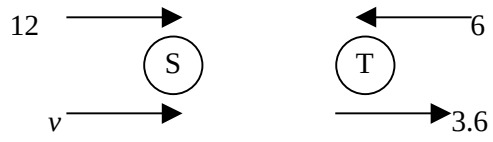
EDEXCEL MECHANICS M1 (6677)
PROVISIONAL MARK SCHEME NOVEMBER 2003

Question Number	Scheme	Marks
1.	**(a)** $0^2 = u^2 - 2\times 9.8\times 40$	M1 A1
	$\Rightarrow \quad \underline{u = 28 \text{ ms}^{-1}}$	A1 (3)
	(b) $-28 = 28 - 9.8\times t$	M1 A1$\surd$
	$\Rightarrow \quad \underline{t = 5.7 \text{ or } 5.71 \text{ s}}$	A1 (3) **6**
2.		
	(a) $28800 = 2000\,(12 - v)$	M1 A1
	$v = -2.4\text{ms}^{-1}$ Speed $= \underline{2.4 \text{ ms}^{-1}}$	A1 (3)
	(b) due west / $\leftarrow$ /reversed direction (o.e.)	A1$\surd$ (1)
	(c) T : $28800 = m(6 + 3.6)$	M1 A1
	$\Rightarrow m = \underline{3000 \text{ kg}}$	M1 A1 (4)
	OR $2000\times 12 - 6\times m = -\ 2000\times 2.4 + m\times 3.6$	M1 A1$\surd$
	$\Rightarrow \quad m = 3000\,\text{kg}$	M1 A1 **8**

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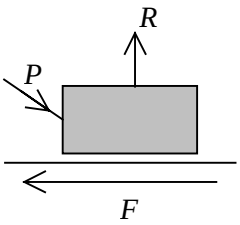
3.		M1 A2, 1, 0 M1 A1 B1 M1 M1 A1	**9**

R $\uparrow$: $R = 50g + P\sin 30°$

R $\rightarrow$: $F = P\cos 30°$

$F = \frac{3}{5}R$ used

$P\cos 30° = \frac{3}{5}(50g + P\sin 30°)$ Elim F, R

Solve $P = 520$ or 519 N

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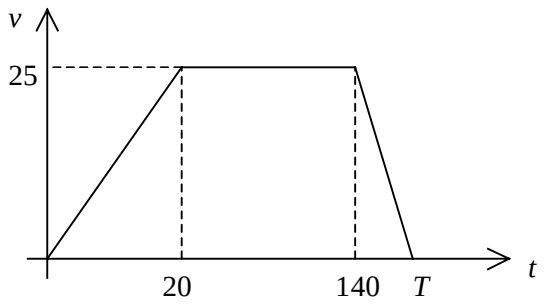
Question Number	Scheme	Marks
4.	**(a)**	
	Shape	B1
	Figs	B1 (2)
		
	(b) $\frac{1}{2}(T+120)\times 25 = 4000$	M1 A1
	$\left[\text{ **or** } \frac{1}{2}.20.25, +120.25+\frac{1}{2}(T-140).25 = 4000\right]$	
	$\rightarrow T = \underline{200\text{ s}}$	A1 (3)
	(c) Car: $\frac{1}{2}.20.25, +25(t-20) = 1500$	M1 A1, A1
	$\rightarrow t = 70\text{s}$	M1
	Hence motorcycle travels for 60s	A1 (5)
	(d) $1500 = \left(\frac{0+v}{2}\right).60$	M1
	$v = \underline{50\,\text{ms}^{-1}}$	A1 (2)
		12
5.	**(a)** $a = \frac{1}{4}\left[(5\mathbf{i}+11\mathbf{j})-(3\mathbf{i}-5\mathbf{j})\right] = -2\mathbf{i}+4\mathbf{j}$	M1 A1 (2)
	(b) $\mathbf{F} = m\mathbf{a} = -6\mathbf{i}+12\mathbf{j}$	M1 A1
	$\lvert\mathbf{F}\rvert = \sqrt{180} \simeq 13.4\text{ N}$ (AWRT)	M1 A1 (4)
	[**OR** $\lvert\mathbf{a}\rvert = \sqrt{20} \simeq 4.47 \Rightarrow \lvert\mathbf{F}\rvert = 3\times 4.47 \simeq 13.4\text{ N}$]	

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	(c) $t = 6 \quad \mathbf{v} = 3\mathbf{i} - 5\mathbf{j} + 6(-2\mathbf{i} + 4\mathbf{j}) \quad [= -9\mathbf{i} + 19\mathbf{j}]$ $\text{At B}: \mathbf{r} = (6\mathbf{i} - 29\mathbf{j}) + 3(-9\mathbf{i} + 19\mathbf{j}) \quad [= -21\mathbf{i} + 28\mathbf{j}]$ $\text{OB} = \sqrt{(21^2 + 28^2)} = \underline{35\,\text{m}}$	M1 A1√ M1 A1√ M1 A1√	(6) **12**

EDEXCEL MECHANICS M1 (6677)
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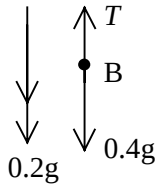
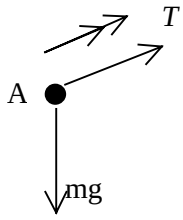
Question Number	Scheme	Marks
6.	**(a)** M(D): $160 \times 2.5 = W \times 4 + 200(4 - x)$	M1 A2, 1, 0
	$400 = 4W + 800 - 200x$	
	$200x - 4W = 400 \Rightarrow 50x - W = 100$ *	M1 A1 (5)
	(b) M(D): $50 \times 2.5 + W \times 1 = 200(4 - x)$	M1 A2, 1, 0
	$200x + W = 675$	(3)
	(c) Solving $\rightarrow x = \underline{3.1\text{m}}$	M1 A1
	: $W = \underline{55\text{N}}$	M1 A1 (4)
		12
7.	**(a)**  $0.4\text{g} - T = 0.4 \times \frac{1}{5}\text{g}$	M1 A1 (2)
	(b) $T = \underline{\frac{8}{25}g}$ or 3.14 or 3.1 N	M1 A1 (2)
	(c) $T - mg\sin 30° = m \times \frac{1}{5}\text{g}$	M1 A1
	$\rightarrow m = \underline{\frac{16}{35}}$ *	M1 A1 (4)
		
	(d) Same T for A & B	B1 (1)
	(e) $v^2 = 2 \times \frac{1}{5}g \times 1$	M1
	$v = \underline{\sqrt{\frac{2g}{5}}} \simeq \underline{1.98 \text{ or } 2 \text{ ms}^{-1}}$	A1 (2)

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	(f) A: $-\frac{1}{2}mg = ma \Rightarrow a = -\frac{1}{2}g$	M1 A1	
	$v^2 = \frac{2g}{5} - 2\times\frac{1}{2}g\times 0.4$	M1 A1$\surd$	(5)
	$\Rightarrow v = 0$	A1	**16**