

# Computer Programming

Dr. Deepak B Phatak

Dr. Supratik Chakraborty

Department of Computer Science and Engineering

IIT Bombay

Session: Arrays in C++

# Quick Recap

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- Need to handle a large number of values
- Instead of many variables with different names, we need
  - A single name to represent a set of variables
  - Individual elements should be accessed using an index

# Overview of This Lecture

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- Array data structure in C++, and its properties
- Accessing elements of an array
  - Index expressions
- Example of use of arrays in a C++ program

# Array in C++

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- Array is a collection of elements of the same type
  - It has a name, chosen by us, and a fixed size (number of elements)
- Declaring an array

```
int marks[500], roll_numbers[500]; float distances[25];
```
- **Only one element** participates in an operation
  - Input or output
  - As an operand in an expression
  - As a location on LHS of an assignment statement

# Index expression for an array element

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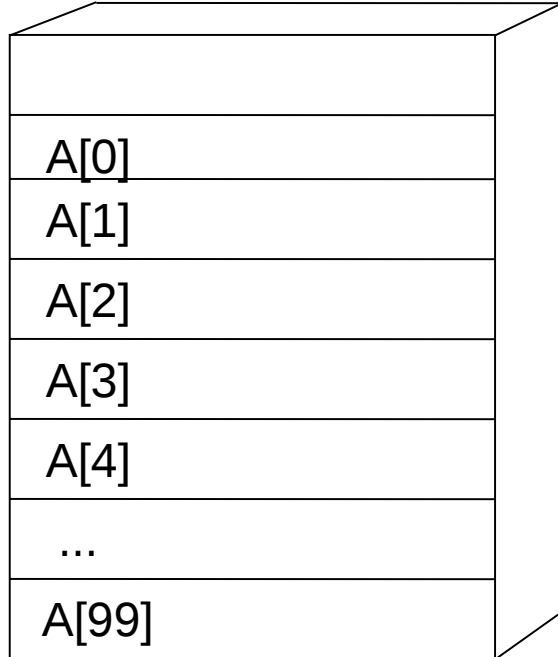


- **Index expression** is used to refer to an element
  - Written in square brackets [ ], immediately after the array name
  - the **value** of index expression is the actual reference.
- Thus when we use a[i]
  - if i is equal to 5 at that point, refers to 5th element
  - if i is equal to 123, 123rd element
- **C++ array index starts with 0**

# A pictorial view of C++ array



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- Array A has 100 int elements

`int A[100];`

- Suppose it stores 5 values

53, 79, 41, 94, 38

`A[0] = 53`

`A[1] = 79`

`A[2] = 41`

`A[3] = 94`

`A[4] = 38`

# Index expression

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- Index can be any expression, which will be evaluated first, the resulting integer value is used to identify a particular element.
- An index expression must result in a value in the range 0 to size-1, where size is as declared in the definition
  - If not, the results are **unpredictable**

# Index expression ...

- Index for the first element is 0, for next element it is 1, etc.

$A[j]$ , for  $j = 86$  means 86th element

$A[k-m+52]$ , for  $k = 1200$ ,  $m=1240$

the index value evaluates to 12

$A[x/5.0]$  for  $x = 7.0$ , expression evaluates to 1

for  $x = 22.5$ , it evaluates to 4



# A program to find sum of marks of N students

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```
int main(){
    // program to find the sum of N marks
    int marks[600] , sum = 0, count, N;
    cin >> N;
    for (count =1; count <= N; count = count +1){
        cin >> marks[count]; sum = sum + marks[count];
    }
    cout << sum;
    return 0;
}
```

# corrected program to find sum of marks of N students



```
int main(){
    // program to find the sum of N marks
    int marks[600] , sum = 0, count, N;
    cin >> N;
    for (count =0; count < N; count = count +1){
        cin >> marks[count]; sum = sum + marks[count];
    }
    cout << sum;
    return 0;
}
```

# Program to find the value of largest element



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```
int main(){
    int a[1000], max, N, i;
    cin >> N;
    for (i=0; i < N; i++) {cin >> a[i];}
    max = a[0];
    for (i=1; i < N; i++) {
        if (a[i] > max) { max = a[i];}
    }
    cout << "maximum Value is " << max << endl;
    return 0;
}
```

# Summary

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- We have learnt how to declare arrays in C++
- Must declare its name and size. Size must be an integer value
- We have learnt how to use an array
- Using an index expression
  - must evaluate to an integer value between 0 and size-1
- We can iterate over an index variable, to successively scan/process all elements of the array