

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International Advanced Subsidiary and Advanced Level

MARK SCHEME for the May/June 2015 series

9709 MATHEMATICS

9709/41

Paper 4, maximum raw mark 50

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B Mark for a correct result or statement independent of method marks.

- When a part of a question has two or more “method” steps, the M marks are generally independent unless the scheme specifically says otherwise; and similarly when there are several B marks allocated. The notation DM or DB (or dep*) is used to indicate that a particular M or B mark is dependent on an earlier M or B (asterisked) mark in the scheme. When two or more steps are run together by the candidate, the earlier marks are implied and full credit is given.
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AG	Answer Given on the question paper (so extra checking is needed to ensure that the detailed working leading to the result is valid)
BOD	Benefit of Doubt (allowed when the validity of a solution may not be absolutely clear)
CAO	Correct Answer Only (emphasising that no “follow through” from a previous error is allowed)
CWO	Correct Working Only – often written by a ‘fortuitous’ answer
ISW	Ignore Subsequent Working
MR	Misread
PA	Premature Approximation (resulting in basically correct work that is insufficiently accurate)
SOS	See Other Solution (the candidate makes a better attempt at the same question)
SR	Special Ruling (detailing the mark to be given for a specific wrong solution, or a case where some standard marking practice is to be varied in the light of a particular circumstance)

Penalties

MR –1	A penalty of MR –1 is deducted from A or B marks when the data of a question or part question are genuinely misread and the object and difficulty of the question remain unaltered. In this case all A and B marks then become “follow through ✓” marks. MR is not applied when the candidate misreads his own figures – this is regarded as an error in accuracy. An MR –2 penalty may be applied in particular cases if agreed at the coordination meeting.
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1	(i)	$[20 + 25\sin\theta = 2.7g]$	M1		For resolving forces vertically
		$\sin\theta = 0.28$	A1	2	AG
	(ii)	$[25 \times 5 \times \sqrt{(1 - 0.28^2)}]$	M1		For using $WD = Fd\cos\theta$
		Work done is 120 J	A1	2	
2			M1		For resolving components of F in x and y directions
		$F_x = F \cos\theta = 25 \times 0.8 = 20$, $F_y = F \sin\theta = 63 - 25 \times 0.6 = 48$	A1		
			M1		For using $F = \sqrt{F_x^2 + F_y^2}$ or for using $\tan\theta = F_y \div F_x$
		$F = 52 \text{ N}$ or $\tan\theta = 2.4$	A1		
		$\tan\theta = 2.4$ or $F = 52 \text{ N}$	B1	5	
3		$F = 0.25 \left(6.1 \times \frac{60}{61} \right) [= 1.5]$	B1		Allow $F = 0.25(6.1\cos 10.4)$
		$[W\sin\alpha - F = ma]$	M1		For using Newton's 2 nd law
		$6.1 \times \left(\frac{11}{61} \right) - 0.25 \left(6.1 \times \frac{60}{61} \right)$ $= 0.61a$ or $6.1 \sin 10.4 - 0.25 \times 6.1 \cos 10.4$ $= 0.61a$	A1		$\left[a = -\frac{40}{61} = -0.656 \right]$ The value of a may be seen but is not a required answer.
			M1		For using $0 = v_A^2 + 2as$
		Distance is $4 \div \left(2 \times \frac{40}{61} \right)$ $= 3.05 \text{ m}$	A1	5	
Alternative method					
		$F = 0.25 \left(6.1 \times \frac{60}{61} \right) [= 1.5]$	B1		Allow $F = 0.25(6.1 \cos 10.4)$
		$\text{KE loss} = \frac{1}{2} \times 0.61 \times 2^2$	B1		Finding loss of KE
		$\text{PE loss} = 0.61 \times 10 \times x \left(\frac{11}{61} \right)$	B1		Finding loss of PE
		$[1.5x = 1.22 + 1.1x]$	M1		Using WD against $F = \text{KE loss} + \text{PE loss}$
		$0.4x = 1.22 \rightarrow \text{distance} = 3.05 \text{ m}$	A1	5	

