Student ID: 7300q1091

ECM1419DA exam

1) a. i) $A = \begin{pmatrix} 50 \\ 90 \\ 80 \end{pmatrix}$

ii) $B = \begin{pmatrix} 6 & 9 & 7 \\ 4 & 11 & 9 \end{pmatrix}$

~~iii) B x A =~~

iii) $B \times A = \begin{pmatrix} 6\times50 + 9\times90 + 7\times80 \\ 4\times50 + 11\times90 + 9\times80 \end{pmatrix} = \begin{pmatrix} 1670 \\ 1910 \end{pmatrix}$

iv) £1910

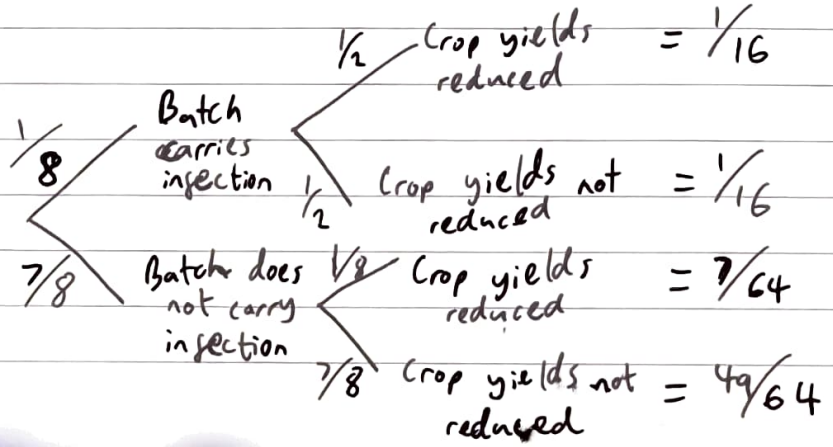
b. i)

Material \ Size	40	41	42	43	44	45
Leather	•	•	•	•	•	•
Synthetics	•	•	•	○	○	○

ii) A) $3/4$

B) $3/4 \times 1/3 + 1/4 \times 3/3 = 1/2$

c. i)



ii) $\frac{1}{16} + \frac{7}{64} = \frac{11}{64}$

iii) $P(\text{Not reduced yield}) \cdot \frac{1}{16} + \frac{49}{64} = \frac{53}{64}$

$P(\text{Neither gives reduced yield}) = (\frac{53}{64})^2 = \frac{2809}{4096}$

iv) $1/4$

d.

A	B	A∨B	¬(A∨B)	¬A	¬B	¬A∧¬B
T	T	T	F	F	F	F
T	F	T	F	F	T	F
F	T	T	F	T	F	F
F	F	F	T	T	T	T

Let A be whether a task is started
Let B be whether a task is completed

As can be seen in the truth table, $\neg(A \vee B) = \neg A \wedge \neg B$
∴ testing whether a task is not either started or completed is logically equivalent to testing whether it is not started and not completed

2) a. Multiply both sides by 18

$$9(3_p + 1) - 6(4_p - 4) = 2(4_p - 1)$$

$$27_p + 9 - 24_p + 24 = 8_p - 2$$

$$5_p = 35$$

$$p = 7$$

b. (1) $x - 3y = 16$

$x = 3y + 16$ (3)

Substitute (3) into (2)

$5(3y+16) + 4y = 23$

$15y + 80 + 4y = 23$

$19y = -57$

$y = -3$

Substitute $y = -3$ into (3)

$x = 3(-3) + 16$

$= 16 - 9 = 7$

c. 70

$1 \quad 70$

$2 \quad 35$

$-5 \quad +14$

$7 \quad 10$

$7x^2 - 5x + 14x - 10 = 0$

$x(7x-5) + 2(7x-5)$

$(x+2)(7x-5) = 0$

$x = -2$ or $x = 5/7$

d. $-4.9x^2 + 30x + 12 = 0$

$$x = \frac{-30 \pm \sqrt{30^2 - 4(-4.9)(12)}}{2(-4.9)}$$

$x = -0.38$ (2d.p.) or $x = 6.50$ (2 d.p.)

