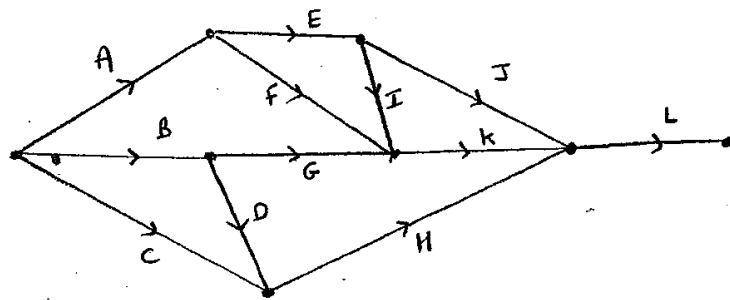


D1 Revision Answers

1)

1)



M1 (A → G)

A1

A1 ✓ (H → K)

A1 (L)

B1 arrows 5

2.

(a)

Critical activities B, F, J, K, N (not I); length 25 hours

(b)

$$A = 5 - 0 - 3 = 2$$

$$E = 9 - 3 - 4 = 2$$

$$L = 22 - 11 - 4 = 7$$

$$C = 9 - 0 - 6 = 3$$

D

$$G = 9 - 4 - 3 = 2$$

$$M = 22 - 16 - 2 = 4$$

$$= 11 - 3 - 3 = 5$$

$$H = 16 - 7 - 7 = 2$$

$$P = 25 - 18 - 3 = 4$$

$$I = 16 - 9 - 5 = 2$$

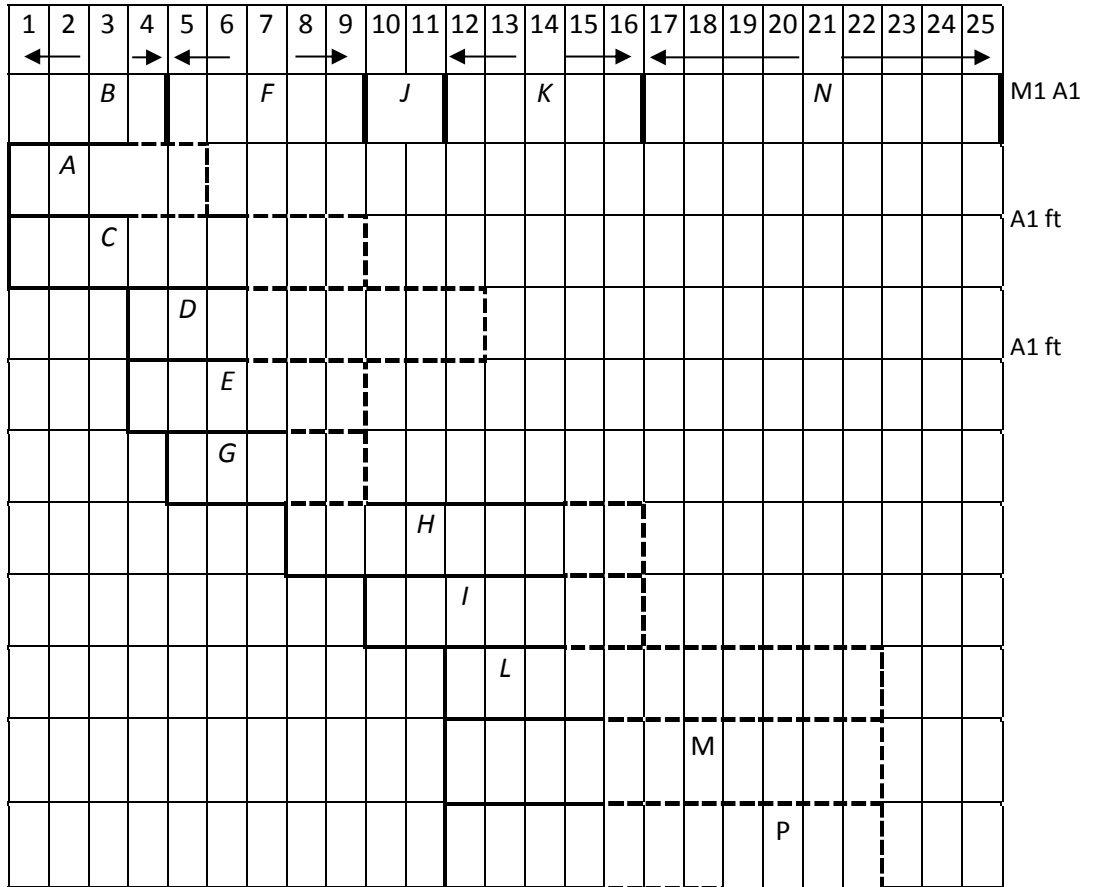
B1; B1 (2)

