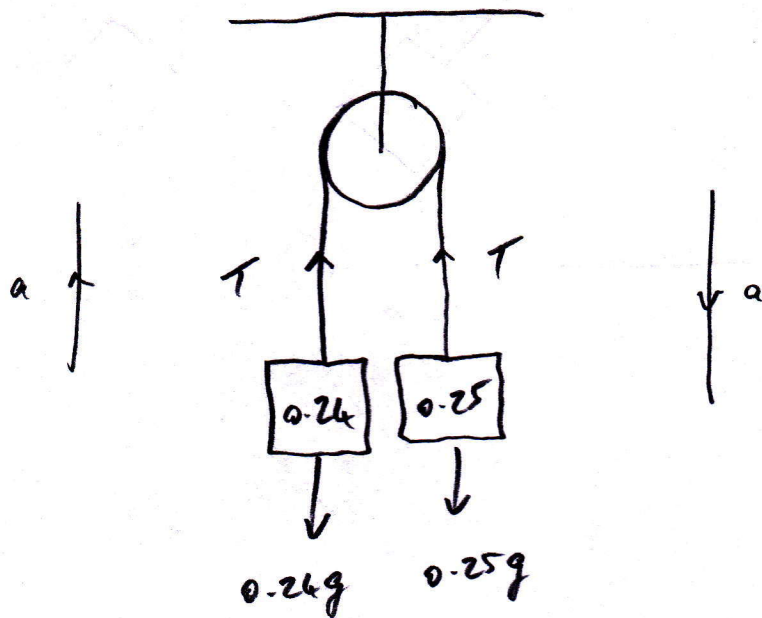


2010 Q4.

(a)

(i)



$$F = ma \Rightarrow 0.25g - T = 0.25a$$

$$\text{and } T - 0.24g = 0.24a$$

---

$$0.01g = 0.49a$$

$$\Rightarrow a = 0.2 \text{ m s}^{-2}$$

$$T - 0.24g = 0.24a$$

$$\Rightarrow T = 0.24g + 0.24(0.2)$$
$$= 2.4 \text{ N}$$

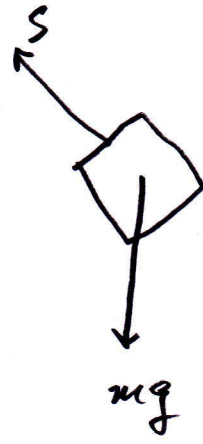
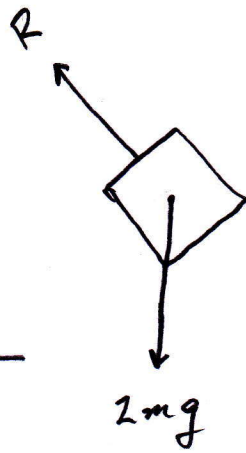
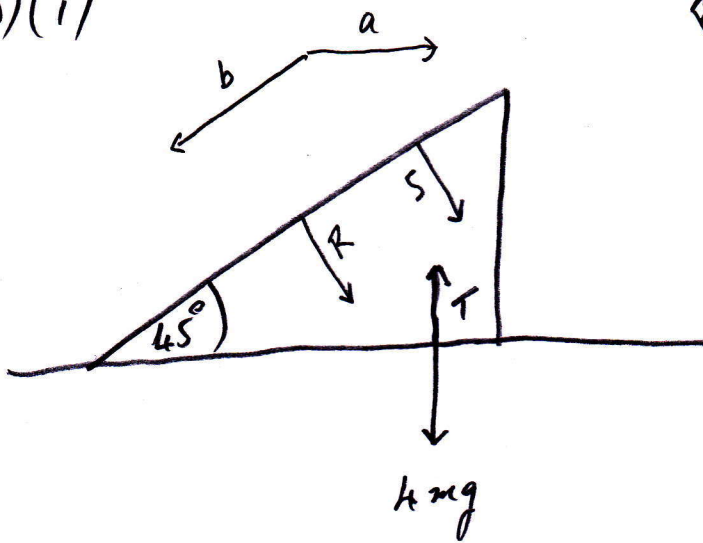
(ii)  $v^2 = u^2 + 2as$

