

Winter 2018

Mark Scheme (Results)

January 2018

Pearson Edexcel International Advanced Subsidiary Level In Mechanics M1 (WME01) Paper 01



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General Marking Guidance

• All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

• Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

• Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.

• There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.

• All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

• Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

• When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.

• Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

PEARSON EDEXCEL IAL 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.

- bod benefit of doubt
- ft follow through
- the symbol $\sqrt{}$ 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
- o.e. or equivalent (and appropriate)
- d... or dep dependent
- indep independent
- dp decimal places
- sf significant figures
- * The answer is printed on the paper or ag- answer given
- L or d... 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.
- 6. If a candidate makes more than one attempt at any question:
 - If all but one attempt is crossed out, mark the attempt which is NOT crossed out.
 - If either all attempts are crossed out or none are crossed out, mark all the attempts and score the highest single attempt.
- 7. Ignore wrong working or incorrect statements following a correct answer.

General Principles for Mechanics Marking

(But note that specific mark schemes may sometimes override these general principles)

- Rules for M marks: correct no. of terms; dimensionally correct; all terms that need resolving (i.e. multiplied by cos or sin) are resolved.
- Omission or extra g in a resolution is an accuracy error not method error.
- Omission of mass from a resolution is a method error.
- Omission of a length from a moments equation is a method error.
- Omission of units or incorrect units is not (usually) counted as an accuracy error.
- DM indicates a dependent method mark i.e. one that can only be awarded if a previous specified method mark has been awarded.
- Any numerical answer which comes from use of g = 9.8 should be given to 2 or 3 SF.
- Use of g = 9.81 should be penalised once per (complete) question.

N.B. Over-accuracy or under-accuracy of correct answers should only be penalised *once* per complete question. However, premature approximation should be penalised every time it occurs.

- Marks must be entered in the same order as they appear on the mark scheme.
- In all cases, if the candidate clearly labels their working under a particular part of a question i.e. (a) or (b) or (c),.....then that working can only score marks for that part of the question.
- Accept column vectors in all cases.
- Misreads if a misread does not alter the character of a question or materially simplify it, deduct two from any A or B marks gained, bearing in mind that after a misread, the subsequent A marks affected are treated as A ft
- Mechanics Abbreviations
 - M(A) Taking moments about A.
 - N2L Newton's Second Law (Equation of Motion)
 - NEL Newton's Experimental Law (Newton's Law of Impact)
 - HL Hooke's Law
 - SHM Simple harmonic motion
 - PCLM Principle of conservation of linear momentum
 - RHS, LHS Right hand side, left hand side.

January 2018 Mechanics 1 - WME01 Mark Scheme

Question Number	Scheme	Marks
1	$\begin{array}{c c} A & & B \\ \hline & 30^{\circ} & & 45^{\circ} \\ \hline & T_{A} & & \\ \hline & & \\ C & & W \end{array}$	
	N.B. If they assume that the tensions are the same, can score max:M0A0M1A0DM0A0A0. If they use the same angles, can score max: M1A0M1A0DM0A0A0	
	Resolve parallel to AB: $T_A \cos 30 = T_B \cos 45$	M1A1
<u> </u>	Resolve perpendicular to AB: $W = T_A \sin 30 + T_B \sin 45$	M1A1
	Solve for T_A or T_B	DM 1
	$T_A = \frac{2}{1 + \sqrt{3}} W (= 0.73W)$ (or better)	A1
	$T_B = \frac{\sqrt{6}}{1 + \sqrt{3}} W (= 0.90W)$ (or better)	A1
		(7)
	Anternative (triangle of forces): $W = \begin{pmatrix} 60^{\circ} & T_{A} \\ 75^{\circ} & T_{B} \end{pmatrix}$	
	Sine rule for T_A : $\frac{T_A}{\sin 45} = \frac{W}{\sin 75}$ M1A1	
	Sine rule for T_B : $\frac{T_B}{\sin 60} = \frac{W}{\sin 75}$ M1A1	
	Solve for T_A or T_B : $T_A = 0.73W$ (or better) DM 1A1	
	$T_B = 0.90W$ (or better) A1	
	(7)	
		[7]

