Question	Scheme	Marks	AOs
14(a)	Attempts to find $\lvert\overrightarrow{OA}\rvert$ and uses the cosine rule in an attempt to find $\lvert\overrightarrow{AB}\rvert$.	M1	3.1a
	$\lvert\overrightarrow{OA}\rvert = \sqrt{3^2+4^2} = 5$	B1	1.2
	$\lvert\overrightarrow{AB}\rvert^2 = 5^2 + 10^2 - 2(5)(10)\cos 60° \Rightarrow \lvert\overrightarrow{AB}\rvert = ...$	M1	1.1b
	$\lvert\overrightarrow{AB}\rvert = 5\sqrt{3}$ *	A1*	1.1b
		(4)	
(b)	$\left(5\sqrt{3}\right)^2 = \left(4\sqrt{3}\right)^2 + p^2$	M1	1.1b
	$p = 3\sqrt{3}$	A1	1.1b
	$\overrightarrow{OB} = \overrightarrow{OA} + \overrightarrow{AB} = 3\mathbf{i} - 4\mathbf{j} + \left(-4\sqrt{3}\right)\mathbf{i} + \left(-3\sqrt{3}\right)\mathbf{j}$	dM1	2.1
	$\overrightarrow{OB} = \left(3-4\sqrt{3}\right)\mathbf{i} + \left(-4-3\sqrt{3}\right)\mathbf{j}$	A1	2.5
		(4)	
			(8 marks)

Notes:

(a)

M1: An overall problem-solving mark, condoning slips, for using the given information in an attempt to

- find $\lvert\overrightarrow{OA}\rvert$
- use the cosine rule to find $\lvert\overrightarrow{AB}\rvert$

B1: $\lvert\overrightarrow{OA}\rvert = 5$ seen.

M1: Attempts to use the cosine rule to find $\lvert\overrightarrow{AB}\rvert$.

A1*: Complete solution showing all steps. There is no need to see any working for $\lvert\overrightarrow{OA}\rvert = 5$ but it should be stated or seen on a diagram as a minimum.

(b)

M1: Attempts to find *p* using Pythagoras' Theorem with $\lvert\overrightarrow{AB}\rvert = 5\sqrt{3}$

A1: $p = 3\sqrt{3}$ or $\sqrt{27}$ or awrt 5.2

dM1: Attempts to use $\overrightarrow{OB} = \overrightarrow{OA} - \overrightarrow{BA}$ with their *p*.
Condone slips but there must be a clear attempt to subtract the two vectors the correct way round.

A1: $\overrightarrow{OB} = \left(3-4\sqrt{3}\right)\mathbf{i} + \left(-4-3\sqrt{3}\right)\mathbf{j}$ only.

(b) Alternative

M1: Attempts to find *p* using Pythagoras' Theorem with $\lvert\overrightarrow{OB}\rvert = 10$

For reference: $\left(3-4\sqrt{3}\right)^2 + \left(-4-p\right)^2 = 100$; $p^2 + 8p - 27 - 24\sqrt{3} = 0$

A1: $p = 3\sqrt{3}$ or $\sqrt{27}$ or awrt 5.2

dM1: Attempts to use $\overrightarrow{OB} = \overrightarrow{OA} - \overrightarrow{BA}$ with their *p*.

Condone slips but there must be a clear attempt to subtract the two vectors the correct way round.

A1: $\overrightarrow{OB} = \left(3 - 4\sqrt{3}\right)\mathbf{i} + \left(-4 - 3\sqrt{3}\right)\mathbf{j}$ only.