

# Mark Scheme (Results)

June 2011

GCE Mechanics M1 (6677) Paper 1

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## EDEXCEL GCE MATHEMATICS

### General Instructions for Marking

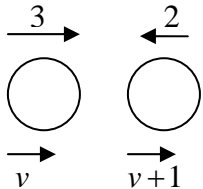
1. The total number of marks for the paper is 75.
2. The Edexcel Mathematics mark schemes use the following types of marks:
  - **M** marks: method marks are awarded for 'knowing a method and attempting to apply it', unless otherwise indicated.
  - **A** marks: Accuracy marks can only be awarded if the relevant method (M) marks have been earned.
  - **B** marks are unconditional accuracy marks (independent of M marks)
  - Marks should not be subdivided.

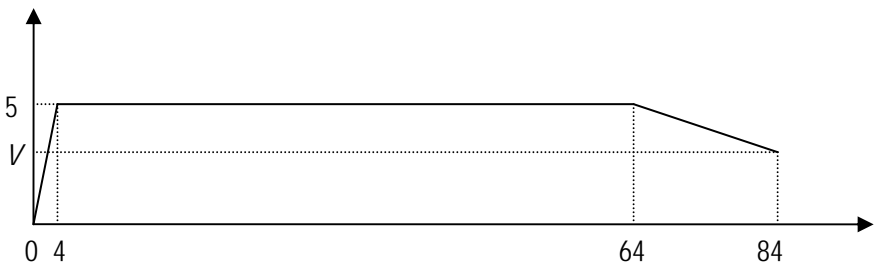
### 3. Abbreviations

These are some of the traditional marking abbreviations that will appear in the mark schemes and can be used if you are using the annotation facility on ePEN.

- bod – benefit of doubt
- ft – follow through
- the symbol  $\checkmark$  will be used for correct ft
- cao – correct answer only
- cso - correct solution only. There must be no errors in this part of the question to obtain this mark
- isw – ignore subsequent working
- awrt – answers which round to
- SC: special case
- oe – or equivalent (and appropriate)
- dep – dependent
- indep – independent
- dp decimal places
- sf significant figures
- \* The answer is printed on the paper
- $\square$  The second mark is dependent on gaining the first mark

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Mechanics M1 6677  
Mark Scheme**

Question Number	Scheme	Marks
<b>1.</b> <b>(a)</b>	$0^2 = u^2 - 2 \times 9.8 \times 40$ $u = 28 \text{ m s}^{-1} \text{ ** GIVEN ANSWER}$	M1 A1 A1  (3)
<b>(b)</b>	$33.6 = 28t - \frac{1}{2}9.8t^2$ $4.9t^2 - 28t + 33.6 = 0$ $t = \frac{28 \pm \sqrt{28^2 - 4 \times 4.9 \times 33.6}}{9.8}$ $= 4 \text{ s or } (1.7 \text{ s or } 1.71 \text{ s})$	M1 A1  M1 A1 A1  (5) <b>8</b>
<b>2.</b> <b>(a)</b>	 <p style="margin-left: 150px;">CLM: <math>3 \times 3 - 2 \times 2 = 3v + 2(v+1)</math></p> <p style="margin-left: 150px;"><math>v_P = 0.6 \text{ m s}^{-1}; v_Q = 1.6 \text{ m s}^{-1}</math></p>	M1 A1  M1A1 (A1 ft)  (5)
<b>(b)</b>	$3(v-3) \quad \text{OR} \quad 2(v+1--2)$ $= 7.2 \text{ Ns} \quad \quad \quad = 7.2 \text{ Ns}$	M1 A1 ft A1  (3) <b>8</b>

