GCE

Further Mathematics B MEI

Y411/01: Mechanics A

AS Level

Mark Scheme for June 2023

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

MARKING INSTRUCTIONS

PREPARATION FOR MARKING
RM ASSESSOR

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: RM A*ssessor Online Training*; *OCR Essential Guide to Marking*.

2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are posted on the RM Cambridge Assessment Support Portal http://www.rm.com/support/ca

3. Log-in to RM Assessor and mark the **required number** of practice responses ("scripts") and the **number of required** standardisation responses.

YOU MUST MARK 10 PRACTICE AND 10 STANDARDISATION RESPONSES BEFORE YOU CAN BE APPROVED TO MARK LIVE SCRIPTS.

MARKING

1. Mark strictly to the mark scheme.

2. Marks awarded must relate directly to the marking criteria.

3. The schedule of dates is very important. It is essential that you meet the RM Assessor 50% and 100% (traditional 40% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.

4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone or the RM Assessor messaging system, or by email.

5. **Crossed Out Responses**
Where a candidate has crossed out a response and provided a clear alternative then the crossed out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed out response where legible.

Rubric Error Responses – Optional Questions
Where candidates have a choice of question across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. Enter a mark for each question answered into RM assessor, which will select the highest mark from those awarded. *(The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.)*

Multiple Choice Question Responses
When a multiple choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate).

Contradictory Responses
When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

Short Answer Questions (requiring only a list by way of a response, usually worth only **one mark per response**)
Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. *(The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)*

Short Answer Questions (requiring a more developed response, worth **two or more marks**)
If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space.)

Longer Answer Questions (requiring a developed response)
Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there then add a tick to confirm that the work has been seen.

7. Award No Response (NR) if:

- there is nothing written in the answer space.

Award Zero '0' if:

- anything is written in the answer space and is not worthy of credit (this includes text and symbols).

Team Leaders must confirm the correct use of the NR button with their markers before live marking commences and should check this when reviewing scripts.

8. The RM Assessor **comments box** is used by your team leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**
If you have any questions or comments for your team leader, use the phone, the RM Assessor messaging system, or e-mail.

9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.

10. For answers marked by levels of response:
a. **To determine the level** – start at the highest level and work down until you reach the level that matches the answer
b. **To determine the mark within the level**, consider the following:

Descriptor	**Award mark**
On the borderline of this level and the one below	At bottom of level
Just enough achievement on balance for this level	Above bottom and either below middle or at middle of level (depending on number of marks available)
Meets the criteria but with some slight inconsistency	Above middle and either below top of level or at middle of level (depending on number of marks available)
Consistently meets the criteria for this level	At top of level

Text Instructions

1. **Annotations and abbreviations**

Annotation in scoris	**Meaning**
✓and ✗	
BOD	Benefit of doubt
FT	Follow through
ISW	Ignore subsequent working
M0, M1	Method mark awarded 0, 1
A0, A1	Accuracy mark awarded 0, 1
B0, B1	Independent mark awarded 0, 1
SC	Special case
^	Omission sign
MR	Misread
Highlighting	
Other abbreviations in mark scheme	**Meaning**
E1	Mark for explaining a result or establishing a given result
dep*	Mark dependent on a previous mark, indicated by *
cao	Correct answer only
oe	Or equivalent
rot	Rounded or truncated
soi	Seen or implied
www	Without wrong working
AG	Answer given
awrt	Anything which rounds to
BC	By Calculator
DR	This indicates that the instruction **In this question you must show detailed reasoning** appears in the question.

2. Subject-specific Marking Instructions for A Level Mathematics B (MEI)

a Annotations should be used whenever appropriate during your marking. The A, M and B annotations must be used on your standardisation scripts for responses that are not awarded either 0 or full marks. It is vital that you annotate standardisation scripts fully to show how the marks have been awarded. For subsequent marking you must make it clear how you have arrived at the mark you have awarded.

b An element of professional judgement is required in the marking of any written paper. Remember that the mark scheme is designed to assist in marking incorrect solutions. Correct solutions leading to correct answers are awarded full marks but work must not be judged on the answer alone, and answers that are given in the question, especially, must be validly obtained; key steps in the working must always be looked at and anything unfamiliar must be investigated thoroughly. Correct but unfamiliar or unexpected methods are often signalled by a correct result following an apparently incorrect method. Such work must be carefully assessed. When a candidate adopts a method which does not correspond to the mark scheme, escalate the question to your Team Leader who will decide on a course of action with the Principal Examiner.
If you are in any doubt whatsoever you should contact your Team Leader.

c The following types of marks are available.