M1 A1 ft

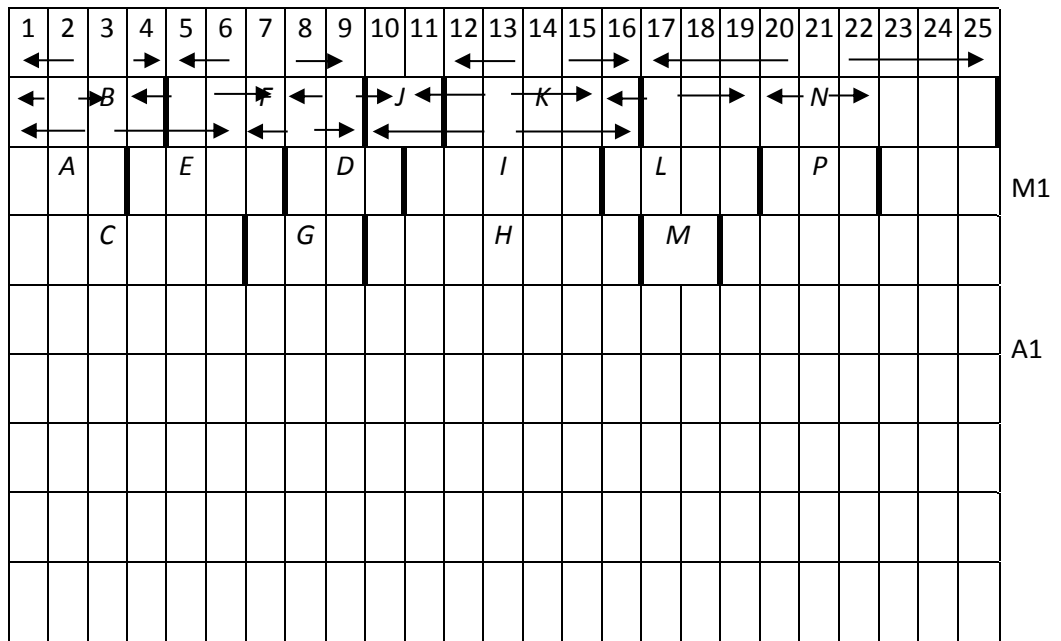
A1

(3)

(c)



(d)

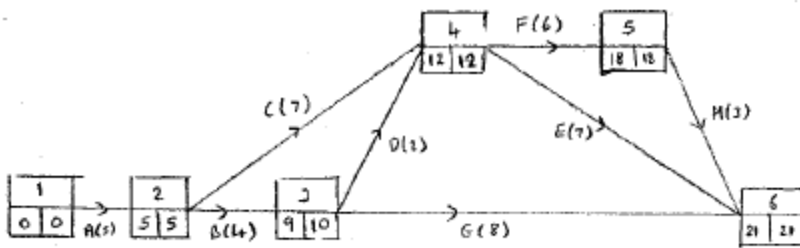


3 workers needed

A1 (3)

3.

7) (a)



Forward pass
M1 A1
Backward pass
M1 A1
(4)

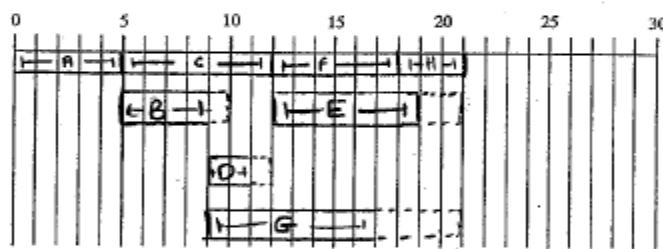
(b) activities A, C, F and H, length 21

B1, B1 ✓
(2)

(c) Float for B is 1 (= 10 - 5 - 4)
D is 1 (= 12 - 9 - 2)
E is 2 (= 21 - 12 - 7)
G is 4 (= 21 - 9 - 8)

