



Introduction to Arrays

ELEC1006: ENGINEERING COMPUTING

Array

- Array: variable that can store multiple values of the same type.
- Values are stored in adjacent memory locations.
- Declared using `[]` operator:

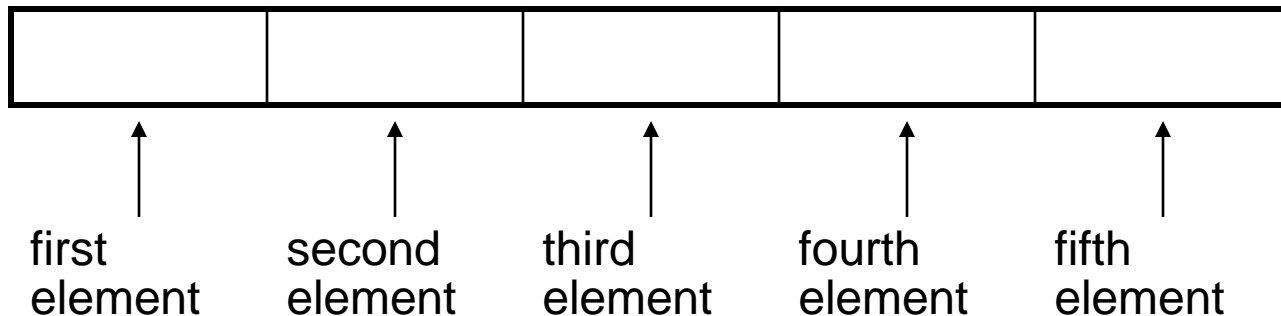
```
int tests[5];
```
- In the definition `int tests[5];`
 - `int` is the data type of the array elements.
 - `tests` is the name of the array.
 - `5`, in `[5]`, is the size declarator. It shows the number of elements in the array.

Array Memory Layout

- The definition:

```
int tests[5];
```

allocates the following memory:



Size of an Array

- The size of an array is:
 - the total number of bytes allocated for it.
 - (number of elements) * (number of bytes for each element).
- Examples:
 - `int tests[5]` is an array of 20 bytes, assuming 4 bytes for an `int`.
 - `long double measures[10]` is an array of 80 bytes, assuming 8 bytes for a `long double`.

Size Declarators

- Named constants are commonly used as size declarators.

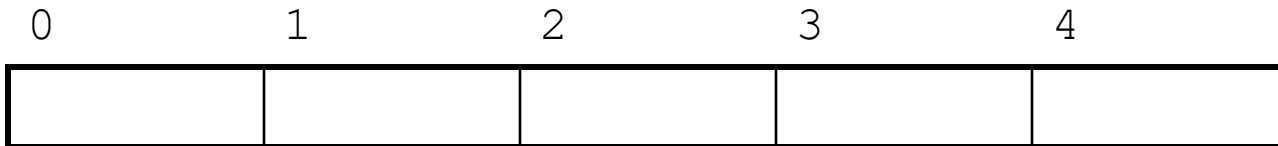
```
const int SIZE = 5;  
int tests[SIZE];
```

- This eases program maintenance when the size of the array needs to be changed.

Array Subscript

- Each element in an array is assigned a unique *subscript*.
- **Subscripts start at 0.**
- **The last element's subscript is $n-1$ where n is the number of elements in the array.**

subscripts:



Accessing Array Elements

- Array elements can be used as regular variables:

```
tests[0] = 79;  
cout << tests[0];  
cin >> tests[1];  
tests[4] = tests[0] + tests[1];
```

- Arrays must be accessed via individual elements:

```
cout << tests; // illegal
```

Example 1

```
1 // This program asks for the number of hours worked
2 // by six employees. It stores the values in an array.
3 #include <iostream>
4 using namespace std;
5
6 int main()
7 {
8     const int NUM_EMPLOYEES = 6;
9     int hours[NUM_EMPLOYEES];
10
11     // Get the hours worked by each employee.
12     cout << "Enter the hours worked by "
13         << NUM_EMPLOYEES << " employees: ";
14     cin >> hours[0];
15     cin >> hours[1];
16     cin >> hours[2];
17     cin >> hours[3];
18     cin >> hours[4];
19     cin >> hours[5];
20
```

Example 1 (continued)

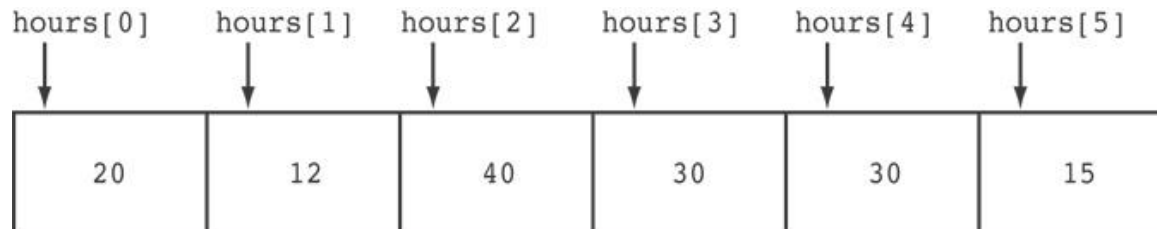
```
21 // Display the values in the array.
22 cout << "The hours you entered are:";
23 cout << " " << hours[0];
24 cout << " " << hours[1];
25 cout << " " << hours[2];
26 cout << " " << hours[3];
27 cout << " " << hours[4];
28 cout << " " << hours[5] << endl;
29 return 0;
30 }
```

Program Output with Example Input Shown in Bold

Enter the hours worked by 6 employees: **20 12 40 30 30 15** [Enter]

The hours you entered are: 20 12 40 30 30 15

Here are the contents of the `hours` array, with the values entered by the user in the example output:



More info

- [1] cplusplus.com: Arrays
<https://www.cplusplus.com/doc/tutorial/arrays/>
- [2] learncpp.com: 6.1 – Arrays (Part I)
<https://www.learncpp.com/cpp-tutorial/61-arrays-part-i/>