Question Number	Scheme	Marks
<p><b>3.</b></p> <p><b>OR</b></p>	<p> <math>\nearrow</math> <math>4 \cos \alpha + F = W \sin \alpha</math>  <math>\nwarrow</math> <math>R = 4 \sin \alpha + W \cos \alpha</math>  <math>F = 0.5R</math>  <math>\cos \alpha = 0.8</math> or <math>\sin \alpha = 0.6</math>  <math>R = 20\text{N}</math> ** GIVEN ANSWER  <math>W = 22\text{N}</math> </p> <p> <math>\rightarrow</math> <math>R \sin \alpha = 4 + F \cos \alpha</math>  <math>\uparrow</math> <math>R \cos \alpha + F \sin \alpha = W</math>  <math>F = 0.5R</math>  <math>\cos \alpha = 0.8</math> or <math>\sin \alpha = 0.6</math>  <math>R = 20\text{N}</math> ** GIVEN ANSWER  <math>W = 22\text{N}</math> </p>	<p>M1 A1                      M1 A1                      B1                      B1                      M1 A1                      A1</p> <p>(9)</p> <p>M1 A1                      M1 A1                      B1                      B1                      M1 A1                      A1</p> <p>(9)</p> <p><b>9</b></p>
<p><b>4.</b></p> <p><b>(a)</b></p>		<p>B1 shape                      B1 figs</p> <p>(2)</p>
<p><b>(b)</b></p>	<p><math>(\frac{1}{2} \times 4 \times 5) + 60 \times 5</math>  <math>= 310</math></p>	<p>M1 A1                      A1</p> <p>(3)</p>
<p><b>(c)</b></p>	<p><math>\frac{(5+V)}{2} \times 20 = (400-310)</math>  <math>V = 4</math></p>	<p>M1 A2 ft                      DM1 A1</p> <p>(5)</p>
<p><b>(d)</b></p>	<p><math>\frac{5-4}{20} = 0.05 \text{ ms}^{-2}</math></p>	<p>M1 A1</p> <p>(2)</p> <p><b>12</b></p>

Question Number	Scheme	Marks
<p><b>5.</b></p> <p>(a)</p> <div style="text-align: center;"> </div> <p>(i) <b>EITHER</b> <math>M(R), 8X + 2X = 40g \times 6 + 20g \times 4</math> solving for <math>X, X = 32g = 314</math> or <math>310</math> N</p> <p>(ii) <math>(\uparrow) X + X = 40g + 20g + Mg</math> (or another moments equation) solving for <math>M, M = 4</math></p> <p>(i) <b>OR</b> <math>M(P), 6X = 40g \times 2 + 20g \times 4 + Mg \times 8</math> solving for <math>X, X = 32g = 314</math> or <math>310</math> N</p> <p>(ii) <math>(\uparrow) X + X = 40g + 20g + Mg</math> (or another moments equation) solving for <math>M, M = 4</math></p>	<p>M1 A2 M1 A1</p> <p>M1 A2 M1 A1</p> <p>M1 A2 M1 A1 M1 A2 M1 A1</p> <p>(10)</p>	
(b)	<p>Masses concentrated at a point or weights act at a point</p>	<p>B1 (1) <b>11</b></p>
<p><b>6.</b></p> <p>(a)</p>	<p><math>R = 0.3g \cos \alpha</math> <math>= 0.24g = 2.35</math> (3sf)<math>= 2.4</math> (2sf)</p>	<p>M1 A1 (2)</p>
(b)	<p><math>mg - T = 1.4m</math> <math>T - 0.3g \sin \alpha - F = 0.3 \times 1.4</math> <math>F = 0.5R</math> Eliminating <math>R</math> and <math>T</math> <math>m = 0.4</math></p>	<p>M1 A1 M1 A2 M1 <b>DM1</b> A1 (8)</p>
(c)	<p><math>v = 1.4 \times 0.5</math> <math>-0.3g \sin \alpha - F = 0.3a</math> <math>a = -9.8</math> <math>0 = 0.7 - 9.8t</math> <math>t = 0.071</math> s or <math>0.0714</math> s (1/14 A0)</p>	<p>B1 M1 A1 A1 M1 A1 (6) <b>16</b></p>

Question Number	Scheme	Marks
7. (a)	$\tan\theta = \frac{3}{4}$ ; bearing is $37^\circ$ ( <b>nearest degree</b> )	M1; A1 (2)
(b) (i) (ii) (iii)  (c) (i) (ii)	$\mathbf{p} = (\mathbf{i} + \mathbf{j}) + t(2\mathbf{i} - 3\mathbf{j})$ $\mathbf{q} = (-2\mathbf{j}) + t(3\mathbf{i} + 4\mathbf{j})$ $\mathbf{PQ} = \mathbf{q} - \mathbf{p} = (-\mathbf{i} - 3\mathbf{j}) + t(\mathbf{i} + 7\mathbf{j})$  $-1 + t = 0$ $t = 1$ or 3pm  $-1 + t = -(-3 + 7t)$ $t = \frac{1}{2}$ or 2.30 pm	M1 A1 A1 M1 A1 (5)  M1 A1 M1 A1 (4) <b>11</b>

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