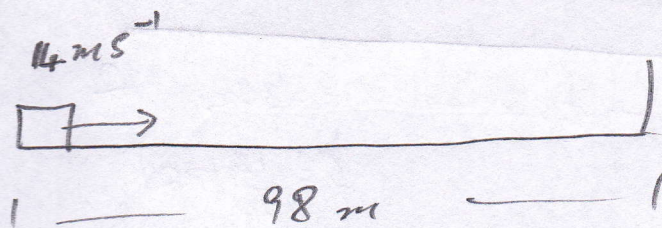


2010 Q1.

(a)(i)



$$u = 14 \text{ ms}^{-1}$$

$$v = 0$$

$$s = 98 \text{ m}$$

$$a = ?$$

$$v^2 = u^2 + 2as$$

$$\Rightarrow 0 = 14^2 + (2)a(98)$$

$$\Rightarrow -196 = 196a$$

$$\Rightarrow -1 \text{ ms}^{-2} = a$$

(ii) $t = 1 \text{ sec.}$

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

$$= 14(1) + \frac{1}{2}(0)t^2$$

$$= 14 \text{ m travelled in 1 sec.}$$

$$v^2 = u^2 + 2as$$

$$u = 14 \text{ ms}^{-1}$$

$$v = 0 \text{ ms}^{-1}$$

$$\Rightarrow 0 = 14^2 + 2a(84)$$

$$s = 98 - 14$$

$$= 84 \text{ m}$$

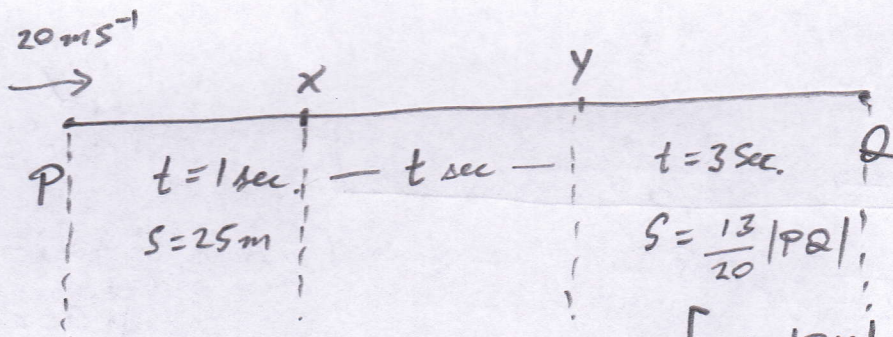
$$\Rightarrow -196 = 168a$$

$$\Rightarrow \frac{-196}{168} = a$$

$$a = ?$$

$$\Rightarrow -1.17 \text{ ms}^{-2} = a$$

(b)



$$\left[\Rightarrow |Py| = \frac{7}{20} |PQ| \right]$$

Find a: from P \rightarrow X

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

$$\Rightarrow 25 = 20(1) + \frac{1}{2}a(1)^2$$

$$\Rightarrow 5 = \frac{1}{2}a \Rightarrow a = 10 \text{ ms}^{-2}$$

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

$$\frac{7}{20} |PQ| = 20(t+1) + \frac{1}{2}(10)(t+1)^2$$

$$\Rightarrow \frac{7}{20} |PQ| = 20t + 20 + 5(t^2 + 2t + 1)$$

$$\Rightarrow \frac{7}{20} |PQ| = 20t + 20 + 5t^2 + 10t + 5$$

$$\Rightarrow \frac{7}{20} |PQ| = 5t^2 + 30t + 25 \quad \text{eqn (1)}$$

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

$$|PQ| = 20(t+4) + \frac{1}{2}(10)(t+4)^2$$

$$= 20t + 80 + 5(t^2 + 8t + 16)$$

$$= 20t + 80 + 5t^2 + 40t + 80$$

$$= 5t^2 + 60t + 160 \quad \text{eqn (2)}$$

Substituting eqn (2) into eqn (1)

$$\frac{7}{20}(5t^2 + 60t + 160) = 5t^2 + 30t + 25$$

$$\Rightarrow 35t^2 + 420t + 1120 = 100t^2 + 600t + 500$$

$$\Rightarrow 0 = 65t^2 + 180t - 620$$

$$\Rightarrow 0 = 13t^2 + 36t - 124$$

$$a = 13$$

$$b = 36$$

$$c = -124$$

$$t = \frac{-36 \pm \sqrt{(36)^2 - 4(13)(-124)}}{2(13)}$$

$$= \frac{-36 \pm \sqrt{7744}}{26}$$

$$= \frac{-36 \pm 88}{26} = 2 \text{ or } -\frac{62}{13}$$

✓ ✗

$$t = 2 \text{ sec.}$$

$$\text{Eqn (2)} \quad |PQ| = 5t^2 + 60t + 160$$

$$= 5(2)^2 + 60(2) + 160$$

$$= 20 + 120 + 160$$

$$= 300 \text{ m}$$