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4 (i)		M1		For using KE gain = $\frac{1}{2}mv_B^2$ or PE loss = $mg \times AB\sin\theta$
	For KE gain = 4032×10^3 or PE loss = $42 \times 10^6 \sin\theta$	A1		
	PE loss = $42 \times 10^6 \sin\theta$ or KE gain = 4032×10^3	B1	3	
(ii)		M1		For using WD by DF = KE gain – PE loss + WD by resistance
	$5000 = 4032 - 42000\sin\theta + 3360$	A1✓		
	$\theta = 3.3^\circ$	A1	3	
5		M1		For using DF = $\frac{P}{v}$ for DF up and down
		M1		For applying Newton's 2 nd law up and down
	$\frac{P}{3} - R - 84g \times 0.1 = 84 \times 1.25$	A1		
	$\frac{P}{10} - R + 84g \times 0.1 = 84 \times 1.25$	A1		
	$\left[P\left(\frac{1}{3} - \frac{1}{10}\right) - 168 = 0 \right]$	M1		For solving equations for P
	$P = 720$	A1		
	$\left[R = \frac{720}{3} - 84 - 105 \right]$	M1		For substitution for P to obtain R
	$R = 51$	A1	8	
6 (i)		M1		For integrating $a(t)$ to find $v(t)$
	$v(t) = 0.05t - 0.0001t^2$ (+ 0)	A1		
	$v(200) = 10 - 4 = 6 \text{ ms}^{-1}$	A1		
	$v(500) = 25 - 25 = 0$	A1	4	
(ii)		M1		For integrating $v(t)$ between limits 0 to 500 to obtain the distance A travels

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	$\int_0^{500} (0.05t - 0.0001t^2) dt$ $\left[\frac{0.05t^2}{2} - \frac{0.0001t^3}{3} \right]_0^{500}$	A1		
	Distance = $0.025 \times 500^2 - 0.0001 \times 500^3 \div 3$ = 2083 m	A1		Accept 2080
		M1		For using area property of graph or $s = \frac{1}{2} (u + v)t$ or $s = ut + \frac{1}{2} at^2$ to find distance travelled by B
	Distance = $\frac{1}{2} \times 6 \times 500 = 1500$ m or distance = $\frac{1}{2} (0+6) \times 200 + \frac{1}{2} (6+0) \times 300$ or distance = $\left(0 + \frac{1}{2} 0.03 \times 200^2 \right)$ $+ \left(6 \times 300 + \frac{1}{2} (-0.02) 300^2 \right)$	A1		
	Distance between A and B is $2083 - 1500 = 583$ m	B1✓	6	Can only be scored if distance travelled by A has been found using integration
7 (i)		M1		For using Newton's 2 nd law for both particles
	$T - 0.2 \times 3 = 0.3a$ and $7 - T = 0.7a$	A1		
	Acceleration = 6.4 ms^{-2}	A1		
	$[v = 0 + 6.4 \times 0.25]$	M1		For using $v = 0 + at$ to find speed when string breaks
	$v = 1.6 \text{ ms}^{-1}$	A1		
	$\left[\text{Distance} = 0 + \frac{1}{2} 6.4 \times 0.25^2 \right]$	M1		For using $s = ut + \frac{1}{2} at^2$ to find distance moved before break
	Distance = 0.2 m	A1		
	$[v^2 = 1.6^2 + 2g \times (0.5 - 0.2)]$	M1		For using $v^2 = u^2 + 2gs$ to find speed when B hits floor
	Speed is 2.93 ms^{-1}	A1	9	

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(ii)		M1		For finding distance travelled by A after break from $v^2 = u^2 + 2as$
	Distance travelled after break $= (0 - 1.6^2) \div (2 \times -2) = 0.64$	A1		For A , $F = 0.2 \times 3$ and so $-0.2 \times 3 = 0.3a$ so $a = -2$
	Total distance travelled $= 0.2 + 0.64 = 0.84$	B1	3	Distance = 0.84 m
	Alternative method for 7(ii)			
(ii)	$T = 2.52$, $F = 0.2 \times 3$ WD by $T = 2.52 \times 0.2$ WD by $F = 0.2 \times 3 \times d$	B1		For stating WD by T on A and WD by F
	$[0.6d = 2.52 \times 0.2]$	M1		Using WD by $F =$ WD by T (No change in KE or PE for A)
	WD by $T =$ WD by $F \rightarrow d = 0.84$	A1	3	Distance = 0.84 m

