Oxford Revise | Edexcel A Level Maths | Answers

- Method (**M**) marks are awarded for showing you know a method and have attempted to apply it.
- Accuracy (**A**) marks should only be awarded if the relevant M marks have been awarded.
- Unconditional accuracy (**B**) marks are awarded independently of M marks. They do not rely on method.
- The abbreviation **o.e.** means 'or equivalent (and appropriate)'.

Please note that:

- efficient use of advanced calculators is expected
- inexact numerical answers should be given to three significant figures unless the question states otherwise; values from statistical tables should be quoted in full
- when a value of g is required, it is taken as $g = 9.8\,\text{m}\,\text{s}^{-2}$ unless stated otherwise in the question.

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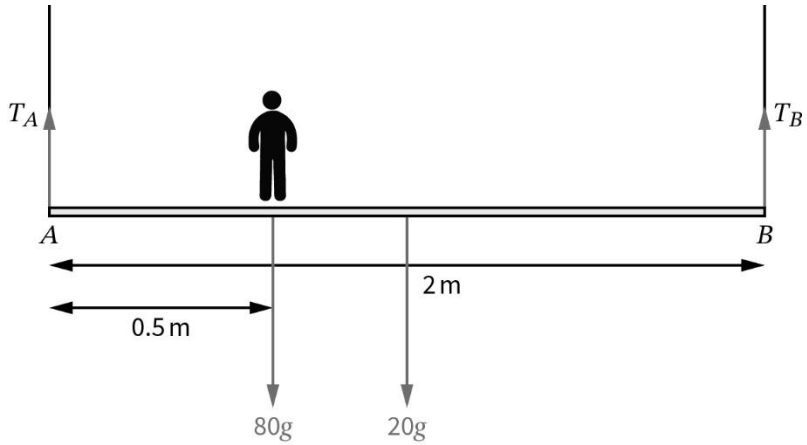
Chapter 38 Moments

Question	Answer	Extra information	Marks
38.1 (a)			
	$T_A + T_B = 100g$	Resolving vertically	M1A1
	M(A)	Attempting to take moments about any point on the platform	M1
	$20g(1) + 80g\ (0.5) = 2T_B$	Correct equation	A1
	$T_B = 30g = 294$ (N)	Correct T_B	A1
	$T_A = 70g = 686$ (N)	Correct T_A	A1
38.1 (b)	The weight acts at the centre of the platform	Valid explanation	B1
	Total		**7 marks**

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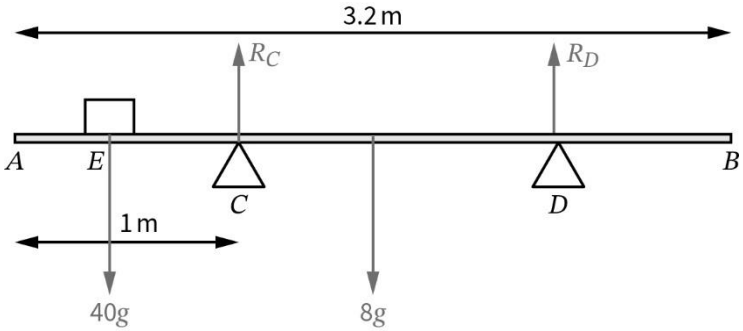
Question	Answer	Extra information	Marks
38.2 (a)	 On the point of tilting about C, $R_D = 0$ Let the distance EC be x M(C): $8g(0.6) = 40gx$ ($x = 0.12$) $AE = 1 - 0.12$ $= 0.88$ (m)	 Attempting to take moments about any point Correct equation Correct AE	 M1 A1 A1
38.2 (b)	The child's weight acts at a single point, E		B1
	Total		**4 marks**

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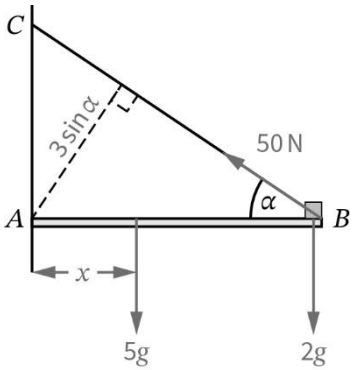
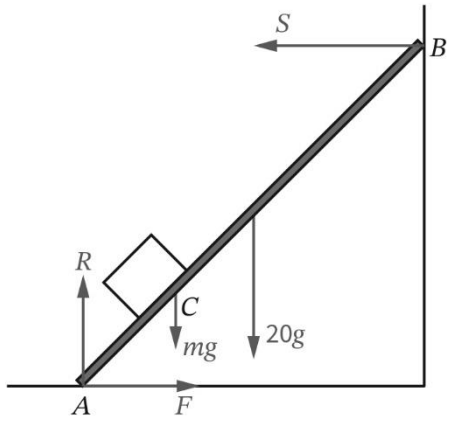
Question	Answer	Extra information	Marks
38.3			
	Let the distance of the centre of mass from A be x	Attempting to take moments about A	M1
	$50(3 \sin \alpha) = 5gx + 2g(3)$	Correct equation	A1
	$x = 0.64$ (m)	Correct x	A1
	Total		**3 marks**
38.4 (a)(i)		Diagram with all forces	B1

