Data Structure

Arrays-II

DPP-02

[NAT]

1. Consider a lower triangular 2D array arr[][5] with 15 elements. The number of rows in arr is- ________

[NAT]

2.
Consider an integer 2D array a[-7 to +7] [-7 to +7] that stores an upper triangular matrix uppertm where uppertm[i][j] is 1 for all i<=j. The sum of all the elements in the array is _____________.

[NAT]

3. Consider an integer lower triangular 2D array arr[-16 to +15][-16 to +15] having base address 1000. If the size of the integer is 4 bytes, the address of the element arr[8][7]is- _____________

[NAT]

4. Consider an integer upper triangular 2D array arr[-8 to +7][-8 to +7] having base address 1000. If the size of integer is 4 bytes, the address of the element present at location arr[-6][4] is- _____________.

[NAT]

5. Consider the natural numbers starting from 1 are stored in a lower triangular matrix arr[-3 to 3][-3 to 3]. Find the element present at location arr[1][1]. ________________

[NAT]

6. Consider the natural numbers starting from 1 are stored in a upper triangular 2D array arr[-3 to 3][-3 to 3]. Find the element present at location arr[1][2]. _________________.

[NAT]

7. Consider a 2D array arr[-4 to +4][-4 to 4] stores an upper triangular matrix. Find the address of the location arr[-1][-1] if the starting address of the array is 500 and size of each element is 8 bytes. Assume that elements are stored in column-major order. ________________

[NAT]

8. Consider a 2D array arr[-4 to +4][-4 to +4] stores a lower triangular matrix. Find the address of the location arr[-2][-3] if the starting address of the array is 500 and size of each element is 8 bytes. Assume, that elements are stored in column major order. ________________

Answer Key

1. (5)
2. (120)
3. (2292)
4. (1164)
5. (15)
6. (24)
7. (572)
8. (580)

Hints and Solutions

1. (5)
A lower triangular matrix is always a square matrix.
So, the number of rows in the array = 5.

2. (120)
Number of rows=Number of columns=7+7+1=15.

The sum of all elements-

= 1 + 2 +3 +…..+15

= 120

3. (2292)
The address of the element arr[8][7] is-

$$= 1000 + \left(\frac{(8+16)(8+16+1)}{2} + (7+16)\right) \times 4$$

= 2292

4. (1164)
Number of non-zero elements in the -8th row = 16
Number of non-zero elements in the -7th row = 15

The address of arr[-6][4]-

= 1000 + (16+15+10)*4
= 1164

5. (15)
The element present at arr[1][2] in lower triangular matrix:
= 1 + 2 + 3 + 4 + 1 +1 +1 +1+1
=15.

6. (24)
Number of elements in each row/column=3+3+1=7
The element present at arr[1][2] in upper triangular matrix:
= 7 + 6 + 5 + 4 + 1 + 1
= 24

7. (572)
Number of elements in each row= 4+4+1=9

When stored in column-major order, upper triangular matrix becomes lower triangular.

The number of non-zero elements from arr[-4][-4] to arr[-1][-1]
= 1+2+3+3=9

The address of the element arr[-1][-2] is-

= 500 + (9)*8

= 572

8. (580)
When stored in column-major order, lower triangular matrix becomes upper triangular.

The number of non-zero elements from arr[-4][-4] to arr[-2][-3]
= 10

The address of the element arr[-2][-3] is-

= 500 + 10*8

= 580

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