

Mark Scheme (Final)

Summer 2007

GCE

GCE Mathematics (6677/01)

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.

M (method) marks in Mechanics are usually awarded for the application of some mechanical principle to produce an equation:

e.g. resolving in a particular direction, taking moments about a point, applying the conservation of momentum principle, etc.

To earn the M mark the following criteria are (usually) applied:

The equation

(i) should have the correct number of terms

(ii) should be dimensionally correct

In addition, for a resolution, all terms that need to be resolved are resolved.

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.

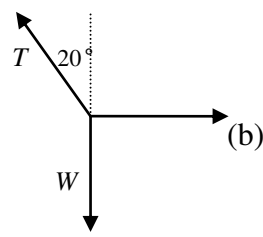
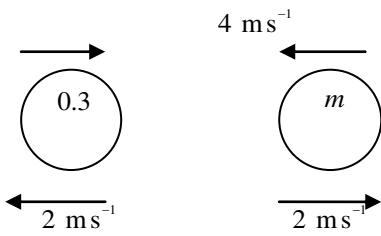
- bod - benefit of doubt
- ft - follow through
- the symbol \checkmark will be used for correct ft
- cao - correct answer only
- cso - correct solution only. There must be no errors in this part of the question to obtain this mark
- isw - ignore subsequent working
- awrt - answers which round to
- SC: 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

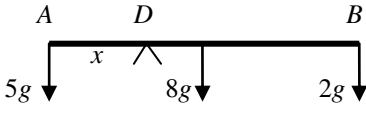
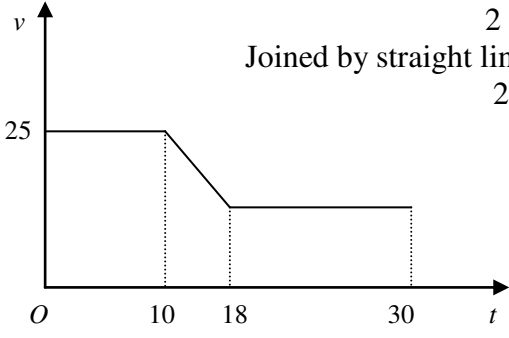
4. All A marks are 'correct answer only' (cao.) unless shown, for example, as A1 ft to indicate that previous wrong working is to be followed through. After a misread however, the subsequent A marks affected are treated as A ft, but manifestly absurd answers should never be awarded A marks.
5. For misreading which does not alter the character of a question or materially simplify it, deduct two from any A or B marks gained, in that part of the question affected. If you are using the annotation facility on ePEN, indicate this action by 'MR' in the body of the script.
6. If a candidate makes more than one attempt at any question:
7. If all but one attempt is crossed out, mark the attempt which is NOT crossed out.
8. If either all attempts are crossed out or none are crossed out, mark all the attempts and score the highest single attempt.
9. Ignore wrong working or incorrect statements following a correct answer.
10. Marks for each question are scored by 'clicking' in the marking grids that appear below each student response on ePEN. The maximum mark allocation for each question/part question(item) is set out in the marking grid and you should allocate a score of '0' or '1' for each mark as shown:

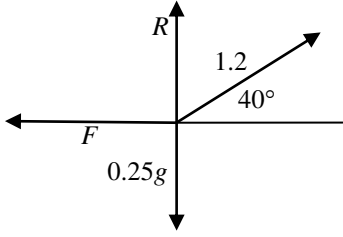
	0	1
aM		•
aA	•	
bM1		•
bA1	•	
bB	•	
bM2		•
bA2		•

11. Be careful when scoring a response that is either all correct or all incorrect. It is very easy to click down the '0' column when it was meant to be '1' and all correct.

June 2007
6677 Mechanics M1
Mark Scheme

Question Number	Scheme	Marks
1.	<p style="text-align: center;">(a)</p> $\rightarrow T \sin 20^\circ = 12$ $T \approx 35.1 \text{ (N) awrt } 35$  <p style="text-align: center;">(b)</p> $\uparrow W = T \cos 20^\circ$ $\approx 33.0 \text{ (N) awrt } 33$	<p>M1 A1 A1 (3)</p> <p>M1 A1 DM1 A1 (4) [7]</p>
2.	 <p>(a) A: $I = 0.3(8 + 2)$ $= 3 \text{ (Ns)}$</p> <p>(b) LM $0.3 \times 8 - 4m = 0.3 \times (-2) + 2m$ $m = 0.5$</p> <p><i>Alternative to (b)</i> B: $m(4 + 2) = 3$ $m = 0.5$</p> <p>The two parts of this question may be done in either order.</p>	<p>M1 A1 A1 (3)</p> <p>M1 A1 DM1 A1 (4) [7]</p> <p>M1 A1 DM1 A1 (4)</p>