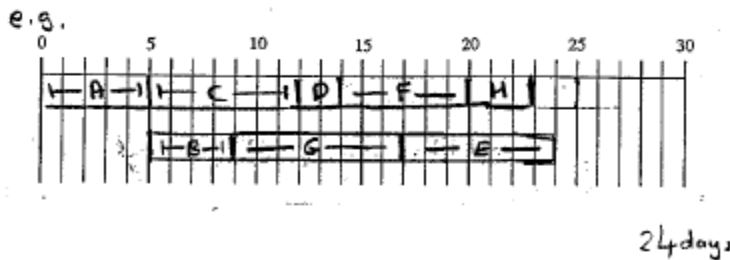
M1
A1
A1 (3)

(d)



M1 A1
A1 ✓
A1
(4)

(e)



M1 A1
A1
A1
(4)

17

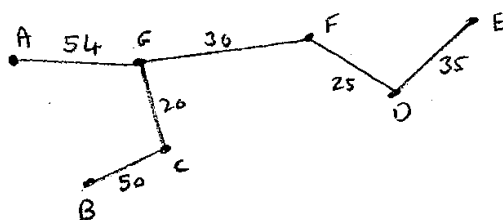
4.

2) (a)

GC, FD, FG; DE, BC, GA

M1 A1; M1 A1
(4)

(b)



B1 ✓

$$\text{cost} = (20 + 25 + 30 + 35 + 50 + 54) \times 1000 = \text{£}214000$$

M1
A1
(3)

7

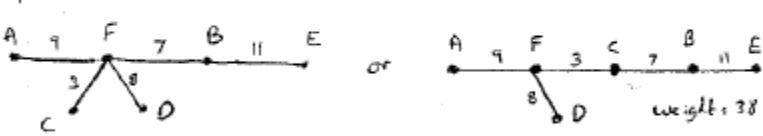
5.

3)(i)(a) method: choose vertex nearest to A and add to tree
 choose vertex nearest to any vertex on tree
 repeat last step until all vertices included } or an account of the specific solution to this problem

MI
 AI

Order of arc selection: AF, FC, $\begin{matrix} FB \\ BC \end{matrix}$, FD, EB

MI AI
 (4)

b) 

B1 ✓
 B1 ✓
 B1 (3)

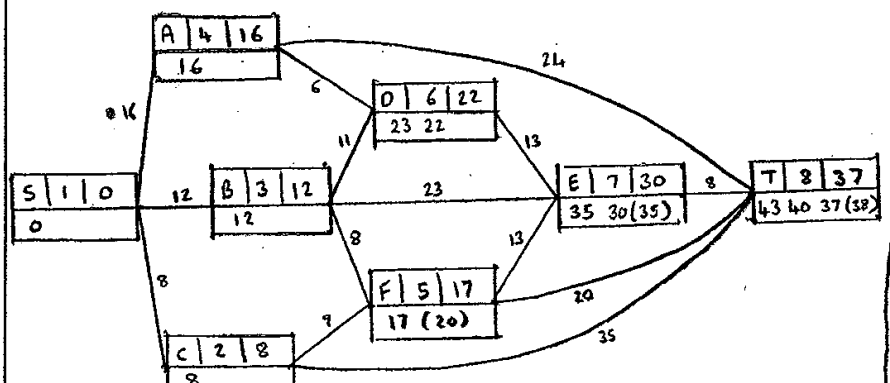
(c) Not unique - gives other one, or convincing explanation

(ii)(a) number of edges = $7 - 1 = 6$
 (b) number of vertices = $n + 1$

B1
 B1 (2)

6.

4)(a)



either e.s
 Trace back, Include an arc xy if y already included and
 weight of xy = final label of y - final label of x

or
 e.g. $T \leftarrow F : 37 - 17 = 20$ (FT)
 $F \leftarrow C : 17 - 8 = 9$ (CF)
 $C \leftarrow S : 8 - 0 = 8$ (SC)

shortest route : SCFT length 37 km

(b) Need shortest path S to E plus ET
 shortest path S to E is SCFE length 30km from above
 \therefore SCFET length 38 km

(MI) (Dijkstra)
 AI (S, A, B, C)
 AI (D, E)
 AI (rest)
 AI (order)
 (5)

B 2, 1

(AI) (3)

MI
 AI ✓
 AI ✓ (3)

II

7.

