LC 2016: Paper 1

Question 2 (25 marks)

Question 2 (a)

Step 1: $\boxed{|x-4| \geq 2}$...Test box

Step 2: $|x-4| = 2$

$x - 4 = \pm 2 \Rightarrow x = 2, 6$

Step 3: Region test

$\leftarrow$	$\boxed{2}$	$\leftrightarrow$	$\boxed{6}$	$\rightarrow$
$\lvert x-4\rvert \geq 2$		$\lvert x-4\rvert \geq 2$		$\lvert x-4\rvert \geq 2$
$0 : \lvert 0-4\rvert \geq 2$		$4 : \lvert 4-4\rvert \geq 2$		$8 : \lvert 8-4\rvert \geq 4$
$4 \geq 2$ [True]		$0 \geq 2$ [False]		$4 \geq 2$ [True]
$\downarrow$				$\downarrow$
$x \leq 2$				$x \geq 6$

Step 4: $x \leq 2,\ x \geq 6,\ x \in \mathbb{R}$

Marking Scheme Notes
Question 2 (a) [Scale 10C (0, 3, 7, 10)]
3: • either side squared
• one correct linear inequality written
• stating range of natural numbers only
7: • correct solutions to quadratic
10: • correct answer without work
Note: use of natural numbers in range merits High Partial Credit at most

Question 2 (b)

$2x + 3y = -1 \Rightarrow x = \dfrac{-1-3y}{2}$...(**1**)

$x^2 + xy + 2y^2 = 4$..(**2**)

$$\left(\frac{-1-3y}{2}\right)^2 + \left(\frac{-1-3y}{2}\right)y + 2y^2 = 4$$

$$\frac{1+6y+9y^2}{4} + \frac{-y-3y^2}{2} + 2y^2 = 4\ [\times 4]$$

$$1 + 6y + 9y^2 - 2y - 6y^2 + 8y^2 = 16$$

$$11y^2 + 4y - 15 = 0$$

$$(11y+15)(y-1) = 0$$

$$\therefore y = -\tfrac{15}{11}, 1$$

$$y = 1 : x = \frac{-1-3(1)}{2} = \frac{-4}{2} = -2$$

$$y = -\tfrac{15}{11} : x = \frac{-1-3(-\frac{15}{11})}{2} = \frac{17}{11}$$

Answer: $(-2, 1), (\tfrac{17}{11}, -\tfrac{15}{11})$

Marking Scheme Notes
Question 2 (b) [Scale 15C (0, 5, 10,15)]
5: • effort to isolate x (or y)
10: • fully correct substitution into quadratic