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1	(i)	$\left[s = 0.3 \times 5 + \frac{1}{2} \cdot 0.5 \times 5^2 \right]$ $[v = 0.3 + 0.5 \times 5 = 2.8\text{m}]$ Complete method for finding s required Distance = 7.75 m	M1 A1	 2	For using $s = ut + \frac{1}{2}at^2$ or using $v = u + at$ followed by either $v^2 = u^2 + 2as$ or $s = \frac{(u+v)}{2}t$ or $s = vt - \frac{1}{2}at^2$
	(ii)	$[\text{WD} = 8 \times 7.75 \times 0.5]$ Work done is 31 J	M1 A1	 2	For using $\text{WD} = Td\cos 60^\circ$
2	(i)	$\left[\frac{P}{5} = 80 \times 1.2 \right]$ $P = 480$	M1 A1	 2	For using $\text{DF} = \frac{P}{v}$ and Newton's 2nd law
	(ii)	$\frac{450}{3.6} - 80g \times 0.035 = 80a$ Acceleration is 1.21 ms^{-2}	M1 A1 A1	 3	For using $\frac{P}{v} - W\sin\alpha = ma$ Allow $a = \frac{97}{80}$
3	(i)	KE gain $\left[= \frac{1}{2} \times 8 \times 4.5^2 \right] = 81 \text{ J}$ $\left[\text{Decrease} = 8g \times 12 \times \left(\frac{1}{8} \right) \right]$ PE loss = 120 J	B1 M1 A1	 3	For using $\text{PE} = mgh$ and $h = d \sin\alpha$
	(ii)	$[81 = 120 - 12R]$ Resisting force is 3.25 N	M1 A1	 2	For using KE gain = PE loss –WD by resistance Allow $R = \frac{13}{4}$

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Alternative method for (ii)				
	(ii)	$[4.5^2 = 2 \times a \times 12] \rightarrow$ $[a = \frac{27}{32} = 0.84375]$ $[8g \sin \alpha - R = 8 \times \frac{27}{32}]$ Resisting force is 3.25 N	M1 A1	2 For using $v^2 = u^2 + 2as$ to find a and using Newton's 2nd law to find R
	4 (i)	$v(t) = 0.025t^3 - 0.75t^2 + 5t \quad (+0)$ $s(t) = 0.00625t^4 - 0.25t^3 + 2.5t^2 \quad (+0)$	M1 A1 M1 A1	4 For integrating to obtain $v(t)$. For integrating to obtain $s(t)$.
	(ii)	$[t^4 - 40t^3 + 400t^2 = 0 \rightarrow t^2(t - 20)^2 = 0]$ Time taken is 20 s	M1 M1 A1	3 For setting $s = 0$ (t not zero) in their attempt at s which was obtained using integration only. For attempting to solve a quartic equation for $s = 0$ where s was obtained using integration only. $t = 20$ only
	5 (i)	$-20 = 20 - 10t \rightarrow$ time taken is 4s or $0 = 20 - 10t \rightarrow$ time taken is $2 \times 2s = 4s$ $[30 = 0 + 4a]$ Acceleration of P is 7.5 ms^{-2}	M1 A1 M1 A1	4 For using $v = u - gt$ to find the time taken by Q . Must be for a complete method for the total time taken to return to point A For using $v = u + at$ to find the acceleration of P ft on an incorrect positive value of the time taken

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	(ii)	Either $30^2 = 2 \times 7.5 \times OA$ or $OA = \frac{(0+30)}{2} \times 4$ or $OA = \frac{1}{2} \times 7.5 \times 4^2$ or $OA = 30 \times 4 - \frac{1}{2} \times 7.5 \times 4^2$ → Distance OA is 60 m	M1		For using $v^2 = u^2 + 2as$ or $s = \frac{(u+v)}{2}t$ or $s = ut + \frac{1}{2}at^2$ or $s = vt - \frac{1}{2}at^2$ to find the distance OA
			A1	2	
6	(i)	$\left[h = \frac{1}{2} \times 0.5 \times 2 \right]$ $h = 0.5$	M1		For using area property of the graph or constant acceleration formulae
			A1	2	
	(ii)	$[a = 2 \div 0.5]$ $[T - mg = ma$ and $(1 - m)g - T = (1 - m)a$ or $a = \{(1 - 2m) \div (1 - m + m)\}g]$	B1		State the value of a using the gradient property of the graph
			M1		For applying both
					- Newton's 2nd law to P (while Q is moving) - Newton's 2nd law to Q (while Q is moving)
					or using $a = [(M - m) \div (M + m)]g$
		$m = 0.3$ $[T - 0.3 \times 10 = 4 \times 0.3$ or $0.7 \times 10 - T = 4 \times 0.7]$ Tension is 4.2 N	M1		For eliminating T or rearranging to find m
			A1		
			M1		For substituting a and m into
					- Newton's 2nd law to P (while Q is moving) - Newton's 2nd law to Q (while Q is moving)
					to find T (tension)
			A1	6	

