Question	Scheme	Marks	AOs
3(a)	$\left(\left\|\overrightarrow{OA}\right\|=\right)\sqrt{5^2+3^2+2^2}\ =\sqrt{38}$ *	B1*	1.1b
		(1)	
(b)	$\left\|\overrightarrow{OB}\right\|=\sqrt{2^2+4^2+a^2}\ =\sqrt{20+a^2}$ so when $a=5$ $\left\|\overrightarrow{OB}\right\|=\sqrt{20+25}=\sqrt{45}$	M1	1.1b
	$=5$	A1cso	2.3
		(2)	
		(3 marks)	

Notes

(a)

B1*: Shows the magnitude of $\overrightarrow{OA}$ is $\sqrt{38}$. Must see $\sqrt{5^2+3^2+2^2}$ or e.g. $\sqrt{25+9+4}$. We need to see

how   the value 38 or $\sqrt{38}$ is formed using the three components. Withhold this mark for incorrect

working such as $\left\|\overrightarrow{OA}\right\|=5^2+3^2+2^2=38\Rightarrow\left\|\overrightarrow{OA}\right\|=\sqrt{38}$ but do not penalise poor notation to denote

vectors or the magnitude as long as the intention is clear as to what they are finding (OA instead of

$\left\|\overrightarrow{OA}\right\|$ is fine). Do not penalise if their square root does not go fully over all three terms as long as the

intention is clear. May find $\left\|\overrightarrow{AO}\right\|$ instead which is acceptable.

$\left(\left\|\overrightarrow{OA}\right\|^2=\right)25+9+4=38\Rightarrow\left(\left\|\overrightarrow{OA}\right\|=\right)\sqrt{38}$ scores B1 (we see how 38 is found)

$\left(\left\|\overrightarrow{OA}\right\|^2=\right)25+9+4\Rightarrow\sqrt{38}$ scores B1 (we see how 38 is found)

$25+9+4=\sqrt{38}$ scores B0 (they are not equal)

$\left(\left\|\overrightarrow{OA}\right\|^2=\right)38\Rightarrow\left(\left\|\overrightarrow{OA}\right\|=\right)\sqrt{38}$ scores B0 (no method seen to show how 38 is found)

(b)

M1: Attempts to find $\left\|\overrightarrow{OB}\right\|$ (or $\left\|\overrightarrow{OB}\right\|^2$) in terms of a and substitutes in a positive integer for a to find a value

for $\left\|\overrightarrow{OB}\right\|$ (or $\left\|\overrightarrow{OB}\right\|^2$). e.g. $\left\|\overrightarrow{OB}\right\|=\sqrt{20+a^2}\Rightarrow$ when $a=2\Rightarrow\sqrt{24}$. Also accept e.g. $\left\|\overrightarrow{BO}\right\|$ (or $\left\|\overrightarrow{BO}\right\|^2$).

Alternatively sets up an equation or an inequality e.g. $\sqrt{20+a^2}>\sqrt{38}$ and proceeds to $a^2>...$ (or

$a^2=...$) . Condone sign slips in their rearrangement only.

Allow the use of $=$, $<$ or $>$ for this mark. $"20"+a^2...38\Rightarrow a^2..."18"$

(may be implied by sight of $\sqrt{18}=4.24...$)

A1: 5 cso (answer on its own with no incorrect working seen scores M1A1). Withhold this mark if $\left\|\overrightarrow{OB}\right\|$

(or $\left\|\overrightarrow{OB}\right\|^2$) is incorrect (or $\left\|\overrightarrow{BO}\right\|$ or $\left\|\overrightarrow{BO}\right\|^2$) . Do not be concerned with the notation as long as the

intention is clear or implied as to what they are trying to calculate (the calculations must be correct)

Withhold this mark if at any point they set $\left\|\overrightarrow{OB}\right\|<\left\|\overrightarrow{OA}\right\|$ but accept an argument leading to an answer of

5 from either $\left\|\overrightarrow{OB}\right\|>\left\|\overrightarrow{OA}\right\|$ or $\left\|\overrightarrow{OB}\right\|=\left\|\overrightarrow{OA}\right\|$