Mark Scheme (Results)
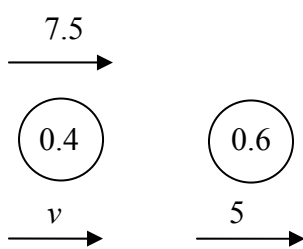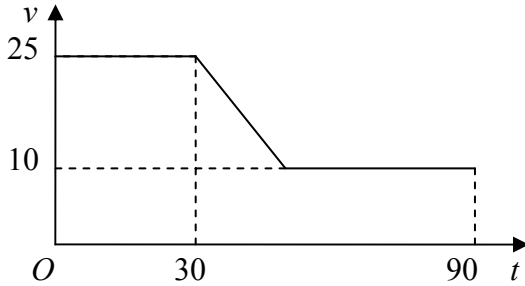# Summer 2008
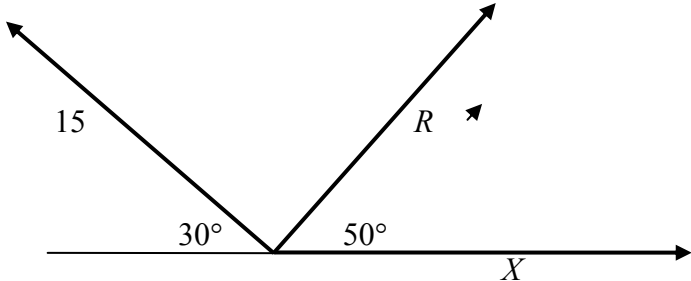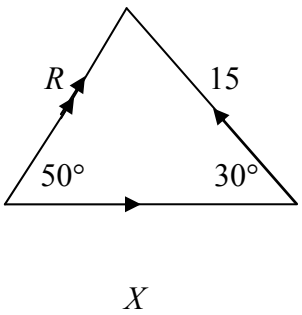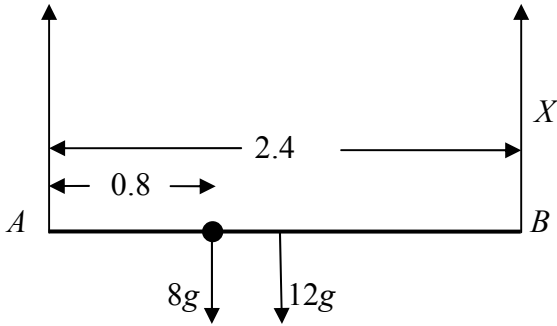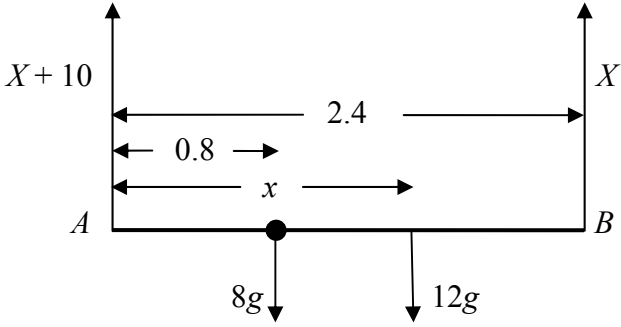
GCE Mathematics (6677/01)
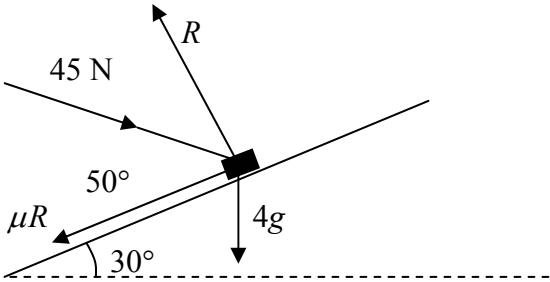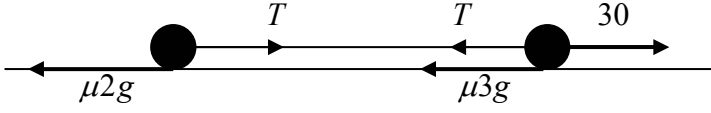
Question Number	Scheme	Marks
1.	(a) $\qquad I = mv \quad \Rightarrow \quad 3 = 0.4 \times v$ $\qquad\qquad\qquad v = 7.5 \ \left(\mathrm{ms}^{-1}\right)$	M1 A1 A1 **(3)**
	(b) LM $\qquad 0.4 \times 7.5 = 0.4v + 0.6 \times 5$ $\qquad\qquad 0 = 0.4v \quad \Rightarrow \quad v = 0$ ✳ $\qquad$ cso	 M1 A1 A1 **(3)** **[6]**
2.	(a) $v^2 = u^2 + 2as \quad \Rightarrow \quad 17.5^2 = u^2 + 2 \times 9.8 \times 10$ $\qquad\qquad$ Leading to $u = 10.5$	M1 A1 A1 **(3)**
	(b) $\qquad v = u + at \quad \Rightarrow \quad 17.5 = -10.5 + 9.8T$ $\qquad\qquad\qquad T = 2\dfrac{6}{7} \quad$ (s)	M1 A1 f.t. DM1 A1 **(4)**
	Alternatives for (b) $\qquad\qquad s = (\dfrac{u+v}{2})T \Rightarrow 10 = (\dfrac{17.5 + -10.5}{2})T$ $\qquad\qquad\qquad \dfrac{20}{7} = T$	**[7]** M1A1 f.t. DM1A1 **(4)**
	$\qquad$ OR $\qquad s = ut + \tfrac{1}{2}at^2 \quad \Rightarrow \quad -10 = 10.5t - 4.9t^2$ $\qquad$ Leading to $\; T = 2\dfrac{6}{7}, \left(-\dfrac{5}{7}\right) \qquad\qquad$ Rejecting negative	M1 A1 f.t. DM1 A1 **(4)**
	(b) can be done independently of (a) $\qquad\qquad s = vt - \tfrac{1}{2}at^2 \quad \Rightarrow \quad -10 = -17.5t + 4.9t^2$ $\qquad\qquad$ Leading to $T = 2\dfrac{6}{7}, \dfrac{5}{7}$ For final A1, second solution has to be rejected. $\dfrac{5}{7}$ leads to a negative u.	 M1 A1 DM1 A1 **(4)**

