

TP - Initial Basic Feasible Solution

Vogel's Approximation Method (VAM)

Vogel's Approximation Method

		Destination				Supply
		D1	D2	D3	D4	
Source	O1	3	1	7	4	300
	O2	2	6	5	9	400
	O3	8	3	3	2	500
Demand:		250	350	400	200	1200

VAM - row penalties and column penalties

- ▶ For each row find the least value and then the second least value and take the absolute difference of these two least values and write it in the corresponding row

In row **O1**, **1** is the least value and **3** is the second least value and their absolute difference is **2**. Similarly, for row **O2** and **O3**, the absolute differences are **3** and **1** respectively.

- ▶ For each column find the least value and then the second least value and take the absolute difference of these two least values then write it in the corresponding column

In column **D1**, **2** is the least value and **3** is the second least value and their absolute difference is **1**. Similarly, for column **D2**, **D3** and **D3**, the absolute differences are **2**, **2** and **2** respectively.

VAM

		Destination					
		D1	D2	D3	D4	Supply	Row Difference
Source	O1	3	1	7	4	300	2
	O2	2	6	5	9	400	3
	O3	8	3	3	2	500	1
Demand:		250	350	400	200	1200	
Column Difference:		1	2	2	2		

- ▶ These row difference and column difference are also called as penalty. Now select the maximum penalty. The maximum penalty is **3** i.e. row **O2**.
- ▶ Now find the cell with the least cost in row **O2** and allocate the minimum among the supply of the respective row and the demand of the respective column. Demand is smaller than the supply so allocate the column's demand i.e. **250** to the cell. Then cancel the column **D1**

		Destination					
		D1	D2	D3	D4	Supply	Row Difference
Source	O1	3	1	7	4	300	2
	O2	250	6	5	9	400 150	3
	O3	8	3	3	2	500	1
Demand:		250 0	350	400	200	1200	
Column Difference:		1	2	2	2		

From the remaining cells, find out the row difference and column difference.

		Destination					Row Difference	
		D1	D2	D3	D4	Supply		
Source	O1	3	1	7	4	300	2	3
	O2	250	2	6	5	400 150	3	1
	O3	8	3	3	2	500	1	1
Demand:		250 0	350	400	200	1200		
Column Difference:		1	2	2	2			
		-	2	2	2			

- ▶ Again select the maximum penalty which is **3** corresponding to row **O1**. The least-cost cell in row **O1** is **(O1, D2)** with cost **1**.
- ▶ Allocate the minimum among supply and demand from the respective row and column to the cell. Cancel the row or column with zero value.

		Destination						
		D1	D2	D3	D4	Supply	Row Difference	
Source	O1	2	1	7	4	300 0	2	3
	O2	2	6	5	9	400 150	3	1
	O3	8	3	3	2	500	1	1
Demand:		250 0	350 50	400	200	1200		
Column Difference:		1	2	2	2			
		-	2	2	2			

Now find the row difference and column difference from the remaining cells.

		Destination					Row Difference		
		D1	D2	D3	D4	Supply			
Source	O1	2	300	7	4	300 0	2	3	-
	O2	250		6	5	400 150	3	1	1
	O3	8	3	3	2	500	1	1	1
Demand:		250 0	350 50	400	200	1200			
Column Difference:		1	2	2	2				
		-	2	2	2				
		-	3	2	7				

Now select the maximum penalty which is **7** corresponding to column **D4**. The least cost cell in column **D4** is **(O3, D4)** with cost **2**. The demand is smaller than the supply for cell **(O3, D4)**. Allocate **200** to the cell and cancel the column.

		Destination					Row Difference		
		D1	D2	D3	D4	Supply			
Source	O1		300			300 0	2	3	-
	O2	250				400 150	3	1	1
	O3				200	500 300	1	1	1
Demand:		250 0	350 50	400	200 0	1200			
Column Difference:		1	2	2	2				
		-	2	2	2				
		-	3	2	7				

Find the row difference and the column difference from the remaining cells.

		Destination					Row Difference			
		D1	D2	D3	D4	Supply				
Source	O1		300			300 0	2	3	-	-
	O2	250				400 150	3	1	1	1
	O3					500 300	1	1	1	0
Demand:		250 0	350 50	400	200 0	1200				
Column Difference:		1	2	2	2					
		-	2	2	2					
		-	3	2	7					
		-	3	2	-					

Now the maximum penalty is **3** corresponding to the column **D2**.
 The cell with the least value in **D2** is **(O3, D2)**.
 Allocate the minimum of supply and demand and cancel the column

		Destination				Supply	Row Difference			
		D1	D2	D3	D4					
Source	O1	2	300	7	4	300 0	2	3	-	-
	O2	2	6	5	9	400 150	3	1	1	1
	O3	8	50	3	2	500 250	1	1	1	0
Demand:		250 0	350 50	400	200 0	1200				
Column Difference:		1	2	2	2					
		-	2	2	2					
		-	3	2	7					
		-	3	2	-					

Now there is only one column so select the cell with the least cost and allocate the value.

		Destination				Supply	Row Difference			
		D1	D2	D3	D4					
Source	O1	2	300	7	4	300 0	2	3	-	-
	O2	250	1	5	9	400 150	3	1	1	1
	O3	8	50	3	2	500 300 250	1	1	1	0
Demand:		250 0	350 50 0	400 150	200 0	1200 0				
Column Difference:		1	2	2	2					
		-	2	2	2					
		-	3	2	7					
		-	3	2	-					

Now there is only one cell so allocate the remaining demand or supply to the cell

		Destination				Supply	Row Difference			
		D1	D2	D3	D4					
Source	O1	2	300	7	4	300 0	2	3	-	-
	O2	250	1	150	9	400 150 0	3	1	1	1
	O3	8	50	3	200	500 300 250	1	1	1	0
Demand:		250 0	350 50 0	400 150 0	200 0	1200 0				
Column Difference:		1	2	2	2					
		-	2	2	2					
		-	3	2	7					
		-	3	2	-					

VAM

- ▶ No balance remains
- ▶ So multiply the allocated value of the cells with their corresponding cell cost
- ▶ Add all to get the final cost i.e.
- ▶ **$(300 * 1) + (250 * 2) + (50 * 3) + (250 * 3) + (200 * 2) + (150 * 5)$
= 2850**