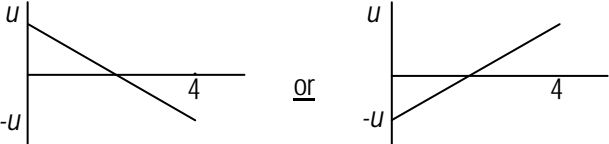


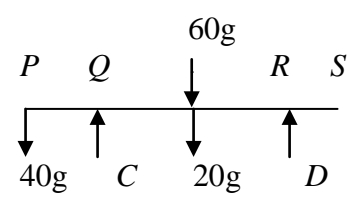
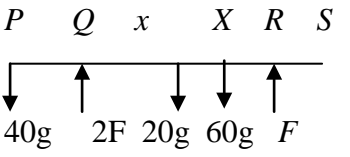
# Mark Scheme (Results) January 2009

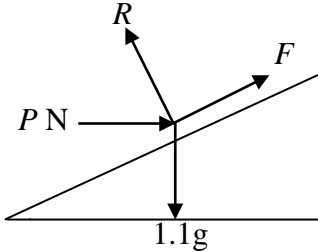
GCE

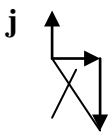
GCE Mathematics (6677/01)

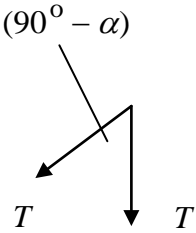
January 2009  
6677 Mechanics M1  
Mark Scheme

Question Number	Scheme	Marks
1	$-6\mathbf{i} + \mathbf{j} = \mathbf{u} + 3(2\mathbf{i} - 5\mathbf{j})$ $\Rightarrow \mathbf{u} = -12\mathbf{i} + 16\mathbf{j}$ $\Rightarrow u = \sqrt{(-12)^2 + 16^2} = 20$	M1 A1 A1 cso M1 A1 [5]
2	<p>(a)</p>  <p style="text-align: center;">or</p> <p style="text-align: center;">shape values</p> <p>(b)</p> $19.6 = \frac{1}{2} \times 2 \times u$ $u = 19.6$	B1 B1 (2)  M1 A1 A1 (3) [5]
3	<p>(a)</p> $2u \rightarrow \leftarrow 4u \quad km2u - 4mu = -kmu + mv$ $km \quad m \quad u(3k - 4) = v$ $u \leftarrow \rightarrow v$ <p>(b)</p> $k > 2 \Rightarrow v > 0 \Rightarrow \text{dir}^n \text{ of motion reversed}$ <p>(c)</p> <p>For B, <math>m(u(3k - 4) - -4u)</math>  <math>= 7mu</math></p>	M1 A1 A1 (3)  M1A1A1 cso (3)  M1 A1 f.t. A1 (3) [9]

Question Number	Scheme	Marks
4 (a)	 <p style="text-align: center;"> <math>C + D = 120g</math>  <math>M(Q), 80g \cdot 0.8 - 40g \cdot 0.4 = D \cdot 1.6</math>  solving  <math>C = 90g; D = 30g</math> </p>	M1 A1 M1 A1 M1 A1 A1 (7)
(b)	 <p style="text-align: center;"> <math>2F + F = 40g + 20g + 60g</math>  <math>M(Q), 60gx + 20g \cdot 0.8 = 40g \cdot 0.4 + F \cdot 1.6</math>  solving  <math>QX = x = \frac{16}{15} \text{ m} = 1.07\text{m}</math> </p>	M1 A1 M1 A1 M1 A1 (6) [13]

Question Number	Scheme	Marks
5 (a)		B2 -1 e.e.o.o. (labels not needed) (2)
(b)	$F = \frac{1}{2}R$ $(\uparrow), R \cos \alpha + F \sin \alpha = mg$ $R = \frac{1.1g}{(\cos \alpha + \frac{1}{2} \sin \alpha)} = 9.8 \text{ N}$ $(\rightarrow), P + \frac{1}{2}R \cos \alpha = R \sin \alpha$ $P = R(\sin \alpha - \frac{1}{2} \cos \alpha)$ $= 1.96$	B1 M1 A2 M1 A1 (6) M1 A2 M1 A1 (5) [13]

Question Number	Scheme	Marks
6 (a)	 $\tan \theta = \frac{2}{1} \Rightarrow \theta = 63.4^\circ$ <p>angle is <math>153.4^\circ</math></p>	M1 A1 A1 (3)
(b)	$(4 + p)\mathbf{i} + (q - 5)\mathbf{j}$ $(q - 5) = -2(4 + p)$ $2p + q + 3 = 0 *$	B1 M1 A1 A1 (4)
(c)	$q = 1 \Rightarrow p = -2$ $\Rightarrow \mathbf{R} = 2\mathbf{i} - 4\mathbf{j}$ $\Rightarrow  \mathbf{R}  = \sqrt{2^2 + (-4)^2} = \sqrt{20}$ $\sqrt{20} = m8\sqrt{5}$ $\Rightarrow m = \frac{1}{4}$	B1 M1 M1 A1 f.t. M1 A1 f.t. A1 cao (7) [14]

Question Number	Scheme	Marks
7 (a)	$T - 5g \sin \alpha = 5a$ $15g - T = 15a$ solving for $a$ $a = 0.6g$ solving for $T$ $T = 6g$	M1 A1 M1 A1 M1 A1 M1 A1 (8)
(b)	For $Q$ : $5g - N = 5a$ $N = 2g$	M1 A1 A1 f.t. (3)
(c)	 $F = 2T \cos\left(\frac{90^\circ - \alpha}{2}\right)$ $= 12g \cos 26.56^\circ$ $= 105 \text{ N}$	M1 A2 A1 f.t. A1 (5) [16]