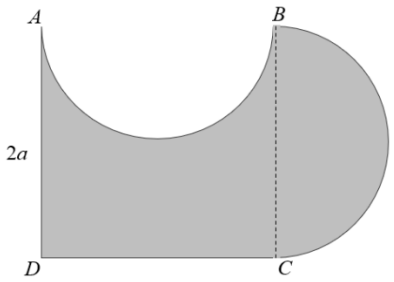
QUESTION NUMBER	SCHEME	MARKS
2		
2(a)	<table><tr><td></td><td>Mass ratio</td><td>Distance from AD</td></tr><tr><td>Square</td><td>$4a^2$</td><td>a</td></tr><tr><td>Semicircle removed</td><td>$\frac{\pi a^2}{2}$</td><td>a</td></tr><tr><td>Semicircle attached</td><td>$\frac{\pi a^2}{2}$</td><td>$\frac{4a}{3\pi}+2a$</td></tr><tr><td>Lamina</td><td>$4a^2$</td><td>$\bar{x}$</td></tr></table>	B1 (mass) B1 (distances)
	Moments equation about AD or a parallel axis	M1
	About AD $\left(4a^2\times a\right)-\left(\frac{\pi a^2}{2}\times a\right)+\frac{\pi a^2}{2}\left(\frac{4a}{3\pi}+2a\right)=4a^2\bar{x}$ About BC $4a^2(a)-\frac{\pi a^2}{2}(a)-\frac{\pi a^2}{2}\left(\frac{4a}{3\pi}\right)=4a^2(2a-\bar{x})$ About line joining midpoints of AB and DC $4a^2(0)-\frac{\pi a^2}{2}(0)+\frac{\pi a^2}{2}\left(a+\frac{4a}{3\pi}\right)=4a^2(\bar{x}-a)$	A1
	Obtain given answer from correct working. $\bar{x}=\frac{a}{24}(28+3\pi)$ *	A1*
		(5)
2(b)	Relevant moments equation	M1
	$T\times 2a=W\frac{a}{24}(28+3\pi)$	A1
	Second relevant equation	M1
	e.g. $5T=W+kW$	A1
	$k=\left(\frac{92+15\pi}{48}\right)$	A1
		(5)
		(10)
	Notes for question	
2(a)	**Vector form is acceptable for part a**	

B1	Correct mass ratios for all 4 sections.	
B1	Correct distances for square and two semicircle sections measured from their moments line. (or shape to LHS of BC and semicircle)	
M1	Moments taken about *AD* or a parallel axis. Dimensionally correct equation. All terms required. 'a^2's may have been cancelled. LHS correct and RHS uses their $\bar{x}$.	
A1	Correct unsimplified equation in terms of a, $\bar{x}$ and π.	
A1*	Obtain given answer from correct working. At least one stage of simplification must be seen. Must be factorised with Allow$(28+3\pi)$ and $(3\pi+28)$	
2(b)		
M1	Form a moments equation about *AD* or a parallel axis. Dimensionally correct equation. All terms required.	
A1	Correct unsimplified equation. Allow in terms of $\bar{x}$. Accept decimal form for $\bar{x}$	
M1	Second relevant equation (moments or vertical equilibrium). Dimensionally correct equation. All terms required.	
A1	Correct unsimplified equation. Accept decimal form for $\bar{x}$ Other possible moments equations include: About *B*: $4T\times 2a - kW\times 2a - W\left(2a-\bar{x}\right)=0$ About midpoint *AB*: $4T\times a - kWa - W\left(\bar{x}-a\right) - Ta = 0$ About G: $4T\,\bar{x} - kW\,\bar{x} = T\left(2a-\bar{x}\right)$	
A1	Cao Accept equivalent forms in the form $p + q\pi$, but must be **exact**	