M
A suitable method has been selected and *applied* in a manner which shows that the method is essentially understood. Method marks are not usually lost for numerical errors, algebraic slips or errors in units. However, it is not usually sufficient for a candidate just to indicate an intention of using some method or just to quote a formula; the formula or idea must be applied to the specific problem in hand, e.g. by substituting the relevant quantities into the formula. In some cases the nature of the errors allowed for the award of an M mark may be specified.

A
Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. Accuracy marks cannot be given unless the associated Method mark is earned (or implied). Therefore M0 A1 cannot ever be awarded.

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

E
A given result is to be established or a result has to be explained. This usually requires more working or explanation than the establishment of an unknown result.

Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored. Sometimes this is reinforced in the mark scheme by the abbreviation isw. However, this would not apply to a case where a candidate passes through the correct answer as part of a wrong argument.

d When a part of a question has two or more 'method' steps, the M marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several B marks allocated. (The notation 'dep*' is used to indicate that a particular mark is dependent on an earlier, asterisked, mark in the scheme.) Of course, in practice it may happen that when a candidate has once gone wrong in a part of a question, the work from there on is worthless so that no more marks can sensibly be given. On the other hand, when two or more steps are successfully run together by the candidate, the earlier marks are implied and full credit must be given.

e The abbreviation FT implies that the A or B mark indicated is allowed for work correctly following on from previously incorrect results. Otherwise, A and B marks are given for correct work only – differences in notation are of course permitted. A (accuracy) marks are not given for answers obtained from incorrect working. When A or B marks are awarded for work at an intermediate stage of a solution, there may be various alternatives that are equally acceptable. In such cases, what is acceptable will be detailed in the mark scheme. If this is not the case please, escalate the question to your Team Leader who will decide on a course of action with the Principal Examiner.
Sometimes the answer to one part of a question is used in a later part of the same question. In this case, A marks will often be 'follow through'. In such cases you must ensure that you refer back to the answer of the previous part question even if this is not shown within the image zone. You may find it easier to mark follow through questions candidate-by-candidate rather than question-by-question.

f Unless units are specifically requested, there is no penalty for wrong or missing units as long as the answer is numerically correct and expressed either in SI or in the units of the question. (e.g. lengths will be assumed to be in metres unless in a particular question all the lengths are in km, when this would be assumed to be the unspecified unit.) We are usually quite flexible about the accuracy to which the final answer is expressed; over-specification is usually only penalised where the scheme explicitly says so. When a value is given in the paper only accept an answer correct to at least as many significant figures as the given value. This rule should be applied to each case. When a value is not given in the paper accept any answer that agrees with the correct value to 2 s.f. Follow through should be used so that only one mark is lost for each distinct accuracy error, except for errors due to premature approximation which should be penalised only once in the examination. There is no penalty for using a wrong value for g. E marks will be lost except when results agree to the accuracy required in the question.

g Rules for replaced work: if a candidate attempts a question more than once, and indicates which attempt he/she wishes to be marked, then examiners should do as the candidate requests; if there are two or more attempts at a question which have not been crossed out, examiners should mark what appears to be the last (complete) attempt and ignore the others. NB Follow these maths-specific instructions rather than those in the assessor handbook.

h For a genuine misreading (of numbers or symbols) which is such that the object and the difficulty of the question remain unaltered, mark according to the scheme but following through from the candidate's data. A penalty is then applied; 1 mark is generally appropriate, though this may differ for some units. This is achieved by withholding one A mark in the question. Marks designated as cao may be awarded as long as there are no other errors. E marks are lost unless, by chance, the given results are established by equivalent working. 'Fresh starts' will not affect an earlier decision about a misread. Note that a miscopy of the candidate's own working is not a misread but an accuracy error.

i If a graphical calculator is used, some answers may be obtained with little or no working visible. Allow full marks for correct answers (provided, of course, that there is nothing in the wording of the question specifying that analytical methods are required). Where an answer is wrong but there is some evidence of method, allow appropriate method marks. Wrong answers with no supporting method score zero. If in doubt, consult your Team Leader.

j If in any case the scheme operates with considerable unfairness consult your Team Leader.

