

Question	Scheme	Marks	AOs
	Part (a) is a ‘Show that..’ so equations need to be given in full to earn A marks		
3(a)			
	Moments equation: (M1A0 for a moments inequality)	M1	3.3
	M(A), $mga \cos \theta = 2Sa \sin \theta$ M(B), $mga \cos \theta + 2Fa \sin \theta = 2Ra \cos \theta$ M(C), $F \times 2a \sin \theta = mga \cos \theta$ M(D), $2Ra \cos \theta = mga \cos \theta + 2Sa \sin \theta$ M(G), $Ra \cos \theta = Fa \sin \theta + Sa \sin \theta$.	A1	1.1b
	$(\uparrow) R = mg$ OR $(\leftrightarrow) F = S$	B1	3.4
	Use their equations (<u>they must have enough</u>) and $F \leq \mu R$ to give an inequality in μ and θ only (allow DM1 for use of $F = \mu R$ to give an equation in μ and θ only)	DM1	2.1
	$\mu \geq \frac{1}{2} \cot \theta^*$	A1*	2.2a
	(5)		
3(b)			
	Moments equation:	M1	3.4
	M(A), $mga \cos \theta = 2Na \sin \theta$ M(B), $mga \cos \theta + 2kmga \sin \theta = 2Ra \cos \theta + \frac{1}{2} mg 2a \sin \theta$ M(D), $2Ra \cos \theta = mga \cos \theta + N 2a \sin \theta$ M(G), $kmga \sin \theta + Na \sin \theta = \frac{1}{2} mga \sin \theta + Ra \cos \theta$	A1	1.1b

S.C. M(C), $mga \cos \theta + \frac{1}{2}mg2a \sin \theta = kmg2a \sin \theta$ M1A1B1 $1 + \frac{5}{4} = \frac{5k}{2}$ M1 $k = 0.9$ A1				
$N = kmg - F$ OR $R = mg$			B1	3.3
Use their equations (<u>they must have enough</u>) to solve for k (numerical)			DM1	3.1b
$k = 0.9$ oe			A1	1.1b
			(5)	
(10 marks)				
Notes:				
3a	M1	Any moments equation with correct terms, condone sign errors and sin/cos confusion		
	A1	Correct equation		
	B1	Correct equation		
	DM1	Dependent on M1, for using their equations (<u>they must have enough</u>) and $F \leq \mu R$ to give an inequality in μ and θ only (allow M1 for use of $F = \mu R$ to give an equation in μ and θ only)		
	A1*	Given answer correctly obtained with no wrong working seen (e.g. if they use $F = \mu R$ anywhere, A0)		
3b	M1	Any moments equation with correct terms, condone sign errors		
	A1	Correct equation		
	B1	Correct equation		
	DM1	Dependent on M1, for using their equations (<u>they must have enough</u>) with trig substituted, to solve for k , which must be numerical.		
	A1	cao		