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

Question Number	Scheme	Marks
5.	(a)	

$$(\uparrow) \qquad 15\sin 30° = R\sin 50°$$

M1 A1

$$R \approx 9.79 \; (\text{N})$$

DM1 A1 **(4)**

(b) $\qquad (\rightarrow) \, X - 15\cos 30° = R\cos 50°$ ft their R M1 A2 ft

$$X \approx 19.3 \; (\text{N})$$

DM1 A1 **(5)**

[9]

Alternatives using sine rule in (a) or (b); cosine rule in (b)

(a) $\dfrac{R}{\sin 30°} = \dfrac{15}{\sin 50°}$

M1 A1

$$R \approx 9.79 \; (\text{N})$$

DM1 A1 (4)

(b) $\dfrac{X}{\sin 100°} = \dfrac{15}{\sin 50°} = \dfrac{R}{\sin 30°}$

M1 A2 ft on R

$$X \approx 19.3 \; (\text{N})$$

DM1 A1 (5)

$$X^2 = R^2 + 15^2 - 2 \text{ x } 15 \text{ x } R\cos 100^o$$

OR: cosine rule; any of $\; R^2 = X^2 + 15^2 - 2 \text{ x } 15 \text{ x } X\cos 30^o$

M1 A2 ft on R

$$15^2 = R^2 + X^2 - 2 \text{ x } X \text{ x } R\cos 50^o$$

$$X \approx 19.3 \; (\text{N})$$

DM1 A1 (5)

Question Number	Scheme	Marks
6.	(a)	

$M(A)$ $\qquad 8g \times 0.8 + 12g \times 1.2 = X \times 2.4$ $\qquad\qquad$ M1 A1

$\qquad\qquad\qquad\qquad X \approx 85 \ (\text{N}) \qquad\qquad$ accept 84.9, $\dfrac{26g}{3}$ $\qquad$ DM1 A1 **(4)**

(b)

$R(\uparrow) \qquad \underline{(X+10)} + \underline{X} = 8g + 12g \qquad$ M1 $\underline{B1}$ A1

$\qquad\qquad\qquad (X = 93)$

$M(A) \qquad 8g \times 0.8 + 12g \times x = X \times 2.4 \qquad$ M1 A1

$\qquad\qquad\qquad x = 1.4 \ (\text{m}) \qquad$ accept 1.36 $\qquad$ A1 **(6)**

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ **[10]**

Question Number	Scheme	Marks
7.	(a) $$R = 45\cos 40° + 4g\cos 30°$$ $$R \approx 68 \qquad\qquad\text{accept } 68.4$$ (b) $\qquad\qquad$ Use of $\;F = \mu R$ $$F + 4g\sin 30 = 45\cos 50°$$ Leading to $\;\;\mu \approx 0.14 \qquad\qquad$ accept 0.136	M1 A2 (1, 0) DM1 A1 (5) M1 M1 A2 (1, 0) DM1 A1 (6) **[11]**

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