Question			Answer	Marks	AOs	Guidance	
1	(a)		Let the driving force on the car be D N				
			$D = \frac{5000}{20}$ $(= 250)$	B1	3.4	soi	
			$D = k(20)^2$	M1	3.3	Using driving force = resistance e.g. $5000 = k(20)^2 \times 20$ implies B1 and M1	
			$\Rightarrow k = \frac{5000}{20^3} = \frac{5}{8}$	A1	1.1	**AG** Must be correctly obtained	
				[3]			
	(b)		Power is $\frac{5}{8}(28)^3 = 13720$ (W)	B1	1.1	Accept 13 700 www Accept 14 000 from correct method	
				[1]			
	(c)		Let the mass of the car be m kg				
			$\frac{13000}{20} = \frac{5}{8}(20)^2 + mg \sin 2°$ $650 = 250 + mg \sin 2°$	B1 M1	1.1 1.1	Correct weight component $mg \sin 2°$ (B0 for $W \sin 2°$ unless $W = mg$ used later) Resolving parallel to the plane – attempt at driving force (using 13000), resistance, and attempt to resolve weight (condone missing g) Driving force 13000 is M0	
			Mass is 1170 (kg)	A1	1.1	1169.53911…	
				[3]			

Question			Answer	Marks	AOs	Guidance	
2	(a)		Let the speed of the ball just before and just after hitting the ground be u and v m s^{-1}. Let the coefficient of restitution be e.				
			$u^2 = 0^2 + 2g \times 12.8$ or $\frac{1}{2}mu^2 = mg \times 12.8$ $u^2 = \frac{128}{5}g = 250.88,\ u = 15.84$	**M1**	**3.3**	Attempt at equation for u	
			$0^2 = v^2 - 2g \times 5$ or $\frac{1}{2}mv^2 = mg \times 5$ $v^2 = 10g = 98,\ v = 9.90$	**M1**	**3.3**	Attempt at equation for v	
		OR	$5 = 12.8e^2$	**M2**			
			$e = \frac{v}{u} = \frac{5}{8}\ (= 0.625)$	**A1**	**1.1**	Accept 0.62 to 0.63 from correct method (e.g. 9.9/15.8 = 0.627) A0 for −5/8 (as final answer)	
				[3]			
	(b)		'Perfectly elastic' means no energy loss	**B1**	**1.2**	Or Speed is unchanged by the impact Just $e = 1$ is not sufficient	
			$mg \times 12.8 - E(12.8 + 5) = mg \times 5$	**M1**	**3.3**	WEP Allow sign errors *M1 normally implies B1*	
		OR	$\frac{1}{2}mv_1^2 = mg \times 12.8 - 12.8E$, $\frac{1}{2}mv_2^2 = mg \times 5 + 5E$ $v_2 = v_1$	**M1** **B1**		WEP in two stages	
			$\Rightarrow 17.8E = 7.8mg \Rightarrow E = \frac{39}{89}mg$	**A1**	**2.2a**	**AG** Must be convincingly shown. Note that (39/89)g = 1911/445	
				[3]			
	(c)		**Model A**. Speed just after second bounce is $w = ev = \frac{5}{8} \times \sqrt{98} = 6.187,\ w^2 = \frac{125}{32}g = 38.28125$	**M1**	**3.1b**	Attempt to find w or w^2	
		OR	Maximum height is $5e^2 = 5 \times \left(\frac{5}{8}\right)^2$ or $5 \times \frac{5}{12.8}$	**M1**			
			Maximum height is $\frac{125}{64}\ (= 1.953125)$ m	**A1**	**1.1**	Accept 1.9 to 2.0 from correct method	
			Model B. Let maximum height be h m after second bounce.				
			$mg \times 5 - \frac{39}{89}mg(5 + h) = mgh$	**M1**	**1.1**	WEP	
			$\Rightarrow \frac{128}{89}h = \frac{250}{89} \Rightarrow h = \frac{125}{64}\ (= 1.953125)$ (which is the same)	**A1**	**2.2a**	Both A1's can only be awarded if values agree to at least 3 sf	
				[4]			

