Question Number	Scheme	Marks
2(a)	Gradient $= \dfrac{8-5}{7\sqrt{3}-\left(-2\sqrt{3}\right)}$ o.e.	M1
	e.g. $\Rightarrow \dfrac{3}{9\sqrt{3}} \times \dfrac{\sqrt{3}}{\sqrt{3}} = \dfrac{\sqrt{3}}{9}$	A1
		(2)
(b)	$\dfrac{1}{9}\sqrt{3} \rightarrow -\dfrac{9}{\sqrt{3}}$	B1ft
	$y-5 = "-\dfrac{9}{\sqrt{3}}"\left(x+2\sqrt{3}\right)$	M1
	$y = -3\sqrt{3}x - 13$	A1
		(3)
		(5 marks)

(a) Note $\dfrac{1}{9}\sqrt{3}$ with no working seen is M0A0

M1 Finds a correct expression for the gradient between *A* and *B* **which must not be of the form** $p\sqrt{3}$ where *p* is a rational constant e.g. $\dfrac{3}{9\sqrt{3}}$

We are not allowing sign slips when substituting in the coordinates for this mark. May subtract the other way round which is fine as long as it is consistent i.e. $\dfrac{5-8}{-2\sqrt{3}-7\sqrt{3}}$

Allow any version of the final answer which is not of the form $p\sqrt{3}$ where *p* is a rational constant to score.

May alternatively form two simultaneous equations ($5 = -2\sqrt{3}m + c$ and $8 = 7\sqrt{3}m + c$) and proceed to e.g. $\dfrac{8-5}{7\sqrt{3}-\left(-2\sqrt{3}\right)}$ or e.g. $\dfrac{3}{9\sqrt{3}}$ which must not be of the form $p\sqrt{3}$ where *p* is a rational constant.

Note working leading to e.g. $3 = m \times 9\sqrt{3} \Rightarrow m = \dfrac{\sqrt{3}}{9}$ is M0A0 (it is not of an allowable form before achieving the required answer)

A1 $p\sqrt{3}$ where *p* is a rational constant which does not have to be simplified e.g. $\dfrac{1}{9}\sqrt{3}$ or $\dfrac{\sqrt{3}}{9}$ or $\dfrac{3}{27}\sqrt{3}$ or $\dfrac{27}{243}\sqrt{3}$. It must come from a correct method and evidence of rationalising the denominator seen (they cannot just use their calculator)

Minimum working required e.g. $\dfrac{3}{9\sqrt{3}} \times \dfrac{\sqrt{3}}{\sqrt{3}} = \dfrac{\sqrt{3}}{9}$ or e.g. $\dfrac{3}{9\sqrt{3}} = \dfrac{3\sqrt{3}}{27}\left(= \dfrac{\sqrt{3}}{9}\right)$ is M1A1

Allow e.g. $\dfrac{3}{9\sqrt{3}} = \dfrac{1}{3\sqrt{3}} = \dfrac{\sqrt{3}}{9}$ to score M1A1 (cancelling first before rationalising)

(b) Full marks can be scored in this part even if insufficient working is shown in part (a) to find the correct gradient.

B1ft Correct perpendicular gradient to l_1 or follow through the negative reciprocal of their gradient from part (a), which may be an earlier form rather than their final answer.
May be implied by further work. Do not withhold this mark if they have a correct unsimplified expression for the perpendicular gradient, but make manipulation or transcription errors in further work.

M1 Attempts to find the equation of the perpendicular line through A using a changed gradient. Allow one sign slip on the coordinates. If they use $y = mx + c$ then they must proceed as far as $c = ...$ (you do not need to check the mechanics of the rearrangement of this)

A1 $y = -3\sqrt{3}x - 13$ o.e. e.g. $y = -\frac{9}{\sqrt{3}}x - 13$ isw once a correct equation of the required form is found.

Question Number	Scheme	Marks
3(a)	$58^2 = a + 5^3 \times b$, $65^2 = a + 10^3 \times b \Rightarrow a = ...$, or $b = ...$	M1
	$a = 3241,\ b = 0.984$	A1A1
		(3)
(b)	e.g. $85^2 = "3241" + "0.984" \times T^3 \Rightarrow T = ...$	M1
	$(T =)$ awrt 15.9	A1
		(2)
		(5 marks)

If the equation is misread and used consistently throughout the question with either indices of 2 or 3 e.g. $P^3 = a + bt^2$ or e.g. $P^2 = a + bt^2$ then only allow the M marks to be scored. The equation must be seen.

Note candidates who work with 58000 and 65000 in (a) and 85000 in (b) can score maximum (a) M0A0A0 (b) M1A1 for 15.9

(a) **Note that correct values for *a* and *b* scores full marks.**

M1 Forms two simultaneous equations in *a* and *b* (at least one equation must be correct) and proceeds to find a value for *a* (must be positive) or a value for *b* (which may be directly from a calculator).
May see e.g. $3364 = a + 125b$ or e.g. $4225 = a + 1000b$
You do not need to check the mechanics of any rearrangement.

A1 One of $a = 3241,\ b = 0.984$ (or $\frac{123}{125}$) (may be embedded in the equation)

A1 $a = 3241,\ b = 0.984$ (or $\frac{123}{125}$) (may be embedded in the equation) isw once the correct values paired correctly with *a* and *b* are seen.

SC $b = 3241,\ a = 0.984$ (wrongly paired) score M1A1A0

(b) **Note candidates who work with 58000 and 65000 in (a) and 85000 in (b) can score maximum (a) M0A0A0 (b) M1A1 for 15.9**

Note awrt 15.9 with no working is M0A0

M1 Forms a correct equation for their *a* and their *b* and proceeds to find a value for *T*
Condone use of 3240 (3241 to 3sf)

If their *a* is 3 241 000 000 (or 3 240 000 000 to 3sf) and *b* is 984 000 condone miscopying/transcription errors provided the intention was clear to use these.

A1 awrt 15.9 following a correct equation seen. isw if they subsequently round to e.g. 16
Allow awrt 15.9 using 85000 if their *a* is 3 241 000 000 (or 3 240 000 000 to 3sf) and *b* is 984 000