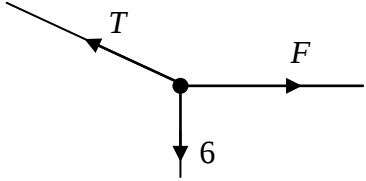
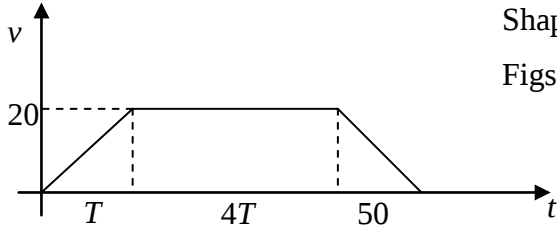
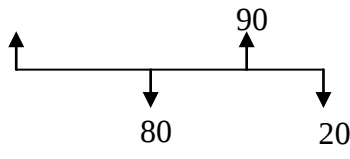
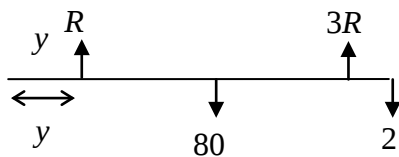
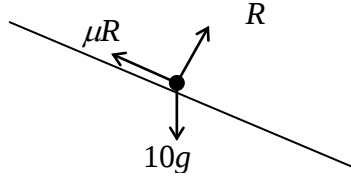
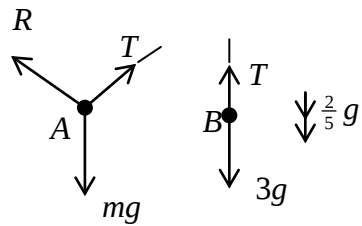


Question Number	Scheme	Marks
1. (a) (b)	 $R(\uparrow): T \cos 30^\circ = 6$ $T = 6.93$ $R(\rightarrow): 'T' \sin 30^\circ = F$ $F = 3.46$	M1 A1 A1 (3) M1 A1 A1 (3) (6 marks)
2. (a) (b)	$3\mathbf{i} - 7.5\mathbf{j} = 1.5\mathbf{a} \Rightarrow \mathbf{a} = 2\mathbf{i} - 5\mathbf{j}$ $ \mathbf{a} = \sqrt{(2^2 + 5^2)} = \sqrt{29} \approx 5.39 \text{ (awrt)}$ $\mathbf{v} = (2\mathbf{i} + 3\mathbf{j}) + 4(2\mathbf{i} - 5\mathbf{j})$ $= 10\mathbf{i} - 17\mathbf{j}$	M1 A1 M1 A1 (4) M1, A1ft A1 (3) (7 marks)
3. (a) (b) (c)	 Shape Figs (20, 50, T, 4T/5T) $\frac{1}{2} \times T \times 20 + 4T \times 20 + \frac{1}{2} \times 50 \times 20 = 1220$ $T = 8$ $\text{Acceleration} = \frac{20}{8} = 2.5 \text{ m s}^{-2}$	B1 B1 (2) M1 A1 A1 (3) M1 A1ft (2) (8 marks)

Question Number	Scheme		Marks
4.	(a)	 $M(A): 80 \times \frac{x}{2} + 20 \times x = 90 \times 2$$\text{Solve for } x: x = 3$	M1 A1
	(b)	By having weight act at B.	M1 A1 (4)
	(c)	 $R(\uparrow): R + 3R = 100 \text{ (} R = 25 \text{)}$$M(A): 25y + 75 \times 2 = 80 \times 1.5 + 20 \times 3$$\text{Solve: } y = 1.2 \text{ m}$	B1
			M1 A1 ft A1 (4) (9 marks)
5.	(a)	$8^2 = 10^2 + 2a \times 5 \rightarrow a = (-)3.6 \text{ m s}^{-2}$	M1 A1 (2)
	(b)	 $R = 10g \cos 20^\circ$$F = \mu R \text{ used}$$10g \sin 20^\circ - \mu \cdot 10g \cos 20^\circ = 10(-3.6)$$\text{Solve: } \mu = 0.75 \text{ (or } 0.755 \text{)}$	B1 B1 M1 A1
	(c)	AC maximum if speed at C = 0 $\therefore 0^2 = 10^2 - 2 \times 3.6 \times s$ $s \approx 13.9 \text{ m (awrt)}$	M1 A1 (6)
			M1 A1 (2) (10 marks)

Question Number	Scheme	Marks
6.	(a) $1500 \times 10 + 2500 \times 5 = 1500 \times 4 + 2500 \times v$ $\rightarrow v = 8.6 \text{ m s}^{-1} \quad (*)$ (b) $P: 1500a = -500 \quad (\Rightarrow a = -\frac{1}{3} \text{ m s}^{-2})$ $0^2 = 4^2 - 2 \times \frac{1}{3} \times s \quad \Rightarrow s = 24 \text{ m}$ (c) $P: 0 = 4 - \frac{1}{3}t \Rightarrow t = 12 \text{ s}$ $Q: s = 8.6 \times 12 = 103.2 \text{ m}$ Distance apart = $103.2 - 24 = 79.2 \text{ m}$	M1 A1 A1 (3) M1 M1 A1 (3) M1 M1 A1 M1 A1 (5) (11 marks)
7.	(a) $v_P = \frac{(50\mathbf{i} - 25\mathbf{j}) - (20\mathbf{i} + 35\mathbf{j})}{\frac{1}{2}} = 60\mathbf{i} - 120\mathbf{j}$ (b) $\mathbf{p} = 20\mathbf{i} + 35\mathbf{j} + (60\mathbf{i} - 120\mathbf{j})t$ (c) $v_Q = \frac{120}{5}(4\mathbf{i} - 3\mathbf{j}) \quad (= 96\mathbf{i} - 72\mathbf{j})$ $\mathbf{q} = 96t\mathbf{i} - 72t\mathbf{j}$ (d) $t = 2: \mathbf{p} = 140\mathbf{i} - 205\mathbf{j}, \mathbf{q} = 192\mathbf{i} - 144\mathbf{j}$ Use of $(PQ =) \mathbf{q} - \mathbf{p}$ or $\mathbf{p} - \mathbf{q} (= QP) \quad (= 52\mathbf{i} + 61\mathbf{j})$ $PQ = \sqrt{(52^2 + 61^2)} \approx 80 \text{ km}$	M1 A1 M1 A1 ft (2) M1 M1 A1 (3) M1 M1 M1 A1 (4) (11 marks)

Question Number	Scheme	Marks
8. (a)	 $B: 3g - T = 3 \times \frac{2}{5}g$ $\rightarrow T = \frac{9}{5}g = 17.6 \text{ N}$	M1 A1 A1 (3)
(b)	A: $17.6 - mg \sin 30^\circ = m \times \frac{2}{5}g$ Solve: $\rightarrow m = 2$	M1, A1 ft M1 A1 (4)
(c)	Speed of B at ground: $v^2 = 2 \times \frac{2}{5}g \times 0.25 (=1.4)$ $I = 3 \times v = 4.2 \text{ N s}$	M1 M1 A1 (3)
(d)	A: $-mg \sin 30^\circ = ma \Rightarrow a = -\frac{1}{2}g = -4.9$ $0 = 1.4 - 4.9t$ $T = 0.29 \text{ s (or } 0.286 \text{ s)}$	M1 A1 M1 A1 (4) (14 marks)