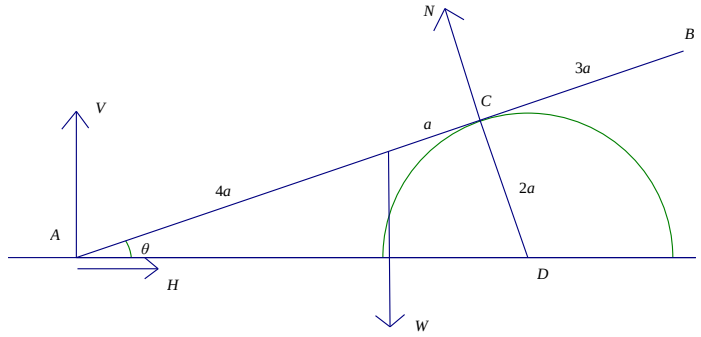
Q	Mark Scheme	Marks	Marking guidance
			
5 (a)	$AD = \sqrt{(2a)^2 + (5a)^2} = \sqrt{29}a$ *	B1*	Correct use of Pythagoras to show **given answer** from correct working (need *a* on both sides)
		1	
5 (b)	M(*A*): $W \times 4a\cos\theta = N \times 5a$	M1	Dimensionally correct equation in *a*. Allow if *a* cancelled. Condone sin/cos confusion
	$W \times 4a \times \frac{5}{\sqrt{29}} = N \times 5a$	A1	Correct unsimplified equation. Allow with $\cos\theta$. NB: $5a = \sqrt{29}a\cos\theta$
	$N = \frac{4}{\sqrt{29}}W$ *	A1*	Obtain **given answer** from correct working
		3	
5 (c)	The candidates need to form sufficient equations to solve for *k* and $\tan\alpha$. There should be two independent equations. Allow M1A1 for the first equation seen, and M1A1 for the second equation. If there are more than 2 equations, award the marks for the equations used to solve for *k* and $\tan\alpha$. If they stop after forming the equations, allow the marks for the best 2 equations.		
	Resolve vertically	M1	Requires all relevant terms. Condone sin / cos confusion
	$V + N\cos\theta = W \quad \left(V = \frac{9}{29}W\right)$ or $kW\sin\alpha + N\cos\theta = W$	A1	Correct unsimplified equation. Need not substitute for trig.
	Resolve horizontally	M1	Requires all relevant terms. Condone consistent sin / cos confusion
	$H = N\sin\theta\left(=\frac{8}{29}W\right)$ or $kW\cos\alpha = N\sin\theta\left(=\frac{8}{29}W\right)$	A1	Correct unsimplified equation. Need not substitute for trig.
	Possible alternative equation for M1A1 using M(*C*): $aW\cos\theta + 5aH\sin\theta = 5aV\cos\theta$ or $aW\cos\theta = kW \times 5a\sin(\alpha - \theta)$		
	Use Pythagoras to obtain *k*: $k^2 = \left(\frac{9}{29}\right)^2 + \left(\frac{8}{29}\right)^2$	DM1	Correct use of perpendicular components. Dependent on the first 2 M marks

	$k = \frac{\sqrt{145}}{29} = \sqrt{\frac{5}{29}}$	A1	Correct only. Any equivalent exact form (ISW but 0.415 with no exact answer seen is A0)
	Use trig to obtain $\tan\alpha$	DM1	Dependent on the first 2 M marks
	$\tan\alpha = \frac{9}{8}$	A1	Correct only. Must be a simplified number. Do not accept answer including W
		8	
5 (c) alt	Resolve parallel to rod	M1	Requires all relevant terms. Condone sin / cos confusion
	$F = W\sin\theta \left(= \frac{2}{\sqrt{29}}W \right)$	A1	Correct unsimplified equation. Need not substitute for trig.
	Resolve perpendicular to rod	M1	Requires all relevant terms. Condone consistent sin / cos confusion
	$E + N = W\cos\theta \quad \left(E = \frac{1}{\sqrt{29}}W \right)$	A1	Correct unsimplified equation. Need not substitute for trig.
	Possible alternative equation for M1A1 using M(C) : $aW\cos\theta + 5aH\sin\theta = 5aV\cos\theta$ or $aW\cos\theta = kW \times 5a\sin(\alpha - \theta)$		
	Use Pythagoras to obtain k	M1	Correct use of Pythagoras
	$k = \frac{1}{\sqrt{29}}\sqrt{1+4} = \sqrt{\frac{5}{29}}$	A1	Correct only
	Use trig to obtain $\tan\alpha$: $\tan(\alpha - \theta) = \frac{1}{2} = \frac{\tan\alpha - \frac{2}{5}}{1 + \frac{2}{5}\tan\alpha}$	DM1	Use of trig to obtain expression in $\tan\alpha$
	$\tan\alpha = \frac{9}{8}$	A1	Correct only
		8	
		(12)	