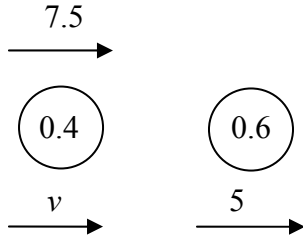


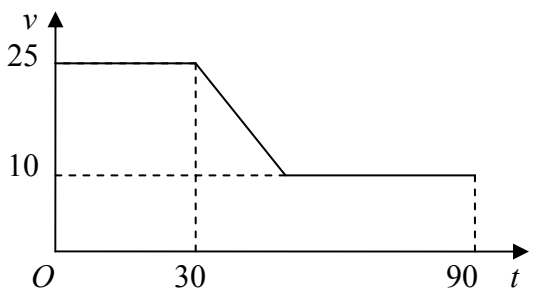
# Mark Scheme (Results) Summer 2008

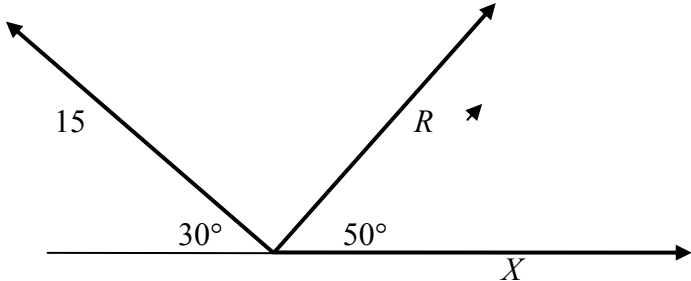
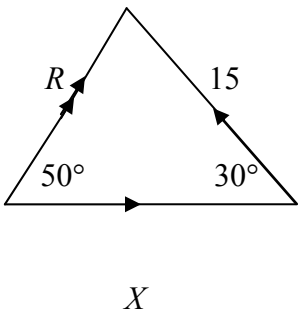
GCE

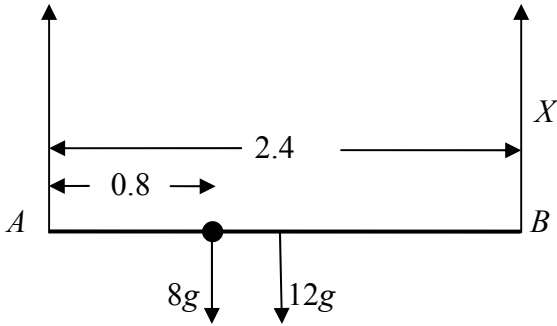
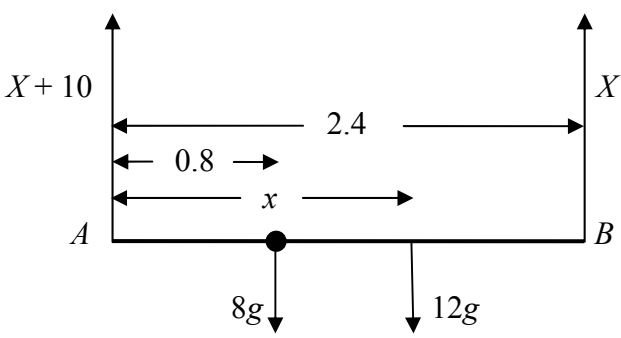
GCE Mathematics (6677/01)

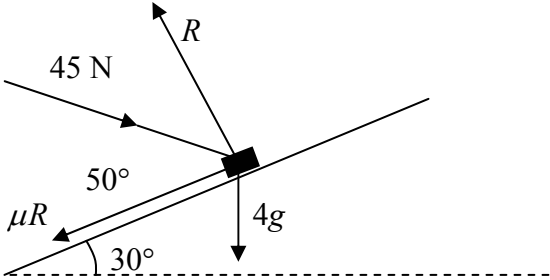
June 2008  
6677 Mechanics M1  
Final Mark Scheme

