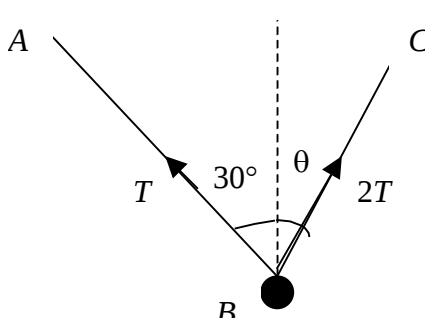


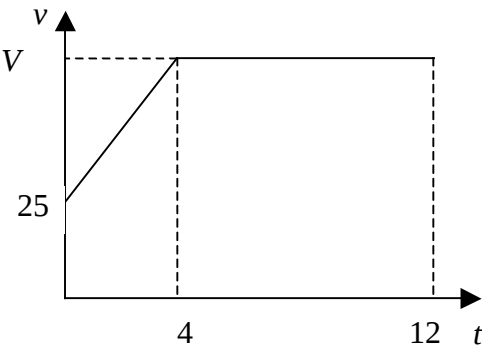
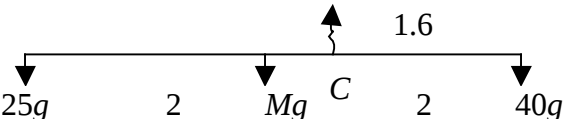
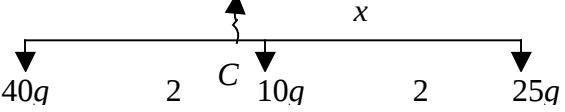
Mock Paper Mark Scheme

Advanced Subsidiary/Advanced GCE
General Certificate of Education

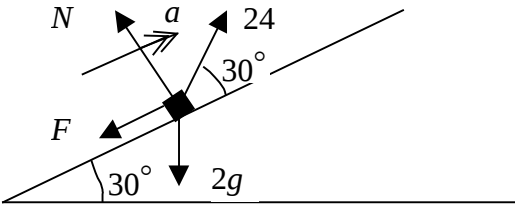
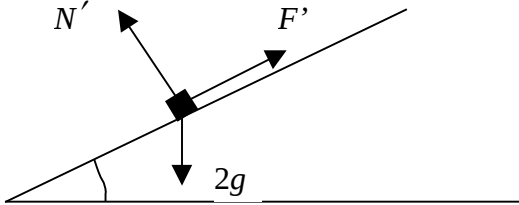
Subject **MECHANICS**

Paper No. **Mock M1**

Question number	Scheme	Marks
1. (a)	$34^2 = 16^2 + 2 \cdot a \cdot 150$ $\Rightarrow a = 3 \text{ m s}^{-2}$	M1 A1
(b)	$\text{hence } t = \frac{34 - 16}{a} = 6 \text{ s}$	A1 (3)
(c)	$v^2 = 16^2 + 2 \cdot 3 \cdot 75$ $\Rightarrow v \approx 26.6 \text{ m s}^{-1}$	M1 A1 (2)
		7
2. (a)	 $\text{R}(\rightarrow) \quad T \sin 30^\circ = 2T \sin \theta$ $\Rightarrow \sin \theta = 0.25$ $\Rightarrow \theta \approx 14.5^\circ$	M1 A1
(b)	$\text{R}(\uparrow) \quad T \cos 30 + 2T \cos \theta = 2g$ $\Rightarrow T \approx 6.99 \text{ N}$	M1 A1 (4)
		M1 A1 (4)

Question number	Scheme	Marks
3. (a)		B1 (shape) B1 (figs) (2)
(b)	$600 = 8V + \frac{1}{2}(25 + V) \cdot 4$ $\Rightarrow V = 55$	M1 A1, A1 A1 (4)
(c)	$a = \frac{55 - 25}{4} = 7.5 \text{ m s}^{-2}$	M1 A1 (2)
4. (a)	 $\text{M}(C) \quad 40g \cdot 1.6 = Mg \cdot 0.4 + 25g \cdot 2.4$ $\Rightarrow M = 10 \text{ kg}$	M1 A1 A1 (3)
(b)	 $\text{M}(C) \quad 25g \cdot x + 10g \cdot (x - 2) = 40g \cdot (4 - x)$ $\Rightarrow 75x = 180$ $\Rightarrow x = 2.4 \text{ m}$	M1 A1 A1 M1 A1 (5)