4) (a)

Traceback. Include xy if y is already on the path and
 length of $xy = \text{final label of } y - \text{final label of } x$
 or a detailed account for this question
 path is $\{A E F G H L\}$ (of length 13)
 $\{A E I J K L\}$

(b) states other path

max(Dijkstra)
 A1
 A1 ✓
 A1
 (4)
 B2, 1, 0
 A1
 B1 (4)
 8

8.

(a)

(b)(i) Shortest route ABFEHI, length 22 km
 Odd vertices A and I only, shortest route between them needs to be repeated, hence repeat
 AB, BF, FE, EH, HI

(ii) e.g. AB FBFEFGIFE HI HECDACBA

(ii) $91 + 22 = 113$ km

M1 A1 A1
 (3)
 B1 B1 (2)
 M1
 A1
 A1 (3)
 M1 A1 (2)
 (Marks 10)

9.

<p>3)</p>	<p>odd vertices B, C, F and G</p> <p>pairings $BC + FG = 38 + 40 = 78$ $BF + CG = 66 + 68 = 134$ $BG + CF = 35 + 28 = 63 *$</p> <p>Repeat BG and CF</p> <p>Minimum distance = $440 + 63 = 503m$</p> <p>Route e.g. $A \underline{B} C D E \underline{F} C \underline{F} G \underline{B} A$</p>	<p>B1</p> <p>M1</p> <p>A1 A1(BF+CG)</p> <p>(4)</p> <p>M1 A1 ✓</p> <p>B1 (3)</p> <p style="text-align: center;">7</p>
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<p>10.</p>	<p>(a) Odd nodes C, F, G, H</p> <p>$CF + GM = 12 + 8 = 20$</p> <p>$CG + FM = 9 + 7 = 16$</p> <p>$CM + FG = 9 + 10 = 19$</p> <p>So CG and FH should be repeated</p>	<p>B1</p> <p>M1</p> <p>A1</p> <p>A1 (4)</p>
<p>(b)</p>	<p>FH is the shortest path so finish at G</p> <p>Length of route = $137 + 7 = 144$</p>	<p>B2, 1, 0</p> <p>B1 (3)</p> <p style="text-align: center;">(7 marks)</p>

11.

5) (a) either Bubbling from left or Bubbling from right

<p>90 <u>50 55</u> 40 20 35 30 25 45 90 55 50 40 <u>20 35</u> 30 25 45 90 55 50 40 35 <u>20 30</u> 25 45 90 55 50 40 35 30 <u>20 25</u> 45 90 55 50 40 35 30 25 <u>20 45</u> 90 55 50 40 35 30 <u>25 45</u> 20 90 55 50 40 35 <u>30 45</u> 25 20 90 55 50 40 <u>35 45</u> 30 25 20 90 55 50 <u>40 45</u> 35 30 25 20 90 55 50 45 40 35 30 25 20</p>	<p>90 50 55 40 20 35 30 <u>25 45</u> 90 50 55 40 20 35 <u>30 45</u> 25 90 50 55 40 20 <u>35 45</u> 30 25 90 50 55 40 <u>20 45</u> 35 30 25 90 50 55 <u>40 45</u> 20 35 30 25 90 <u>50 55</u> 45 40 20 35 30 25 90 55 50 45 40 <u>20 35</u> 30 25 90 55 50 45 40 35 <u>20 30</u> 25 90 55 50 45 40 35 30 <u>20 25</u> 90 55 50 45 40 35 30 25 20</p>	<p>M1 A1 (1st pass) A1 (2nd pass) A1 (3rd pass) A1 C50 (5) M1 A1 (2) M1 A1 A1 (3) M1 A1 (2) 12</p>
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(b) $\frac{475}{120} \approx 3.96$ so lower bound is 4 tapes

(c) Tape 1: 90 + 30 (full) Tape 3: 45 + 40 + 35 (full) Tape 5: 20
 Tape 2: 55 + 50 Tape 4: 35 + 30 + 25 + 20

(d) e.g. Tape 1: 90 + 30 (full)
 Tape 2: 55 + 35 + 30 (full)
 Tape 3: 45 + 40 + 35 (full)
 Tape 4: 50 + 25 + 20 + 20

12.

