

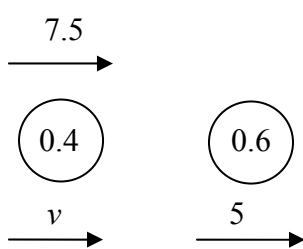
Mark Scheme (Results)

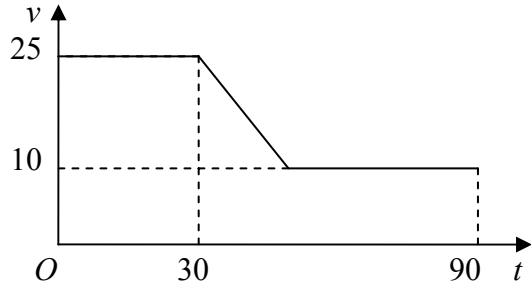
Summer 2008

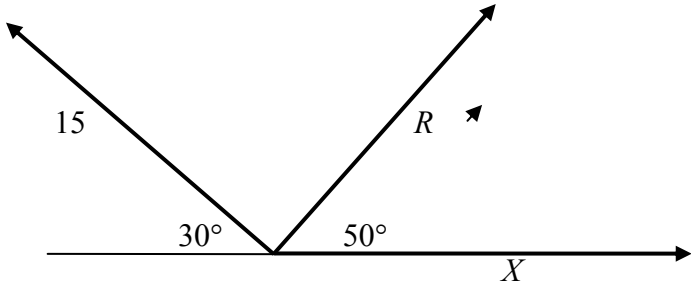
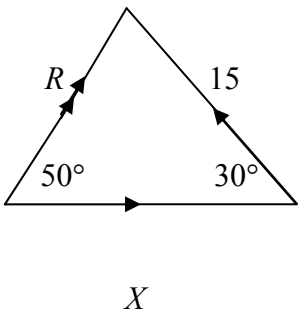
GCE

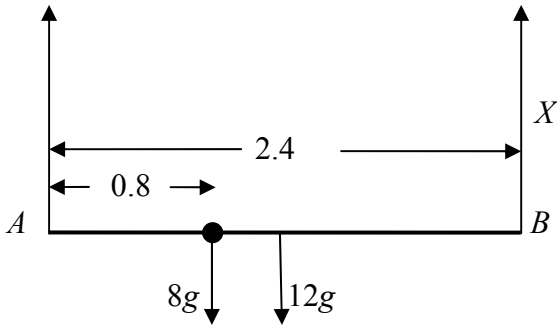
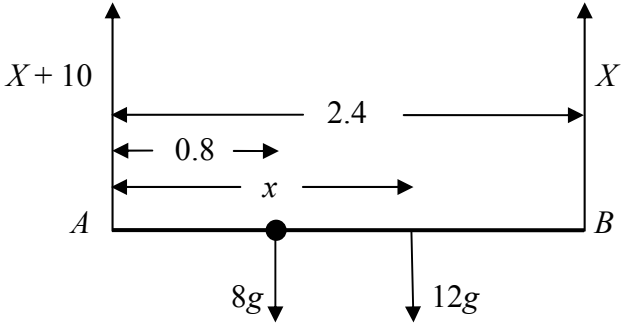
GCE Mathematics (6677/01)

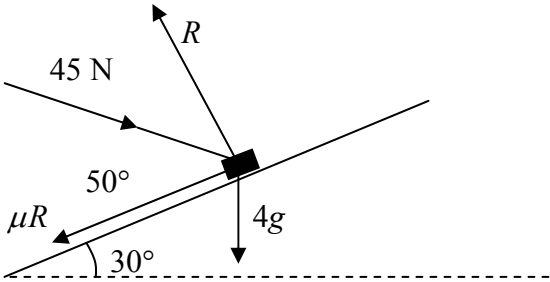
June 2008
6677 Mechanics M1
Final Mark Scheme

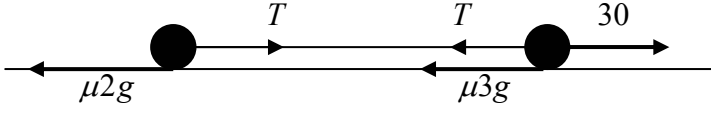
Question Number	Scheme	Marks
1.	(a) $I = mv \Rightarrow 3 = 0.4 \times v$ $v = 7.5 \text{ (ms}^{-1}\text{)}$ (b)  LM $0.4 \times 7.5 = 0.4v + 0.6 \times 5$ $0 = 0.4v \Rightarrow v = 0 \quad *$ cs0	M1 A1 A1 (3) M1 A1 A1 (3) [6]
2.	(a) $v^2 = u^2 + 2as \Rightarrow 17.5^2 = u^2 + 2 \times 9.8 \times 10$ Leading to $u = 10.5$ (b) $v = u + at \Rightarrow 17.5 = -10.5 + 9.8T$ $T = 2\frac{6}{7} \text{ (s)}$ Alternatives for (b) $s = \left(\frac{u+v}{2}\right)T \Rightarrow 10 = \left(\frac{17.5 + -10.5}{2}\right)T$ $\frac{20}{7} = T$ OR $s = ut + \frac{1}{2}at^2 \Rightarrow -10 = 10.5t - 4.9t^2$ Leading to $T = 2\frac{6}{7}, \left(-\frac{5}{7}\right)$ Rejecting negative (b) can be done independently of (a) $s = vt - \frac{1}{2}at^2 \Rightarrow -10 = -17.5t + 4.9t^2$ Leading to $T = 2\frac{6}{7}, \frac{5}{7}$ For final A1, second solution has to be rejected. $\frac{5}{7}$ leads to a negative u.	M1 A1 A1 (3) M1 A1 f.t. DM1 A1 (4) [7] M1A1 f.t. DM1A1 (4) M1 A1 f.t. DM1 A1 (4) M1 A1 DM1 A1 (4)

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

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

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

Question Number	Scheme	Marks
7.	(a)  $R = 45 \cos 40^\circ + 4g \cos 30^\circ$ $R \approx 68$ (b) Use of $F = \mu R$ $F + 4g \sin 30 = 45 \cos 50^\circ$ Leading to $\mu \approx 0.14$	M1 A2 (1, 0) DM1 A1 (5) M1 M1 A2 (1, 0) DM1 A1 (6) [11]

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