Question Number	Scheme	Marks
	Notes for question 1	
1	First M1 for resolving horizontally with usual rules	
	First A1 for a correct equation	
	Second M1 for resolving vertically with usual rules	
	Second A1 for a correct equation	
	Third DM 1, dependent on both previous M marks, for solving for either	
	T_A or T_B	
	Third A1 for $T_A = 0.73W$ or better or any correct surd answer but A0 for	
	$\frac{W}{k}$, where k is a decimal. Allow 'invisible brackets'	
	Fourth A1 for $T_B = 0.90W$ or better (0.9W is A0) or any correct surd	
	answer but A0 for $\frac{W}{k}$, where k is a decimal.	
	Alternative using sine rule or Lami's Theorem	
	First M1A1 for $\frac{T_A}{\sin 45} = \frac{W}{\sin 75}$ oe (e.g. allow sin 105 or reciprocals)	
	Second M1 for $\frac{T_B}{\sin 60} = \frac{W}{\sin 75}$ (allow sin 30 and/or sin 105)	
	Second A1 for $\frac{T_B}{\sin 60} = \frac{W}{\sin 75}$	
	Third DM 1, dependent on either previous M mark, for solving for either T_A or T_B	
	Third A1 for $T_A = 0.73W$ or better or any correct surd answer but A0 for W	
	$\frac{k}{k}$, where k is a decimal.	
	Fourth A1 for $T_B = 0.90W$ or better or any correct surd answer but A0	
	for $\frac{W}{k}$, where k is a decimal.	

Question Number	Scheme	Marks
2.	$\begin{array}{c} & & & \\ & & & & \\ & & & \\ & & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & &$	
	Resolve horizontally: $F = 20\cos\theta$ Their F e.g. allow μR	M1A1
	Resolve vertically: $R = 40 + 20\sin\theta$	M1A1
	Use of $F \le \mu R$: $20\cos\theta \le \mu (40+20\sin\theta)$	DM 1
	$\mu \ge \frac{20\cos\theta}{40 + 20\sin\theta} \Rightarrow \mu \ge \frac{\cos\theta}{2 + \sin\theta} \text{Given Answer}$	A1
		[6]
	Notes for question 2	
2	First M1 for resolving horizontally with usual rules	
	First A1 for a correct equation	
	Second M1 for resolving vertically with usual rules	
	Second A1 for a correct equation	
	Third DM 1, dependent on both previous M marks, for use of $F \le \mu R$ to	
	give inequality in θ only. (N.B. If they use $F = \mu R$ in the horizontal	
	resolution, this mark is not available)	
	Third A1 for given answer	

Question Number	Scheme	Marks	5
	\longrightarrow 2 <i>u</i> \longleftarrow <i>u</i>		
3 a	$ \begin{array}{c} A\\ 2m \end{array} $ $ \begin{array}{c} B\\ km \end{array} $		
	$\leftarrow \frac{u}{2} \longrightarrow v$		
	Impulse on $A = 2m\left(\frac{u}{2} - (-2u)\right)$	M1A1	
	Magnitude of impulse $=5mu$	A1	
			(3)
3b	CLM: $2m \times 2u - km \times u = 2m \times \left(-\frac{u}{2}\right) + kmv$	M1A1	
	Use of $v > 0$: $kmv = 5mu - kmu > 0$	DM 1	
	$\Rightarrow k < 5 \qquad \qquad \text{Given Answer}$	A1	
			(4)
3b alt	Alternative : Impulse on <i>B</i> : $5mu = km(v - (-u))$ M1A1		
	$v = \frac{5u}{k} - u \mathbf{OR} \qquad k = \frac{5u}{u + v}$		
	Use of $v > 0$: $\frac{5u}{k} - u > 0 \Longrightarrow k < 5$ OR if $v > 0$, then $k < 5$		
	Given Answer DM1A1		
	(4)		
	Nuture from and the 2		[7]
	Notes for question 3 M1 for using impulse – change in momentum for A (M0 if <i>clearly</i>		
3 a	adding momenta or if g is included or if not using $2m$ in <i>both</i> terms) but condone sign errors.		
	First A1 for $2m\left(\frac{u}{2}-(-2u)\right)$ or $-2m\left(\frac{u}{2}-(-2u)\right)$		
	Second A1 for 5mu (must be positive since magnitude) terms collected		
	Alternative: Use CLM to find $v = \frac{5u}{L} - u$ then use		
3a alt	Impulse on $B := km ((5u/k - u) + u)^{k}$ M1A1 for the <u>complete</u> method		
	=5mu A1		
3h	First M1 for CLM with correct no. of terms, all dimensionally correct.		
50	Condone consistent g's or cancelled m's and sign errors.		
	First A1 for a correct equation (allow $-v$ in place of v)		
	Second DM 1 for use of $v > 0$ or $v < 0$ as appropriate	ļ	
	Second A1 for given answer correctly obtained.		

