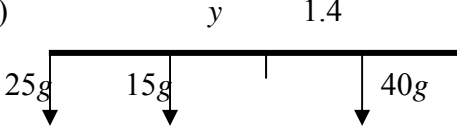
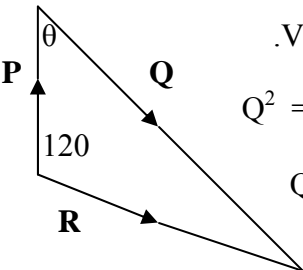
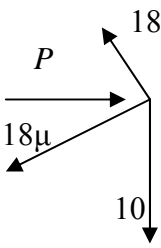
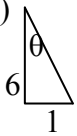
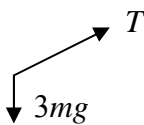
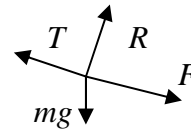



Question Number	Scheme	Marks
1.	<p>(a) Distance after 4 s = $16 \times 4 - \frac{1}{2} \times 9.8 \times 4^2$ $= -14.4 \Rightarrow h = (+) \underline{14.4 \text{ m}}$</p> <p>(b) $v = 16 - 9.8 \times 4$ $= -23.2 \Rightarrow \text{speed} = (+) \underline{23.2 \text{ m s}^{-1}}$</p>	<p>M1 A1 A1 (3)</p> <p>M1 A1 A1 (3)</p> <p>6</p>
2.	<p>(a) CLM: $3 \times 4 + 2 \times 1.5 = 5 \times v$ $\Rightarrow v = \underline{3 \text{ m s}^{-1}}$</p> <p>(b) (i) CLM: $3 \times 4 - m \times 4 = -3 \times 2 + m \times 1$ $\Rightarrow m = \underline{3.6}$</p> <p>(ii) $I = 3.6(4 + 1)$ [or $3(4 + 2)$] $= \underline{18 \text{ N s}}$</p>	<p>M1 A1 A1 (3)</p> <p>M1 A1 A1 (3)</p> <p>M1 A1√ (2)</p> <p>8</p>

Question Number	Scheme	Marks
3.	<p>(a) $M(C): 25g \times 2 = 40g \times x$ $x = \underline{1.25 \text{ m}}$</p> <p>(b) Weight/mass acts at mid-point; or weight/mass evenly distributed (o.e.)</p> <p>(c)  $M(C): 40g \times 1.4 = 15g \times y + 25g \times 2$ Solve: $y = \underline{0.4 \text{ m}}$</p>	<p>M1 A1 A1 (3) B1 (1) M1 A1 ↓ M1 A1 (4) 8</p>
4.	<p>$\mathbf{R} = 10\sqrt{3}/2 \mathbf{i} - 5\mathbf{j}$</p> <p>Using $\mathbf{P} = 7\mathbf{j}$ and $\mathbf{Q} = \mathbf{R} - \mathbf{P}$ to obtain $\mathbf{Q} = 5\sqrt{3}\mathbf{i} - 12\mathbf{j}$</p> <p>Magnitude = $\sqrt{[(5\sqrt{3})^2 + 12^2]} \approx \underline{14.8 \text{ N}}$ (AWRT)</p> <p>angle with $\mathbf{i} = \arctan(12/5\sqrt{3}) \approx 64.2^\circ$</p> <p>bearing $\approx \underline{144^\circ}$ (AWRT)</p> <p>Alternative method</p>  <p>.Vector triangle correct</p> $Q^2 = 10^2 + 7^2 + 2 \times 10 \times 7 \cos 60$ <p>$Q \approx \underline{14.8 \text{ N}}$ (AWRT)</p> $\frac{14.8}{\sin 120} = \frac{10}{\sin \theta}$ <p>$\Rightarrow \theta = 35.8, \Rightarrow \text{bearing } 144$ (AWRT)</p>	<p>M1 A1 ↓ M1 A1 ↓ ↓ M1 A1 M1 A1 A1 (9) B1 M1 A1 A1 M1 A1 √ ↓ M1 A1, A1 9</p>

