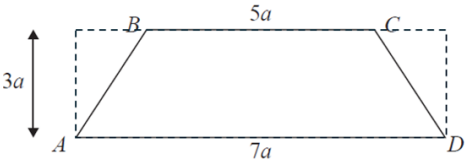
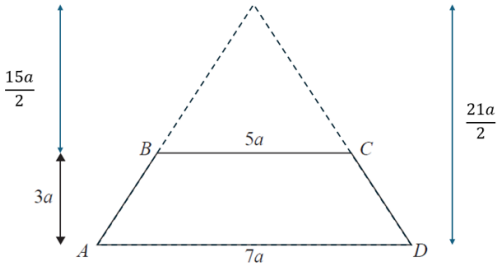
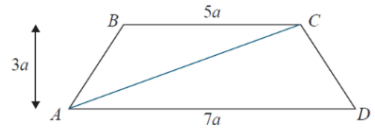
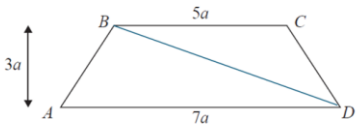
<table>
<tr><th>Question</th><th>Scheme</th><th>Marks</th></tr>
<tr><td>4(a)</td><td>
<table>
<tr><td></td><td>Rectangle</td><td>2 x Triangle</td><td>Trapezium</td></tr>
<tr><td>Mass</td><td>$15a^2$</td><td>$2\times\frac{3}{2}a^2$</td><td>$18a^2$</td></tr>
<tr><td>From AD</td><td>$\frac{3}{2}a$</td><td>a</td><td>d</td></tr>
</table>
</td><td>B1

B1</td></tr>
<tr><td></td><td>Some examples of alternatives




<table>
<tr><td></td><td>Large rectangle</td><td>2 removed triangles</td><td>Trapezium</td></tr>
<tr><td>Mass</td><td>$21a^2$</td><td>$2\times\frac{3a\times a}{2}$</td><td>$18a^2$</td></tr>
<tr><td>Distance from AD</td><td>$\frac{3a}{2}$</td><td>$\frac{2}{3}\times 3a = 2a$</td><td>$d$</td></tr>
</table>
<table>
<tr><td></td><td>Large triangle</td><td>Removed triangle</td><td>Trapezium</td></tr>
<tr><td>Mass</td><td>$\frac{147a^2}{4}$</td><td>$\frac{75a^2}{4}$</td><td>$18a^2$</td></tr>
<tr><td>Distance from AD</td><td>$\frac{1}{3}\times\frac{21a}{2}=\frac{7a}{2}$</td><td>$3a+\frac{1}{3}\times\frac{15a}{2}=\frac{11a}{2}$</td><td>$d$</td></tr>
</table>




<table>
<tr><td></td><td>Triangle ABC</td><td>Triangle ACD</td><td>Trapezium</td></tr>
<tr><td>Mass</td><td>$\frac{5a\times 3a}{2}=\frac{15}{2}a^2$</td><td>$\frac{7a\times 3a}{2}=\frac{21}{2}a^2$</td><td>$18a^2$</td></tr>
<tr><td>Distance from AD</td><td>$\frac{2}{3}\times 3a = 2a$</td><td>$\frac{1}{3}\times 3a = a$</td><td>$d$</td></tr>
</table>
<table>
<tr><td></td><td>Triangle ABD</td><td>Triangle ACD</td><td>Trapezium</td></tr>
<tr><td>Mass</td><td>$\frac{7a\times 3a}{2}=\frac{21}{2}a^2$</td><td>$\frac{5a\times 3a}{2}=\frac{15}{2}a^2$</td><td>$18a^2$</td></tr>
<tr><td>Distance from AD</td><td>$\frac{1}{3}\times 3a = a$</td><td>$\frac{2}{3}\times 3a = 2a$</td><td>$d$</td></tr>
</table>
</td><td></td></tr>
<tr><td></td><td>Moments about AD</td><td>M1</td></tr>
<tr><td></td><td>$15a^2\times\frac{3}{2}a+3a^2\times a=18a^2d$</td><td>A1</td></tr>
<tr><td></td><td>$\frac{51}{2}a=18d\Rightarrow d=\frac{17a}{12}$ *</td><td>A1*</td></tr>
<tr><td></td><td></td><td>(5)</td></tr>
<tr><td>4(b)</td><td>$\bar{x}=\frac{9}{2}a$</td><td>B1</td></tr>
<tr><td></td><td>Moments about PS or a parallel axis for Lamina</td><td>M1</td></tr>
<tr><td></td><td>From PS: $27a^2\bar{y}=45a^2\times 2.5a-18a^2\left(a+\frac{17}{12}a\right)$

From AD: $27a^2\bar{Y}=45a^2\times 1.5a-18a^2\left(\frac{17}{12}a\right)$</td><td>A1
A1</td></tr>
<tr><td></td><td>$\bar{y}=\frac{69}{27}a=\frac{23}{9}a$</td><td>A1</td></tr>
<tr><td></td><td>Expression for relevant angle</td><td>M1</td></tr>
</table>

	$\tan\theta° = \frac{\bar{y}}{"\left(9a/2\right)"} \quad \left(=\frac{46}{81}\right)$	
	$\theta = 29.6$	A1
		(7)
		(12)
	Notes	
4(a)		
B1	Correct mass ratio.	
B1	Correct distances from *AD*, for an appropriate division of *ABCD* Distances may be measured from a parallel axis	
M1	Dimensionally consistent equation with all required terms. Accept working from a parallel axis. Accept an equation embedded in vector form.	
A1	Correct unsimplified equation. Accept embedded in vector form.	
A1*	Obtain given answer from correct working. Working must include simplification or rearrangement (may be seen from table to equation). Answer must be extracted from vector form and have *d* =	
4(b)		
B1	Distance of c of m of lamina from *PQ* seen or implied. May not be seen until the trig ratio.	
M1	Complete method to find c of m of Lamina (remaining mass) from *PS* or a parallel axis. Dimensionally consistent equation containing all required terms. If one distance is from *PS* and the other is from *AD*, treat as an accuracy error.	
A1	Unsimplified equation for *PS* or their parallel axis, with at most one error	
A1	Correct unsimplified equation for *PS* or their parallel axis.	
A1	Correct distance of c of m from *PS*, $2.6a$ or better	
M1	Correct use of trig for a relevant angle where $"\left(9a/2\right)"$ is their distance of the c of m of the lamina from *PQ* and $\bar{y}$ is their **calculated** distance from *PS*. Allow with both *a*'s or neither. Allow reciprocal.	
A1	30 or better (29.59229…) cao	