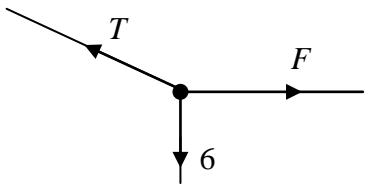
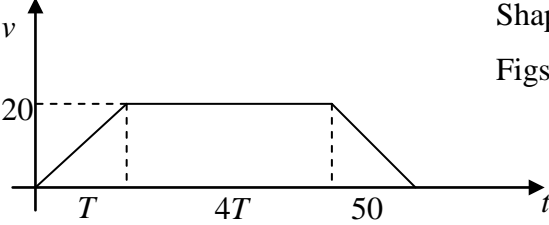
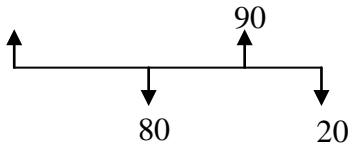
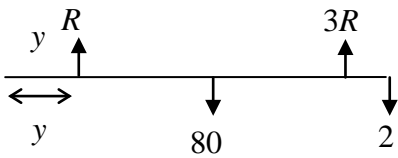
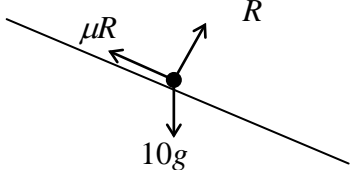
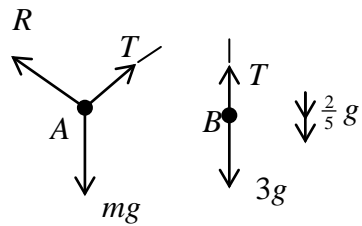


Question Number	Scheme	Marks
<p>1. (a)</p> <p>(b)</p>	 <p style="margin-left: 400px;"><math>R(\uparrow): T \cos 30^\circ = 6</math></p> <p style="margin-left: 400px;"><math>T = 6.93</math></p> <p style="margin-left: 400px;"><math>R(\rightarrow): T \sin 30^\circ = F</math></p> <p style="margin-left: 400px;"><math>F = 3.46</math></p>	<p>M1 A1</p> <p>A1 (3)</p> <p>M1 A1</p> <p>A1 (3)</p> <p><b>(6 marks)</b></p>
<p>2. (a)</p> <p>(b)</p>	<p><math>3\mathbf{i} - 7.5\mathbf{j} = 1.5\mathbf{a} \Rightarrow \mathbf{a} = 2\mathbf{i} - 5\mathbf{j}</math></p> <p><math> \mathbf{a}  = \sqrt{(2^2 + 5^2)} = \sqrt{29} \approx 5.39</math> (awrt)</p> <p><math>\mathbf{v} = (2\mathbf{i} + 3\mathbf{j}) + 4(2\mathbf{i} - 5\mathbf{j})</math></p> <p><math>= 10\mathbf{i} - 17\mathbf{j}</math></p>	<p>M1 A1</p> <p>M1 A1 (4)</p> <p>M1, A1ft</p> <p>A1 (3)</p> <p><b>(7 marks)</b></p>
<p>3. (a)</p> <p>(b)</p> <p>(c)</p>	 <p style="margin-left: 400px;">Shape</p> <p style="margin-left: 400px;">Figs (20, 50, T, 4T/5T)</p> <p style="margin-left: 400px;"><math>\frac{1}{2} \times T \times 20 + 4T \times 20 + \frac{1}{2} \times 50 \times 20 = 1220</math></p> <p style="margin-left: 400px;"><math>T = 8</math></p> <p style="margin-left: 400px;">Acceleration = <math>\frac{20}{8} = 2.5 \text{ m s}^{-2}</math></p>	<p>B1</p> <p>B1</p> <p>(2)</p> <p>M1 A1</p> <p>A1 (3)</p> <p>M1 A1ft (2)</p> <p><b>(8 marks)</b></p>

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

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

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