Question Number	Scheme	Marks
3balt	First M1 for using their impulse on A = change in momentum for B (M0 if <i>clearly</i> adding momenta or if g is included or if not using km in <i>both</i> terms) but condone sign errors.	
	First A1 for a correct equation (allow $-v$ in place of v)	
	Second DM 1 for use of $v > 0$ or $v < 0$, as appropriate, but must be from a correct <i>v</i> or <i>k</i> , to deduce given answer.	
	Second A1 for given answer correctly obtained.	

Question Number	Scheme	Marks	6
4 a	R F $6g$ 30°		
	Perpendicular to plane: $R = 6g \cos 30$	B1	
	Parallel to plane: $6g \sin 30 - F = 6a$ N.B. Could be their F	M1A1	
	$F = \frac{1}{4}R$ seen. N.B. Could be their R	B 1	
	Solve for $a : a = 2.78$ (2.8) (ms ⁻²)	M1A1	
			(6)
<i>4</i> b	$U_{22} = f_{22} + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 $	M1	
40	$v = 7.45417 = 7.45 (7.5) (ms^{-1})$	A1	
			(2)
			[8]
	Notes for question 4		
4a	First B1 for $R = 6g\cos 30$ seen		
	First A1 for a correct equation		
	N.B. <i>F</i> does not need to be substituted for this A mark		
	Second B1 for $F = \frac{1}{4}R$ seen N.B. could be their R		
	Second M1 for solving for <i>a</i>		
	Second A1 for 2.78 or 2.8		
4h	M1 for a complete method for finding y, using their a		
-~	A1 for 7.45 or 7.5		

Question Number	Scheme	Marks
5a	Speed 20 4T T Time	
	Basic shape	B1
	20, 4 <i>T</i> and <i>T</i> placed correctly	DB 1 (2)
		(2)
5b	Use of $y = u + at$: constant speed = $0.6 \times 20 = 12$ (ms ⁻¹)	M1A1
	(Speed at end = $12-0.3T$)	
	Using <i>v</i> - <i>t</i> graph:	
	Distance: $705 = \frac{12}{2} (4T + (20 + 4T)) + \frac{T}{2} (12 + (12 - 0.3T))$	M1A2
	$=48T+120+12T-0.15T^{2}=60T+120-0.15T^{2}$	
	Form 3 term quadratic and solve for <i>T</i> :	M1
	$\Rightarrow 3T^2 - 1200T + 11700 = 0 \qquad (T^2 - 400T + 3900 = 0)$	IVI I
	$\Rightarrow (T-10)(T-390) = 0 \qquad T = 10 \text{ only}$	A1
		(7)
	Alternative: Use of y_{1} , y_{2} , y_{3} , y_{4} ,	
	Use of $v = u + dt$: constant speed = $0.0 \times 20 = 12$ (ms ⁻¹) MTA1	
	Using $s = ut + \frac{1}{2}at^2$: $705 = (0.3 \times 400) + (4T \times 12) + (12T - 0.15T^2)$	
	M1A2	
	$\Rightarrow 0.15T^2 - 60T + 585 = 0 \ \left(T^2 - 400T + 3900 = 0\right)$	
	$\Rightarrow (T-10)(T-390) = 0 \qquad T = 10 \text{ only} \qquad M1A1$	
	(7)	
5c	Extra time: (2×20) - their T OR $\frac{12 - 0.3 \times theirT}{0.3}$	B1
	Total time: $20+5T+40-T$ (their T)	M1
	=100 (s)	Al
		(3)
	Alternative : Total time to decelerate to rest = $12/0.3 = 40$ B1	
	Total time A to $C = 20 + 4T + 40 = 100$ M1A1	
		[12]

