

# Finding the primal Solution By using the Vogel's approximation Method in transportation problem

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The Vogel's approximation Method (VAM) is most common method used to determine efficient initial solutions for solving the transportation .

For Example the explaining steps by taking the initial solution for VAM

		Storage locations				supply
Manufacturing locations	X1	20	22	17	4	120
	X2	24	37	9	7	70
	X3	32	37	20	15	50
Demand		60	40	30	110	

The steps calculated the initial solution for the VAM :

- 1- Calculating the difference between the lowest cost for each row and column of the cost-matrix.

- Calculating the difference between the Rows

Step 1		Storage locations				supply	D.B.L. Row
		Y1	Y2	Y3	Y4		
Manufacturing locations	X1	20	22	17	4	120	13
	X2	24	37	9	7	70	2
	X3	32	37	20	15	50	5
Demand		60	40	30	110		
DBL Column							

- Calculating the difference between the columns

Step 1		Storage locations				supply	D.B.L. Row
		Y1	Y2	Y3	Y4		
Manufacturing locations	X1	20	22	17	4	120	
	X2	24	37	9	7	70	
	X3	32	37	20	15	50	
Demand		60	40	30	110		
DBL Column		4	15	8	3		

Step 1		Storage locations				supply	D.B.L. Row
		Y1	Y2	Y3	Y4		
Manufacturing locations	X1	20	22	17	4	120	13
	X2	24	37	9	7	70	2
	X3	32	37	20	15	50	5
Demand		60	40	30	110	240 240	
DBL Column		4	15	8	3		

- 2- then assigning the maximum number of units possible to the least-cost cell in the row or column with the largest penalty.

Step 2		Storage locations				supply	D.B.L. Row
		Y1	Y2	Y3	Y4		
Manufacturing locations	X1	20	40 22	17	4	80 120	13
	X2	24	37	9	7	70	2
	X3	32	37	20	15	50	5
Demand		60	0 40	30	110	240 240	
DBL Column		4	15	8	3		

- selected the maximum number in column (Y2) is (15) .
  - selected the minimum cost in the column (Y2) is (22) .
  - Fill the cell ( X1Y2 ) with storage capacity that equal (40) .
  - Hidden the (Y2) about the solution .
- 3- Repeated the step 1 by carelessly the column (Y2)

Step 3		Storage locations				supply	D.B.L. Row
		Y1	Y2	Y3	Y4		
Manufacturing locations	X1	20	40 22	17	80 4	0 120	13
	X2	24	37	9	7	70	2
	X3	32	37	20	15	50	5
Demand		60	0 40	30	110	240 240	
DBL Column		4		8	3		

- selected the maximum number in row (X1) is (13) .
- selected the minimum cost in the row (X1) is (4) .
- Fill the cell ( X1Y4 ) with storage capacity that equal (80) .
- Hidden the (X1) about the solution .

4- Repeated the step 1 by carelessly the column (Y2) and Row (X1)

Step 4		Storage locations				supply	DBL Row		
		Y1	Y2	Y3	Y4				
Manufacturing locations	X1	20	40	22	17	80	4	0	120
	X2	24	37	30	9	7	40	70	2
	X3	32	37	20	15	50	5		
Demand		60	0	40	0	30	30	110	240
DBL Column		8		11		8			

- selected the maximum number in column (Y3) is (11) .
- selected the minimum cost in the column (Y3) is (9) .
- Fill the cell ( X2Y3 ) with storage capacity that equal (30) .
- Hidden the (Y3) about the solution .

5- Repeated the step 1 by carelessly the columns (Y2, Y3) and Row (X1)

Step 5		Storage locations				supply	DBL Row		
		Y1	Y2	Y3	Y4				
Manufacturing locations	X1	20	40	22	17	80	4	0	120
	X2	24	37	30	9	30	7	10	70
	X3	32	37	20	15	50	17		
Demand		60	0	40	0	30	0	110	240
DBL Column		8				8			

- Can see the difference between lowest that equals in rows and columns .
- The choice is made in such a case by adopting the least cost among the remaining costs is (7) .
- Fill the cell ( X2Y4 ) with storage capacity that equal (30) .

Step 6		Storage locations				supply	DBL Row			
		Y1	Y2	Y3	Y4					
Manufacturing locations	X1	20	40	22	17	80	4	0	120	
	X2	10	24	37	30	9	30	7	0	70
	X3	50	32	37	20	15	50	0	50	
Demand		0	60	0	40	0	30	0	110	240
DBL Column										

- Fill the cells ( X2Y1 ) with storage capacity that equal (10) .
- Fill the cells ( X3Y1 ) with storage capacity that equal (50) .

**The initial Salutation for the Transportation Problem by VAM**

<b>Step 6</b>		<b>Storage locations</b>				<b>supply</b>
		<b>Y1</b>	<b>Y2</b>	<b>Y3</b>	<b>Y4</b>	
<b>Manufacturing locations</b>	<b>X1</b>	20	40 22	17	80 4	120
	<b>X2</b>	10 24	37	30 9	30 7	70
	<b>X3</b>	50 32	37	20	15	50
<b>Demand</b>		<b>60</b>	<b>40</b>	<b>30</b>	<b>110</b>	<b>240</b>

**THE TOTAL COST FOR BROBLEM**

<b>Supply</b>	<b>Demand</b>	<b>X<sub>ij</sub></b>	<b>C<sub>ij</sub></b>	<b>The cost per unit of each Manufacturing</b>
<b>X1</b>	<b>Y2</b>	<b>40</b>	<b>22</b>	<b>880</b>
<b>X1</b>	<b>Y4</b>	<b>80</b>	<b>4</b>	<b>320</b>
<b>X2</b>	<b>Y1</b>	<b>10</b>	<b>24</b>	<b>240</b>
<b>X2</b>	<b>Y3</b>	<b>30</b>	<b>9</b>	<b>270</b>
<b>X2</b>	<b>Y4</b>	<b>30</b>	<b>7</b>	<b>210</b>
<b>X3</b>	<b>Y1</b>	<b>50</b>	<b>32</b>	<b>1600</b>
<b>TOTAL COST FOR TRANSPORTATION PROBLEM</b>				<b>3520</b>