Question number	Scheme	Marks
9 (a)	$\overrightarrow{AB} = \overrightarrow{AD} + \overrightarrow{DB} = 2\mathbf{a} + \mathbf{b} - \ -4\mathbf{a} - \mathbf{b}\ = 6\mathbf{a} + 2\mathbf{b}$ or $2\ 3\mathbf{a} + \mathbf{b}$ oe	B1
	$\overrightarrow{DC} = \overrightarrow{DB} + \overrightarrow{BC} = 4\mathbf{a} + \mathbf{b} + \frac{1}{3}\mathbf{b} = \left(4\mathbf{a} + \frac{4}{3}\mathbf{b}\right)$ or $\frac{4}{3}(3\mathbf{a} + \mathbf{b})$	B1
	$\overrightarrow{AB} = \frac{3}{2}\overrightarrow{DC}$ so $\overrightarrow{AB}$ is a multiple of $\overrightarrow{DC}$	M1
	Conclusion: Therefore, *DC* parallel to *AB*)	A1
		[4]
(b)	$\overrightarrow{AC} = 2\mathbf{a} + \mathbf{b} + '\left(4\mathbf{a} + \frac{4}{3}\mathbf{b}\right)' = \left[6\mathbf{a} + \frac{7}{3}\mathbf{b}\right]$	M1
	$\overrightarrow{AY} = \lambda\text{“}\overrightarrow{AC}\text{”}$ $(= \lambda\text{”}(6\mathbf{a} + \frac{7}{3}\mathbf{b})\text{”})$	M1
	$\overrightarrow{AY} = \overrightarrow{AD} + \mu\overrightarrow{DB}$ $(= 2\mathbf{a} + \mathbf{b} + \mu(4\mathbf{a} + \mathbf{b}))$ or $\overrightarrow{AY} = \text{“}\overrightarrow{AB}\text{”} + \alpha\overrightarrow{BD}$ $(= \text{“}6\mathbf{a} + 2\mathbf{b}\text{”} + \alpha(-4\mathbf{a} - \mathbf{b}))$	M1
	$2 + 4\mu = 6\lambda$ or $6 - 4\alpha = 6\lambda$ $1 + \mu = \frac{7}{3}\lambda$ $1 + \mu = \frac{7}{3}\lambda$	M1
	$\lambda = \frac{3}{5}$ or $\mu = \frac{2}{5}$ or $\alpha = \frac{3}{5}$	A1
	$\overrightarrow{AY} = \frac{18}{5}\mathbf{a} + \frac{7}{5}\mathbf{b}$ or $\overrightarrow{AY} = \frac{1}{5}(8\mathbf{a} + 7\mathbf{b})$	A1cao
		[6]
		Total 10 marks

Part	Mark	Additional Guidance
(a)	B1	For stating a valid vector for $\overrightarrow{AB} = 6\mathbf{a} + 2\mathbf{b}$ [accept simplified or unsimplified] **NB: This is an M mark in Epen**
	B1	For stating a valid vector for $\overrightarrow{DC} = \frac{4}{3}(3\mathbf{a} + \mathbf{b})$ [accept simplified or unsimplified] **NB: This is an A mark in Epen**
	M1	For comparing their two vectors and establishing that $\overrightarrow{DC}$ and $\overrightarrow{AB}$ are multiples of each other .i.e. $\overrightarrow{AB} = \frac{3}{2}\overrightarrow{DC}$ oe **NB** This statement must be correct! **Incorrect directions.** Award this mark if they are comparing for example; $\overrightarrow{CD}$ and $\overrightarrow{AB}$ or $\overrightarrow{CD}$ and $\overrightarrow{BA}$ and ft their incorrect direction for the M mark.

	A1ft	For a conclusion that the vectors are therefore parallel. Allow for example $\overrightarrow{AB} = -6\mathbf{a} - 2\mathbf{b}$ and $\overrightarrow{DC} = \frac{4}{3}(3\mathbf{a} + \mathbf{b})$ are therefore parallel Accept a very brief conclusion even if it is just the word 'shown' or 'QED' or even '#' or a tick.
(b)	Part (b) can be done in a number of different ways – use the following as general principles to mark, referring also to the scheme and additional guidance for the example given, to determine when each mark should be awarded	
	M1	For any simplified or un-simplified vector along AC $\overrightarrow{AC} = 2\mathbf{a} + \mathbf{b} + '\left(4\mathbf{a} + \frac{4}{3}\mathbf{b}\right)' = \left[6\mathbf{a} + \frac{7}{3}\mathbf{b}\right]$ For this mark allow $\overrightarrow{CA} = -6\mathbf{a} - \frac{7}{3}\mathbf{b}$ as it is possible to use this to find $\overrightarrow{AY}$ This mark can be implied by a correct vector for $\overrightarrow{AY}$ e.g. $\overrightarrow{AY} = \lambda\left[6\mathbf{a} + \frac{7}{3}\mathbf{b}\right]$
	M1	Uses their vector for $\overrightarrow{AC}$ to write a vector for $\overrightarrow{AY}$ by introducing a parameter e.g. $\overrightarrow{AY} = \lambda\left[6\mathbf{a} + \frac{7}{3}\mathbf{b}\right]$
	M1	States a second valid vector path for $\overrightarrow{AY}$ introducing a second parameter that can be used with the first vector path [to solve an equation to find their parameters]. Note: this mark is awarded only for stating the vector path, but it must be valid – i.e. able to be used to find the parameters. This second parameter cannot be 1 – their first parameter.
	dddM1	Equating components and reaching a value for any of their parameters. Allow arithmetical slips in processing their simultaneous equations. This is dependent on all previous method marks.
	A1	Any one correct value for one of their two parameters.
	A1	For $\overrightarrow{AY} = \frac{18}{5}\mathbf{a} + \frac{7}{5}\mathbf{b}$

USEFUL SKETCH