LC 2012 (Set D): Paper 1

Question 1 (25 marks)

Question 1 (a)

$a^2 - ab + b^2 = 3$.....(Q)

$a + 2b + 1 = 0$.....(L)

$a + 2b + 1 = 0 \Rightarrow a = -2b - 1$

$a^2 - ab + b^2 = 3$

$(-2b-1)^2 - (-2b-1)b + b^2 = 3$

$4b^2 + 4b + 1 + 2b^2 + b + b^2 = 3$

$7b^2 + 5b - 2 = 0$

$(7b - 2)(b + 1) = 0$

$\therefore b = -1, \frac{2}{7}$

$b = -1 : a = -2(-1) - 1 = 2 - 1 = 1$

$b = \frac{2}{7} : a = -2(\frac{2}{7}) - 1 = -\frac{4}{7} - 1 = -\frac{11}{7}$

Solutions: $(1, -1)$, $(-\frac{11}{7}, \frac{2}{7})$

Marking Scheme Notes

Question 1 (a) [Scale 15C (0, 8, 14, 15)]

8:
- Any attempt at trial and error
- Writes a in terms of b, or b in terms of a, and stops
- Any reasonable first step

14:
- Solves for one variable (two values), more or less correctly
- Substitutes $-2b - 1$ for a in the non-linear equation and some further progress
- Substitutes $\frac{-a-1}{2}$ for b in the non-linear equation and some further progress

Question 1 (b)

$\frac{2x-5}{x-3} \leq \frac{5}{2}$

$\frac{2(x-3)^2(2x-5)}{(x-3)} \leq \frac{5 \times 2(x-3)^2}{2}$ ← Multiply across by $2(x-3)^2$ to get rid of the fractions. By multiplying across by $(x-3)^2$ you are ensuring that you are multiplying across by a positive number.

$2(x-3)(2x-5) \leq 5(x-3)^2$

$2(x-3)(2x-5) - 5(x-3)^2 \leq 0$

$(x-3)[2(2x-5) - 5(x-3)] \leq 0$

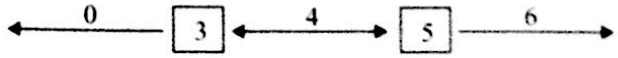
$(x-3)[4x - 10 - 5x + 15] \leq 0$

$(x-3)[5-x] \leq 0$ ← You need to solve this inequality.

$(x-3)(5-x) = 0$ ← First, find the roots of the equality.

$\therefore x = 3, 5$

Use the region test to find the regions that satisfy the inequality.



$(x-3)(5-x) \leq 0$	$(x-3)(5-x) \leq 0$	$(x-3)(5-x) \leq 0$
$(-3)(5) \leq 0$	$(1)(1) \leq 0$	$(3)(-1) \leq 0$
True	False	True

$\therefore x < 3$ or $x \geq 5$