

## Multi Dimensional Array(2-D Array)

### Address Calculation in a multi Dimensional Array

1. An array Arr[15][20] is stored in the memory along the row with each element occupying 4 bytes of memory. Find out the Base address and address of the element Arr[3][2], if the element Arr[10][25] is stored at the address 1500.

#### **Solution:**

Total no. of Rows R=15

Total no. of Columns C=20

Lowest Row lr=0

Lowest Column lc=0

Size of element W=4 bytes

Arr[I][J] i.e., Arr[5][2]=1500

Arrangement Order:Row wise

Base Address B=?

$Arr[I][J] = B + W(C(I-lr) + (J-lc))$

$Arr[5][2] = B + 4(20(5-0) + (2-0))$

$1500 = B + 408$

$B = 1092$

Base Address=1092.

$Arr[3][2] = B + W(C(3-0) + (2-0))$

$= 1092 + 4(20(3-0) + (2-0))$

$$=1092+248$$

$$=1340$$

$$\text{Arr}[3][2]=1340.$$

2. An array VAL[1..15][1..10] is stored in the memory with each element requiring 4 bytes of storage. If the base address of array VAL is 1500, determine the location of VAL[12][9] when the array VAL is stored (i) Row wise (ii) Column wise

**Solution:**

Base address B=1500

Element width w=4 bytes

Total rows r=15

Total columns c=10

$$\text{ARR}[I][J] = \text{ARR}[12][9] \Rightarrow I=12, J=9$$

Lowest row index lr=

Lowest column index lc=0

(i) **Row wise**

$$\text{VAL}[I][J] = B + w(c(I - lr) + (J - Lc))$$

$$\text{VAL}[12][9] = 1500 + 4(10(12-1) + (9-1))$$

$$= 1500 + 472$$

$$= 1972$$

(ii) **Column wise**

$$\text{VAL}[I][J]=B+W(I-lr)+R(J-lc)$$

$$=1500+4((12-1)+15(9-1))$$

$$=1500+4(131)$$

$$=1500+524$$

$$=2024$$