1

Question Number	Scheme	Marks
	Notes for question 5	
	≜	
5a	First B1 for basic shape. Allow if 'extra triangle' on end included, provided <i>B</i> clearly marked	
	Second DB 1 : may use, $20, 20 + 4T, 20 + 5T$	
5b	First M1 for attempt to find constant speed ($v = u + at$ or $a = gradient$) 20 x 0.6	
	First A1 for 12	
	Second (generous) M1 for clear attempt to use $705 = total$ area under the graph to give an equation in <i>T</i> only but must see $\frac{1}{2}$ used somewhere N.B. M0 if just a trapezium oe is used	
	Second A1 and Third A1: for any correct equation, -1 e.e.o.o.	
	Third M1 for forming and attempt to solve a 3 term quadratic (need <i>evidence</i> of solving e.g. formula or factorising, if T values are incorrect) otherwise this M mark can be implied if they state that $T = 10$ with no working. ($T = 390$ NOT needed)	
	Fourth A1 for $T = 10$.	
	Trapezium + Rectangle + Triangle $705 = \frac{12}{2} (4T + (20 + 4T)) + T(12 - 0.3T) + \frac{1}{2}T \times 0.3T$ Triangle + Rectangle + Trapezium $705 = \frac{1}{2} \cdot 20.12 + (4T \times 12) + \frac{1}{2}T(12 + 12 - 0.3T)$	
	Triangle + Rectangle + Rectangle + Triangle $705 = \frac{1}{2} \cdot 20.12 + (4T \times 12) + T(12 - 0.3T) + \frac{1}{2}T \times 0.3T$ Triangle + Rectangle + Trapezium (at top) $705 = \frac{1}{2} \cdot 20.12 + 5T(12 - 0.3T) + \frac{1}{2} \cdot 0.3T(5T + 4T)$ Rectangle - triangle- triangle $705 = 12(20 + 5T) - \frac{1}{2} \cdot 20.12 - \frac{1}{2}T \times 0.3T$	
5c	B1 for either additional time is $\frac{12}{0.3} - T$ or time to decelerate is $\frac{12}{0.3}$	
	M1 for a correct method to find the total time, using <i>their</i> T = $20 + 4T + T + \frac{12}{0.3} - T$ or $20 + 4T + \frac{12}{0.3}$	
	A1 for 100 cao	

Question Number	Scheme	Marks
6a	Resultant force = $(2\mathbf{i}+3\mathbf{j})+(4\mathbf{i}-5\mathbf{j})=6\mathbf{i}-2\mathbf{j}$ (N)	M1
	Use of $\mathbf{F} = m\mathbf{a}$: $6\mathbf{i} - 2\mathbf{j} = 2\mathbf{a}$, $\mathbf{a} = 3\mathbf{i} - \mathbf{j}$	M1
	Magnitude: $ a = \sqrt{3^2 + 1^2} = \sqrt{10} (= 3.2 \text{ or better}) (\text{ms}^{-2})$	M1A1
		(4)
6b	$(10\mathbf{i}+2\mathbf{j}) = (-u\mathbf{i}+u\mathbf{j}) + T(3\mathbf{i}-\mathbf{j})$	M1
	10 = -u + 3T and 2 = u - T	DM 1A1 ft
	$\frac{T=6}{C}$	Al
	$\begin{array}{c} (1) u = 8 \\ \hline \end{array}$	A1 (5)
		(3)
		[9]
	Notes for question 6	L*]
6a	First M1 for adding forces – must collect i's and j's	
	Second M1 for use of $\mathbf{F} = m\mathbf{a}$ or $F = ma$	
	Third M1 for finding a magnitude	
	A1 for $\sqrt{10} (= 3.2 \text{ or better})$	
6b	First M1 for use of $\mathbf{v} = \mathbf{u} + \mathbf{a}t$ with their \mathbf{a} (M0 if clearly using \mathbf{F} instead of \mathbf{a})	
	Second DM 1, dependent on previous M, for equating cpts of i and j	
	First A1 ft for two correct equations following their a	
	Second A1 for $T = 6$	
	Third A1 for $u = 8$	

