

Exercise 7: Arrays and Strings

1. An array is used to hold several data items together as one entity. Can data of different types be stored in a single array?

Revise the first 4 pages of the narrated teaching slides of Chapter 7.1.

2. Explain the difference between the character '5' and the string "5" in C++ language.

Revise the narrated teaching slides of Chapter 7.1.
A quiz at the end of those slides asks a similar question.

3. Which of the following statements about arrays are TRUE?

- (a) The index of a 1-D array starts with zero.
- (b) Once an array has been initialized, its elements cannot be modified.
- (c) You cannot declare a character array with only one element.
- (d) A double array is initialized to store 4 numbers. The size of the array must be declared to be 4.
- (e) You must initialize all elements in a double-scripted array.

Revise the narrated teaching slides of Chapters 7.1 & 7.2. Hint: Only one statement is true.

4. Study the code shown below:

```
#include <iostream>
#include <cstring>
using namespace std;

int main()
{
    char myname[] = "Barney";
    char yourname[20];
    int i, length;

    length = strlen(myname);
    for(i=0; i<length+1; i++)
        yourname[i] = myname[i];

    cout << yourname;

    return 0;
}
```

The key learning points of this question are
(1) string declaration and initialization,
(2) the library function, strlen,
(3) the string terminating character,
(4) using loop to access array elements, and
(5) using cout to display a string.

All topics before 2-D Array are related to this question. That is Chapters 7.1 to 7.4 of the narrated teaching slides.

What does the program do? What is the output?

5. Given the following declarations:

```
int i, zero_count;
double data[5], max;
```

Revise teaching slides about “Access Array with Loop”. Try to write the program on your own without referring to the solution guide below first.

Follow the instructions below to write a C++ program. Codes for the 4 tasks are to be written in the main function. You are NOT expected to write other user-defined functions.

- Use a for-loop to fill in each element of the array, **data**, with the value entered by the user. The user has to enter 5 data one at a time.
- Use a while-loop to display each element of the array.
- Find the largest value in the array, store it in the variable, **max**, and display **max** on the screen.
- Count the number of zeros in the array, store it in the variable, **zero_count**, and display **zero_count** on the screen.

Solution Guide

Fill in the blanks

```
1  #include <iostream>
2  using namespace std;
3
4  int main()
5  {
6      int i, zero_count;
7      double data[5], max;
8
9      //Part a
10     for (i=0; i<5; i++)
11     {
12         cout << "Enter data " << i+1 << ": ";
13         _____ //Assign user's entry into array
14     }
15
16     //Part b
17     cout << endl;
18     _____ //Initialize array index
19     while (_____) //Condition
20     {
21         cout << "Data " << i+1 << " = " << _____ << endl;
22         _____ //Re-initialization
23     }
24
```

Read the comments too. They are hints.

```

25 //Part c
26 max = data[0];
27 for (i=1; i<5; i++)
28     if (max < data[i]) //Check whether current maximum < current array element
29         max = data[i] //Update current maximum to be current array element
30
31 cout << "\nMaximum value = " << max << endl;
32
33 //Part d
34 zero_count = 0;
35 for (i=0; i<5; i++)
36     if (data[i] == 0) //Check whether current array element equals zero
37         zero_count++; //Increment zero counter
38
39 cout << "\nNumber of zero = " << zero_count << endl;
40
41 return 0;
42 }

```

Read the comments too.
They are hints.

6. Write another C++ program for Q5. Follow the template below to write user-defined functions for the 4 tasks listed in Q5.

```

#include <iostream>
using namespace std;

#define SIZE 5

//Function prototype
void enterData(double data[], int s);
void displayData(double data[], int s);
double findMax(double data[], int s);
int countZero(double data[], int s);

int main()
{
    int zero_count;
    double data[SIZE], max;
    :
    :
}

```

Revise teaching slides about “**Passing Array by Reference**” and the few **quizzes** of that section. Try to write the program on your own without referring to the solution guide below first.

Return type of enterData() and displayData() is **void** because these two functions do not require to process any data and return answers.

∴ Data type of the array, data, is given to be double. (See its declaration in the main function.)
 ∴ Data type of the maximum value of the array is also double.
 ∴ findMax() must return a double value.
 ∴ **Return type of findMax is double.**

∴ Number of zero elements in the data array can only be an integer.
 ∴ countZero() must return an integer value.
 ∴ **Return type of countZero is int.**

Solution Guide**Fill in the blanks**

```

1  #include <iostream>
2  using namespace std;
3
4  #define SIZE 5
5
6  //Function prototype
7  void enterData(double data[], int s);
8  void displayData(double data[], int s);
9  double findMax(double data[], int s);
10 int countZero(double data[], int s);
11
12 int main()
13 {
14     int zero_count;
15     double data[SIZE], max;
16
17     //Part a
18     enterData( );
19
20     //Part b
21     (data, SIZE);
22
23     //Part c
24     max =
25     cout << "\nMaximum value = " << max << endl;
26
27     //Part d
28
29     cout << "Number of zero = " << zero_count << endl;
30
31     return
32 }
33
34 //Function for part a
35 void enterData(double data[], int s)
36 {
37     int i;
38
39     for (i=0; i<s; i++)
40     {
41         cout << "Enter data " << i+1 << ": ";
42         //Assign user's entry into array
43     }
44
45     //Return statement of the function
46 }
47

```

What are the input parameters? See the function prototype above and line 21 below.

See the prototype above.

See the prototype above.

See the prototype above.

Read the comments too. They are hints.

```

48 //Function for part b
49            displayData(                  )
50 {
51                //Declare array index i
52
53     cout << endl;
54                //Initialize array index
55     while            //Condition
56     {
57         cout << "Data " << i + 1 << " = " << data[i] << endl;
58                    //Re-initialization
59     }
60
61     return;
62 }
63
64 //Function for part c
65            findMax(                  )
66 {
67     int i;
68     double            //Declare a variable
69
70     curMax =            //Initiaize current maximum value
71     for (i=1; i<s; i++)
72         if (curMax <           ) //Compare current maximum value with current array element
73             curMax = data[i];
74
75     return curMax;
76 }
77
78 //Function for part d
79           
80 {
81     int i, zero_count;
82
83                //Initiaize zero counter
84     for (i=0; i<s; i++)
85         if (          ) //Check whether current array element equals zero
86             zero_count++; //Increment zero counter
87
88     return           
89 }

```

What should be the 1st line of the function definiton?
Hint: See the prototype above.

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Hint: See the prototype above.

~~~~~ End ~~~~~