Question Number	Scheme	Marks
2. (a)	$5(x+3)>4(2x-5)\Rightarrow 5x+15>8x-20\Rightarrow ax>b$ or $px<q$	M1
	$\Rightarrow x<\frac{35}{3}$	A1
		(2)
(b) (i)	$x^2-6x+1=(x-3)^2\pm...=(x-3)^2-8$	M1, A1
(ii)	$(x-3)^2-8=0\Rightarrow x=3+\sqrt{8}$ or $3-\sqrt{8}$	M1
	$x^2-6x+1\geqslant 0\Rightarrow x\leqslant 3-\sqrt{8}, x\geqslant 3+\sqrt{8}$	A1
		(4)
(c)	$x\leqslant 3-\sqrt{8},\ 3+\sqrt{8}\leqslant x<\frac{35}{3}$	B1
		(1)
		(7 marks)

This is effectively a non- calculator question and methods must be clearly shown.

(a)

M1: Attempts to expand brackets and then collect terms. Look for

- $5x\pm 15>8x\pm 20$
- followed by $ax>b$ or $px<q$

Also condone with an = sign in place of the inequality

A1: $x<\frac{35}{3}$ or exact equivalent such as $\frac{35}{3}>x$ **following the award of M1.**

Do not accept $x<11.66$ or $x<11.7$ but $x<11.\dot{6}$ is acceptable and ISW after a correct answer

Mark part (b) as one question

(b) (i)

M1: Starts the process by writing x^2-6x+1 as $(x-3)^2\pm c$, where c is a constant (which may not be simplified)

A1: $x^2-6x+1=(x-3)^2-8$. It is acceptable to write this down for the two marks

(b) (ii) **Note that this must follow on from their (b)(i) and CANNOT be restarted via the quadratic formula**

M1: Correctly solves their $(x+a)^2-b=0,\ b>0$ and finds at least one critical value.

Look for an intermediate line of working such as $(x+a)^2=b$ or $x+a=\pm\sqrt{b}$

Do not allow decimals, i.e. awrt 5.83, 0.17 but isw after a correct (exact) answer

It can be implied by an attempt to solve their inequality as long as an intermediate line is seen.

E.g. $(x+a)^2-b\geqslant 0,\ b>0\Rightarrow x+a...\sqrt{b}\Rightarrow x...-a+\sqrt{b}$ where … can even be an incorrect inequality

Again, it is important to see an intermediate line of working.

A1: $x\leqslant 3-\sqrt{8}, x\geqslant 3+\sqrt{8}$ o.e following the award of M1

ISW if this is subsequently changed to decimals. Accept $\sqrt{8}$ as $2\sqrt{2}$

(c)

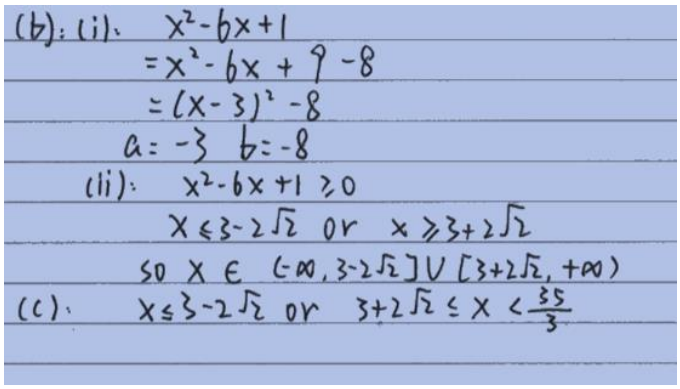
B1: CAO $x \leqslant 3-\sqrt{8},\ 3+\sqrt{8} \leqslant x < \frac{35}{3}$ o.e. It must be given as two separate inequalities.

Allow set notation $\left\{x \in \mathbb{R} : x \leqslant 3-\sqrt{8}\right\} \cup \left\{x \in \mathbb{R} : 3+\sqrt{8} \leqslant x < \frac{35}{3}\right\}$

A list $x < \frac{35}{3},\ x \leqslant 3-\sqrt{8},\quad x \geqslant 3+\sqrt{8}$ is B0.

There must be a correct attempt to state the two separate regions.

Condone a solution with 'and' between. E.g. $x \leqslant 3-\sqrt{8}$ and $3+\sqrt{8} \leqslant x < \frac{35}{3}$



Example of how to mark:
(b)(i) M1, A1: Completely correct

(ii) M0, A0: No intermediate line.
This could have been done on a calculator

(c) B1: Completely correct answer

Question Number	Scheme	Marks
3.(a)	$\left(\frac{dy}{dx}\right) = 3x^2 + \frac{48}{\sqrt{x}}$	M1, A1, A1 **(3)**
(b)	$\left(\frac{d^2y}{dx^2}\right) = 6x - \frac{24}{x^{\frac{3}{2}}}$	M1
	$\Rightarrow x^{\frac{5}{2}} = ...$ $\quad x = 2^{\frac{4}{5}}$	dM1 A1 **(3)** **(6 marks)**

(a)

M1: For reducing a correct power by one any term. So, award for $x^3 \to x^2$, $x^{\frac{1}{2}} \to x^{-\frac{1}{2}}$ or even $5 \to 0$
As in question 1, the indices must be processed

A1: One of the two terms, correct **and** simplified, either $3x^2$ or $+\frac{48}{\sqrt{x}}$ or exact simplified equivalent

A1: CAO $3x^2 + \frac{48}{\sqrt{x}}$ or exact simplified equivalent such as $3x^2 + 48x^{-\frac{1}{2}}$

(b)

M1: For reaching $\left(\frac{d^2y}{dx^2}\right) = Ax \pm \frac{B}{x^{\frac{3}{2}}}$ o.e where A and B are non-zero constants

dM1: Sets their $\frac{d^2y}{dx^2} = Ax \pm \frac{B}{x^{\frac{3}{2}}} = 0$ and proceeds to $x^{\frac{5}{2}} = C$ (or equivalent working) where C is a constant.

Example of equivalent working $x = \frac{4}{x^{\frac{3}{2}}} \Rightarrow x^2 = \frac{16}{x^3} \Rightarrow x^5 = 16$

A1: CAO $x = 2^{\frac{4}{5}}$ following correct $\frac{d^2y}{dx^2}$ with dM1 also being scored. If it is achieved via decimals it is A0

Condone sight of correct work with correct k. E.g. $x^{\frac{5}{2}} = 4 \Rightarrow k = \frac{4}{5}$