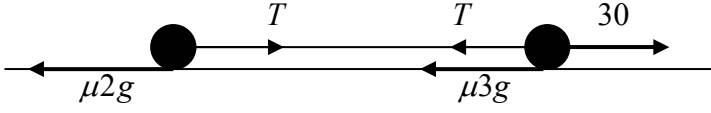
Question Number	Scheme	Marks
1.	<p>(a) <math>I = mv \Rightarrow 3 = 0.4 \times v</math> <math>v = 7.5 \text{ (ms}^{-1}\text{)}</math></p> <p>(b) </p> <p>LM <math>0.4 \times 7.5 = 0.4v + 0.6 \times 5</math> <math>0 = 0.4v \Rightarrow v = 0 \quad *</math></p>	<p>M1 A1 A1 (3)</p> <p>M1 A1 A1 (3) [6]</p>
2.	<p>(a) <math>v^2 = u^2 + 2as \Rightarrow 17.5^2 = u^2 + 2 \times 9.8 \times 10</math> Leading to <math>u = 10.5</math></p> <p>(b) <math>v = u + at \Rightarrow 17.5 = -10.5 + 9.8T</math> <math>T = 2\frac{6}{7} \text{ (s)}</math></p> <p>Alternatives for (b)</p> $s = \left(\frac{u+v}{2}\right)T \Rightarrow 10 = \left(\frac{17.5 + -10.5}{2}\right)T$ $\frac{20}{7} = T$ <p>OR <math>s = ut + \frac{1}{2}at^2 \Rightarrow -10 = 10.5t - 4.9t^2</math> Leading to <math>T = 2\frac{6}{7}, \left(-\frac{5}{7}\right)</math> Rejecting negative</p> <p>(b) can be done independently of (a) <math>s = vt - \frac{1}{2}at^2 \Rightarrow -10 = -17.5t + 4.9t^2</math> Leading to <math>T = 2\frac{6}{7}, \frac{5}{7}</math></p> <p>For final A1, second solution has to be rejected. <math>\frac{5}{7}</math> leads to a negative <math>u</math>.</p>	<p>M1 A1 A1 (3)</p> <p>M1 A1 f.t. DM1 A1 (4) [7]</p> <p>M1A1 f.t. DM1A1 (4)</p> <p>M1 A1 f.t. DM1 A1 (4)</p> <p>M1 A1 DM1 A1 (4)</p>

Question Number	Scheme	Marks
3.	<p>(a) <math>\tan \theta = \frac{8}{6}</math> <math>\theta \approx 53^\circ</math></p> <p>(b) <math>\mathbf{F} = 0.4(6\mathbf{i} + 8\mathbf{j}) (= 2.4\mathbf{i} + 3.2\mathbf{j})</math> <math> \mathbf{F}  = \sqrt{(2.4^2 + 3.2^2)} = 4</math> <i>The method marks can be gained in either order.</i></p> <p>(c) <math>\mathbf{v} = 9\mathbf{i} - 10\mathbf{j} + 5(6\mathbf{i} + 8\mathbf{j})</math> <math>= 39\mathbf{i} + 30\mathbf{j} \text{ (ms}^{-1}\text{)}</math></p>	<p>M1 A1 (2)</p> <p>M1 M1 A1 (3)</p> <p>M1 A1 A1 (3) [8]</p>
4.	<p>(a) </p> <p>shape 25, 10, 30, 90</p> <p>(b) <math>30 \times 25 + \frac{1}{2}(25 + 10)t + 10(60 - t) = 1410</math> <math>7.5t = 60</math> <math>t = 8 \text{ (s)}</math> <math>a = \frac{25 - 10}{8} = 1.875 \text{ (ms}^{-2}\text{)}</math></p>	<p>B1 B1 (2)</p> <p>M1 <u>A1</u> A1</p> <p>DM1 A1</p> <p>M1 A1 (7) [9]</p>

Question Number	Scheme	Marks
5.	<p>(a) </p> <p>(↑) <math>15\sin 30^\circ = R\sin 50^\circ</math>  <math>R \approx 9.79</math> (N)</p> <p>(b) <math>(\rightarrow) X - 15\cos 30^\circ = R\cos 50^\circ</math>      ft their R  <math>X \approx 19.3</math> (N)</p> <p>Alternatives using sine rule in (a) or (b); cosine rule in (b)</p> <p></p> <p>(a) <math>\frac{R}{\sin 30^\circ} = \frac{15}{\sin 50^\circ}</math>  <math>R \approx 9.79</math> (N)</p> <p>(b) <math>\frac{X}{\sin 100^\circ} = \frac{15}{\sin 50^\circ} = \frac{R}{\sin 30^\circ}</math>  <math>X \approx 19.3</math> (N)</p> <p><math>X^2 = R^2 + 15^2 - 2 \times 15 \times R \cos 100^\circ</math>  <b>OR:</b> cosine rule; any of <math>R^2 = X^2 + 15^2 - 2 \times 15 \times X \cos 30^\circ</math>  <math>15^2 = R^2 + X^2 - 2 \times X \times R \cos 50^\circ</math>  <math>X \approx 19.3</math> (N)</p>	<p>M1 A1  DM1 A1 (4)</p> <p>M1 A2 ft  DM1 A1 (5)  [9]</p> <p>M1 A1  DM1 A1 (4)</p> <p>M1 A2 ft on R  DM1 A1 (5)</p> <p>M1 A2 ft on R  DM1 A1 (5)</p>

