Question			Answer	Mark	AO	Guidance
4	(a)		$[\overrightarrow{AM} =] \begin{pmatrix}4\\1\end{pmatrix} - \begin{pmatrix}2\\-3\end{pmatrix} [= \begin{pmatrix}2\\4\end{pmatrix}]$	B1	1.1	soi, or for $\overrightarrow{OB} = \begin{pmatrix}6\\5\end{pmatrix}$ or for $\overrightarrow{AB} = \begin{pmatrix}4\\8\end{pmatrix}$
			$\overrightarrow{OC} = \overrightarrow{OA} + 4\overrightarrow{AM}$ or $\overrightarrow{OC} = \overrightarrow{OM} + 3\overrightarrow{AM}$ or $\overrightarrow{OC} = \overrightarrow{OB} + \overrightarrow{AB}$ or $\overrightarrow{OC} = \overrightarrow{OB} + 2\overrightarrow{AM}$	M1	1.1	Attempt at a complete method for $\overrightarrow{OC}$ (may be implied by A1 in this case, following B1). This addition may be implied by a clear diagram or appropriate sum (i.e. vector notation not needed).
			$= \begin{pmatrix}10\\13\end{pmatrix}$	A1 [3]	1.1	Allow $10\mathbf{i} + 13\mathbf{j}$ **SCB1** for $\begin{pmatrix}10\\13\end{pmatrix}$ without working (max 1/3)
4	(b)	(i)	$\sqrt{20}$	B1 [1]	1.1	oe e.g. $2\sqrt{5}$ (must be exact)
4	(b)	(ii)	$\overrightarrow{OQ} = -2\mathbf{i} + 4\mathbf{j} + k(3\mathbf{i} - \mathbf{j})$	B1 [1]	1.1	oe e.g. $(-2 + 3k)\mathbf{i} + (4 - k)\mathbf{j}$ Allow as column vector. ISW incorrect simplification following a correct answer
4	(b)	(iii)	$(-2 + 3k)^2 + (4 - k)^2$	B1FT	2.1	FT their $\overrightarrow{OQ}$ in this expression (may be embedded)
			$(-2 + 3k)^2 + (4 - k)^2 = 20$	M1*	1.1	Set = 20 to form a quadratic equation in k (FT their 20 but must be their answer to **(b)(i)** squared or with √ both sides as appropriate). Do not allow with **i** and **j**.
			$10k^2 - 20k = 0$ or $10k^2 - 20k + 20 = 20$	M1 dep*	1.1	Rearrange their quadratic correctly to solvable form
			$k = 2$ **and** $k = 0$	A1 [4]	1.1	For both (AG for $k = 0$)

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4	(b)	(iv)	Q is at P	**B1** **[1]**	**3.2a**	oe - Allow: • "(Q is) exactly where P is" or "It is at P" B1 • "the vector (-2,4) is the same as $\overrightarrow{OP}$" B1 (BOD) • $\overrightarrow{OQ} = \overrightarrow{OP}$ B1 Condone "$Q = P$" B1 BOD • "Q and P would be the same" (not spoilt if candidates go on to say 'which is not possible' oe) Do not allow: • "k can't be 0" or "Q is at the origin" B0 • "k can't be 0 because Q and P are different" • "Q is on the x-axis" (or "y-axis") B0