Data Structure & Programming

DPP

Arrays-I

Section-01

[NAT]

1. Consider a 1D array a with 9 elements. If the base address of the array is 108 and the size of each array element is 4 bytes, the address of a[7] is- _____ (Assume array index starts from 0)

[NAT]

2. Consider a 1D array a[-127……..,+255] where -127 and +255 are the starting index and ending index of the array respectively. The number of elements in the array is _____.

[NAT]

3. Consider a 1D array a with 19 elements. If the base address of the array is 108 and the size of each array element is 4 bytes, the address of a[7] is- (Assume array index starts from -11)_____

[NAT]

4. Consider a 2D array a[-127 to +255][-13 to +14]. The number of elements in the array is _____.

[NAT]

5. Consider the natural numbers from 1 to 256 are stored in a 2D array arr[-28 to 3][-3 to 3]. Find the element present at location arr[-16][1]. (Suppose, the elements are stored in row-major order)_____

[NAT]

6. Consider the natural numbers from 1 to 256 are stored in a 2D array arr[-28 to 3][-3 to 3]. Find the address of the location arr[-16][1] if the starting address of the array is 625 and size of each element is 4 bytes. (Suppose, the elements are stored in row-major order) _____.

[NAT]

7. Consider the whole numbers from 0 to 127 are stored in a 2D array arr[0 to 15][0 to 7]. Find the element present at location arr[6][4]. (Suppose, the elements are stored in column-major order)_____

[NAT]

8. Consider a 2D array arr[-15 to 15][-7 to 7]. Find the address of the location arr[-1][5] if the starting address of the array is 500 and size of each element is 4 bytes. (Suppose, the elements are stored in column-major order) _____

Answer Key

1. **(136)**
2. **(383)**
3. **(180)**
4. **(10724)**
5. **(89)**
6. **(977)**
7. **(70)**
8. **(2044)**

Hints and Solutions

1. (136)
Address of a[7] = 108+(7-0)*4 = 136.

2. (383)
Number of elements in the array=255-(-127)+1=383

3. (180)
Address of a[7] = 108+(7-(-11))*4 = 180.

4. (10724)
Number of elements in each row= 255-(-127)+1=383
Number of elements in each column = +14-(-13)+1=28
Number of elements in the 2D array = 383*28 = 10724

5. (89)
Number of elements in each column=3-(-3)+1=7
The element present at arr[-16][1]
=(-16-(-28))*7+(1-(-3)+1)
=89.

6. (977)
Number of elements in each column= 3-(-3)+1=7
Address of location arr[-16][1]
= 625 + [(-16-(-28))*7+(1-(-3))]*4
= 977

7. (70)
Number of elements in each row= 16
The element present at arr[6][4]=(4-0)*16+(6-0)=70

8. (2044)
Number of elements in each row= 15-(-15)+1=31
Address of location arr[-1][5]
= 500 + [(5-(-7))*31+(-1-(-15))]*4
= 2044

Data Structure & Programming

Arrays-II

Section-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][2]. _____

[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][-2] 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][-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. _____

Answer Key

1. **(5)**
2. **(120)**
3. **(2292)**
4. **(1132)**
5. **(13)**
6. **(25)**
7. **(564)**
8. **(644)**

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-

= 15 +14 + 13 +……+ 3 + 2 + 1

= 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. (1132)
Number of non-zero elements in the -8th row = 15
Number of non-zero elements in the -7th row = 14

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

= 1000 + (15+14+4)*4
= 1132

5. (13)
The element present at arr[1][2] in lower triangular matrix:
= 1 + 2 + 3 + 4 + 1 +1 +1
=13.

6. (25)
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 + 1
= 25

7. (564)
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][0] to arr[-1][-2]
= 1+2+3+3=9

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

= 500 + (9-1)*8

= 564

8. (644)
Number of elements in each row= 4+4+1=9

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

The number of non-zero elements from arr[-4][0] to arr[-2][-1]
= 9+8+2=19

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

= 500 + (19-1)*8

= 644