

Linear programming

1.	(a) let the No. of garments of type A be x and those of type B be y (i) $3x + 2\frac{1}{2}y \leq 600$ (material) (ii) $x \leq 1000$ $y \geq 80$ $x \geq 0$ (b) Lines drawn $3x + 2\frac{1}{2}y = 600$ $x = 100$ $x = 80$ $x = 0$ (c) The object function is $P = 80x + 60y$ where P = total profit Either drawn a search line by choosing an appropriate value of P e.g $12000 = 80x + 60y$ or inspect for maximum profit using points further from origin maximum profit 100 garment of type A 120 garments of type B	B1 B2 B1 B1 B1 B1 B1 B1 B1	all✓ any two✓ ✓lines and shading✓ ✓lines and shading for✓region indicated ✓objective function Use of search line or inspection ✓

1.

$$30x + 20y \leq 4800 \dots\dots (i)$$

$$30x + 40y \geq 3600 \dots\dots (ii)$$

$$10x \leq 30y \dots\dots (iii)$$

$$x \geq 0 \quad y \geq 0$$

objective function $10x + 12y = K$

$3x + 2y = 480$					$3x + 4y = 360$					$x = 3y$			
X	40	60	80		X	20	40	60		X	20	45	60
y	180	150	120		Y	5	60	45		Y	15	20	

(ii) consider (60,40)

$$10(60) + 12(40) = 600 + 480$$

$$= 1080$$

$$10x + 12y = 1080$$

$$5x + 6y = 540 - \text{search line}$$

20	40	60
73	57	40

Maximum profit at $(\alpha, 240)$

No queen cake , 240 marble cakes

(iii) $240 \times 12 = \text{sh. } 2880$

(iv) $10x + 12y \geq 600 \Rightarrow 10x + 12y = 600$

$5x + 6y = 300$

X	α	12	60
y	50	40	0

2. Machine A

Shirts Jerseys

No. x y

Hrs. @2hrs @3hrs

(i) $2x + 3y = 24$

(i) $2x + 3y \leq 24$

(ii) $2x + y \leq 12$

(iii) $y > x$

(iv) $x > 0$

$y > 0$

Max pt(3,6)