Question Number	Scheme	Marks
5.	 <p>(a) R(perp to plane): $P \sin 30 + 10 \cos 30 = 18$ Solve: $P \approx \underline{18.7 \text{ N}}$</p> <p>(b) R(// plane): $P \cos 30 = 10 \sin 30 + F$ $F = 18\mu$ used Sub and solve: $\mu = \underline{0.621 \text{ or } 0.62}$</p> <p>(c) Normal reaction now = $10 \cos 30$ Component of weight down plane = $10 \sin 30 (= 5 \text{ N})$ (seen) $F_{\max} = \mu R_{\text{new}} \approx 5.37 \text{ N}$ (AWRT 5.4) $5.37 > 5 \Rightarrow$ does not slide</p>	<p>M1 A1 ↓ M1 A1 (4)</p> <p>M1 A1 ↓ ↓ M1 A1 (5)</p> <p>M1 A1 ↓ M1 A1 cso (5)</p> <p>14</p>

Question Number	Scheme	Marks
6.	<p>(a) Speed of $A = \sqrt{1^2 + 6^2} \approx \underline{6.08 \text{ m s}^{-1}}$</p> <p>(b)  $\tan \theta = 1/6 \Rightarrow \theta \approx 9.46^\circ$ Bearing $\approx \underline{351}$</p> <p>(c) P.v. of A at time $t = (2 - t)\mathbf{i} + (-10 + 6t)\mathbf{j}$ p.v. of B at time $t = (-26 + 3t)\mathbf{i} + (4 + 4t)\mathbf{j}$ (E.g.) \mathbf{i} components equal $\Rightarrow 2 - t = -26 + 3t \Rightarrow t = 7$ \mathbf{j} components at $t = 7$: $A: -10 + 6t = 32$ $B: 4 + 4t = 32$ Same, so collide at $t = 7$ s at point with p.v. $(-5\mathbf{i} + 32\mathbf{j})$ m</p> <p>(d) New velocity of $B = \frac{8}{5}(3\mathbf{i} + 4\mathbf{j}) \text{ m s}^{-1}$ P.v. of B at 7 s = $-26\mathbf{i} + 4\mathbf{j} + 1.6(3\mathbf{i} + 4\mathbf{j}) \times 7 = 7.6\mathbf{i} + 48.8\mathbf{j}$ $\underline{PB} = \mathbf{b} - \mathbf{p} = 12.6\mathbf{i} + 16.8\mathbf{j}$ (in numbers) Distance = $\sqrt{(12.6^2 + 16.8^2)} = \underline{21 \text{ m}}$</p>	<p>M1 A1 (2)</p> <p>M1 A1 A1 (3)</p> <p>B1 (either)</p> <p>M1 A1</p> <p>↓ M1</p> <p>A1 cso (5)</p> <p>B1</p> <p>M1 A1 ↓ M1 ↓ M1 A1 (6)</p> <p>16</p>

Question Number	Scheme	Marks
7.	<p>(a)  A: $3mg \sin 30 - T = 3m \cdot \frac{1}{10}g$ $\Rightarrow T = \frac{6}{5}mg$</p> <p>(b)  F: R(perp): $R = mg \cos 30$ R(//): $T - mg \sin 30 - F = m \cdot \frac{1}{10}g$ Using $F = \mu R$ $\frac{6}{5}mg - \frac{1}{2}mg - \mu mg \frac{\sqrt{3}}{2} = \frac{1}{10}mg$ $\rightarrow \mu = \underline{0.693 \text{ or } 0.69 \text{ or } \frac{2\sqrt{3}}{5}}$</p> <p>(c)  Magn of force on pulley = $2T \cos 60 = \frac{6}{5}mg$ Direction is vertically downwards</p>	<p>M1 A1 A1 (3)</p> <p>M1 A1 M1 A2, 1, 0 M1 ↓↓↓ M1 A1 (8)</p> <p>M1 A1 ✓ B1 (cso) (3)</p> <p>14</p>