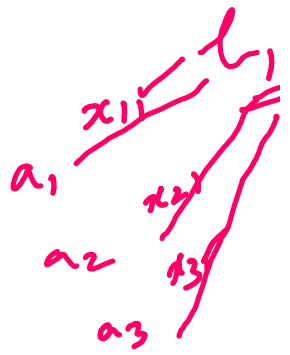
Transportation Problem

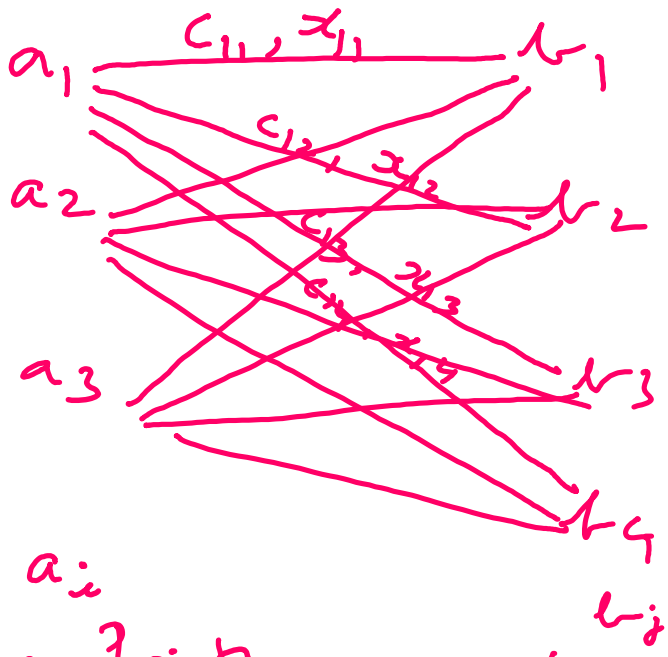
02 March 2021 10:01

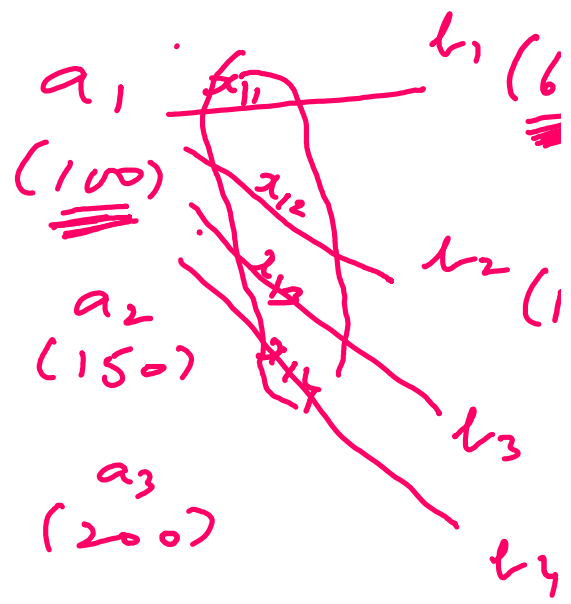
Transportion Model

Transporting a single item from a given set of supply Points to a given set of destination points.



(Eg)





a_i (Supply Points or Source)

$i = 1, 2, 3$

In general $i = 1, 2, \ldots m$

b_j (demand points) or destination

$j = 1, 2, 3, 4$

In general $j = 1, 2, \ldots n$

x_{11} = x_{12} = x_{13} x_{14}

C_{ij} — cost of transporting one unit from supply point 'i' to demand point j.

x_{ij} — The Quantity Shipped from Source i to dest 'j'.

Objective

Minimize total transportion cost satisfying supply and demand restriction

Transportation represented as LPP as follows.

$$\text{Min. } Z = \sum_{i=1}^{m} \sum_{j=1}^{n} c_{ij}\, x_{ij}$$

s.t.

$$\sum_{j=1}^{n} x_{ij} = a_i \qquad i = 1, 2, \ldots m$$

$$\sum_{i=1}^{m} x_{ij} = b_j, \qquad j = 1, 2, \ldots n$$

Prev example

$$x_{11} + x_{12} + x_{13} + x_{14} = a_1 \checkmark$$

$$x_{11} + x_{21} + x_{31} = b_1$$

$$x_{ij} \geq 0 \quad i = 1, 2, \ldots m \quad j = 1, 2, \ldots n$$

Total Supply = Total demand

is called Balanced Transportion problem

$$\sum_i a_i = \sum_j b_j$$

Solution to Transportation Problem.

