Question	Scheme	Marks
10(a)	(i) $\overrightarrow{AB} = -\overrightarrow{OA} + \overrightarrow{OB} \Rightarrow \overrightarrow{AB} = -2\mathbf{a} + 4\mathbf{b}$	B1
	(ii) $\overrightarrow{MY} = \overrightarrow{MA} + \frac{3}{4}\left(\overrightarrow{AB}\right) = \mathbf{a} + \frac{3}{4}(-2\mathbf{a} + 4\mathbf{b}) = -\frac{\mathbf{a}}{2} + 3\mathbf{b}$	M1A1 [4]
(b)	$\overrightarrow{OX} = \mu\overrightarrow{OB} = \mu 4\mathbf{b}$	M1
	$\overrightarrow{OX} = \overrightarrow{OM} + \overrightarrow{MX} = \overrightarrow{OM} + \lambda\overrightarrow{MY} = \mathbf{a} + \lambda\left(-\frac{\mathbf{a}}{2} + 3\mathbf{b}\right) = \mathbf{a}\left(1 - \frac{\lambda}{2}\right) + 3\lambda\mathbf{b}$	M1
	$\Rightarrow \mu 4\mathbf{b} = \mathbf{a}\left(1 - \frac{\lambda}{2}\right) + 3\mathbf{b}$	dM1
	$\Rightarrow 1 - \frac{\lambda}{2} = 0 \Rightarrow \lambda = 2$	
	$\Rightarrow 4\mu = 3\lambda \Rightarrow \mu = \frac{6}{4} = \frac{3}{2}$	ddM1
	$OB : OX = 2 : 3$ oe	A1 [5]
	ALT – working with alternative vector within triangle *OMX*	
	$\overrightarrow{MX} = \overrightarrow{MO} + \overrightarrow{OB} + \mu\overrightarrow{OB} = -\boldsymbol{a} + 4\boldsymbol{b} + \mu 4\boldsymbol{b}$	[M1
	$\overrightarrow{MX} = \lambda\left(-\frac{\boldsymbol{a}}{2} + 3\boldsymbol{b}\right)$	M1
	$\Rightarrow -\boldsymbol{a} = -\frac{\lambda\boldsymbol{a}}{2} \quad \Rightarrow \quad \lambda = 2$	dM1
	$\Rightarrow 4\boldsymbol{b} + \mu 4\boldsymbol{b} = 3\lambda\mathbf{b} \quad \Rightarrow \quad \mu = \frac{1}{2}$	ddM1
	$OB : OX = 2 : 3$ oe	A1]
(c)	$\frac{\Delta YBX}{\Delta ABX} = \frac{1}{4}$	M1
	$\frac{\Delta ABX}{\Delta OAX} = \frac{1}{3}$	
	$\Rightarrow \frac{\Delta YBX}{\Delta OAX} = \frac{1}{4} \times \frac{1}{3} = \frac{1}{12} \Rightarrow \Delta YBX : \Delta OAX = 1:12$	M1A1 [3]
	ALT – working with relative areas of triangles	
	Area $\Delta YBX = a$ Area $\Delta ABX = 4a$ Area $\Delta OMX = 6a$ Area $\Delta AYX = 3a$ Area $\Delta OAY = 6a$ Area $\Delta OYB = 2a$	[M1
	Area $\Delta OAX = 12a$	M1
	$\Delta YBX : \Delta OAX = 1:12$	A1]
		Total 11 marks

Part	Mark	Notes
(a)	B1	For the correct simplified vector $\overrightarrow{AB}$
	M1	For the correct vector statement for $\overrightarrow{MY}$
	A1	For the correct simplified vector for $\overrightarrow{MY}$
(b)	M1	For the statement $\overrightarrow{OX} = \mu 4\mathbf{b}$ Note: this is a B mark on epen.
	M1	For the correct vector for $\overrightarrow{OX}$ (ft their MY)
	dM1	For equating both vectors for $\overrightarrow{OX}$ and for comparing coefficients of **a** and **b** Dep on M1M1
	ddM1	For finding a value for their parameter for μ Note: there is no mark for only finding λ, they must find μ Dep on M1M1M1
	A1	For the correct ratio $OB:OX = 2:3$ Allow equivalent ratios e.g. 4 : 6, 1 : 1.5
	ALT – working with alternative vector within triangle OMX	
	M1	For a vector statement which includes $\mu 4\boldsymbol{b}$ (for OX or BX) (ft their MY) Note: this is a B mark on epen.
	M1	For a correct second vector equation for the same vector (ft their MY)
	dM1	For equating both vectors and comparing coefficients of **a** and **b** Dep on M1M1
	ddM1	For finding a value for their parameter for μ Note: there is no mark for only finding λ, they must find μ Dep on M1M1M1
	A1	For the correct ratio $OB:OX = 2:3$ Allow equivalent ratios e.g. 4 : 6, 1 : 1.5 Condone $OX:OB = 3:2$ if clearly stated, but not just 3:2
(c)	M1	For either the relationship between the of areas of triangles BYX and ABX **or** the relationship between the areas of triangles ABX and OAX
	M1	For finding the relationship between the of areas of triangles BYX and OAX
	A1	For the correct ratio [1:12] Allow equivalent ratios. Note: do not penalise answer given as a fraction i.e. $\frac{1}{12}$ if already penalised in (b).
	ALT – working with relative areas	
	M1	For assigning a value to one triangle area and writing a second area in terms of this. Note: This could also follow from working with area of a triangle $= \frac{1}{2}ab\sin C$

		e.g. $\Delta YBX = ½\, yz \sin B$ and $\Delta ABX = \frac{1}{2}y(4z)\sin B$
	M1	For finding the relationship between the of areas of triangles *BYX* and *OAX* Note: This could also follow from working with area of a triangle $= \frac{1}{2}ab\sin C$ e.g. $\Delta YBX = ½\, yz \sin B$ and $\Delta ABX = \frac{1}{2}y(4z)\sin B$
	A1	For the correct ratio [1:12] Allow equivalent ratios. Note: do not penalise answer given as a fraction i.e. $\frac{1}{12}$ if already penalised in (b).

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