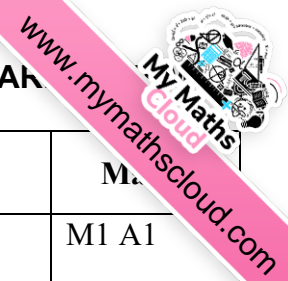
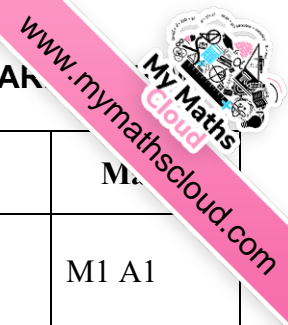


| Question Number   | Scheme   | Marks   |
|-------------------|--|---|
| 1.                | $45 = 2u + \frac{1}{2}a2^2 \Rightarrow 45 = 2u + 2a$ $165 = 6u + \frac{1}{2}a6^2 \Rightarrow 165 = 6u + 18a$ <p style="text-align: center;">eliminating either <math>u</math> or <math>a</math></p> $u = 20 \text{ and } a = 2.5$  | M1 A1<br>M1 A1<br>M1<br>A1 A1<br><b>(7 marks)</b>       |
| 2. (a)<br><br>(b) | $\tan \theta = \frac{p}{2p} \Rightarrow \theta = 26.6^\circ$ $\mathbf{R} = (\mathbf{i} - 3\mathbf{j}) + (p\mathbf{i} + 2p\mathbf{j}) = (1 + p)\mathbf{i} + (-3 + 2p)\mathbf{j}$ <p><math>\mathbf{R}</math> is parallel to <math>\mathbf{i} \Rightarrow (-3 + 2p) = 0</math></p> $\Rightarrow p = \frac{3}{2}$  | M1 A1 (2)<br>M1 A1<br>DM1<br>A1 (4)<br><b>(6 marks)</b> |
| 3. (a)<br><br>(b) | <p>For A:</p> $-\frac{7mu}{2} = 2m(v_A - 2u)$ $v_A = \frac{u}{4}$ <p>For B:</p> $\frac{7mu}{2} = m(v_B - -3u)$ $v_B = \frac{u}{2}$   | M1 A1<br>A1 (3)<br>M1 A1<br>A1 (3)<br><b>(6 marks)</b>  |
| 4.                | $0.5g \sin \theta - F = 0.5a$ $F = \frac{1}{3}R \text{ seen}$ $R = 0.5g \cos \theta$ <p>Use of <math>\sin \theta = \frac{4}{5}</math> or <math>\cos \theta = \frac{3}{5}</math> or decimal equiv or decimal angle e.g <math>53.1^\circ</math> or <math>53^\circ</math></p> $a = \frac{3g}{5} \text{ or } 5.88 \text{ m s}^{-2} \text{ or } 5.9 \text{ m s}^{-2}$ | M1 A1 A1<br>B1<br>M1 A1<br>B1<br>DM1 A1<br><b>[9]</b>   |
|                   |  | <b>(9 marks)</b>  |



| Question Number | Scheme   | Marks  |
|-----------------|--|--|
| 5.              | $F = P \cos 50^\circ$ $F = 0.2R \text{ seen or implied.}$ $P \sin 50^\circ + R = 15g$ <p>Eliminating <math>R</math>; Solving for <math>P</math>; <math>P = 37</math> (2 SF)</p>  | M1 A1<br>B1<br>M1 A1 A1<br>M1; M1; A1<br><b>(9 marks)</b>  |
| 6.              | <p>(a) For whole system: <math>1200 - 400 - 200 = 1000a</math></p> $a = 0.6 \text{ m s}^{-2}$ <p>(b) For trailer: <math>T - 200 = 200 \times 0.6</math></p> $T = 320 \text{ N}$ <p><b>OR:</b> For car: <math>1200 - 400 - T = 800 \times 0.6</math></p> $T = 320 \text{ N}$ <p>(c) For trailer: <math>200 + 100 = 200f</math> or <math>-200f</math></p> $f = 1.5 \text{ m s}^{-2} \text{ (-1.5)}$ <p>For car: <math>400 + F - 100 = 800f</math> or <math>-800f</math></p> $F = 900$ <p>(N.B. For both: <math>400 + 200 + F = 1000f</math>)</p> | M1 A1<br>A1 (3)<br>M1 A1 ft<br>A1<br><b>OR:</b><br>M1 A1 ft<br>A1 (3)<br>M1 A1<br>A1<br>M1 A2<br>A1 (7)<br><b>(13 marks)</b> |



| Question Number | Scheme  | Marks   |
|-----------------|---|---|
| 7.              | <p>(a) <math>M(Q), 50g(1.4 - x) + 20g \times 0.7 = T_p \times 1.4</math></p> <p style="text-align: right;"><math>T_p = 588 - 350x</math> Printed answer</p> <p>(b) <math>M(P), 50gx + 20g \times 0.7 = T_Q \times 1.4</math> or <math>R(\uparrow), T_p + T_Q = 70g</math></p> <p style="text-align: center;"><math>T_Q = 98 + 350x</math></p> <p>(c) Since <math>0 &lt; x &lt; 1.4</math>,</p> <p><math>98 &lt; T_p &lt; 588</math> and <math>98 &lt; T_Q &lt; 588</math></p> <p>(d) <math>98 + 350x = 3(588 - 350x)</math></p> <p style="text-align: center;"><math>x = 1.19</math></p>  | <p>M1 A1</p> <p>A1 (3)</p> <p>M1 A1</p> <p>A1 (3)</p> <p>M1</p> <p>A1 A1 (3)</p> <p>M1</p> <p>M1 A1 (3)</p> <p><b>(12 marks)</b></p>                                      |
| 8.              | <p>(a) <math> \mathbf{v}  = \sqrt{1.2^2 + (-0.9)^2} = 1.5 \text{ m s}^{-1}</math></p> <p>(b) <math>(\mathbf{r}_H =) 100\mathbf{j} + t(1.2\mathbf{i} - 0.9\mathbf{j}) \text{ m}</math></p> <p>(c) <math>(\mathbf{r}_K =) 9\mathbf{i} + 46\mathbf{j} + t(0.75\mathbf{i} + 1.8\mathbf{j}) \text{ m}</math></p> <p style="text-align: center;"><math>\overrightarrow{HK} = \mathbf{r}_K - \mathbf{r}_H = (9 - 0.45t)\mathbf{i} + (2.7t - 54)\mathbf{j} \text{ m Printed Answer}</math></p> <p>(d) Meet when <math>\overrightarrow{HK} = \mathbf{0}</math></p> <p style="text-align: center;"><math>(9 - 0.45t) = 0</math> and <math>(2.7t - 54) = 0</math></p> <p style="text-align: center;"><math>t = 20</math> from both equations</p> <p style="text-align: center;"><math>\mathbf{r}_K = \mathbf{r}_H = (24\mathbf{i} + 82\mathbf{j}) \text{ m}</math></p> | <p>M1 A1 (2)</p> <p>M1 A1 (2)</p> <p>M1 A1</p> <p>M1 A1 (4)</p> <p>M1 A1</p> <p>A1</p> <p>M1 A1</p> <p>A1</p> <p>M1 A1 <b>cso</b></p> <p>(5)</p> <p><b>(13 marks)</b></p> |