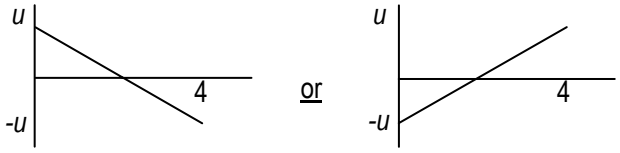
edexcel
advancing learning, changing lives

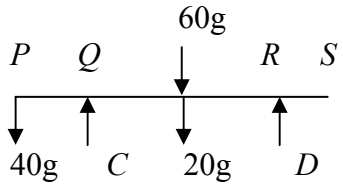
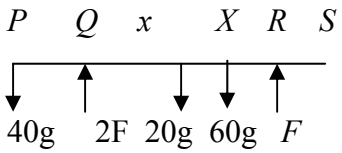
Mark Scheme (Results)
January 2009

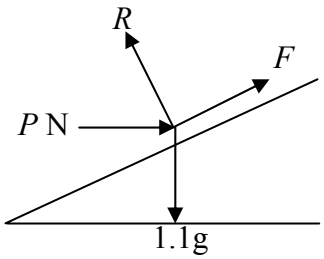
GCE

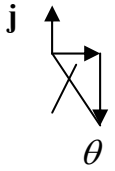
GCE Mathematics (6677/01)

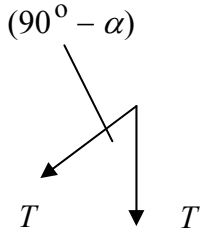
January 2009
6677 Mechanics M1
Mark Scheme

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 (a)	 shape values	B1 B1 (2)
(b)	$19.6=\frac{1}{2}\times 2\times u$ $u=19.6$	M1 A1 A1 (3) **[5]**
3 (a)	$2u \rightarrow \quad \leftarrow 4u$ $km \quad m$ $u \leftarrow \quad \rightarrow v$ $km2u-4mu=-kmu+mv$ $u(3k-4)=v$	M1 A1 A1 (3)
(b)	$k>2\Rightarrow v>0\Rightarrow$ dir^{n} of motion reversed	M1A1A1 cso (3)
(c)	For B, $m(u(3k-4)--4u)$ $=7mu$	M1 A1 f.t. A1 (3) **[9]**

Question Number	Scheme	Marks
4 (a)	 $C + D = 120g$ $M(Q),\ \ 80g.0.8 - 40g.0.4 = D.1.6$ solving $C = 90g; D = 30g$	M1 A1 M1 A1 M1 A1 A1 (7)
(b)	 $2F + F = 40g + 20g + 60g$ $M(Q),\ \ 60gx + 20g.0.8 = 40g.0.4 + F.1.6$ solving $QX = x = \frac{16}{15}\ \text{m} = 1.07\text{m}$	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)	$F = \frac{1}{2}R$ $(\uparrow),\ R\cos\alpha + F\sin\alpha = mg$ $R = \dfrac{1.1g}{(\cos\alpha + \frac{1}{2}\sin\alpha)} = 9.8\ \text{N}$ $(\rightarrow),\ P + \frac{1}{2}R\cos\alpha = R\sin\alpha$ $P = R(\sin\alpha - \frac{1}{2}\cos\alpha)$ $= 1.96$	B1 M1 A2 M1 A1 (6) M1 A2 M1 A1 (5) **[13]**

Question Number		Scheme	Marks
6	(a)	 $\tan\theta = \frac{2}{1} \Rightarrow \theta = 63.4^{\circ}$	M1 A1
		angle is 153.4°	A1 (3)
	(b)	$(4+p)\mathbf{i} + (q-5)\mathbf{j}$	B1
		$(q-5) = -2(4+p)$	M1 A1
		$2p + q + 3 = 0$ *	A1 (4)
	(c)	$q = 1 \Rightarrow p = -2$	B1
		$\Rightarrow \mathbf{R} = 2\mathbf{i} - 4\mathbf{j}$	M1
		$\Rightarrow \lvert\mathbf{R}\rvert = \sqrt{2^2 + (-4)^2} = \sqrt{20}$	M1 A1 f.t.
		$\sqrt{20} = m8\sqrt{5}$	M1 A1 f.t.
		$\Rightarrow m = \frac{1}{4}$	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)	 $F = 2T\cos(\frac{90^o - \alpha}{2})$ $= 12g\cos 26.56..^o$ $= 105$ N	M1 A2 A1 f.t. A1 (5) **[16]**