8. *Three – Dimensional Array*

```
int p = 2;
int q = 3;
int r = 4;
int[p][q] [r] array = {
  {
    { 1, 2, 3, 4 },
    { 5, 6, 7, 8 },
    { 9, 10, 11, 12 }
 },
    {
        { 13, 14, 15, 16 },
        { 17, 18, 19, 20 },
        { 21, 22, 23, 24 }
     }
  };
```

***Time Complexity* : $O(1)$**

Traversal of Array

```
for (int i = 0; i < p; i++)
   {
    for (int j = 0; j < q; j++)
    {
     for (int k = 0; k < r; k++)
     {
      cout << array[i][j][k] << " ";
     }
    }
   }
```

Time Complexity : $O(PQR)$

Insertion of Elements in Array

```
for (int i = 0; i < p; i++)
   {
    for (int j = 0; j < q; j++)
    {
     for (int k = 0; k < r; k++)
     {
      cin << array[i][j][k] ;
     }
    }
   }
```

Time Complexity : O(PQR)

Time Complexity of Three Dimensional Array

The time complexity of inserting a single element into an array at a specific index is O (1) if the index is known. However, the time complexity of inserting 'n' elements into an array sequentially is O(n), since we need to perform the insertion operation 'n' times.

In the code snippet we provided, we are inserting 'n' elements into the array sequentially by using a loop, which means the time complexity of the overall operation is O(n).

The time complexity of entering elements into a three-dimensional array also depends on the number of rows, columns, and depth of the array, as well as the method used to input the elements.

If we are entering each element manually, the time complexity would be O(PNM), where N is the number of rows, M is the number of columns, and P is the depth of the array (No. of Pages).

This is because we would need to iterate through each element in the array to input its value, resulting in NMP operations.

If we are reading in elements from a file or some other data source, the time complexity would depend on the algorithm used to read in the data. In the best case, the time complexity would be O(NMP), but in the worst case, it could be much higher if the data source is very large or requires complex parsing.

Overall, the time complexity of entering elements into a three-dimensional array is primarily determined by the number of elements that need to be entered, and the method used to input them. However, since a three-dimensional array has more elements than a two-dimensional array, the time complexity would generally be higher for a three-dimensional array.

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