Max profit = $22 \times 3 + 200 \times 6$

= $600 + 1200$

= Shs. 1800

Machine B

Shirts Jerseys

x y

@2hrs @1hr

x | 0 12

y | 8 0

(ii) $2x + y = 12$

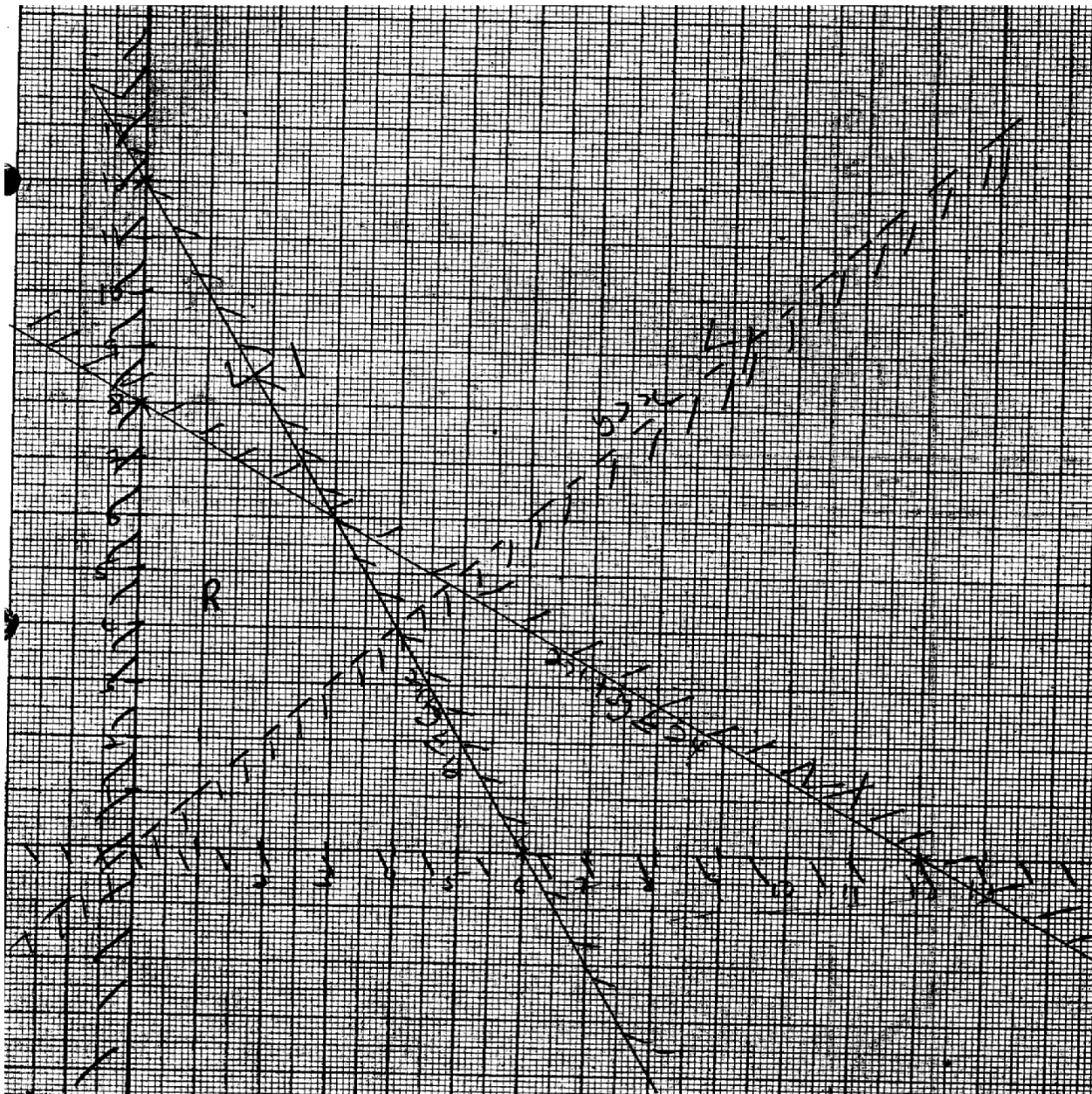
x | 0 6

y | 12 0

(iii) $y = x$

(iv) $y = 0$

$x = 0$



3. (a) $3x + 7y \leq 210$
 $x + y \leq 20$
 $x < 2y$
 $x > 15$

