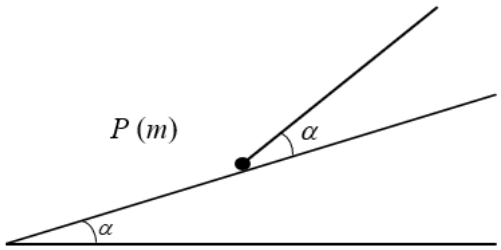
QUESTION NUMBER	SCHEME	MARKS
6		
6(a)	$(F =)\ 0.75mg\cos\alpha - mg\sin\alpha$ **N.B. Accept** $\frac{1}{2}\left(mg\cos\alpha - 0.75mg\sin\alpha\right)$	M1 A1 A1
		(3)
6(b)	$R = mg\cos\alpha - 0.75mg\sin\alpha$	M1 A1
	Use of (max) $F = \frac{1}{2}R$	B1
	$0.75mg\cos\alpha - mg\sin\alpha = \frac{1}{2}\left(mg\cos\alpha - 0.75mg\sin\alpha\right)$	M1 A1
	e.g. $(0.75mg - \frac{1}{2}mg)\cos\alpha = (mg - \frac{1}{2}\times 0.75mg)\sin\alpha$ $\tan\alpha = \frac{2}{5}$ *	A1*
		(6)
6(c)		
	(Finds max friction =) $\frac{1}{2}\left(mg\cos\alpha\right)$ (and weight component down the plane =) $mg\sin\alpha$	M1
	Sub for α AND compare: (max friction) $= \frac{1}{2}mg\times\frac{5}{\sqrt{29}} = \frac{5\sqrt{29}mg}{58} = 0.4642..mg$ (wt cpt) $= mg\times\frac{2}{\sqrt{29}} = \frac{4\sqrt{29}mg}{58} = 0.371..mg$ AND e.g. $0.464mg > 0.371mg$ **N.B.** Must see an **inequality or a difference** i.e words are not sufficient. **OR: use** $\tan\alpha = \frac{2}{5}$, e.g. $mg\sin\alpha = \frac{2}{5}mg\cos\alpha < \frac{1}{2}\left(mg\cos\alpha\right)$ **OR**: At rest if $\frac{1}{2}\left(mg\cos\alpha\right) > mg\sin\alpha$ oe	A1

	$\frac{1}{2} > \tan\alpha$	
	Conclusion: since 0.4642..oe > 0.371..oe the box remains at rest. **OR:** $\frac{1}{2} > \frac{2}{5}$ so the box remains at rest.	A1
		(3)
		(12)
	Notes for Question 6	
6(a)		
M1	Resolve parallel to the plane to give an expression in m, g and α only.Correct no. of terms, dimensionally correct, any forces that should be resolved must be resolved, condone sign errors and sin/cos confusion.	
A1	Unsimplified expression in m, g and α only, with at most one error (if **both** signs are wrong treat as one error) Sin/cos reversed is ONE error. Omission of g's is ONE error.	
A1	Correct expression	
6(b)		
M1	Resolve perpendicular to the plane. Correct no. of terms, dimensionally correct, any forces that should be resolved must be resolved, condone sign errors and sin/cos confusion.	
A1	Correct unsimplified equation.	
B1	Use of $\max F = \frac{1}{2}R$	
M1	Eliminate F and R to form an equation in mg and α **with correct no. of terms**	
A1	Correct equation in mg and α	
A1*	cso Complete method to reach the given answer from sufficient working, must have collected the $\sin\alpha$ terms and the $\cos\alpha$ terms, before proceeding to the given answer OR collect $\tan\alpha$ terms if they divide through by $\cos\alpha$ first.	
6(c)		
M1	Finds new max friction and weight component down the plane. Condone sign errors and sin/cos confusion. M0 if no new R is used.	
A1	Correct expressions with α replaced AND compared or difference found (this could be done by writing down an equation of motion parallel to the plane) **OR: if** α not replaced, correct inequality in $\tan\alpha$ only.	
A1	Correct conclusion with valid reason.	