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(iii)	$(-2 - 2) \div (t - 0.5) = -10$ $T = 0.9$	M1 A1 A1	3	For using the gradient property of the graph with acceleration $-g$
First Alternative method for (iii)				
(iii)	$[-2 = 2 - 10t]$ $t = 0.4$ Required time = $0.5 + 0.4 = 0.9$	M1 A1 A1	3	For using $v = u + at$ to find the total time that string is slack
Second Alternative method for (iii)				
(iii)	$t = 0.2$ s $t = 0.2 \times 2 = 0.4$ s Total time = 0.9 s	B1 B1 B1	3	Obtaining the time taken from $v = 0$ to $v = 2$ OR $v = 0$ to $v = -2$ Obtaining the total time that the string is slack. For completing the solution using $0.4 + 0.5 = 0.9$ s
7 (i)	$0.8T_A + 0.6T_R = 5.6$ $0.6T_A = 0.8T_R$ Tension in AJ is 4.48 N and tension in RJ is 3.36 N	M1 A1 A1 M1 A1	5	For resolving forces at J horizontally or vertically Allow $T_A \cos 36.9 + T_R \cos 53.1 = 5.6$ oe Allow $T_A \sin 36.9 = T_R \sin 53.1$ oe For solving the simultaneous equations for T_A and T_R
First Alternative Method for (i)				
(i)	$\frac{5.6}{\sin 90} = \frac{T_A}{\sin \alpha} = \frac{T_R}{\sin(270 - \alpha)}$ m $\frac{5.6}{\sin 90} = \frac{T_A}{0.8} = \frac{T_R}{0.6}$ m $T_A = 4.48$ and $T_R = 3.36$	M1 A1 A1 M1 A1	5	For applying Lami's theorem to two of the three forces T_A , T_R , and 5.6 where α is an obtuse angle Allow $\sin 126.9$ for 0.8 and $\sin 143.1$ for 0.6 here Solve for T_A and T_R

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Second Alternative Method for (i)				
(i)	$\frac{5.6}{\sin 90} = \frac{T_A}{\sin \alpha} = \frac{T_R}{\sin(90 - \alpha)} \text{ m}$ $\frac{5.6}{\sin 90} = \frac{T_A}{0.8} = \frac{T_R}{0.6} \text{ m}$ $T_A = 4.48 \text{ and } T_R = 3.36$	M1 A1 A1 M1 A1	5	For applying triangle of forces to two of the three forces T_A , T_R , and 5.6 Allow $\sin 53.1$ for 0.8 and $\sin 36.9$ for 0.6 here Solve for T_A and T_R
(ii)	$0.2g + F = T_R \times \cos 36.9$ $N = T_R \times \sin 36.9$ $[0.2g + \mu \times T_R \times 0.6 = T_R \times 0.8]$ $\mu = 0.688 \div 2.016 = 0.341$	B1✓ B1✓ M1 A1	4	ft on T_R and 36.9 ft on T_R and 36.9 For using $\mu = F \div N$ and obtaining an equation in μ AG
(iii)	$[0.2g + mg = \mu N + 0.8T_R]$ $0.2g + mg = 0.341 \times 2.016 + 3.36 \times 0.8$ $m = 0.137 \text{ or } 0.138$	M1 A1 A1	3	For a four term equation from resolving forces acting on R vertically.

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The marks indicated in the scheme may not be subdivided. If there is genuine doubt whether a candidate has earned a mark, allow the candidate the benefit of the doubt. Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored.

- Wrong or missing units in an answer should not lead to the loss of a mark unless the scheme specifically indicates otherwise.
- For a numerical answer, allow the A or B mark if a value is obtained which is correct to 3 s.f., or which would be correct to 3 s.f. if rounded (1 d.p. in the case of an angle). As stated above, an A or B mark is not given if a correct numerical answer arises fortuitously from incorrect working. For Mechanics questions, allow A or B marks for correct answers which arise from taking g equal to 9.8 or 9.81 instead of 10.

