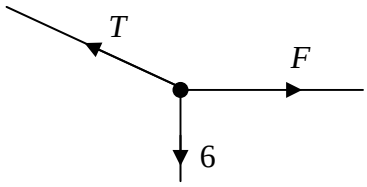
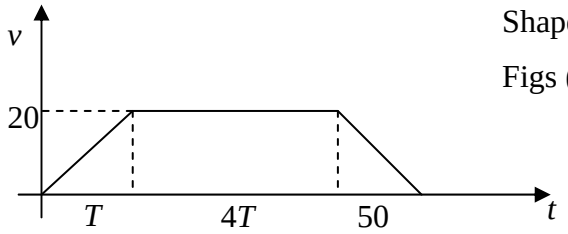
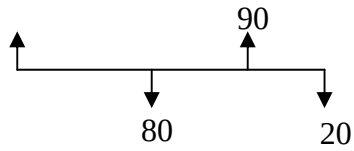
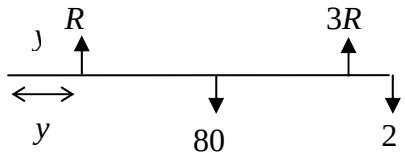
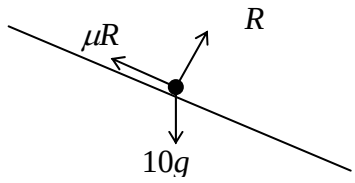
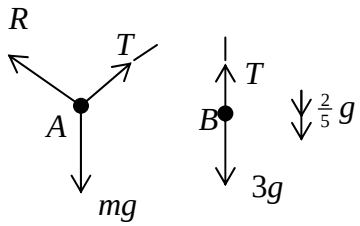
Question Number		Scheme	Marks
1.	(*a*)	 $R(\uparrow)$: $T\cos 30° = 6$	M1 A1
		$T = 6.93$	A1 **(3)**
	(*b*)	$R(\rightarrow)$: 'T' $\sin 30° = F$	M1 A1
		$F = 3.46$	A1 **(3)**
			(6 marks)
2.	(*a*)	$3\mathbf{i} - 7.5\mathbf{j} = 1.5\mathbf{a} \Rightarrow \mathbf{a} = 2\mathbf{i} - 5\mathbf{j}$	M1 A1
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

Question Number	Scheme	Marks
4. (*a*)	 M(*A*): $80 \times \frac{x}{2} + 20 \times x = 90 \times 2$	M1 A1
	Solve for x: $x = 3$	M1 A1 **(4)**
(*b*)	By having weight act at *B*.	B1 **(1)**
(*c*)	 $R(\uparrow)$: $R + 3R = 100$ ($R = 25$)	B1
	M(*A*): $25y + 75 \times 2 = 80 \times 1.5 + 20 \times 3$	M1 A1 ft
	Solve: $y = 1.2$ m	A1 **(4)**
		(9 marks)
5. (*a*)	$8^2 = 10^2 + 2a \times 5 \rightarrow a = (-)3.6$ m s^{-2}	M1 A1 **(2)**
(*b*)	 $R = 10g \cos 20°$	B1
	$F = \mu R$ used	B1
	$10g \sin 20° - \mu.10g \cos 20° = 10\ (-3.6)$	M1 A1
	Solve: $\mu. = 0.75$ (or 0.755)	M1 A1 **(6)**
(*c*)	*AC* maximum if speed at *C* = 0	
	$\therefore 0^2 = 10^2 - 2 \times 3.6 \times s$	M1
	$s \approx 13.9$ m (awrt)	A1 **(2)**
		(10 marks)

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

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