(i) 10 names so middle is $\lceil \frac{1}{2}(10+1) \rceil = 6$ FEW
 SABINE must occur after FEW so list reduces to
 7. Osborne
 8. Paul
 9. Swift
 10. Turner
 middle location is $\lceil \frac{1}{2}(10+7) \rceil = 9$ SWIFT
 SABINE must occur before SWIFT, so list reduces to
 7. Osborne
 8. Paul
 middle location is $\lceil \frac{1}{2}(7+8) \rceil = 8$ PAUL
 SABINE must occur after PAUL, but there is no entry in list after PAUL \therefore SABINE not in list

(ii) Iterations reduce list to maximum length as follows
 1000, 500, 250, 125, 62, 31, 15, 7, 3, 1
 (Final iteration to check if list of 1 is the correct name) \therefore 10 iterations (accept 11)

	<p>M1 A1 A1 ✓ A1 ✓ A1 (5) C50 M1 A1 (2) C60 17</p>
--	---

13.

6	1	:	18	12	9	0	5	13	14
			13					0	
18	14		13	12	9	6	1	0	5
18	14		13	12	9	6	1	0	5
18	14		13	12	9	6	5	1	0
18	14		13	12	9	6	5	1	0
18	14		13	12	9	6	5	1	0

Datchet (18), Wraysbury (14), Staines (13), Feltham (12), Halliford (9), Ashford (6), Poyle (5), Colnbrook (1), Laleham (0).

M1

A1

A1

A1

A1

(5)

(5 marks)

14. (a)

<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>f</i> = 0?
645	255	2.53	2	510	135	No
255	135	1.89	1	135	120	No
135	120	1.13	1	120	15	No
120	15	8	8	120	0	Yes

The answer is 15

M1 A1

M1 A1

A1

A1

A1

(7)

(b)

The first row would be
 255 645 0.40 0 0 255 No
 But the second row would then be the same as the first row above, and the solution thereafter would be the same.

M1 A1

A1

(3)

(c)

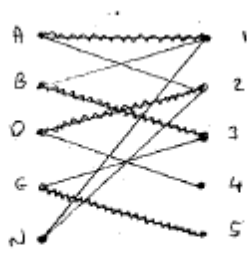
Finds the H.C.F of *a* and *b*.

B1

(1)

(11 marks)

15.

<p>1) (a)</p>		<p>B1 B1 (2)</p>												
<p>(b)</p>	<p><u>Possible paths</u></p> <p>$1 = A - 2 = D - 4$ $N - 2 = D - 4$</p> <p><u>$N = 1 - A = 2 - D = 4$</u> or <u>$N = 2 - D = 4$</u></p> <table border="0" style="width: 100%;"> <tr> <td style="text-align: center;">A - 2</td> <td style="text-align: center;">D - 4</td> <td style="text-align: center;">A - 1</td> <td style="text-align: center;">D - 4</td> </tr> <tr> <td style="text-align: center;">B - 3</td> <td style="text-align: center;">G - 5</td> <td style="text-align: center;">B - 3</td> <td style="text-align: center;">G - 5</td> </tr> <tr> <td></td> <td style="text-align: center;">N - 1</td> <td></td> <td style="text-align: center;">N - 2</td> </tr> </table>	A - 2	D - 4	A - 1	D - 4	B - 3	G - 5	B - 3	G - 5		N - 1		N - 2	<p>M1 A1 A1</p>
A - 2	D - 4	A - 1	D - 4											
B - 3	G - 5	B - 3	G - 5											
	N - 1		N - 2											
<p>(c)</p>	<p>Gives second alternating path</p>	<p>A1 (4) 6</p>												