Question			Answer	Marks	AOs	Guidance	
3	(a)		$[G]\cdot \mathrm{M}\cdot \mathrm{T}^2 = \mathrm{L}^3$	M1	1.1	Allow units (kg, m, s)	
			$\Rightarrow [G] = \mathrm{M}^{-1}\mathrm{L}^3\mathrm{T}^{-2}$	A1	1.1	Accept $\mathrm{L}^3/(\mathrm{MT}^2)$ isw Do not allow units	
				[2]			
	(b)		$[v] = \mathrm{LT}^{-1}$	B1	1.1	Correct dimensions for v Allow units	
			$\mathrm{LT}^{-1} = \left(\mathrm{M}^{-1}\mathrm{L}^3\mathrm{T}^{-2}\right)^{\alpha}\left(\mathrm{LT}^{-1}\right)^{\beta}\left(\mathrm{L}^{\gamma}\right)\left(\mathrm{M}^2\right)(\mathrm{M})$	M1	1.1	Setting up an equation in M, L and T using given equation and their $[G]$ Condone (M + M), 2M etc Allow units M0 for $[m_1 m_2(m_1+m_2)] = \mathrm{M}$ or M^2	
			$[\ -\alpha + 3 = 0 \implies\ ]\qquad \alpha = 3$	B1	1.1	cao	
			$3\alpha + \beta + \gamma = 1$ $-2\alpha - \beta = -1$	M1	1.1a	Setting up equations using L and T FT their dimensions equation. Allow one error	
			$\beta = -5$ and $\gamma = -3$	A1	1.1	cao	
				[5]			
	(c)		$\left(\frac{8.64}{6.13}\right)^3\ (\approx 2.8)$ or $\left(\frac{6.13}{8.64}\right)^3\ (\approx 0.357)$	M1	3.4	For $\left(\frac{6.13}{8.64}\right)^{\pm \text{ their } \gamma}$ M0 if their $\gamma = 0$	
			So the stars approach 2.8 times faster when closer together.	A1	2.2b	cao M1A0 for 2.8 obtained from $\gamma = 3$	
				[2]			

Question			Answer	Marks	AOs	Guidance	
4	(a)		Let the velocity of B after collision be u m s^{-1} in the direction $\overrightarrow{AB}$.				
			$0.3\times8-0.5\times1.6=0.5u$	M1	3.3	COLM – all terms present but allow sign errors	
			$\Rightarrow u=3.2$	A1	1.1		
			So coefficient of restitution $=\frac{3.2}{8+1.6}=\frac{1}{3}$	A1	1.1	**AG** Must be correctly obtained	
				[3]			
	(b)		Let B reach the lower section with speed v m s^{-1}.				
			$\frac{1}{2}\times0.5\times3.2^2+0.5\times9.8\times0.45=\frac{1}{2}\times0.5\times v^2$	M1	3.3	Attempt at WEP: require two KE terms and a GPE term. M0 if $v^2=u^2+2as$ used	
			$\Rightarrow v^2=19.06$, $v=4.36577\ldots$	A1	1.1	**AG** Must be correctly obtained	
				[2]			
	(c)		Let the speed of C after collision be w m s^{-1}.				
			$0.7w=0.5v$ $(\Rightarrow w=\frac{5}{7}v=3.1184)$	M1	3.4	COLM	
			KE of C is $\frac{1}{2}\times0.7\times(3.1184)^2$ $(=3.40357\ldots)$ J	A1	1.1		
			C needs to gain $0.7\times9.8\times0.45=3.087$ J of GPE so C will collide with A next.	A1	2.1	Argument must be clear.	
		OR	Assume C reaches the top section with speed x ms^{-1}				
			$\frac{1}{2}\times0.7\times3.1184^2-0.7\times9.8\times0.45=\frac{1}{2}\times0.7\times x^2$	A1		For KE of C	
			$x^2\ (=0.9044)>0$ ($x=0.951$) So C will collide with A next	A1		Or C can reach a height of 0.496 m (>0.45)	
				[3]			
	(d)		[If $v_B=0$,] by COLM, $v_C>u_B$ giving $e>1$ (or increase of KE) which is impossible [contradicting $e\leq1$]	B2	3.5a	Correct explanation; must mention momentum Give B1 for an explanation which includes at least one of the following (ignore incorrect statements) • This requires $v_C>u_B$ • This requires $e>1$ • If $v_C=u_B$ then $m_Cv_C<m_Bu_B$	
		OR	[If $v_B=0$, since $e\leq1$] $v_C\leq u_B$ and so $m_Cv_C<m_Bu_B$ contradicting COLM				
		OR	$m_Bv_B+m_Cv_C=m_Bu_B$ and $v_C-v_B\leq u_B$ $\Rightarrow(m_B+m_C)v_B\geq(m_B-m_C)u_B\ \Rightarrow\ v_B>0$				
				[2]			

