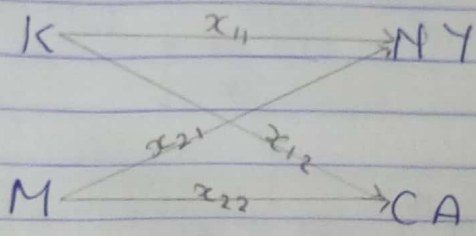
QUESTION 2

PRODUCERS	NUMBER OF BAGS	TRASPORTATION COST NEW YORK (NY)	CALIFORNIA (CA)
Kansas (K)	15	$ 2 a	$ 3 b
Mexico (M)	8	$ 4 c	$ 1 d

~~PRODUCER NO OF BAGS~~

DISTRIBUTION CITY	NO OF BAGS
New York	10
California	13



Decision variable : X_{ij}

Producers constraint

$X_{11} + X_{12} = 15$

$X_{21} + X_{22} = 8$

Consumer constraint:

$X_{11} + X_{21} = 10$

$X_{12} + X_{22} = 13$

Min $Z = aX_{11} + bX_{12} + cX_{21} + dX_{22}$

~~Min $Z = C_{11}X_{11} + C_{12}X_{12} + C_{21}X_{21} + C_{22}X_{22}$~~

Min $Z = 2X_{11} + 3X_{12} + 4X_{21} + X_{22}$

subject to:

$X_{11} + X_{12} = 15$

$X_{21} + X_{22} = 8$

$X_{11} + X_{21} = 10$

$X_{12} + X_{22} = 13$

$\forall X_{ij} \geq 0, \quad i = 1, 2. \quad j = 1, 2$

STEP 1: Find the Initial Solution

From \ To	NY	CA	Supply
Kansas	a 12	b 13	15
Mexico	c 14	d 11	8
Demand	10	13	

where the values in top right are the transportation costs from producer to consumer.

For cell a,

demand < supply,

hence, ∴ a = demand

a = 10.

supply = supply − a ; demand = demand − a

= 15 − 10 = 10 − 10

= 5 = 0

From \ To	NY	CA	Supply
Kansas	a 10 12	b 13	5
Mexico	c 14	d 11	8
Demand	0	13	

For cell b,

demand > supply

hence,

b = supply

b = 5

supply = supply − b ; demand = demand − b

= 5 − 5 = 13 − 5

= 0 = 8

From \ To	NY	CA	Supply
Kansas	a 10 12	b 5 13	0
Mexico	c 14	d 11	8
Demand	0	8	

For cell c,
there is no demand. Hence, c = 0

For cell d,
demand = supply
d = demand
d = 8
demand = demand - d ; supply = supply - d
= 8 - 8 = 0
= 0

From \ To	NY	CA	Supply
Kansas	10 (2)	5 (3)	0
Mexico	(4)	8 (1)	0
Demand	0	0	

Step II : Find R_s (rows) & K_s (columns)

Take $R_1 = 0$
$R + K = C$

~~$R_1 + K_1 = 2$~~

$K_1 = 2$ $K_2 = 3$

	From \ To	NY	CA	Supply
$R_1 = 0$	Kansas	10 (2)	5 (3)	0
$R_2 = -2$	Mexico	(4)	8 (1)	0
	Demand	0	0	

$R_1 + K_1 = C$
$0 + K_1 = 2$
$K_1 = 2$.

$R_1 + K_2 = C$
$0 + K_2 = 3$
$K_2 = 3$

$$R_2 + K_2 = 1$$
$$R_2 + 3 = 1$$
$$R_2 = 1 - 3$$
$$R_2 = -2$$

Step III : Calculate Improvement Index for cell c

$$I = C - R - K$$
$$I = C - R_2 - K_1$$
$$I = 4 - (-2) - 2$$
$$= 4 + 2 - 2$$
$$= 4$$

Since improvement index is POSITIVE, we have reached optimal solution

$$X_{11} = 10$$
$$X_{12} = 5$$
$$X_{21} = 0$$
$$X_{22} = 8$$

From \ To	NY	CA
Kansas	10	5
Mexico	0	8

QUESTION 1

n = number of employees in a month ; n = 30
c = number of carpets made in a month
s = monthly salary of employee
Ov = number of carpets made during overtime

Overtime pay = s + 0.8s = 1.8s

carpets stored in hand = 0

Total carpets made in a month by each employee:

$$c = 20 + Ov$$

Workers can be hired or fired. Hence, workers in a month;

$$n = n + h - f$$

where h = no of hired employees
f = no of fired employees

Number of carpets in hand : Ch

~~$= c + Ss$~~

$$Ch = c + Ss - Sc$$

where: Ss = stored surplus
Sc = sold carpet

The objective function is to minimize cost.
The constraints are:
number of workers
number of stored surplus
number of hired employees
number of fired employees