

2(a)	$3 \times 4 = 3 \times (-1) + 5 \times v$
	or $3 \times 4 = 3 \times 1 + 5v$
	$v = 3 \text{ m s}^{-1}$
	$v = 1.8 \text{ m s}^{-1}$
2(b)	$\text{KE} = \frac{1}{2} \times 3 \times 4^2 (= 24) \text{ or } \text{KE} = \frac{1}{2} \times 3 \times 1^2 + \frac{1}{2} \times 5 \times 1.8^2 (= 9.6)$
	or $\text{KE} = \frac{1}{2} \times 3 \times 1^2 + \frac{1}{2} \times 5 \times 3^2 (= 24)$
	$\lambda = 14.4 \text{ ONLY}$
6	Acceleration of A down the plane is $g \times 0.2 [= 2]$
	Speed of A before collision is $g \times 0.2 \times 2 [= 4]$
	$3 \times 3.5 + 2.5 \times (-4) = 3 \times (-0.5) + 2.5 \times u$
	$u = 0.8$
	$0 = 0.8^2 + 2 \times \left(-g \times \frac{1}{5} \right) \times s$
	$s = 0.16 \text{ m}$
	(1)

4(a)

$$[\text{Height gained by } P (s_P) =] 30t - \frac{1}{2}gt^2$$

$$[\text{Height lost by } Q (s_Q) =] 10t - \frac{1}{2}gt^2$$

$$\text{Meet when } 30t - \frac{1}{2}gt^2 = 10t - \frac{1}{2}gt^2 + 15$$

$$t = \frac{3}{4} \text{ or } 0.75$$

$$\text{Height} = 19.6875 \text{ m or } \frac{315}{16} \text{ m}$$

4(b)

$$[v_P =] \pm \left(30 - \frac{3}{4}g \right) [= \pm 22.5] \quad [v_Q =] \pm \left(10 - \frac{3}{4}g \right) [= \pm 2.5]$$

OR $[v_P =] \pm \sqrt{30^2 - 2g \times 19.6875} [= \pm 22.5]$

$$[v_Q =] \pm \sqrt{10^2 - 2g \times (19.6875 - 15)} [= \pm 2.5]$$

$$0.1 \times 22.5 + 0.4 \times 2.5 = (0.1 + 0.4) \times v_{PQ}$$

$$v_{PQ} = 6.5$$

$$v^2 = \text{their } 6.5^2 + 2g \times \text{their } 19.6875$$

OR

$$0 = \text{their } 6.5^2 + 2(-g)s \Rightarrow s = 2.1125,$$

$$\text{height above ground} = 2.1125 + 19.6875 = 21.8$$

$$\text{hence } v^2 = 0^2 + 2g \times 21.8$$

$$\text{Speed} = 20.9 \text{ ms}^{-1} \text{ or } 2\sqrt{109} \text{ ms}^{-1}$$

5(a)	$\frac{1}{2}mu^2 = 16$
	$mu = 4$
	$u = 8, m = 0.5$
5(b)	$0.5 \times v = 0.5w + 1.25 \times 2w \quad [v = 6w]$
	$\frac{1}{2} \times 0.5 \times v^2 - \left(\frac{1}{2} \times 0.5 \times w^2 + \frac{1}{2} \times 1.25 \times (2w)^2 \right) = \pm 25$
	$9w^2 - \frac{1}{4}w^2 - 2.5w^2 - 25 = 0 \quad \left[\frac{25}{4}w^2 = 25 \right]$
	$w = 2, v = 12$