	$\theta° = \tan^{-1} 2 - \tan^{-1}\left(\frac{29}{59}\right)$	M1	Use their v to find the required angle $\left(63.43..° - 26.175..°\right)$
	$\theta = 37.3$	A1	37 or better
		[7]	
		(12)	
8a	Normal reaction between P and the ramp $= 3g\cos\alpha \qquad \left(= \frac{18g}{\sqrt{37}} = 29.0\right)$	B1	cao ISW
	Use of $F = \frac{3}{4}R$	M1	$\frac{3}{4} \times$ their R (Must have an R)
	Work done $= 4F$	M1	Their F (Must have an F)
	$= 87.0\,(87)\,(\text{J})$	A1	3 sf or 2 sf only (follows 9.8) do not allow $\frac{54}{\sqrt{37}}g$ (this is an acceleration)
		[4]	
8b	Work-energy equation	M1	**M0 if not using work-energy**. All terms required. Condone sign errors Condone sin/cos confusion
	$\frac{1}{2} \times 3U^2 - \text{their(a)} - 3g \times 4\sin\alpha = \frac{1}{2} \times 3 \times 25$	A1ft A1ft	Unsimplified equation with at most one error. Follow their (a) Correct unsimplified equation Follow their (a)
	$U = 9.79$ or $U = 9.8$	A1	3 sf or 2 sf only (follows 9.8)
		[4]	
8c	Time taken:	M1	Complete method using *suvat* and $u = 5$ to form an equation in t only
	$-4\sin\alpha = (5\sin\alpha)t - \frac{1}{2}gt^2$ $\left(4.9\sqrt{37}t^2 - 5t - 4 = 0\right)$	A1	Correct unsimplified equation for t.
	$t = 0.45969....$	A1	Seen or implied
	Horizontal distance	M1	Complete method using *suvat* and $u = 5$
	$= (5\cos\alpha)t \qquad \left(= \frac{30}{\sqrt{37}}t\right)$	A1ft	Follow their t
	$= 2.27$ or 2.3 (m)	A1	3 sf or 2 sf only
		[6]	
	Alternative: First M1A1 as above Second M1A1 as above Second A1 correct quadratic in horizontal distance e.g. $\frac{37\times4.9}{35\times25}d^2 - \frac{1}{6}d - \frac{4}{\sqrt{37}} = 0$ Final A1 as above		
		(14)	

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