(b) refer

(c) $120x + 140y = 120 \times 130 + 140 \times 10$
Profit = shs.5960
 $x = 31$

$y = 16$

4. Passengers
 $64x + 48y \geq 384$ i.e. $8x + 6y \geq 48$
 $x > 0$
 $y > 0$
 $x + y \geq 7$

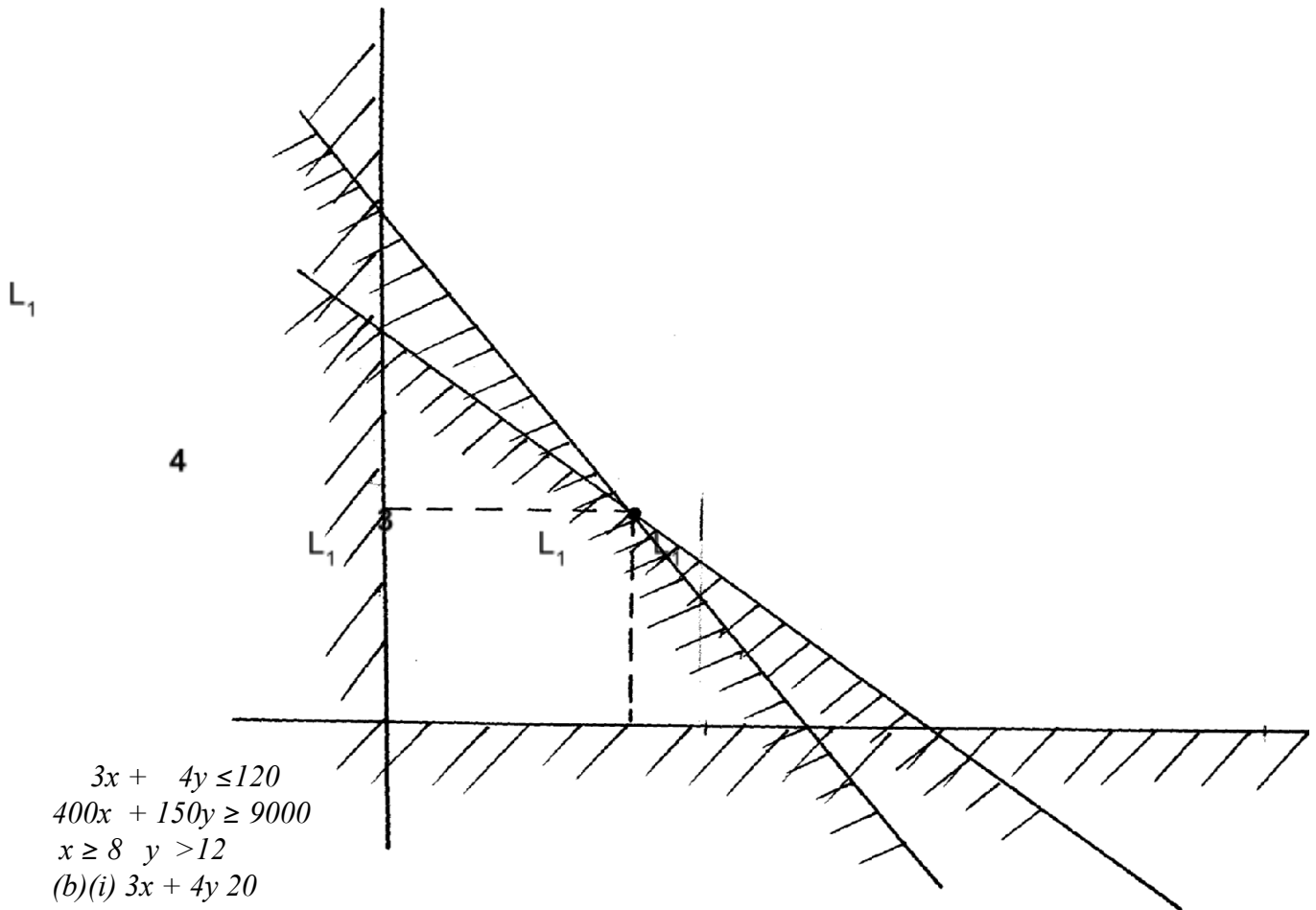
Cost equation

$$\text{Total cost} = 2500x + 20000y$$

(3,4)

3 type x

4 type y



5.