$$v^2 = 0^2 + 2(0.2)(1.6)$$

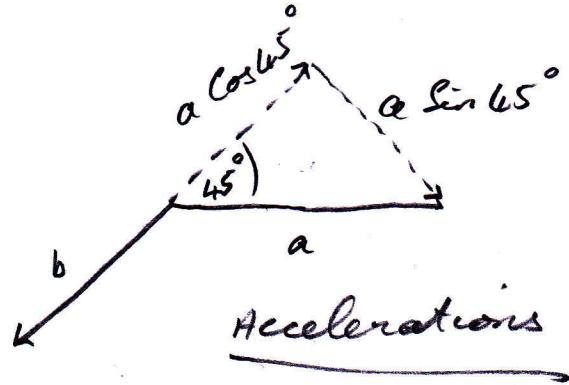
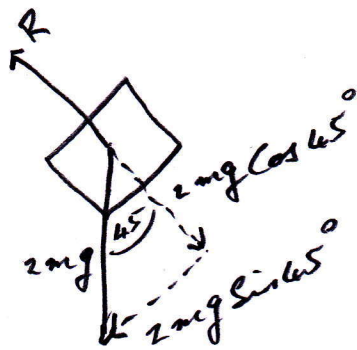
$$v^2 = 0.64$$

$$\Rightarrow v = 0.8 \text{ m s}^{-1}$$

(b)(i)



2m



Forces

$$F = ma \text{ (Perpendicular to the plane)}$$

$$2mg \cos 45^\circ - R = 2m(a \sin 45^\circ)$$

$$\Rightarrow R = 2mg \frac{1}{\sqrt{2}} - 2ma \frac{1}{\sqrt{2}}$$

$$= \sqrt{2}(mg - ma)$$

Note
$\frac{2}{\sqrt{2}} = \sqrt{2}$

m

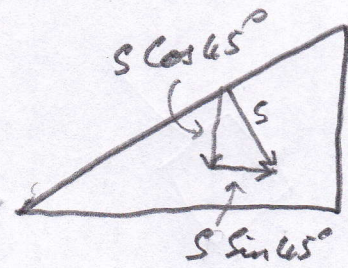
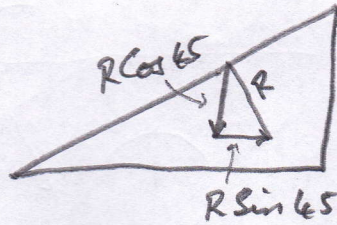
$$F = ma \Rightarrow mg \cos 45^\circ - S = ma \sin 45^\circ$$

$$\Rightarrow S = mg \frac{1}{\sqrt{2}} - ma \frac{1}{\sqrt{2}}$$

$$= \frac{1}{\sqrt{2}}(mg - ma)$$

(Similar diagrams to 2m above)

4m Wedge



Total Horizontal force =  $ma$

$$\Rightarrow R \sin 45 + S \sin 45 = 4ma$$

$$\Rightarrow \frac{\sqrt{2}(mg - ma)}{\sqrt{2}} + \frac{1}{\sqrt{2}}(mg - ma) \frac{1}{\sqrt{2}} = 4ma$$

$$\Rightarrow mg - ma + \frac{1}{2}mg - \frac{1}{2}ma = 4ma$$

$$\Rightarrow g - a + \frac{1}{2}g - \frac{1}{2}a = 4a$$

$$\Rightarrow -a - \frac{1}{2}a - 4a = -g - \frac{1}{2}g$$

$$\Rightarrow -5\frac{1}{2}a = -1\frac{1}{2}g$$

$$\Rightarrow a = 2.672 \text{ ms}^{-2}$$