SEHH2042 Computer Programming

Tutorial 8 – Arrays (1)

Q1. Write a program called **getInteger.cpp** that asks the user to enter *n* integers (*n* is input by the user at the beginning). The program stores the *n* integers in an array. After user's input, the program prints out the integers input by the user, five in a row.

You can assume that the maximum value of *n* entered by the user is 20.

Sample result:

```
How many integers to enter? 7
? 10
? 15
? 20
? 5
? 12
? 8
? 27
The input integers are:
   10   15   20    5   12
    8   27
```

Think about the following first:

(1) What header files/library are required?
(2) How many variables/arrays are needed?
(3) What is/are the data type(s) of variable(s)/array(s)?
(4) What are the steps and calculations involved?

Follow the steps below to write the program:

1. Include necessary header files/library and write the main() block.

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

int main()
{
    // code of subsequent steps

    return 0;
}
```

<iomanip> library for setw().

2. Declare necessary variables.

```
int n, data[20];
```

Array size cannot be variable. Use 20 to cater all possible user input.

3. Ask user to input *n*.

```
cout << "How many integers to enter? ";
cin >> n;
```

4. Use a for loop to repeat *n* times

```
for (int i = 0; i < n; i++) {
    // code to get user input
}
```

Array index begins from 0, so loop counter starts from 0.

5. In the for loop, ask user to enter an integer value to an array element.

```
cout << "? ";
cin >> data[i];
```

Which array element to use depends on which round the for loop is.

6. After the getting all user input, i.e. after the above for loop, display the array content.

```
cout << "The input integers are:\n";
for (int i = 0; i < n; i++){
     cout << setw(5) << data[i];

     if (i % 5 == 4) cout << endl;
}
```

Loop *n* times, not 20 times.

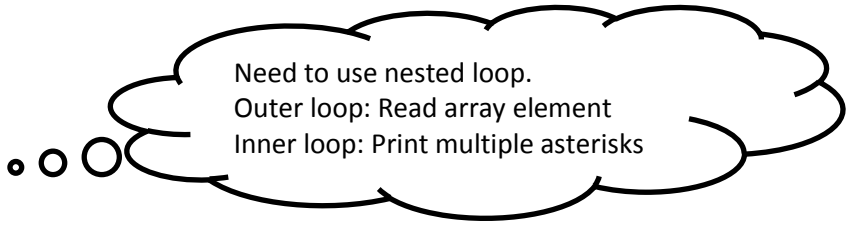
5 in a line, so need to % 5. New line at the position with reminder 4.

Q2. Modify Q1 above so that the program prints out "bar chart" with the input numbers, instead of printing individual values. Each input number represents the number of asterisks (`'*'`) in a bar.

You can assume that the maximum value of *n* entered by the user is 20.

Sample result:

```
How many integers to enter? 7
? 10
? 15
? 20
? 5
? 12
? 8
? 27
The bar chart is:
**********
***************
********************
*****
************
********
**************************
```



Q3. Write a program called **randomInteger.cpp** that finds the largest value of 20 randomly generated integers and calculates the average of them. Values of these integers range from 1 to 100. In your program, you should use an array to store the integers. The program prints the random integers, five in a row, and prints the largest value and average among them. The seed value for the random number sequence should be set by the user at the beginning.

Sample result:

```
Please enter the seed value: 123
The random integers are:
   41    54    76     5    64
   66    50    79    61    65
   30    51    81    64    30
   87    59    96    68    31
The largest number is: 96
The average value is: 57.9
```

Q4. Write a program called **maxAppear.cpp** that finds the most displayed number among 100 randomly generated integers range from 1 to 10. Similar to Q3, your program allows the user to set the seed value, and stores the integers in an array.

Sample result:

```
Please enter the seed value: 456
The random integers are:
    8    1    9    7    8    7   10    9    6    4
    5    9    7    7    2    3    6    2    6    4
    5    2    5    9    1    4    4    1    5    7
   10    4    8    5    8   10    2    9    6    5
    7    7    5    3    3    3    5    4    3    6
    1    9    4    5    1    7    3   10    2    4
    3    9    5    4    8    4    9    9    4    2
    7    3    8    7    3    2    7   10    6    3
    5    5    9   10    1    3    5    6    7    7
    7    4    5   10   10    6    4    1    1    1
5 appears the most with 14 times
```

Q5. Modify all programs above by implementing appropriate function(s), and then use the function(s) in main(). The function prototypes of each question are given below:

Question	Function Prototype
Q1	`void printData( int list[], int size );`
Q2	`void printBar( int list[], int size );`

Q3	`void printData( int list[], int size );`
	`int largest( int list[], int size );`
	`double average( int list[], int size );`

Q4	`void printData( int list[], int size );` `void maxAppear( int list[], int size, int &max, int &freq );`