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The following abbreviations may be used in a mark scheme or used on the scripts:

AEF	Any Equivalent Form (of answer is equally acceptable)
AG	Answer Given on the question paper (so extra checking is needed to ensure that the detailed working leading to the result is valid)
BOD	Benefit of Doubt (allowed when the validity of a solution may not be absolutely clear)
CAO	Correct Answer Only (emphasising that no “follow through” from a previous error is allowed)
CWO	Correct Working Only – often written by a ‘fortuitous’ answer
ISW	Ignore Subsequent Working
MR	Misread
PA	Premature Approximation (resulting in basically correct work that is insufficiently accurate)
SOS	See Other Solution (the candidate makes a better attempt at the same question)
SR	Special Ruling (detailing the mark to be given for a specific wrong solution, or a case where some standard marking practice is to be varied in the light of a particular circumstance)

Penalties

MR –1	A penalty of MR –1 is deducted from A or B marks when the data of a question or part question are genuinely misread and the object and difficulty of the question remain unaltered. In this case all A and B marks then become “follow through ✓” marks. MR is not applied when the candidate misreads his own figures – this is regarded as an error in accuracy. An MR –2 penalty may be applied in particular cases if agreed at the coordination meeting.
PA –1	This is deducted from A or B marks in the case of premature approximation. The PA –1 penalty is usually discussed at the meeting.

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1	$[WD = 500 \times 2.75 \times 40]$ Work done = 55000 J $Power = \frac{55000}{40} = 1375 \text{ W}$ or $Power = 500 \times 2.75 = 1375 \text{ W}$	M1 A1 M1 A1	4	For using $WD = Fs$ or for using $WD = Pt$ For using $Power = \Delta WD \div \Delta t$ or for using $P = Fv$
2 (i)		B1	1	After B reaches the floor, A continues at constant speed until it reaches the pulley (no tension and the surface is smooth). Thus A 's speed when B reaches the floor is the same as A 's speed (3 ms^{-1}) when it reaches the pulley. Until the instant when B reached the floor, A and B have the same speed and hence B reaches the floor with speed 3 ms^{-1} .
(ii)	Loss of PE = $0.15gh$ Gain of KE = $\frac{1}{2} (0.35 + 0.15) \times 3^2$ $1.5h = 0.25 \times 9$ $h = 1.5$	B1 B1 M1 A1	4	For using loss of PE = gain of KE
Alternative Method for part (ii)				
(ii)	$[0.15g - T = 0.15a \text{ and } T = 0.35a$ or $0.15g = (0.35 + 0.15)a]$ $\rightarrow a = \dots$ $a = 3 \text{ ms}^{-2}$ $[3^2 = 0 + 2 \times 3h]$ $h = 1.5$	M1 A1 M1 A1	4	For applying Newton's second law to A and to B or for using $m_B g = (m_A + m_B)a$ to find a For using $v^2 = u^2 + 2as$

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Alternative Method for part (ii)				
(ii)	$[0.15g - T = 0.15a \text{ and } T = 0.35a \rightarrow T = \dots]$ $T = 1.05N$ $\left[0.15gh - \frac{1}{2} \times 0.15 \times 3^2 = 1.05h\right]$ or $\left[\frac{1}{2} \times 0.35 \times 3^2 = 1.05h\right]$ $h = 1.5$	M1 A1 M1 A1	4	For applying Newton's second law to A and to B to find T For using $PE_B \text{ loss} - KE_B \text{ gain} = WD$ against T or for using $KE_A \text{ gain} = WD$ by T
3	$\frac{P}{4.5} - R = 860 \times 4$ $\frac{P}{22.5} - R = 860 \times 0.3$ $\frac{P}{4.5} - \frac{P}{22.5} = 860(4 - 0.3) \rightarrow$ $P = 17900$ or $-4.5R + 22.5R = 860(4 \times 4.5 - 0.3 \times 22.5) \rightarrow$ $R = 537.5$ $R = 537.5$	M1 A1 A1 M1 A1 B1	6	For using $DF = P/v$ and for applying Newton's 2 nd law at one or both points For eliminating R to find P or for eliminating P to find R Accept 538
4	$KE \text{ loss} = \frac{1}{2} \times 12000(24^2 - 16^2)$ $PE \text{ gain} = 12000g \times 25$	B1 B1		
		M1		For using WD by DF $= PE \text{ gain} - KE \text{ loss}$ $+ WD$ against resistance