Question Number	Scheme	Marks
3.	<p>(a) $M(C) \quad 8g \times (0.9 - 0.75) = mg(1.5 - 0.9)$ Solving to $m = 2 \quad *$</p> <p>(b)</p> <div style="text-align: center;">  </div> <p>$M(D) \quad 5g \times x = 8g \times (0.75 - x) + 2g(1.5 - x)$ Solving to $x = 0.6 \quad (AD = 0.6 \text{ m})$</p>	<p>M1 A1 DM1 A1 (4)</p> <p>M1 A2(1, 0) DM1 A1 (5) [9]</p>
4.	<p>(a)</p> <div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>2 horizontal lines Joined by straight line sloping down 25, 10, 18, 30 oe</p> </div> </div> <p>(b) $25 \times 10 + \frac{1}{2}(25 + V) \times 8 + 12 \times V = 526$ Solving to $V = 11$</p> <p>(c) "$v = u + at$" $\Rightarrow 11 = 25 - 8a$ ft their V $a = 1.75 \quad (\text{ms}^{-2})$</p>	<p>B1 B1 B1 (3)</p> <p>M1 <u>A1</u> A1 DM1 A1 (5)</p> <p>M1 A1ft A1 (3) [11]</p>

Question Number	Scheme	Marks
5.	<p>(a)</p>  <p>↑ $\pm R + 1.2 \sin 40^\circ = 0.25g$ Solving to $R = 1.7$ (N) accept 1.68</p> <p>(b) → $F = 1.2 \cos 40^\circ$ (≈ 0.919) Use of $F = \mu R$ $1.2 \cos 40^\circ = \mu R$ ft their R $\mu \approx 0.55$ accept 0.548</p>	<p>M1 A1 DM1 A1 (4)</p> <p>M1 A1 B1 DM1 A1ft</p> <p>A1 cao (6)</p> <p>[10]</p>

Question Number	Scheme	Marks
6.	(a) $s = ut + \frac{1}{2}at^2 \Rightarrow 3.15 = \frac{1}{2}a \times \frac{9}{4}$ $a = 2.8 \text{ (ms}^{-2}\text{)} *$	M1 A1 A1 (3)
	(b) N2L for P : $0.5g - T = 0.5 \times 2.8$ $T = 3.5 \text{ (N)}$	M1 A1 A1 (3)
	(c) N2L for Q : $T - mg = 2.8m$ $m = \frac{3.5}{12.6} = \frac{5}{18} *$	M1 A1 DM1 A1 (4)
	(d) The acceleration of P is equal to the acceleration of Q .	B1 (1)
	(e) $v = u + at \Rightarrow v = 2.8 \times 1.5$ (or $v^2 = u^2 + 2as \Rightarrow v^2 = 2 \times 2.8 \times 3.15$) $(v^2 = 17.64, v = 4.2)$ $v = u + at \Rightarrow 4.2 = -4.2 + 9.8t$ $t = \frac{6}{7}, 0.86, 0.857 \text{ (s)}$	M1 A1 DM1 A1 DM1 A1 (6) [17]

Question Number	Scheme	Marks
7.	(a) $\mathbf{v} = \frac{8\mathbf{i} + 11\mathbf{j} - (3\mathbf{i} - 4\mathbf{j})}{2.5}$ or any equivalent $\mathbf{v} = 2\mathbf{i} + 6\mathbf{j}$	M1 A1 A1 (3)
	(b) $\mathbf{b} = 3\mathbf{i} - 4\mathbf{j} + \mathbf{v}t$ ft their \mathbf{v} $= 3\mathbf{i} - 4\mathbf{j} + (2\mathbf{i} + 6\mathbf{j})t$	M1 A1 ft A1cao (3)
	(c) i component: $-9 + 6t = 3 + 2t$ $t = 3$	M1 M1 A1
	j component: $20 + 3\lambda = -4 + 18$ $\lambda = -2$	M1 A1 (5)
	(d) $v_B = \sqrt{2^2 + 6^2}$ or $v_C = \sqrt{6^2 + (-2)^2}$ Both correct The speeds of B and C are the same cso	M1 A1 A1 (3) [14]