Step 1 : Initial Basic Feasible Solution

Method I : North west Corner rule.

eg:

Sunray Transport Company ships ..... (Refer Taha)

Silo \ Mill	1	2	3	4	Supply
1	10 x_{11}	2 x_{12}	20 x_{13}	11 x_{14}	15
2	12 x_{21}	7 x_{22}	9 x_{23}	20 x_{24}	25
3	4 x_{31}	14 x_{32}	16 x_{33}	18 x_{34}	10
Demand	5	15	15	15	50

100's of dollars

m sources

n destination

m+n constraint eqns

$m+n$

$m+n-1$ basic variables.

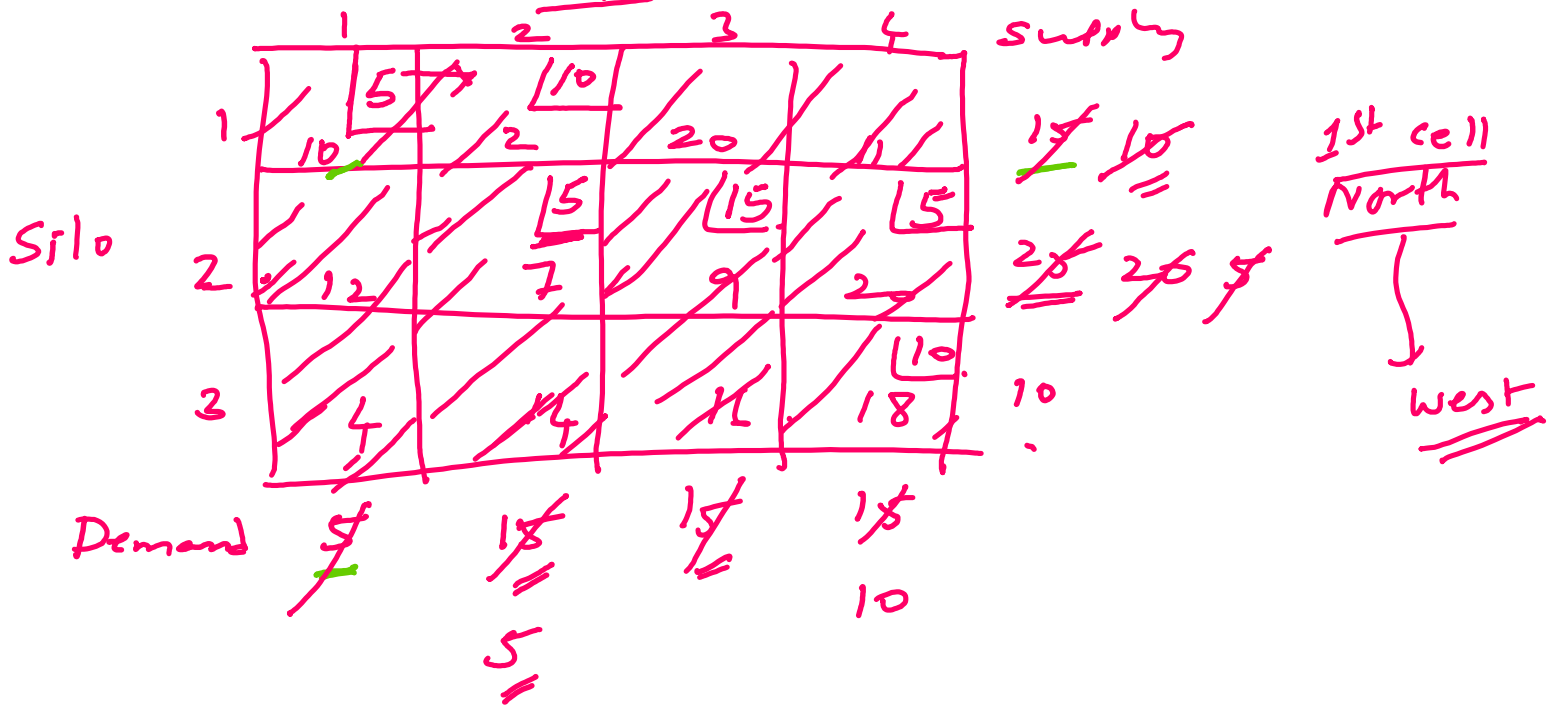
$m=3, \quad n=4$

$m+n=7$ eqns

No. of basic Variables $m+n-1$

$= 7-1=6$ Variables.

Mill.



$x_{11}=5, \quad x_{12}=10$

$x_{22}=5, \quad x_{23}=15 \quad x_{24}=5$

$x_{34}=10$

The cost is,

$= (5\times10)+(2\times10)+(7\times5)$

$+(9\times15)+(20\times5)$

$+(18\times10)$

$= 50+20+35+135+100+180$

$= 520$

Cost is $520

IBFS, $Z=520$

$x_{11}=5 \quad x_{12}=10, \quad x_{22}=5$

$x_{23}=15, \quad x_{24}=5, \quad x_{34}=10$