Question Number	Scheme	Marks
7a	$A \xrightarrow{1 \text{ m } C} 4 \text{ m} \xrightarrow{2R} D \xrightarrow{1 \text{ m}} B$ $A \xrightarrow{1 \text{ m } C} 4 \text{ m} \xrightarrow{2R} D \xrightarrow{1 \text{ m}} B$ $A \xrightarrow{1 \text{ m } C} 4 \text{ m} \xrightarrow{2R} D \xrightarrow{1 \text{ m}} B$ $A \xrightarrow{1 \text{ m } C} 4 \text{ m} \xrightarrow{2R} D \xrightarrow{1 \text{ m}} B$ $A \xrightarrow{1 \text{ m } C} 4 \text{ m} \xrightarrow{2R} D \xrightarrow{1 \text{ m}} B$ $A \xrightarrow{1 \text{ m } C} 4 \text{ m} \xrightarrow{2R} D \xrightarrow{1 \text{ m}} B$ $A \xrightarrow{1 \text{ m } C} 4 \text{ m} \xrightarrow{2R} D \xrightarrow{1 \text{ m}} B$ $A \xrightarrow{1 \text{ m } C} 4 \text{ m} \xrightarrow{2R} D \xrightarrow{1 \text{ m}} B$ $A \xrightarrow{1 \text{ m } C} 4 \text{ m} \xrightarrow{2R} D \xrightarrow{1 \text{ m}} B$ $A \xrightarrow{1 \text{ m } C} 4 \text{ m} \xrightarrow{2R} D \xrightarrow{1 \text{ m}} B$ $A \xrightarrow{1 \text{ m } C} 4 \text{ m} \xrightarrow{2R} D \xrightarrow{1 \text{ m } B}$ $A \xrightarrow{1 \text{ m } C} 4 \text{ m} \xrightarrow{2R} D \xrightarrow{1 \text{ m } B}$ $B \xrightarrow{2R} D \xrightarrow{1 \text{ m } B}$	
	Consistent omission of g in both parts of this question can score all of the marks.	
	Resolve vertically: $3R = 8g$	M1A1
	$\mathbf{M}(C) : 8g(x-1) = 4 \times 2R$	M1A1
	$8gx = 8g + \frac{64g}{3} = \frac{88g}{3}$, $x = \frac{11}{3}$ Given Answer	DM 1A1
		(6)
	N.B. (Allow R_D instead of $2R_C$ in either equation for M mark)	
	SC: M(G): $R(x-1) = 2R(5-x)$	M2 A2
	$x = \frac{11}{3}$ Given answer	DM 1 A1
7b	N.B. If they use a value for a reaction found in part (a) in their part (b), no marks for part (b) available.	(6)
	$3g \xrightarrow{R_F} 3m \xrightarrow{R_D} b 1m B$ $R_F \xrightarrow{2m F} 3m \xrightarrow{2m F} b 1m B$ $R_D \xrightarrow{R_D} B$ $R_D \xrightarrow{R_D} B$ $R_D = kR_F$	
	Resolve vert : $R_F + kR_F = 11g$	N41 A 1
	(Allow R_D instead of kR_F for M mark))	MIAI
	M(F) : $(kR_F \times 3) + (3g \times 2) = 8g \times \frac{5}{3}$ (Allow R_D instead of kR_F for M mark)	M1A1
	$k = \frac{2}{7}$ oe , 0.29 or better	DM 1A1
		(6)
		[12]