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	WD by DF = $3000000 - 1920000 + 7500 \times 500$ Driving force = $4830000 \div 500$ Driving force is 9660 N	A1 M1 A1	6	For using DF = WD by DF $\div$ 500
Alternative Method for 4				
4	$[16^2 = 24^2 + 2 \times 500a]$ $a = -0.32 \text{ ms}^{-2}$ Weight component down hill = $12000g \times 25/500$ $DF - 7500 - 12000g \times \frac{25}{500}$ $= 12000 \times (-0.32)$ Driving force is 9660 N	M1 A1 B1 M1 A1 A1	6	For using $v^2 = u^2 + 2as$ For using Newton's 2nd law
5 (i)	$x\text{-component} = 4 + 8\cos 30^\circ + 12\cos 60^\circ$ $[= 10 + 4\sqrt{3}]$ $y\text{-component} = 8\sin 30^\circ + 12\sin 60^\circ + 16$ $[= 20 + 6\sqrt{3}]$ $R = 34.8$ or $\theta = 60.9^\circ$ with the 4N force $\theta = 60.9^\circ$ with the 4N force or $R = 34.8$	B1 B1 M1 A1 B1	5	16.928 30.392 For using $R^2 = X^2 + Y^2$ or $\tan \theta = Y \div X$
(ii)	$R = 34.8$ $\theta = 29.1^\circ$ with the 16N force	B1✓ B1✓	2	ft R from (i) ft $90 - \theta$ from (i)

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6	(i)	$20 + 5g\sin 10^\circ - F = 0$ $R = 5g\cos 10^\circ$ $[\mu = (20 + 8.6824) \div 49.24]$ Coefficient of friction is 0.582	M1 A1 B1 M1 A1	5	For resolving forces down the plane For using $\mu = F \div R$
	(ii)	$5g\sin 10^\circ - 0.582 \times 49.24 = 5a$ $[0 = 2.5^2 - 2 \times 4s]$ Distance is 0.781 m	M1 A1✓ M1 A1	4	For using Newton's 2nd law ft μ from (i) ($\mu > 0$) For using $v^2 = u^2 + 2as$
Alternative Method for part (ii)					
	(ii)	PE loss = $5gds\sin 10^\circ$ $\frac{1}{2} \times 5 \times 2.5^2 + 5gds\sin 10^\circ = 0.582 \times 5gd\cos 10^\circ$ Distance is 0.781 m	B1 M1 A1✓ A1	4	For using KE loss + PE loss = WD against friction ft μ ($\mu > 0$)
7	(i)	$[0.0001t(t - 50)(t - 100) = 0$ or $v(0) = 0, v(50) = 0, v(100) = 0]$ $v(t) = 0$ when $t = 0, 50$ & 100	M1 A1	2	Either factorise $v(t)$ and solve $v(t) = 0$ or evaluate $v(0), v(50)$ and $v(100)$
	(ii)	$[0.0003t^2 - 0.03t + 0.5 = 0]$ $t^2 - 100t + 1667 = 0 \rightarrow$ $t = \left[\frac{1}{2} \left\{ 100 \pm \sqrt{(100^2 - 4 \times 1667)} \right\} \right]$	M1 dM1		For using $a(t) = \frac{dv}{dt}$ For solving $a(t) = 0$

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	$a = 0$ when $t = 21.1$ and when $t = 78.9$ $v(21.1) = 4.81$ $v(78.9) = -4.81$ Convex curve from (0,0) to (50,0) with $v > 0$ and has a maximum point. The curve for (50, 0) to (100, 0) is exactly the same as the first curve positioned by rotating the first curve through 180° about the point (50, 0).	A1 B1 B1 B1 B1	7	
(iii)	$s(t) = 0.000025t^4 - 0.005t^3 + 0.25t^2 (+ c)$ $[156.25 - 625 + 625]$ Greatest distance is 156 m	M1 A1 M1 A1	4	For integrating $v(t)$ to obtain $s(t)$ For using lower and upper limits of 0 and 50 respectively.