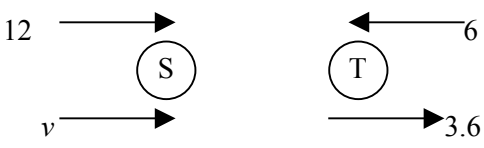
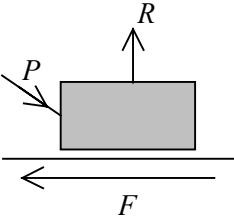
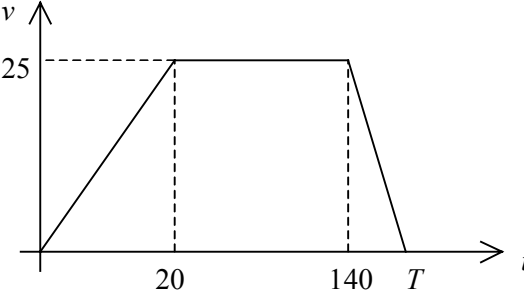


EDEXCEL MECHANICS M1 (6677)
PROVISIONAL MARK SCHEME NOVEMBER 2003

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

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<p>3.</p>	 <p> $R \uparrow: R = 50g + P \sin 30^\circ$ $R \rightarrow: F = P \cos 30^\circ$ $F = \frac{3}{5}R$ used $P \cos 30^\circ = \frac{3}{5}(50g + P \sin 30^\circ)$ Elim F, R Solve <u>$P = 520$ or 519 N</u> </p>	<p>M1 A2, 1, 0 M1 A1 B1 M1 M1 A1</p> <p style="text-align: right;">9</p>
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Question Number	Scheme	Marks
4.	<p>(a)</p>  <p>(b)</p> $\frac{1}{2}(T + 120) \times 25 = 4000$ $\left[\text{or } \frac{1}{2} \cdot 20 \cdot 25 + 120 \cdot 25 + \frac{1}{2}(T - 140) \cdot 25 = 4000 \right]$ $\rightarrow T = \underline{200 \text{ s}}$ <p>(c)</p> <p>Car: $\frac{1}{2} \cdot 20 \cdot 25 + 25(t - 20) = 1500$</p> $\rightarrow t = 70 \text{ s}$ <p>Hence motorcycle travels for 60s</p> <p>(d)</p> $1500 = \left(\frac{0 + v}{2} \right) \cdot 60$ $v = \underline{50 \text{ ms}^{-1}}$	<p>Shape B1</p> <p>Figs B1</p> <p>(2)</p> <p>M1 A1</p> <p>A1</p> <p>(3)</p> <p>M1 A1, A1</p> <p>M1</p> <p>A1</p> <p>(5)</p> <p>M1</p> <p>A1</p> <p>(2)</p> <p>12</p>
5.	<p>(a)</p> $a = \frac{1}{4}[(5\mathbf{i} + 11\mathbf{j}) - (3\mathbf{i} - 5\mathbf{j})] = -2\mathbf{i} + 4\mathbf{j}$ <p>(b)</p> $\mathbf{F} = m\mathbf{a} = -6\mathbf{i} + 12\mathbf{j}$ $ \mathbf{F} = \sqrt{180} \approx 13.4 \text{ N (AWRT)}$ <p>[OR $\mathbf{a} = \sqrt{20} \approx 4.47 \Rightarrow \mathbf{F} = 3 \times 4.47 \approx 13.4 \text{ N}$]</p>	<p>M1 A1</p> <p>(2)</p> <p>M1 A1</p> <p>M1 A1</p> <p>(4)</p>

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	<p>(c) $t = 6 \quad \mathbf{v} = 3\mathbf{i} - 5\mathbf{j} + 6(-2\mathbf{i} + 4\mathbf{j}) \quad [= -9\mathbf{i} + 19\mathbf{j}]$ At B : $\mathbf{r} = (6\mathbf{i} - 29\mathbf{j}) + 3(-9\mathbf{i} + 19\mathbf{j}) \quad [= -21\mathbf{i} + 28\mathbf{j}]$ $OB = \sqrt{(21^2 + 28^2)} = \underline{35 \text{ m}}$</p>	<p>M1 A1√ M1 A1√ M1 A1√ (6) 12</p>
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	<p>(f) A: $-\frac{1}{2}mg = ma \Rightarrow a = -\frac{1}{2}g$</p> $v^2 = \frac{2g}{5} - 2 \times \frac{1}{2}g \times 0.4$ $\Rightarrow v = 0$	<p>M1 A1</p> <p>M1 A1 $\sqrt{\quad}$</p> <p>A1</p> <p>(5)</p> <p>16</p>
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