Question Number	Scheme	Marks
7.	$\sqrt{5}\cos\theta - 2\sin\theta \equiv R\cos(\theta + \alpha)$	
(a)	$R = 3$	B1
	$\tan\alpha = \dfrac{2}{\sqrt{5}}, \Rightarrow \alpha = \text{awrt } 0.7297 \text{ (4 sf)}$	M1, A1
		(3)
(b)	$3\cos(\theta + 0.7297) = 0.5 \Rightarrow \cos(\theta + 0.7297) = \dfrac{0.5}{3}$	M1
	$\Rightarrow \theta_1 = 0.674 \text{ (3 sf)}$	A1
	$\theta_2 + \text{"0.7297"} = \text{"}-1.4033\text{"} \Rightarrow \theta_2 = \ldots$	dM1
	$\Rightarrow \theta_2 = -2.13 \text{ (3 sf)}$	A1
		(4)
(c)	E.g. $\begin{matrix}3A + B = 33 \\ -3A + B = -15\end{matrix}$ or $\begin{matrix}3A + B = -15 \\ -3A + B = 33\end{matrix}$ or $B = \dfrac{33 - 15}{2} = \ldots$ $\Rightarrow A = \ldots$ or $B = \ldots$	M1
	$A = 8, B = 9$ and $A = -8, B = 9$	A1A1A1
		(4)
		(11 marks)

Notes

(a)

B1: For $R = 3$ stated or seen in their expression. $\sqrt{9}$ is B0. ± 3 is B0.

M1: $\tan\alpha = \pm\dfrac{2}{\sqrt{5}}$, $\tan\alpha = \pm\dfrac{\sqrt{5}}{2} \Rightarrow \alpha = \ldots$

Also allow $\cos\alpha = \pm\dfrac{\sqrt{5}}{3}$ or $\pm\dfrac{2}{3}$, $\sin\alpha = \pm\dfrac{2}{3}$ or $\pm\dfrac{\sqrt{5}}{3} \Rightarrow \alpha = \ldots$, where "3" is their R

Note the M may be scored if they find α in degrees (41.8°).

A1: $\alpha = \text{awrt } 0.7297 \text{ (4 sf)}$. No need to state the full expression for this mark.

(b)

M1: Uses part (a) and proceeds to $\cos(\theta + \text{"0.7297"}) = \dfrac{0.5}{\text{"3"}}$. Must see some working, but may be implied by $\theta \pm \text{"0.7297"} = 1.4033$ or $\theta \pm \text{"0.7297"} = \cos^{-1}\left(\dfrac{0.5}{\text{their 3}}\right)$

A1: Achieves a correct value for θ of awrt 0.674

dM1: Correct method for a second angle, usually given for θ_2 + their 0.7297 = − their 1.4033 $\Rightarrow \theta_2 = \ldots$

May be implied but the previous M must have been gained. If working in degrees as long as they are consistently in degrees.

A1: $\Rightarrow \theta_2 = \text{awrt} -2.13 \text{ (3 sf)}$ but withhold if there are extra solutions in the range and first A scored.

For candidates who work consistently in degrees in (a) and (b) allow awrt 38.6° for the first A in (b) or awrt – 122° for the second A mark if the first A was lost due to error (i.e. max one A mark).

(c)

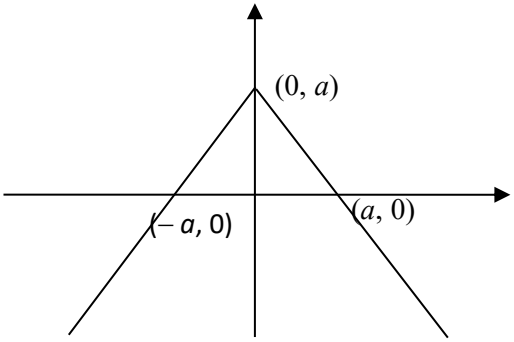
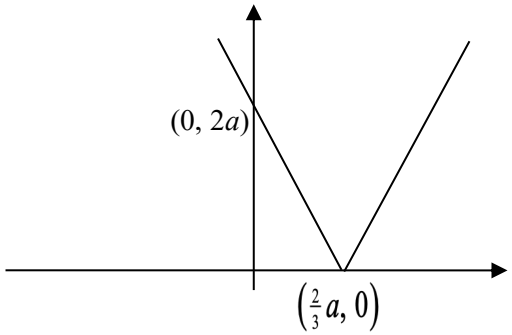
M1: Correct method to find at least one value. E.g. writes down at least one pair of simultaneous equations (or in-equations) of form $-15 = kA + B$, $33 = -kA + B$ or uses B is mean value of end points other suitable working or equation and finds at least one of $A = \ldots$ or $B =$

Note correct value for A or B implies M1A1 (with no incorrect working for it)

A1: At least one of $A = 8$, $B = 9$ or $A = -8$

A1: At least two of $A = 8$, $B = 9$ or $A = -8$

A1: For all three of $A = 8$, $B = 9$ and $A = -8$ and no other values.

Question Number	Scheme		Marks
8(a) (i)		Correct $\wedge$ shape, any position	B1
		Correct diagram with intercepts correctly placed	B1
(ii)		Correct $\vee$ shape, any position	B1
		Correct diagram with intercepts correctly placed	B1
			(4)
(b)	$a-x=3x-2a \Rightarrow x=...$ **or** $a-x=-3x+2a \Rightarrow x=...$		M1
	$x=\frac{3}{4}a$ **or** $x=\frac{1}{2}a$		A1
	$a-x=3x-2a \Rightarrow x=...$ **and** $a-x=-3x+2a \Rightarrow x=...$		dM1
	$x=\frac{3}{4}a$ **and** $x=\frac{1}{2}a$		A1
			(4)
			(8 marks)

Notes

(a)(i)

B1: For a correct $\wedge$ shape in any position. Condone if not quite symmetric.

B1: Fully correct sketch, and must continue below the x axis, with correct intercepts in terms of a either marked on the graph or correctly stated. No need for the 0 coordinate if labelled on the graph. Condone coordinates the wrong way round (eg $(a,0)$ instead of $(0, a)$) only if they are in the correct positions on the graph. Condone if not quite symmetric.

(ii)

B1: For a correct v shape in any position, condone if it does not cross the y axis. Condone if not quite symmetric. Condone a Y shape as benefit of doubt as an attempt to form the graph.

B1: Fully correct sketch, must continue into second quadrant with same conditions for intercepts as above. Condone if not quite symmetric.

If multiple graphs are drawn on the same axes in (a), if they are labelled score for the graph labelled with correct function/part number. If there is no labelling you may apply bod for the first B only.