

Question	Scheme	Marks	AOs
6.			
6(a)	Take moments about A	M1	3.1a
	$S \times 1.5a = Mga \cos \theta = (Mga \times \frac{3}{5})$	A1	1.1b
	$S = \frac{2}{5} Mg *$	A1*	2.2a
		(3)	
6(b)	N.B. Marks for the equations should be awarded in the order in which they appear on the script.		
	Resolve horizontally:	M1	3.4
	$F = S \sin \theta$	A1	1.1b
	Resolve vertically:	M1	3.3
	$R = Mg - S \cos \theta$	A1	1.1b
	Other possible equations: (any of which is worth max M1A1) (parallel to the rod): $F \cos \theta + R \sin \theta = Mg \sin \theta$ (perp to the rod): $F \sin \theta + Mg \cos \theta = S + R \cos \theta$ M(B): $(S \times 0.5a) + (R \times 2a \cos \theta) = (Mg \times a \cos \theta) + (F \times 2a \sin \theta)$ M(C): $(R \times 1.5a \cos \theta) = (Mg \times 0.5a \cos \theta) + (F \times 1.5a \sin \theta)$ M(G): $(R \times a \cos \theta) = (S \times 0.5a) + (F \times a \sin \theta)$ N.B. If they have more than two equations, mark only those that they use to try to find μ		
	$F = \mu R$ and two of their equations used to solve for μ	DM1	3.1a
	$\mu = \frac{8}{19} = 0.42105\dots$	A1	2.2a

(6)

(9 marks)

Notes:

6a M1 Correct no. of terms, dimensionally correct, condone sin/cos confusion and sign errors. Allow use of a different letter for the angle.
N.B. They may resolve the weight into two components, parallel and perpendicular to the rod, and then take the moment of each about A, one of which is 0. (see **N.B.** below)
N.B. M0 if one or both a 's aren't there originally.

A1

Correct equation, $\cos \theta$ may or may not be replaced by $\frac{3}{5}$

N.B. you may see: $S \times 1.5a = Mg \cos \theta \times a$

A1*

Given answer correctly obtained, need to see $\cos \theta = \frac{3}{5}$ used

Allow: $S = \frac{2Mg}{5}$ or $\frac{2Mg}{5} = S$

A0 if S is missing

6b

M1

Correct no. of terms, dimensionally correct, condone sin/cos confusion and sign errors

A1

Correct first equation, S does not need to be substituted

M1

Correct no. of terms, dimensionally correct, condone sin/cos confusion and sign errors

A1

Correct second equation, S does not need to be substituted

DM
1

Dependent on previous two M marks for using $F = \mu R$ and two equations to solve for μ

A1

Accept 0.42 or better (as g cancels)