$$3x + 4y \leq 120$$

$$400x + 150y \geq 9000$$

$$x \geq 8 \quad y > 12$$

$$(b)(i) \quad 3x + 4y \leq 20$$

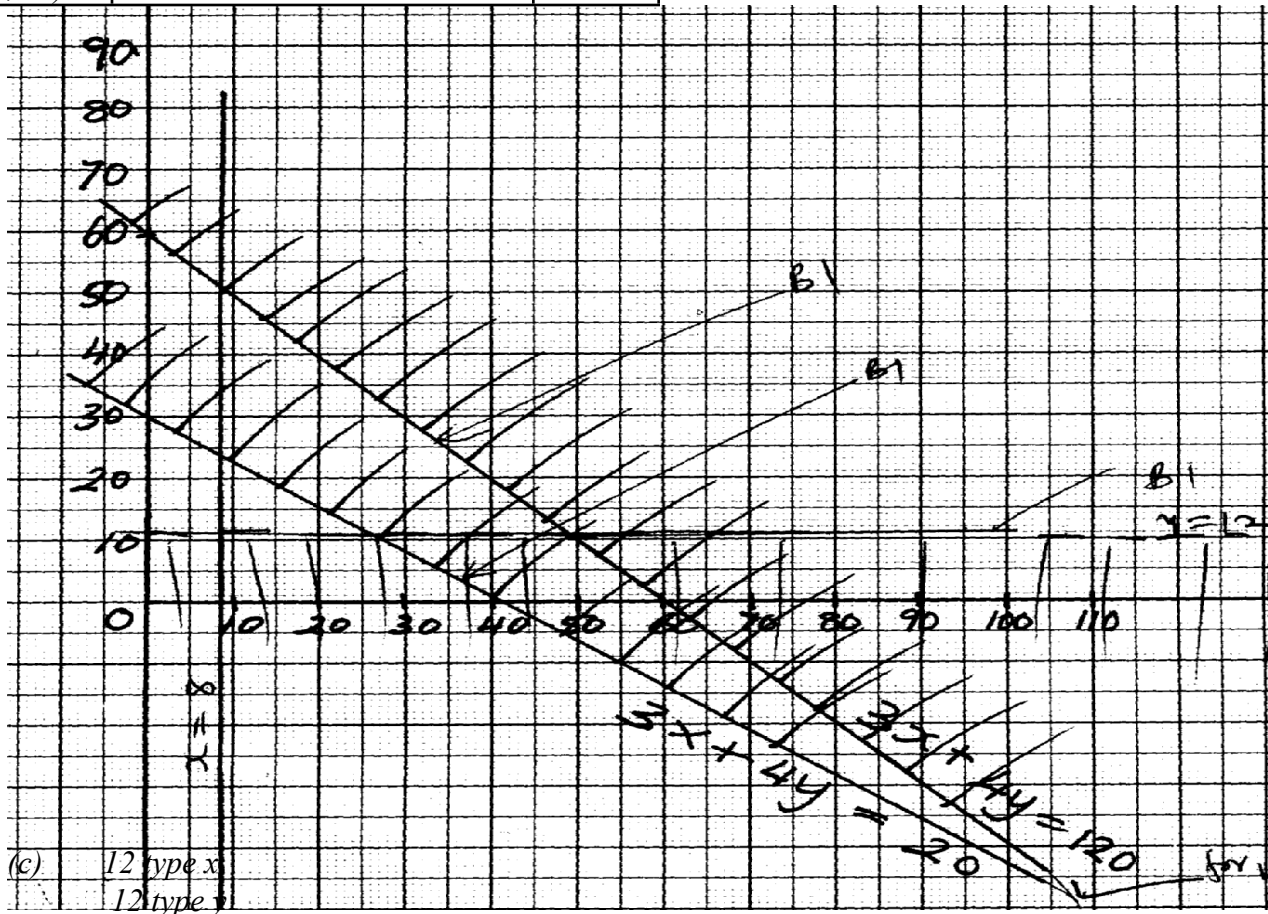
$$(ii) \quad 40x + 15y \leq 900$$

$$(iii) \quad x \leq 8$$

$$(iv) \quad y \leq 12$$

(table showing calculation of profit)

Points	Objective function $40x + 70y$	Profit
(i) (8, 24)	$320 + 1680$	2000
(ii) (24, 12)	$960 + 840$	1800
(iii) (8, 12)	$320 + 840$	1160



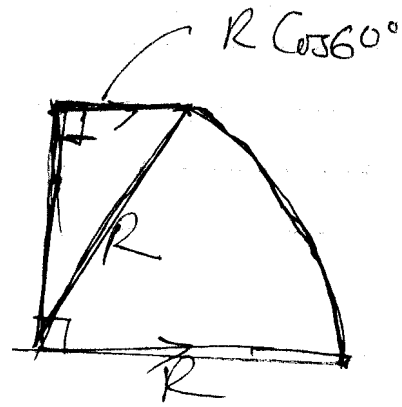
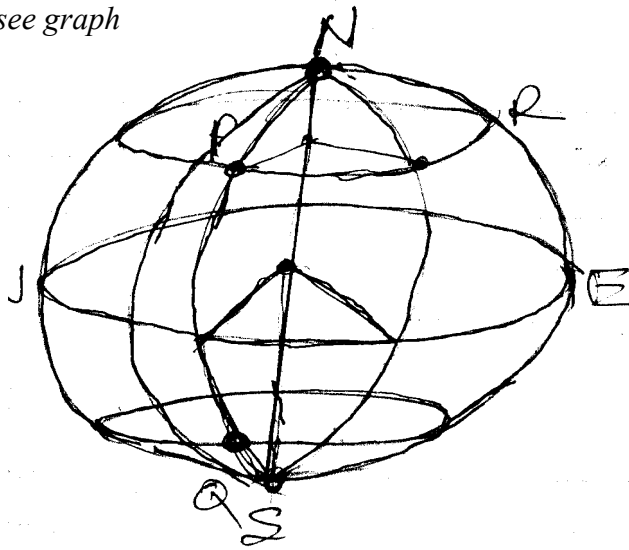
$$\text{Profit} = 40(24) + 70(12) \\ = 1800$$

$$\begin{aligned} 6. \quad 100x + 160y &= 16000 & 5x + 8y &= 800 \\ &= 100x + 200 + 160x + 50 & 1000 + 4000 & \\ &20000 + 8000 & 10x + 200 + 16x + 50 &= \\ 28000 &= & 10x + 16y &= 1600 \\ & & 5x + 8y &= 800 \\ & & 5x + 20 + 100 & \\ & & 8y &= 800 - 100 \\ & & y &= \frac{700}{8} \\ & & 800/8 &= 100 \end{aligned}$$

$$\begin{aligned} a) \quad y &< 2x, \quad 50 \leq x \leq 200, \quad x > 100 \\ y &> 0, \quad x + y \leq 250, \quad 100x + 160y &\geq 16000 \end{aligned}$$

