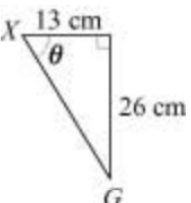


Mechanics 2 Centre of Mass

4(a)	Because the lamina is symmetrical.	B1	1	Correct explanation
(b)	$\bar{y} = \frac{250 \times 2.5 + 150 \times 7.5}{250 + 150}$ $= \frac{1750}{400}$ $= 4.375 \quad \text{AG}$	M1		Moment equation with appropriate number of terms
		A1		Correct numerator
		A1		correct denominator
		A1	4	Correct value from correct working
(c)	$\tan \alpha = \frac{10 - 4.375}{25} = \frac{5.625}{25}$ $\alpha = 12.7^\circ$	M1		Use of tan.
		M1		Subtracting from 10
		A1		Correct expression
		A1	4	Correct angle
(d)	When it has been assumed that the centre of mass of each of the rectangles used is at its centre. OR Relating area to mass.	B1	1	Correct explanation
		Total		10

4(a)	$(10 \times 40)\rho \times 5 + (10 \times 60)\rho \times 40$ $= (10 \times 40 + 10 \times 60)\rho \bar{y}$ $\bar{y} = 26 \text{ cm}$	M1		
		M1		
		A1		
(b)	Symmetry of shape	A1	4	
		B1	1	
(c)	 $\tan \theta = \frac{26}{13}$ $\theta = 63^\circ \quad (63.4)$	M1		Attempting subtraction leading to 13 cm
		M1		Or inverted, must see 26
		A1		Or inverted
		A1	4	Accept 117°
Total			9	

2(a)	Symmetry of the lamina about PQ	E1	1	Accept 'mirror line'
(b)	Taking moments about AB : $600\rho \times 15 + 100\rho \times 35$ $= 700\rho\bar{x}$ $\bar{x} = 17.857 = 17.9 \text{ cm}$	M1A1 A1 A1	4	Condone lack of ρ SC3 17.8
(c)	$\tan \theta = \frac{10}{17.857}$ $= 0.56$ Angle is $29.2488\dots$ $= 29^\circ$	M1A1 M1 A1	4	M1 for use of $\tan \theta$
Total			9	