.5 \text{ m}$$



$$(s_1 = ut_1 - 4.9t_1^2)$$

$$\text{at } v=0 \Rightarrow 0 = u - 9.8t_1 \Rightarrow t_1 = \frac{u}{9.8}$$

$$\text{Find } t_2: \quad s = ut + \frac{1}{2}at^2$$

$$7.2u = ut_2 + \frac{1}{2}(9.8)t_2^2$$

$$7.2u = ut_2 + 4.9t_2^2$$