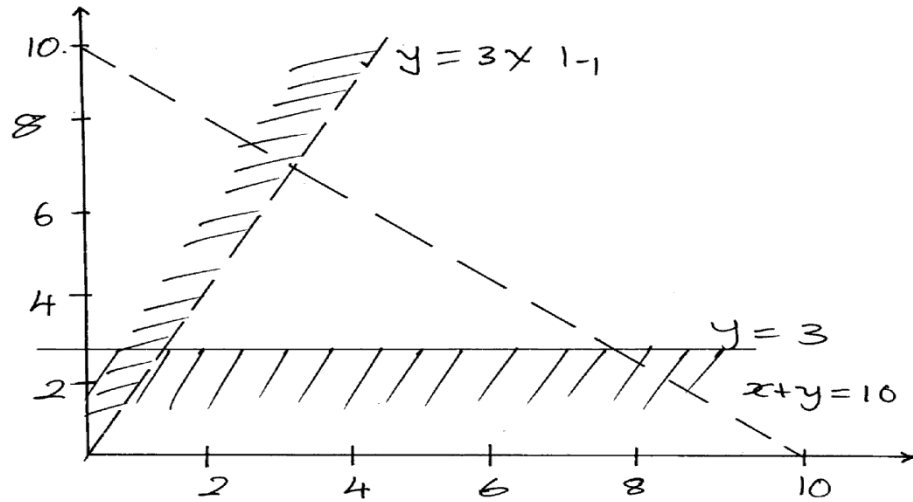
b) See graph

c) see graph



profit?

7. $x + y < 10$
 $y < 3x$
 $y > 3$



(c) Objective function $3x + 2y = I$ or use of search line
 5 packets of cups and 4 packets of sticks

x	y	Profit
2	4	14
2	5	16
3	4	17
3	5	19
3	6	21
4	4	20
4	5	22
5	4	23

8. Panga - P, Jembe J
 (a) $50P + 30J = 4260$
 $50P + 15J = 1290$
 $50P + 30J = 4260$

$$10P + 30J = 1290$$

$$40P = 1680$$

$$P = \frac{168}{4} = 42$$

$$50(42) + 30J = 4260$$

$$2100 + 30J = 4260$$

$$30J = 2160$$

$$J = \frac{(2160)}{30}$$

$$J = 72$$

Wholesaler

$$\frac{110}{100} \times 42 = \text{shs. } 46.50 = \text{pangas}$$

$$\frac{85}{100} \times 72 = \text{shs } 60 = \text{jembes}$$

For B

$$50 \times 46.50 + 30 \times 61.2$$

$$2310 + 1836 = 4146$$

$$\begin{array}{r} \text{Saving} = 4260 \\ \underline{4116} \\ 144 \end{array}$$

$$(b) \text{ Discount } 5000 - 3500 = 1500$$

$$\begin{aligned} \% \text{ discount} &= \frac{1500}{5000} \times 100 \\ &= 30\% \end{aligned}$$

$$\begin{aligned} 9. \quad a) \quad &X \geq 0, y \geq 0 \\ &10x + 20y \geq 120 \\ &4x + y \geq 20 \end{aligned}$$

b) On the graph.

c) i) (4,4)

$$\begin{aligned} &4 \times 100 + 4 \times 300 \\ &400 + 1200 = 1600 \end{aligned}$$

$$\begin{aligned} 10. \quad \text{Distance Covered} &= \int_1^4 (3t^2 - 3t - 6) dt \\ &= \left[t^3 - \frac{3}{2} t^2 - 6t \right]_1^4 \end{aligned}$$

$$\begin{aligned} &\left[\frac{4^3}{2} - \frac{3}{2} (4)^2 - 6(4) \right] - \left[\frac{1^3}{2} - \frac{3}{2} (1)^2 - 6(1) \right] \\ &16 - \frac{13}{2} = \end{aligned}$$