

## User\_Value to Point Conversion and Vice - Versa :

### 1) From Value to Points :

Type equation here. **When,**

**No of Rows , Cols = N**

**Total no of elements (E) = N \* N ( 1 ≤ E ≤ N<sup>2</sup> )**

**But ,**

**Both the x\_index and y\_index starts from 0.**

**∴ Range of X\_index ( 0 ≤ x\_index ≤ N - 1 )**

**∴ Range of Y\_index ( 0 ≤ y\_index ≤ N - 1 )**

	13	14	15	16
(4 - 1 = 3) 3	9	10	11	12
2	5	6	7	8
1	1	2	3	4
0				
	1	2	3	
				(4 - 1 = 3)

**Since,**

**Each User\_Value is one of the elements inside the grid .**

**Range of Element\_Index (Starting from 0) is ( 0 ≤ Index ≤ N<sup>2</sup> - 1 ).**

**∴ User\_Value\_Index (Starting from 0) = User\_value - 1 ..... ( i )**

**Then ,**

**X\_index = (User\_Value\_index) % N**

**∴ x = ( User\_Value - 1 ) % N ..... (ii) { from eq(i) }**

**∴ y = ( User\_value - 1 ) / N ..... ( iii ) { from eq(i) }**

### From Points to User\_Value :

**In the above derivation,**

**X co-ordinate is the remainder while the Y co-ordinate of the User\_value - 1.**

**Thus,**

$$\left( \frac{\text{User\_value} - 1}{N} \right) + x = y \quad \text{..... eq (iv)}$$

**or, User\_value - 1 = N ( y - x )**

**∴ User\_value = N ( y - x ) + 1 ..... eq (v)**

$$\frac{N \left( \text{User\_value} - 1 \right) \left( y\_coordinate \right) - N \left( y\_coordinate \right)}{X\_coordinate}$$