Question			Answer	Marks	AOs	Guidance	
5	(a)		Area of S $= \pi\left(50^2 - 30^2 - 10^2\right) = 1500\pi$	B1	1.1	*Or ratio of masses (e.g. 25:9:1:15) used throughout*	
			$2500\pi\begin{pmatrix}0\\0\end{pmatrix} = 1500\pi\begin{pmatrix}\bar{x}\\\bar{y}\end{pmatrix} + 100\pi\begin{pmatrix}0\\40\end{pmatrix} + 900\pi\begin{pmatrix}-20\\0\end{pmatrix}$	M1	1.1	For $(\pi \times 30^2)(20)$ **or** $(\pi \times 10^2)(40)$ seen	
			$\Rightarrow \bar{x} = 12$	A1	1.1	**AG** Needs convincing working	
			$\bar{y} = -\frac{8}{3}$	A1	1.1	Allow -2.67	
				[4]			
	(b)		$\arctan\left(12 \div \frac{8}{3}\right)$ Angle is $77.47119\ldots°$	M1 A1 FT	3.1b 1.1	$\tan\alpha = 12 \div$ their $\lvert\bar{y}\rvert$ (allow reciprocal) Just $\arctan(\bar{x}/\bar{y})$ is not sufficient Accept 102.5°, −77.5° FT their $\lvert\bar{y}\rvert$	
				[2]			
	(c)		$F \times 50 = W \times 12$	M1	1.1	Taking moments about O – both moments present	
			$\Rightarrow F = 0.24W$	A1	1.1	$\lambda = 6/25$ (or 0.24)	
				[2]			
	(d)		Let the angle between R_A and the horizontal be θ.				
			$R_A \cos\theta + F \sin\theta = R_B \cos\theta$ $0.6R_A + 0.8(0.24W) = 0.6R_B$			Resolving horizontally. Must attempt to resolve all three forces. F may be their $0.24W$	
			$R_A \sin\theta + R_B \sin\theta = W + F\cos\theta$ $0.8R_A + 0.8R_B = W + 0.6(0.24W)$			Resolving vertically. Must include W and attempt to resolve the other three forces	
			$60R_B \sin\theta = 42W$ $0.8 \times 60R_B = 42W$			Moments about A. Both moments present. Must attempt to 'resolve' R_B (or its distance)	
				M1 M1	3.3	Any two of the above. See first lines and notes	
		OR	$18W + 60F\cos\theta = 60R_A \sin\theta$ $18W + 0.6 \times 60(0.24W) = 0.8 \times 60R_A$	M2		Moments about B. Must attempt to 'resolve' R_A and F (or their distances)	
				M1	1.1	Correct values for $\cos\theta$ and $\sin\theta$ used in at least one equation for which M1 has been earned. See second lines above. Allow cos(53.1°) etc *Note* Only $\sin\theta$ needed in the third equation	
			$\Rightarrow R_A = 0.555W$ ($R_B = 0.875W$)	A1	1.1	cao	
			$\Rightarrow \mu = \frac{0.24W}{0.555W} = \frac{16}{37}\left(= 0.432432\ldots\right)$	A1 FT	2.2a	FT their F and R_A given as multiples of W, **dependent on M3**	
				[5]			

Question			Answer	Marks	AOs	Guidance	
6	(a)		Each support must exert $\frac{1}{2}(4g+10g)=7g$ N on the beam.	B1	1.1	soi	
			Taking moments about the left-most point:				
			$R_A x + R_B(x+3.8) = 4g \times 1.95 + 10g \times 3$	M1	3.3	Attempt to take moments about some point. All moments present. Allow one error	
			$7gx + 7g(x+3.8) = 4g \times 1.95 + 10g \times 3$	A1	1.1	Correct equation for x FT their $7g$ Correct equation www implies B1	
			$\Rightarrow x = 0.8$	A1	1.1	cao	
				[4]			
	(b)		Moments about B, $5.3T_L \sin 60° = 10g \times 2.3$	M1	3.1b	Attempt at moments. No force acting at A; allow sin/cos switch. If moments taken about A, $R_A = 0$ must be soi (e.g. by $T_L \sin 60° + R_B = 10g$) *Allow inequalities in (b) and (c)*	
			$\Rightarrow T_L = 49.10745\ldots$	A1	1.1	**AG** Must be convincingly shown.	
				[2]			
	(c)		Let the force at the supports be R_A and R_B N, and the friction at B be F N.				
			$F = 0.4R_B$	B1	3.4	Modelling friction. Must clearly be reaction at B	
			$T_S \cos 60° = F \quad (\Rightarrow T_S = 0.8R_B)$	M1	3.3	Resolving horizontally	
			$T_S \sin 60° + R_A + R_B = 10g$	M1	1.1	Resolving vertically	
			Moments about LH end, $1.5R_A + 5.3R_B = 3 \times 10g$	M1	3.1b	Attempt at moments. All moments present. Allow one error	
		OR	$3.8R_B = 1.5 \times 10g + 1.5 \times T_S \sin 60°$	M2		Moments about A	
			($\Rightarrow R_B = 53.2460$ ... $R_A = 7.864$ ...)				
			$\Rightarrow T_S = 42.5968\ldots$ so beam will slide first (since 42.6 < 49.1)	A1	2.2a	cao	
				[5]			

Need to get in touch?

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