Vogel's Approximation Method 23MX11 – MFCS

Vogel's Approximation Method (VAM) is one of the methods used to calculate the initial basic feasible solution to a transportation problem. However, VAM is an iterative procedure such that in each step, we should find the penalties for each available row and column by taking the least cost and second least cost. Learn how to find the initial basic feasible solution to a transportation problem such that the total cost is minimized.

VAM (Vogel's Approximation Method) is the best method of computing the initial basic feasible solution to a transportation problem. As it provided better results when compared with other methods.

Vogel's Approximation Method Steps

Below are the steps involved in Vogel's approximation method of finding the feasible solution to a transportation problem.

Step 1: Identify the two lowest costs in each row and column of the given cost matrix and then write the absolute row and column difference. These differences are called penalties.

Step 2: Identify the row or column with the maximum penalty and assign the corresponding cell's min (supply, demand). If two or more columns or rows have the same maximum penalty, then we can choose one among them as per our convenience.

Step 3: If the assignment in the previous satisfies the supply at the origin, delete the corresponding row. If it satisfies the demand at that destination, delete the corresponding column.

Step 4: Stop the procedure if supply at each origin is 0, i.e., every supply is exhausted, and demand at each destination is 0, i.e., every demand is satisfying. If not, repeat the above steps, i.e., from step 1.

Solve the given transportation problem using Vogel's approximation method.

Factories	D ₁	D ₂	D₃	D ₄	Supply
F ₁	3	2	7	6	50
F ₂	7	5	2	3	60
F ₃	2	5	4	5	25
Demand	60	40	20	15	

For the given cost matrix,

Total supply = 50 + 60 + 25 = 135 & Total demand = <math>60 + 40 + 20 + 25 = 135

Thus, the given problem is balanced transportation problem.

Apply the Vogel's approximation method to minimize the total cost of transportation.

Step 1: Identify the least and second least cost in each row and column and then write the corresponding absolute differences of these values. For example, in the first row, 2 and 3 are the least and second least values, their absolute difference is 1.

F ₁ 3 2 7 6 50 1 F ₂ 7 5 2 3 60 1 F ₃ 2 5 4 5 25 2 Demand 60 40 20 15		D ₁	D ₂	D ₃	$D_{\!\scriptscriptstyle{4}}$	Supply	Row difference
F ₃ 2 5 4 5 25 2	F,	3	2	7	6	50	1
3 00 40 00 45	F ₂	7	5	2	3	60	1
Demand 60 40 20 15	F ₃	2	5	4	5	25	2
	Demand	60	40	20	15	_	
Column 1 3 2 2	Column	1	3	2	2		

These row and column differences are called penalties.

Step 2: Now, identify the maximum penalty and choose the least value in that corresponding row or column. Then, assign the min (supply, demand).

Here, the maximum penalty is 3 and the least value in the corresponding column is 2. For this cell, min (supply, demand) = min (50, 40) = 40

Allocate 40 in that cell and strike the corresponding column since in this case demand will be satisfied, i.e., 40 - 40 = 0.

		- 1) 1	$D_{_{2}}$	$\mathbf{D}_{_{3}}$	D_4	Supply	Ri di	ow fference
	F,		3	40 2 /	7	6	50 - 40=10	1	
	F ₂		7	5	2	3	60	1	
	F ₃		2	5	4	5	25	2	
	Demand	d (60	40-40=0	20	15			
Ī	Column difference		1	3	2	2			
	dilicience	,							

Step 3: Now, find the absolute row and column differences for the remaining rows and columns. Then repeat step 2.

Here, the maximum penalty is 3 and the least cost in that corresponding row is 3. Also, the min(supply, demand) = min(10, 60) = 10

Thus, allocate 10 for that cell and write down the new supply and demand for the corresponding row and column.

Supply =
$$10 - 10 = 0$$

Demand =
$$60 - 10 = 50$$

As supply is 0, strike the corresponding row.