But time cannot be negative

$\therefore x = 6.50$s (2 d.p.)

e. (1) = (2)

$5 - 2x = 2x^2 + 1$

$2x^2 + 2x - 4 = 0$

$x^2 + x - 2 = 0$

f. $x - 2xy = 3$

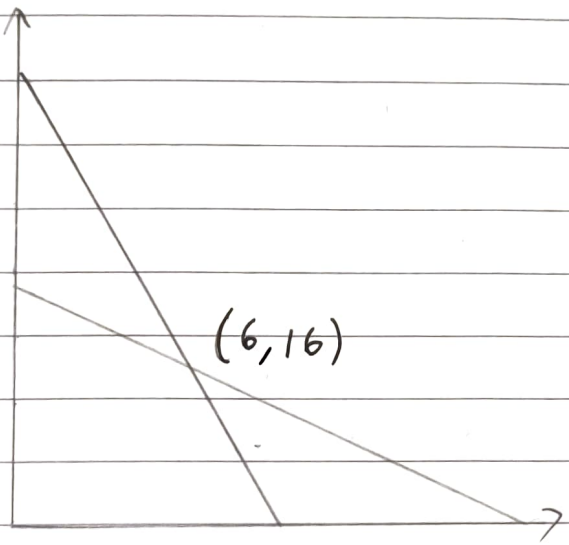
$x(1 - 2y) = 3$

$x = \frac{3}{1-2y}$

g. i) $x + 1.5y = 30 \Rightarrow y = -\frac{2}{3}x + 20$

ii) $2x + 0.5y = 20 \Rightarrow y = -4x + 40$

iii)



Point of intersection:

$-4x + 40 = -\frac{2}{3}x + 20$

$\frac{10}{3}x = 20$

$x = 6$

$y = -4(6) + 40 = 16$

iv) The point of intersection shows the optimum point where the most number of products A and B can be made within the material constraints

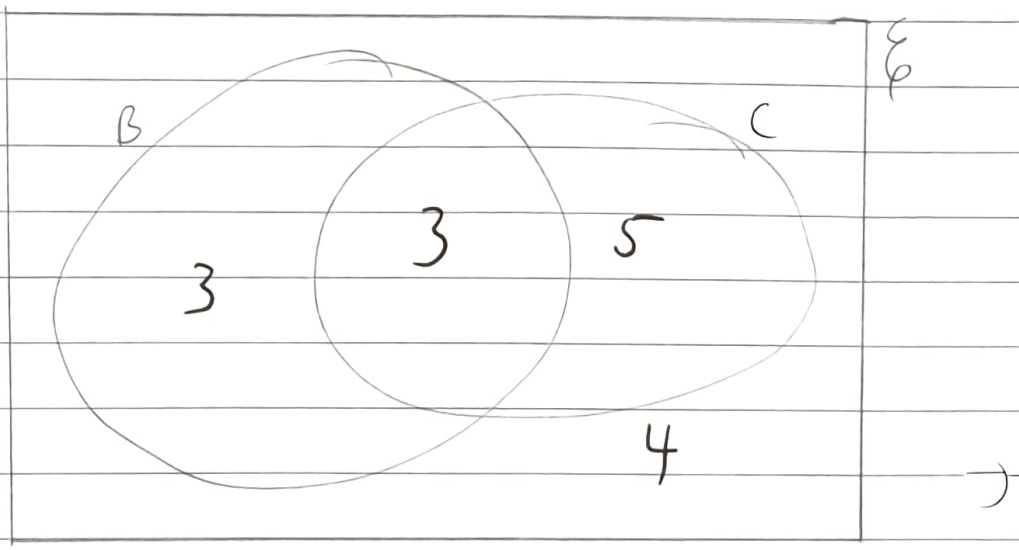
3) a. i) $A = \{1, 2, 3, 5, 8, 13, 14\}$

ii) $A \cap B = \{2, 3, 13\}$

iii) $\{A \cap B\} \cup C = \{1, 2, 3, 4, 6, 7, 9, 10, 12, 13, 14, 15\}$

iv) $\bar{A} \cap B = \{4, 7, 11\}$

v)



b. i) 4

ii) Median position $= \frac{100+1}{2} = 50.5$

Median $= 5$

iii) $\bar{x} = \frac{\Sigma fx}{\Sigma f} = \frac{(2\times7 + 3\times15 + 4\times23 + 5\times18 + 6\times14 + 7\times12 + 8\times8 + 9\times3)}{100}$

$= 5$

iv) $\sigma = \sqrt{\frac{\Sigma fx^2}{\Sigma f} - (\bar{x})^2}$

$\Sigma fx^2 = 2^2 \times 7 + 3^2 \times 15 + 4^2 \times 23 + 5^2 \times 18 + 6^2 \times 14 + 7^2 \times 12 + 8^2 \times 8 + 9^2 \times 3$

$= 2828$

$\sigma = \sqrt{\frac{2828}{100} - 25}$

$= 1.81$ (2 d.p.)

v) A greater range of failures means more batches have a high failure rate.