Winter 2009
Past Paper (Mark Scheme)

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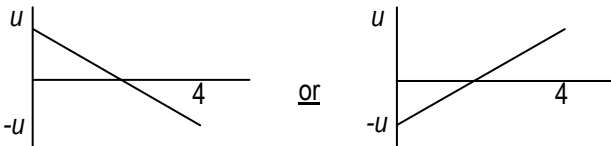This resource was created and owned by Pearson Edexcel

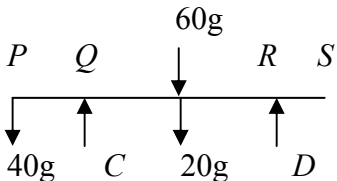**Mathematics M1**
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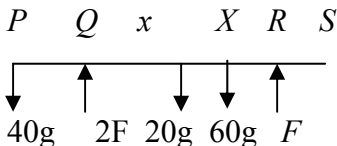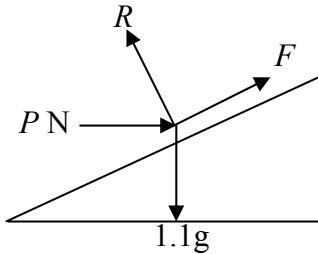
Mark Scheme (Results)
January 2009

GCE
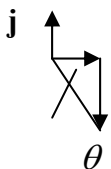
GCE Mathematics (6677/01)
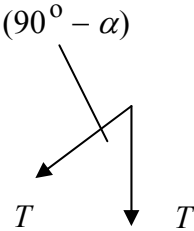
January 2009
6677 Mechanics M1
Mark Scheme

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)	$2u \;\rightarrow\; \leftarrow\; 4u$ $km2u - 4mu = -kmu + mv$
	   km m $u(3k - 4) = v$
	  $u \;\leftarrow\; \rightarrow\; v$
		M1 A1
		
		A1 (3)

(b)	$k > 2 \Rightarrow v > 0 \Rightarrow$ dir$^{\text{n}}$ 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)		

$$C + D = 120g$$

$$M(Q), \quad 80g.0.8 - 40g.0.4 = D.1.6$$

solving

$$C = 90g; D = 30g$$

M1 A1
M1 A1

M1
A1 A1   (7)

(b)

$$2F + F = 40g + 20g + 60g$$

$$M(Q), \quad 60gx + 20g.0.8 = 40g.0.4 + F.1.6$$

solving

$$QX = x = \frac{16}{15} \text{ m} = 1.07\text{m}$$

M1 A1

M1 A1
M1

A1   (6)
[13]

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

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Mathematics M1
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Question Number	Scheme	Marks
6 (a)	$\tan\theta = \dfrac{2}{1} \Rightarrow \theta = 63.4^{\text{o}}$ angle is 153.4^{o}	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)	$q = 1 \Rightarrow p = -2$ $\Rightarrow \mathbf{R} = 2\mathbf{i} - 4\mathbf{j}$ $\Rightarrow |\mathbf{R}| = \sqrt{2^2 + (-4)^2} = \sqrt{20}$ $\sqrt{20} = m8\sqrt{5}$ $\Rightarrow m = \dfrac{1}{4}$	B1 M1 M1 A1 f.t. M1 A1 f.t. A1 cao (7)
		[14]

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Mathematics M1

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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)	$(90^{\text{o}} - \alpha)$ T　　T $$F = 2T\cos(\frac{90^{\text{o}} - \alpha}{2})$$ $$= 12g\cos 26.56..^{\text{o}}$$ $$= 105 \text{ N}$$	M1 A2 A1 f.t. A1　(5) **[16]**