Question Number	Scheme	Marks
6.	<p>(a)</p>  <p><math>M(A)</math> <math>8g \times 0.8 + 12g \times 1.2 = X \times 2.4</math></p> <p><math>X \approx 85 \text{ (N)}</math>      accept 84.9, <math>\frac{26g}{3}</math></p> <p>(b)</p>  <p><math>R(\uparrow)</math> <math>(X + 10) + X = 8g + 12g</math></p> <p><math>(X = 93)</math></p> <p><math>M(A)</math> <math>8g \times 0.8 + 12g \times x = X \times 2.4</math></p> <p><math>x = 1.4 \text{ (m)}</math>      accept 1.36</p>	<p>M1 A1</p> <p>DM1 A1 (4)</p> <p>M1 B1 A1</p> <p>M1 A1</p> <p>A1 (6)</p> <p>[10]</p>

Question Number	Scheme	Marks
7.	<p>(a)</p>  <p style="text-align: center;"> <math>R = 45 \cos 40^\circ + 4g \cos 30^\circ</math>  <math>R \approx 68</math> </p> <p style="text-align: right;">accept 68.4</p> <p>(b)</p> <p style="text-align: center;">Use of <math>F = \mu R</math></p> <p style="text-align: center;"><math>F + 4g \sin 30 = 45 \cos 50^\circ</math></p> <p style="text-align: center;">Leading to <math>\mu \approx 0.14</math></p> <p style="text-align: right;">accept 0.136</p>	<p>M1 A2 (1, 0) DM1 A1 (5)</p> <p>M1 M1 A2 (1, 0) DM1 A1 (6) <b>[11]</b></p>

Question Number	Scheme	Marks
8.	<p>(a)</p>  $s = ut + \frac{1}{2}at^2 \Rightarrow 6 = \frac{1}{2}a \times 9$ $a = 1\frac{1}{3} \text{ (ms}^{-2}\text{)}$ <p>(b) N2L for system <math>30 - \mu 5g = 5a</math> ft their <math>a</math>, accept symbol</p> $\mu = \frac{14}{3g} = \frac{10}{21} \quad \text{or} \quad \text{awrt } 0.48$ <p>(c) N2L for <math>P</math> <math>T - \mu 2g = 2a</math> ft their <math>\mu</math>, their <math>a</math>, accept symbols</p> $T - \frac{14}{3g} \times 2g = 2 \times \frac{4}{3}$ <p>Leading to <math>T = 12 \text{ (N)}</math> awrt 12</p> <p><b>Alternatively</b> N2L for <math>Q</math></p> $30 - T - \mu 3g = 3a$ <p>Leading to <math>T = 12 \text{ (N)}</math> awrt 12</p> <p>(d) The acceleration of <math>P</math> and <math>Q</math> (or the whole of the system) is the same.</p> <p>(e) <math>v = u + at \Rightarrow v = \frac{4}{3} \times 3 = 4</math></p> <p>N2L (for system or either particle)</p> $-5\mu g = 5a \quad \text{or equivalent}$ $a = -\mu g$ $v = u + at \Rightarrow 0 = 4 - \mu g t$ <p>Leading to <math>t = \frac{6}{7} \text{ (s)}</math> accept 0.86, 0.857</p>	<p>M1</p> <p>A1 (2)</p> <p>M1 A1ft</p> <p>DM1 A1 (4)</p> <p>M1 A1 ft</p> <p>DM1 A1 (4)</p> <p>M1 A1</p> <p>DM1 A1</p> <p>B1 (1)</p> <p>B1 ft on <math>a</math></p> <p>M1</p> <p>DM1</p> <p>A1 (4)</p> <p>[15]</p>