Programming for Engineers I
Lab 08
Arrays

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1 What are arrays?

Array is a special data-type. If we have a collection of data of same type as in the case of storage of ages of 100 students, arrays can be used. Arrays are data structure in which identical data types are stored.

2 Declaration

Listing 1: Array declaration

```
datatype ArrayName[Size]; // Size must be constant.
Example: int myArray[10];
         float AnotherArray[33];
         char aString[12];
```

3 Initialization

Array can either be initialised at declaration or at a later stage using loop.

3.1 Initialisation at Declaration

Listing 2: Array initialisation at declaration

```
int myArray1[10] = {0}; // Initialises whole array with zeroes.
int myArray2[10] = {-1,11,-12,10,15,2,4,-7,4,21}; // Initialise individual
    elements.
```

3.2 Using `for` loop

Listing 3: Array initialisation using for loop

```
int myArray1[10]; // Declaration.
for(int i=0; i<10; i++)
{
    myArray[i] = 0; // Initialise all elements to zero.
}
```

4 Sample Program

Listing 4: Sample program

```c
#include <stdio.h>
int main()
{
    int Age[4]; // Declaration.
    Age[0] = 20;
    Age[1] = 19;
    Age[2] = 22;
    Age[3] = 21;

    printf{"First element  = %d\n", Age[0]);
    printf{"Second element = %d\n", Age[1]);
    printf{"Third element  = %d\n", Age[2]);
    printf{"Fourth element = %d\n", Age[3]);

    return 0;
}
```

5 Copying Arrays

Arrays cannot be copied using assignment operator, so individual elements must be copied using a loop. Similarly, other operations like addition, subtraction etc. must performed on individual elements rather than whole arrays.

Listing 5: Copying an array

```c
#include <stdio.h>
int main()
{
    float Array1[5] = {-0.33f,-0.45f,0.22f,0.532f,0.101f};
    float Array2[5];

    // Copying...
    for (int i=0; i<5; i++)
    {
        Array2[i] = Array1[i];
    }
    // Display.
    for (int i=0; i<5; i++)
    {
        printf("Element %d = %f\n", i+1, Array2[i]);
    }

    return 0;
}
```

6 Exercise

Question No. 1: Declare a float array of size 10. Using loop take input from user. Calculate the sum and average of entire array. Print sum and average. And then print the array in reverse order.
Question No. 2: Declare an integer array of size 10. Using for loop take input from user. Take square of each integer and store it in the respective index. Print the array. Do all work in a single array.
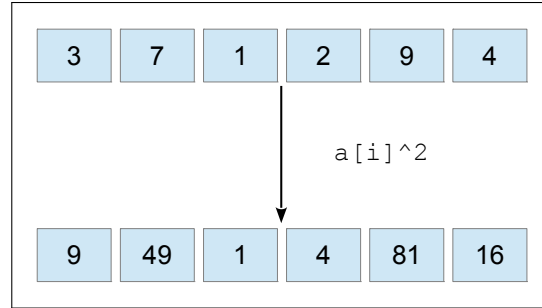
Figure 1: Squaring an array

Question No. 3: Take an array of size 10. Initialize the array with 3's table using for loop. Now ask the user which integer you want to check in the array. If integer is present then print "Yes integer is present its index no is [?]"