Question Number	Scheme	Marks
	Notes for question 7	
70	 First M1 for either resolving vertically or taking moments with usual rules First A1 for a correct equation Second M1 for taking moments with usual rules Second A1 for a correct equation N.B. Their moments equation(s) may not be in <i>x</i>, if they've clearly defined a different distance and can score the A1 in each case. Third DM1, dependent on first two M marks, for solving for <i>x</i> 	
	Third A1 for " x (or AG) = 11/3" GIVEN ANSWER (Must be EXACT)	
	$M(A) = (R \times 1) + (2R \times 5) - 8ar$	
	Possible equations: $M(R)$, $(R \times 5) + (2R \times 1) - 8g(6 - r)$	
	$M(D), (R \times 4) = 8g(5 - r)$	
	N.B. (Allow R_p instead of $2R_c$ in all cases for M mark)	
7ь	First M1 for either resolving vertically or taking moments with usual rules First A1 for a correct equation Second M1 for taking moments with usual rules Second A1 for a correct equation Third DM 1, dependent on first two M marks, for solving for <i>k</i> Third A1 for $k = 2/7$, any equivalent fraction or 0.29 or better $M(A), \ 2R_F + 5kR_F = 8g \times \frac{11}{3}$	
	Possible equations: $M(B), 4R_F + (1 \times kR_F) = (8g \times \frac{7}{3}) + (3g \times 6)$ $M(D), 3R_F = 8g \times \frac{4}{3} + (3g \times 5)$ $M(G), \frac{5}{3}R_F - \frac{4}{3}kR_F = 3g \times \frac{11}{3}$ N.B. (Allow R_D instead of kR_F in all cases for M mark)	

Question Number	Scheme	Marks
8a	$\begin{array}{c} T \\ A \\ 3 \text{ kg} \\ 3g \\ 40^{\circ} \\ \end{array} $	
	Motion of A: $T-3g\sin 40=3a$	M1A1
	Motion of B: $5g - T = 5a$	M1A1
	Solve for T	DM 1
	30 (N) or 30.2 (N)	A1
		(6)
8b	$5g - T = 5a \Rightarrow a = \frac{1}{5}(5g - T) = \frac{g}{8}(5 - 3\sin 40)(= 3.76) \text{ (ms}^{-2})$	M1
	Use of suvat: $v = u + at = 3.76 \times 1.5 = 5.64 \text{ (ms}^{-1}\text{) or } 5.6 \text{ (ms}^{-1}\text{)}$	DM 1A1
		(3)
8c	Distance in first 1.5 seconds: $s = \frac{1}{2}a1.5^2 = 4.23$ (m) <i>their</i> (b) ²	M1A1
	OR : $v^2 = u^2 + 2as$: $s = \frac{1}{2 \times a} = 4.23$ (m)	
	New $a = -g \sin 40$ (-ve sign not needed)	B1
	Distance up plane : $v^2 = u^2 + 2as$, $s = \frac{their (b)^2}{2 \times new a}$ (m)	DM 1
	Total distance: 6.76 (m) (6.8)	A1
		(5)
		[14]
	Notes for question 8	
8a	First M1 for equation of motion for A, with usual rules	
	First A1 for a correct equation	
	Second M1 for equation of motion for <i>B</i> , with usual rules	
	Second A1 for a correct equation	
	N.B. Either of these can be replaced by the whole system equation:	
	$5g - 3g \sin 40 = 8a$	
	I hird DMI , dependent on previous two M marks, for solving for T	
 	1 mird A1 10r 30 0r 30.2 (N)	
8b	First M1 for finding a value for <i>a</i> (possibly incorrect) This mark could be earned in part (a) BUT MUST BE USED IN (b).	
	Second DM 1,dependent on previous M, for a complete method to find	
	the speed of B as it hits the ground	
	A1 for 5.6 or 5.64 (m s ⁻¹)	
8c	First M1 for a complete method to find distance fallen by <i>B</i> First A1 for 4.23 or better	

Question Number	Scheme	Marks
	B1 for new $a = -g \sin 40$ (- sign not needed) (seen or implied)	
	Second DM 1, dependent on having found a <i>new a</i> , for a complete method to find extra distance moved by A up the plane BUT M0 <u>if new a is g</u> .	
	Second A1 for 6.8 or 6.76 (m).	

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