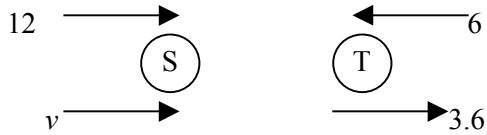


EDEXCEL MECHANICS M1 (6677)
PROVISIONAL MARK SCHEME NOVEMBER 2003

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

EDEXCEL MECHANICS M1 (6677)
PROVISIONAL MARK SCHEME NOVEMBER 2003

3.

M1 A2, 1, 0
 M1 A1

B1

M1

M1 A1

9

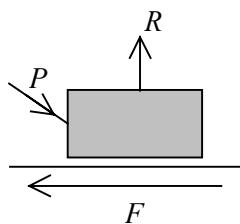
$$R \uparrow: R = 50g + P \sin 30^\circ$$

$$R \rightarrow: F = P \cos 30^\circ$$

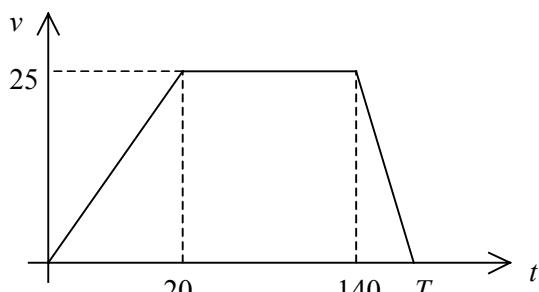
$$F = \frac{3}{5}R \quad \text{used}$$

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

$$\text{Solve} \quad \underline{P = 520 \quad \text{or} \quad 519 \text{ N}}$$



EDEXCEL MECHANICS M1 (6677)
PROVISIONAL MARK SCHEME NOVEMBER 2003

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

EDEXCEL MECHANICS M1 (6677)
PROVISIONAL MARK SCHEME NOVEMBER 2003

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

M1 A1 \checkmark
M1 A1 \checkmark
M1 A1 \checkmark (6)
12

EDEXCEL MECHANICS M1 (6677)
PROVISIONAL MARK SCHEME NOVEMBER 2003

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

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PROVISIONAL MARK SCHEME NOVEMBER 2003

	(f) A: $\begin{aligned} -\frac{1}{2}mg &= ma \Rightarrow a = -\frac{1}{2}g \\ v^2 &= \frac{2g}{5} - 2 \times \frac{1}{2}g \times 0.4 \\ \Rightarrow v &= 0 \end{aligned}$	
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	M1 A1	
	M1 A1 ✓	(5)
	A1	

16