


Title

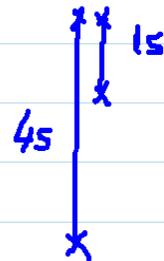
Mon 8th Mar2008

1. (a) A ball is thrown vertically upwards with an initial velocity of 39.2 m/s.

Find (i) the time taken to reach the maximum height

(ii) the distance travelled in 5 seconds.

 <http://www.appliedmaths.net/documents/2008.pdf> - Windows Internet Explorer



(i)

$$-v = 0$$

$$\uparrow u = 39.2 \text{ m/s}$$

$$\left. \begin{array}{l} u = 39.2 \\ a = -9.8 \text{ m/s}^2 \text{ } (-g \text{ m/s}^2) \\ v = 0 \\ t = ? \end{array} \right\}$$

$$v = u + at$$

$$0 = 39.2 - 9t$$

$$9t = 39.2$$

$$t = \frac{39.2}{9}$$

$$= 4.5$$

1st 4 Secs

$$u = 39.2$$

$$a = -g$$

$$v = 0$$

$$t = 4$$

$$s = ?$$

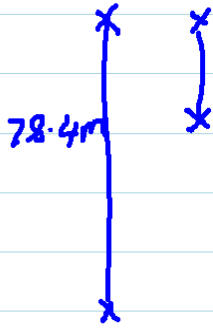
$$s = ut + \frac{1}{2}at^2$$

$$s = 39.2(4) + \frac{1}{2}(-g)4^2$$

$$= 156.8 - 8(9.8)$$

$$= 156.8 - 78.4$$

$$s_1 = 78.4 \text{ m}$$

next 1 sec

$$u = 0$$

$$t = 1$$

$$a = g$$

$$s = ?$$

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

$$s = 0(1) + \frac{1}{2}(g)1^2$$

$$s_2 = 4.9 \text{ m}$$

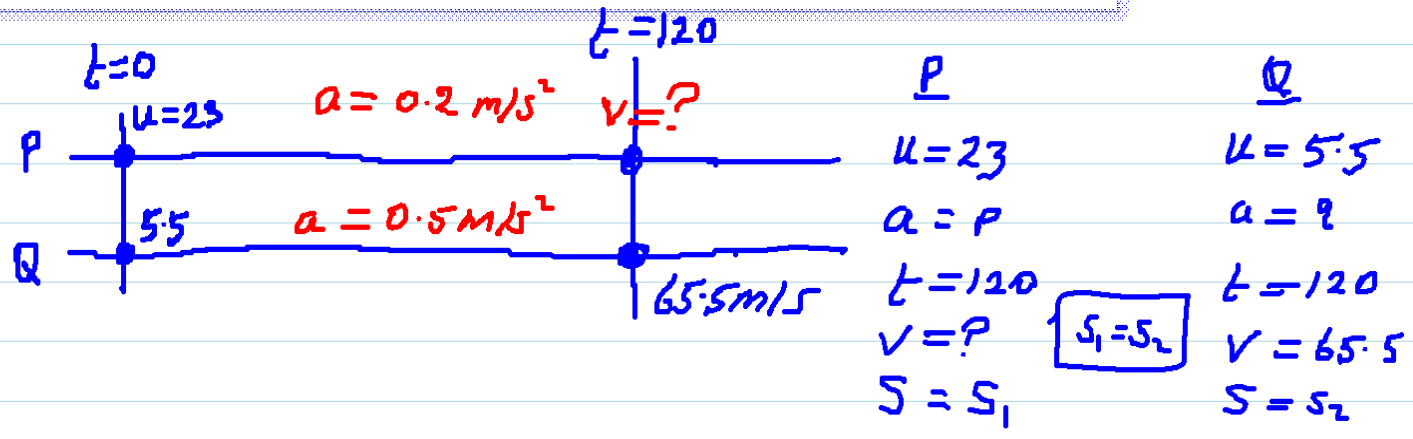
$$\text{Total Dist} = s_1 + s_2$$

$$= 78.4 + 4.9$$

$$= 83.3 \text{ m}$$

(b) Two particles P and Q, each having constant acceleration, are moving in the same direction along parallel lines. When P passes Q the speeds are 23 m/s and 5.5 m/s, respectively. Two minutes later Q passes P, and Q is then moving at 65.5 m/s.

- Find
- (i) the acceleration of P and the acceleration of Q
 - (ii) the speed of P when Q overtakes it
 - (iii) the distance P is ahead of Q when they are moving with equal speeds.



Q

$$V = u + at$$

$$u = 5.5$$

$$65.5 = 5.5 + a(120)$$

$$a = ?$$

$$60 = a(120)$$

$$t = 120$$

$$V = 65.5$$

$$a = \frac{60}{120} = \frac{1}{2} \text{ m/s}^2$$

$$s_1 = ut + \frac{1}{2} at^2$$

$$= (5.5)(120) + \frac{1}{2} \left(\frac{1}{2}\right)(120)^2$$

$$s_1 = 4280 \text{ m } (= s_2)$$

P

$$u = 23$$

$$a = P$$

$$t = 120$$

$$s = s_2$$

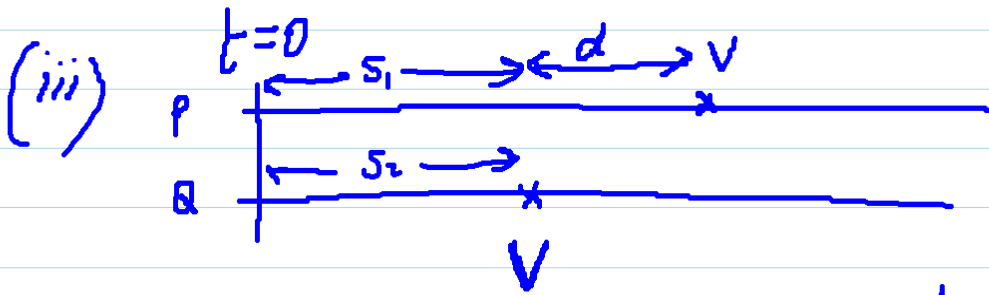
$$s = ut + \frac{1}{2} at^2$$

$$4280 = 23(120) + \frac{1}{2} P(120)^2$$

$$P = \underline{\underline{0.2 \text{ m/s}^2}}$$

$$V = u + at$$

$$v = 23 + (0.2)(120) = 47 \text{ m/s}$$



P

$$u = 23$$

$$a = 0.2$$

$$V = V_1$$

$$t = T$$

$$s = s_1$$

Q

$$u = 5.5$$

$$a = 0.5$$

$$V = V_2$$

$$t = T$$

$$s = s_2$$

$$V_1 = V_2$$

$$s_1 - s_2 = d$$

P

$$V^2 = u^2 + 2as$$

$$V^2 = 23^2 + 2(0.2)s_1$$

$$V^2 = 529 + 0.4s_1$$

Q

$$V^2 = u^2 + 2as$$