Question number	Scheme	Marks
(c)	(i) Weight acts at centre of plank (ii) Plank remains straight (iii) Weights act at the ends of the plank	B1 B1 B1 (3) (11)
5.	(a) “ $v^2 = u^2 + 2as$ ”: $V^2 = 2 \cdot 9.8 \cdot 1.6$ $\Rightarrow V = 5.6 \text{ m s}^{-1}$ (b) $78 \cdot 5.6 = 84 \cdot v$ $\Rightarrow v = 5.2 \text{ m s}^{-1}$ (c) $84 \cdot 5.2 = F \cdot 0.06 - 84g \cdot 0.06$ $\Rightarrow F = 8103.2 \text{ N}$ (d) “ $F = ma$ ”: $8103.2 - 84g = 84a \Rightarrow a = 86.67$ “ $v^2 = u^2 + 2as$ ”: $5.2^2 = 2 \cdot 86.67 \cdot s$ $\Rightarrow s \approx 0.156 \text{ m, or } 0.16 \text{ m to 2 s.f.}$	M1 A1 (2) M1 A1 A1 (3) M1 A1 A1 A1 (4) M1 A1 M1 A1 (4)
6.	(a) At time t $\mathbf{r}_A = (-5 + 2t)\mathbf{i} + (10 + 2t)\mathbf{j}$ $\mathbf{r}_B = (3 - 2t)\mathbf{i} + (4 + 5t)\mathbf{j}$ $\mathbf{i}$ components equal when $-5 + 2t = 3 - 2t \Rightarrow t = 2 \text{ h}$ $t = 2$: $\mathbf{r}_A = -\mathbf{i} + 14\mathbf{j}$; $\mathbf{r}_B = -\mathbf{i} + 14\mathbf{j} \Rightarrow$ collide (b) New $\mathbf{r}_A = (-5 + t)\mathbf{i} + (10 + t)\mathbf{j}$ $\Rightarrow AB = \mathbf{r}_B - \mathbf{r}_A = (8 - 3t)\mathbf{i} + (-6 + 4t)\mathbf{j}$ (c) $t = 2$: $\overrightarrow{AB} = 2\mathbf{i} + 2\mathbf{j}$, $\Rightarrow \text{dist.} = \sqrt{(2^2 + 2^2)} \approx 2.83 \text{ km}$ (d) B north of $A \Rightarrow 8 - 3t = 0 \Rightarrow t = 8/3 \Rightarrow$ time 1440 hours	B1 B1 M1 A1 M1 A1 (6) M1 A1 (2) M1 M1 A1 (3) M1 A1 (2)

Question number	Scheme	Marks
7. (a)	 $R(\searrow) \quad N + 24 \cos 60^\circ = 2g \cos 30^\circ$ $\Rightarrow N = 16.97 - 12 = 4.97 \text{ N}$ $\Rightarrow F = 0.4 \cdot 4.97 = 1.99 \text{ N}$ $R(\nearrow) \quad 2a = 24 \cos 30^\circ - 2g \cos 60^\circ - 1.99$ $\Rightarrow a \approx 4.5 \text{ m s}^{-2}$	M1 A1 A1 M1 A1 M1 A1 A1 (8)
(b)	 $R(\searrow) \quad N' = 2g \cos 30^\circ = 16.97$ $\Rightarrow F'_{\max} = 0.4 \cdot 16.97 = 6.79 \text{ N}$	M1 A1
(c)	Component of weight down plane $= 2g \sin 30^\circ = 9.8 \text{ N}$ $9.8 > F'_{\max} \Rightarrow$ net force down plane $\Rightarrow$ parcel moves $2f = 9.8 - 6.79, \Rightarrow f \approx 1.5 \text{ m s}^{-2}$	M1 A1 (4) M1 A1, A1