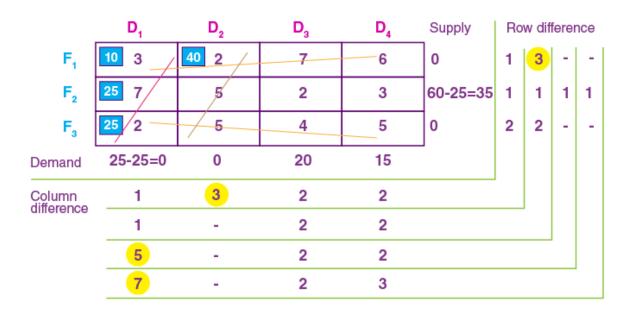
	D_1	$D_{\!\scriptscriptstyle 2}$	D_3	$D_{\scriptscriptstyle{4}}$	Supply	R di	ow ifference
F	10 3	40 2	7	6	10-10=0	1	3
F ₂	7	5	2	3	60	1	1
F ₃	2	5	4	5	25	2	2
Demand	60-10=50	0	20	15			
Column	1	3	2	2			
umerence	1	-	2	2			

Step 4: Repeat the above step, i.e., step 3. This will give the following result.

	D ₁	$D_{\!\scriptscriptstyle 2}$	D ₃	$D_{\!\scriptscriptstyle{4}}$	Supply	R di	ow ffere	nce	
F_{i}	10 3	40 2	7	6	0	1	3	-	
F ₂	7	5	2	3	60	1	1	1	
F ₃	25 2	- 5	4	5	25-25= 0	2	2	2	
Demand	50-25=25	0	20	15	_				
Column difference	1	3	2	2					
difference	1	-	2	2					
	5	-	2	2					

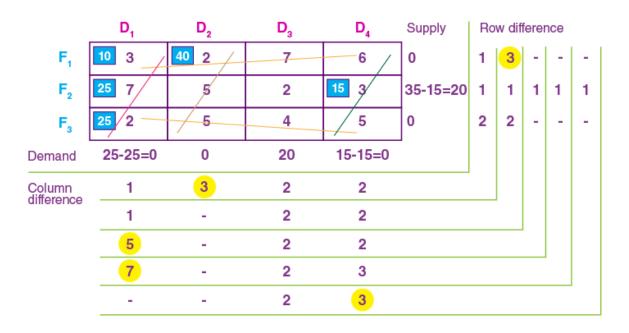
In this step, the second column vanishes and the min(supply, demand) = min(25, 50) = 25 is assigned for the cell with value 2.

Step 5: Again repeat step 3, as did for the previous step.

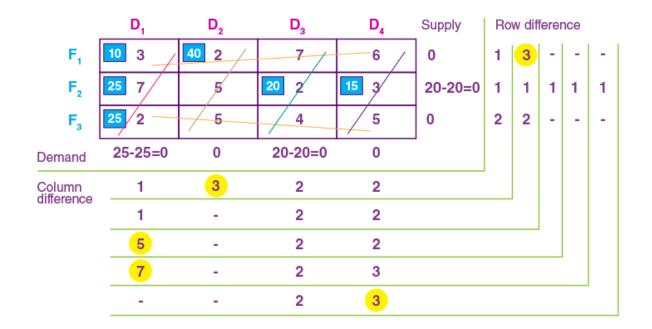


In this case, we got 7 as the maximum penalty and 7 as the least cost of the corresponding column.

Step 6: Now, again repeat step 3 by calculating the absolute differences for the remaining rows and columns.



Step 7: In the previous step, except for one cell, every row and column vanishes. Now, allocate the remaining supply or demand value for that corresponding cell.



Vogel's Approximation Method Problems

1. Consider the transportation problems given below. Solve the problems by Vogel's approximation method.

Origin		Supply			
	D ₁	D_2	D ₃	D_4	
O ₁	3	1	7	4	300
O ₂	2	6	5	9	400
O ₃	8	3	3	2	500
Demand	250	350	400	200	

From		То		Supply
	D ₁	D_2	D_3	
A ₁	6	8	10	150
A_2	7	11	11	175
A ₃	4	5	12	275
Demand	200	100	350	

Sources		Supply		
	D ₁	D_2	D₃	
S ₁	4	5	1	40
S ₂	3	4	3	60
S ₃	6	2	8	70
Demand	70	40	60	