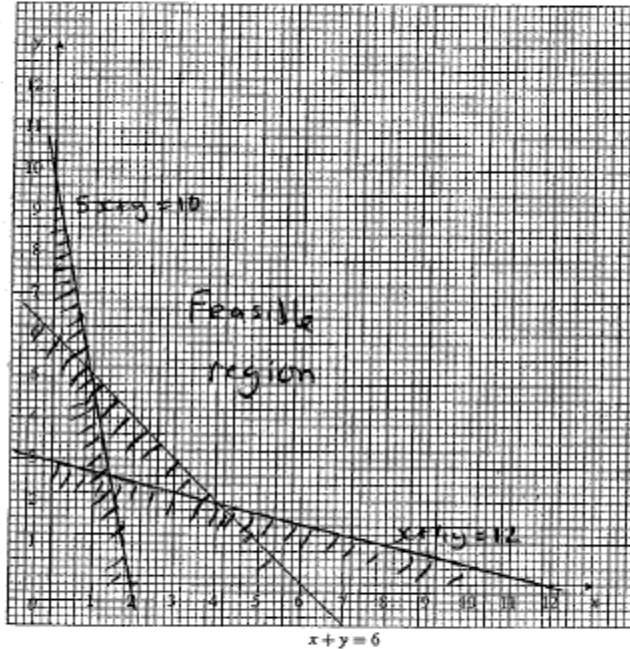
<p>16. (a)</p>	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">1 - C</td> <td style="width: 50%;">1 - C</td> </tr> <tr> <td>2 - B</td> <td>2 - A</td> </tr> <tr> <td>3 - B and</td> <td>3 - D</td> </tr> <tr> <td>4 - E</td> <td>4 - B</td> </tr> <tr> <td>5 - D</td> <td>5 - A</td> </tr> </table>	1 - C	1 - C	2 - B	2 - A	3 - B and	3 - D	4 - E	4 - B	5 - D	5 - A	<p>B1 B1 (2)</p>
1 - C	1 - C											
2 - B	2 - A											
3 - B and	3 - D											
4 - E	4 - B											
5 - D	5 - A											
<p>(b)</p>	<p>$2 - B = 4 - C = 1 - E$</p> <p>$2 - D = 5 - E$</p>	<p>M1 A1 M1 A1 (4) (6 marks)</p>										

17.

- 5) (a) Chemical A $5x + y \geq 10$ *
- Chemical B $2x + 2y \geq 12 \rightarrow x + y \geq 6$ *
- Chemical C $\frac{1}{2}x + 2y \geq 6 \rightarrow x + 4y \geq 12$ *
- $x \geq 0$ $y \geq 0$ - from context

B1
B1
B1
B1 (4)

(b)



B1 ✓
B1 ✓
B1
(3)

(c) $T = 2x + 3y$

B1 (1)

(d) Profit line or point testing (≥ 3)

M1 A1

$x = 4$ $y = 2$, $T = 14$

A1 A1 ✓
(4)

(e) Three (or more) variables e.s.
A blend of three fertilizers x , y and z

M1
A1 (2)

14

18.

(a)

$$x + y \geq 380$$

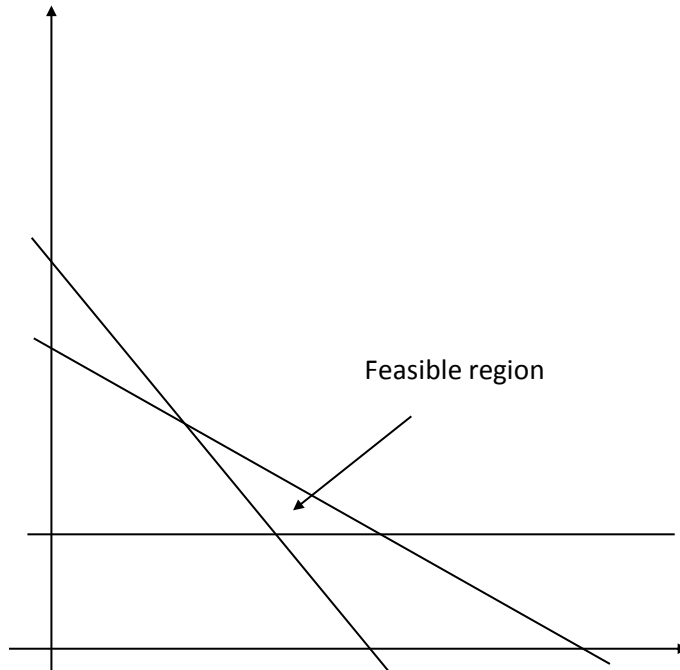
$$y \geq 125$$

$$2x + 4y \leq 1200$$

(b)

$$c = 3x + 2y$$

(c)



Lines must be labelled and shaded correctly

Use of profit line or points testing

Minimum intersection of $x + y = 380$ and $2x + 4y = 1200$

$x = 160, y = 120, \text{ cost} = \text{£}920$

(d)

Maximum at intersection of $y = 125$ and $2x + 4y = 1200$

$x = 350, y = 125, \text{ cost} = \text{£}1300$

B1

B1

B1 (3)

B1 (1)

B4 (4)

M1

A1 A1 (3)

M1

A1 A1 (3)

(14 marks)