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Question	Answer	Extra information	Marks
38.4 (a)(ii)	As the wall is smooth, there is no frictional force at B, just the reaction force which acts perpendicular to the wall.	Valid explanation	B1
38.4 (b)	$R = mg + 20g$ (1) $F = S$ Taking moments about A mg (1 cos 60) + 20g (1.5 cos 60) = S (3 sin 60) $F = S = \frac{1}{4}(mg + 20g)$ $\frac{1}{2}mg + 15g = \frac{3\sqrt{3}}{8}(mg + 20g)$ m = 13.4 (kg)	Resolving vertically Resolving horizontally Attempting to take moments Correct equation Use of $F = \mu R$ Forming an equation in m only Correct answer only	M1A1 M1A1 M1 A1A1 M1 M1 A1
	Total		**12 marks**

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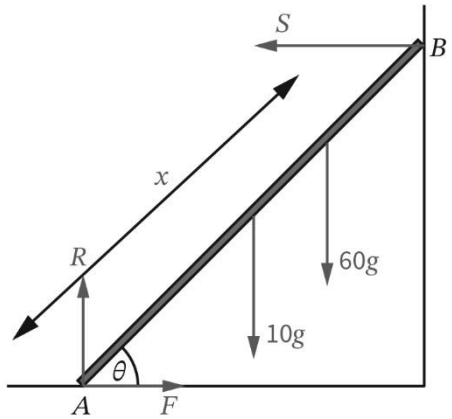
Question	Answer	Extra information	Marks
38.5			
	$\cos\theta = \frac{3}{5}$ $\sin\theta = \frac{4}{5}$		
	M(A)		
	$10g(1\cos\theta) + 60g(x\cos\theta) = S(2\sin\theta)$	Taking moments about any point on the ladder	M1A1
	$R = 70g$	Resolving vertically	M1A1
	$F = S$	Resolving horizontally	M1A1
	$S = \frac{1}{3}(70g)$	Use of $F = \mu R$	M1
	$6g + 36gx = \frac{112}{3}g$	Forming an equation in x only	M1
	$x = 0.87$ (m)	Correct answer only	A1
	Total		**9 marks**

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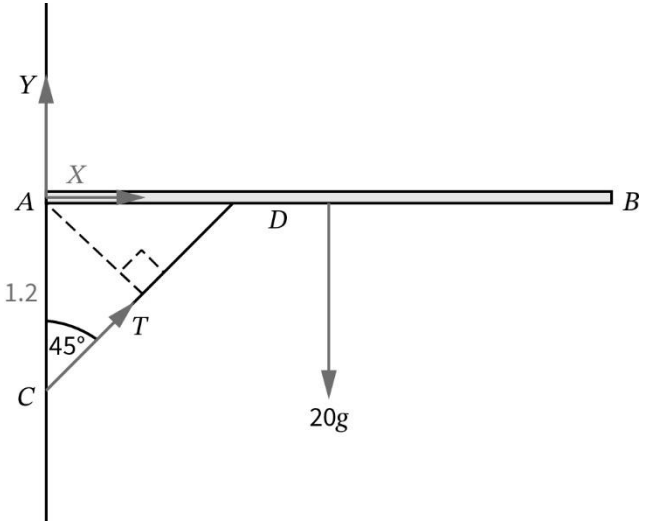
Question	Answer	Extra information	Marks
38.6 (a)			
	Length AC is $\frac{6\sqrt{2}}{5} \times \cos 45° = 1.2$ (m)	Use of trigonometry to find AC	M1
	M(A)		
	T (1.2 sin 45°) = 20g(1.8)	Taking moments about A	M1
	$T = 30g\sqrt{2}$ (N)	Correct simplification	A1

