Question Number	Scheme	Marks
4(a)	$R = kmg\cos\theta + mg\sin\theta$ (perpendicular to the plane)	M1A2
	$F = kmg\sin\theta - mg\cos\theta$ (parallel to the plane)	M1A2
	$F = \mu R$ seen or implied	B1
	Eliminate F and R and **explicitly cancel *m*** to give an equation in k, θ and μ **only** (allow inconsistent or no g's)	M1
	Use of $\tan\theta = \dfrac{\sin\theta}{\cos\theta}$ to obtain an expression for μ in terms of k and $\tan\theta$ only (all g's must have been cancelled) , dependent on previous three M marks. **Need to see division by $\cos\theta$ <u>top and bottom</u> oe for this mark**.	**DM**1
	$\mu = \dfrac{k\tan\theta - 1}{k + \tan\theta}$ GIVEN ANSWER (Must be **exactly** the same)	A1 (10)
Aliter	**N.B. Horizontal and/or vertical resolutions are possible**	
	$mg + F\cos\theta = R\sin\theta$ (horizontal) **M1A2**	
	$R\cos\theta + F\sin\theta = kmg$ (vertical) **M1A2**	
4(b)	$\dfrac{\tan\theta - 1}{1 + \tan\theta} > 0$ **OR** $mg\sin\theta - mg\cos\theta > 0$	M1
	$\tan\theta > 1 \Rightarrow \theta > 45^o$ GIVEN ANSWER	A1 (2)
		(12)
	Notes for qu 4	
4(a)	First M1 for resolving perp to the plane, dimensionally correct, with correct no. of terms, *kmg* and *mg* both resolved, condone sign errors	
	First A2 for a correct equation, -1 each error (allow *X* for *mg* anywhere) Consistent omission of *g*, treat as **one** error	
	Second M1 for resolving parallel to the plane, dimensionally correct, with correct no. of terms, *kmg* and *mg* both resolved, condone sign errors	
	First A2 for a correct equation, -1 each error (allow *X* for *mg* anywhere) Consistent omission of *g*, treat as **one** error	
	$F = \mu R$ seen or implied, even on a diagram	
	Third M1 (independent) for eliminating F and R and cancelling m's	
	Fourth DM1, dependent on previous three M marks	
	Fifth A1 for correctly obtaining the GIVEN ANSWER	
4(b)	M1 for either using $k = 1$ and the given answer > 0 or $= 0$ or using $F > 0$ or $F = 0$ Allow M1A0 for using $k = 1$ and $\theta = 45^o$ to show $\mu = 0$ M0 if first thing seen is $\tan\theta - 1 > 0$	
	A1 for correctly obtaining the GIVEN ANSWER and must have used an inequality throughout. Need to see $\tan\theta - 1 > 0$ oe.	