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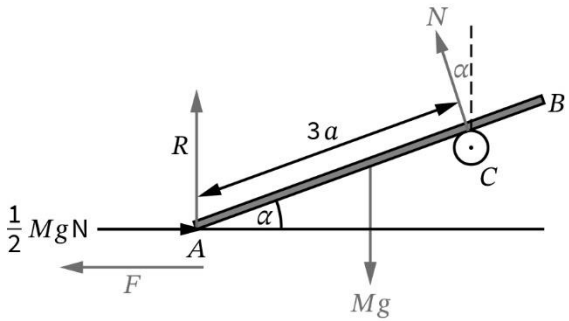
Question	Answer	Extra information	Marks
38.6 (b)	$T\cos 45° + Y = 20g$ $Y = 20g - 30g\sqrt{2}(\cos 45°)$ $Y = 10g$ downwards	Resolving vertically	M1A1
	$T\sin 30° = X$ $X = 15g\sqrt{2}$	Resolving horizontally	M1A1
	$\sqrt{(15\sqrt{2}g)^2 + (10g)^2}$	Use of Pythagoras' theorem to find the resultant force	M1
	$= 5\sqrt{22}g$ (N)	Correct answer	A1
	Total		**9 marks**
38.7 (a)			
	M(A)	Attempting to take moments about any point on the beam	M1
	$Mg(2a\cos\alpha) = N(3a)$	Correct moments equation	A1
	$N = \frac{2Mg\cos\alpha}{3}$	Correct expression for N. Must be in α and M only.	A1

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Question	Answer	Extra information	Marks
38.7 (b)	$R + N\cos\alpha = Mg$	Resolving vertically	M1A1
	$\frac{1}{2}Mg = F + N\sin\alpha$	Resolving horizontally	M1A1
	$R = Mg - \frac{2Mg\cos^2\alpha}{3}$ $= Mg\left(\frac{3-2\cos^2\alpha}{3}\right)$	Forming equation in M and α for R	M1
	$F = \frac{1}{2}Mg - \frac{2Mg\cos\alpha\sin\alpha}{3}$ $= \frac{Mg}{6}(3-4\sin\alpha\cos\alpha)$	Forming equation in M and α for F	M1
	$F \le \mu R$ $\frac{Mg}{6}(3-4\sin\alpha\cos\alpha) \le \mu Mg\left(\frac{3-2\cos^2\alpha}{3}\right)$	Use of $F \le \mu R$ to form an inequality in M and α only Must be $\le$ not =	M1
	$\mu \le \frac{3-2\sin 2\alpha}{2(3-2\cos^2\alpha)}$	Correct conclusion correctly obtained	A1
	Total		**11 marks**

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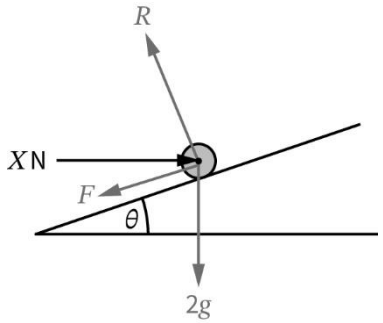
Question	Answer	Extra information	Marks
38.8 (a)			
	$R = 2g\cos\theta + X\sin\theta$	Resolving perpendicular to the plane	M1A1
	$X\cos\theta = F + 2g\sin\theta$	Resolving parallel to the plane	M1A1
	$\frac{4}{5}X - \frac{6g}{5} = 0.6\left(\frac{8g}{5} + \frac{3}{5}X\right)$ $\frac{4}{5}X - \frac{9}{25}X = \left(\frac{6}{5} + \frac{24}{25}\right)g$	Use of $F = \mu R$ and solving for X	M1
	$X = \frac{54g}{11} = 48.1\,(\text{N})$	Correct answer	A1

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Question	Answer	Extra information	Marks
38.8 (b)	When the force X is removed, friction acts up the plane. Force down the plane = $2g \sin\theta = 11.76$ $R = 2g \cos\theta = 15.68$ Maximum frictional force = $\mu R = 9.408$ $11.76 > 9.408$ Therefore, the particle will accelerate down the plane.	 Finding force down plane Correct R Use of μR Correct conclusion. Must see inequality or statement that force is greater than 9.408	 M1 M1 M1 A1
	Total		**10 marks**
38.9 (a)	$900g - T = 900(1.5)$ $T = 7470$ (N)	Use of $F_{res} = ma$ in the direction of motion for the whole system Correct answer only	M1A1 A1
38.9 (b)	$300g - R = 300(1.5)$ $R = 2490$ (N)	Use of $F_{res} = ma$ in the direction of motion for the passengers in the lift Correct answer only	M1A1 A1
38.9 (c)	If the lift travels upwards, the tension in the lift cable will increase.	Valid explanation	B1
	Total		**7 marks**

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