Guide to Exercise 5: Iteration Constructs for Selected Questions

1. Fill in the blanks for the following programs to produce the respective outputs shown.

(a)

```
int m;
for(m=1;_____________; m++)
{

  cout << "We've Got a problem.\n";
}
```

Loop 3 times to display output 3 times

Console output:

```
We've Got a Problem.
We've Got a Problem.
We've Got a Problem.
```

(b)

```
int p =5;
while (p>=1)
{

  cout << p <<"*****\n";

  _____________;
}
```

Console output:

```
5*****
4*****
3*****
2*****
1*****
```

Reinitialise while loop - decrement. Loop 5 times to display output 5

(c)

```
int limit =_____;
do
{

  cout << limit << endl;

  ___________________;
} while (limit<=10000);
```

Console output:

```
10
100
1000
10000
```

Reinitialise loop – limit is incremented by 10 times each loop

(d)

```
int layerOut,layerIn;

for(layerOut=0; layerOut<_____; layerOut++)
{
  for(layerIn=0; layerIn<_____; layerIn++)
  {
        cout << layerOut << "-" << layerIn << endl;
  }
  cout <<"*****\n";

}
```

Outer loop is looped 2 times

Inner loop is looped 4 times

Console output:

Variable layerIn's value changes from 0 to _?_

```
0-0
0-1
0-2
0-3
*****
1-0
1-1
1-2
1-3
*****
```

Printed in inner loop

Printed in outer loop

Printed in inner loop

Printed in outer loop

Variable layerOut's value changes from __?__ to __?__

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2(a). What will be the output of the following code:

```
int i;
for(i=10; i<20; i=i+2)
{
     cout << i*10 ;
}
```

i is incremented by 2 for each loop.

The initial value of i is __?__.
1st time for loop body runs and prints ___?__(i*10=?)
2nd time for loop runs, i is __?__, prints ___?_ (i*10=?)
The last time for loop runs, i is __?__, prints ____?___

2(b). Rewrite the code in question 2(a) using a **while** loop.

3. Spot and correct the errors in the following code segments:

(a)

Console output:

```
Square of 1 = 1
Square of 2 = 4
Square of 3 = 9
Square of 4 = 16
Square of 5 = 25
```

Use ; to separate 3 optional parts of for

```
int num;
for(num=1, num<=5, num=num+1)
{
  cout << "Square of num = << num*num << endl ;
}
```

Value of num needs to be displayed, hence num should be out of " " ...

(b)

```
char input;
double voltage current;
while (input = y);
{
  cout << "Enter the voltage and current: ";
  cin >> voltage >> current;
  cout << "The resistance is " << voltage/current << endl;
  cout << Do you wish to continue [y/n]: ";
  input << cin ;
}
```

- Is char type variable input initialised? If not, How?
- Assign or equal?
- cout and cin syntax
- while loop syntax

4. What is the output of the following code?

```
int count = 1, odd = 0;
do
{
     if ( (count %  2) != 0 )
          odd++;
     count++;
}while (count<10);
cout << "odd = " << odd;
```

Checking for variable **count**'s value is **odd or even**? _____

Checking for the number of odd numbers between __?__ to __?__.

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5(a). Write a program using loop, which prompts the user to enter an integer. The program then displays the corresponding multiplication table.

A sample run is shown below:

Enter an integer : 8

8 x 1 = 8
8 x 2 = 16
8 x 3 = 24
8 x 4 = 32
8 x 5 = 40
8 x 6 = 48
8 x 7 = 56
8 x 8 = 64
8 x 9 = 72
8 x 10 = 80

- Use the loop you are most confident of.
- Draw flowchart first, before coding.
- Then use the other two loops.
- Compare the differences.

The multiplier changes from 1 to __?__, with increment of __?__

5(b). Modify your program in 5(a) above so that after displaying the multiplication table, the program repeats, asking the user to enter another number. If the number entered is non-zero, the multiplication table for the number is displayed and the program repeats. The program terminates if the number entered is zero.

```
#include <iostream>
using namespace std;
int main()
{       int num, i;
        cout << "Enter an integer: ";
        cin >> num;
        while (num!=0)  // loop body runs, so long num is not 0. while loop terminates, if num is 0
        {       cout << endl;
               //inner loop displays the whole multiplication table for each number entered
                for (i=1; i<11; i++)
                {
                      cout << num << " x " << i << " = " << num*i<<endl;
                }
                //Multiplication table displayed.
                //Prompt user to enter another number to display next multiplication table
                cout << "\nEnter another integer: ";
                cin >> num;
                // if remove the above 2 statements, save, rebuild and run the code, what'll happen?
        }
        return 0;
}
```

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6. The gain of a RC active filter is given by the following equation:

Gain = 1/(2nfRC)

Write a program, which prompts the user to enter the value of the resistor (R) and the capacitor (C). It then displays a table of *frequencies* and *Gains* for frequencies from f=0.1Hz to f=1GHz in decade steps (i.e for each iteration, the frequency is multiplied by 10).

Write your program using a
a) **for** loop
b) **while** loop
c) **do-while** loop

6(a).
```
// use for loop
#include <iostream>
#include <iomanip>   // for formatted output value
using namespace std;

#define PI 3.142  // define PI as 3.142
int main()
{
        double R, C, f, Gain; // declare variables with proper data type and meaningful names
        cout << "Enter resistance: "; // prompt user to enter resistance value
        cin >> R;                     // store user entered value to variable R
        cout << "Enter Capacitance: ";
        cin >> C;
        cout<<"Frequency\tGain\n"; // print out header once, \t is equivalent to tab
        for (f=0.1; f<=1E9; f*=10) // f has initial value 0.1, condition for the loop to run is f<=1E9,
        {                          // after each run of the for loop, f is changed by incrementing 10 times.
                Gain = 1/(2*PI*f*R*C); // calculate Gain, if remove ( ), what'll happen?
                cout <<setw(10)<<setprecision(10)<< f<<"\t"<<Gain<<endl; /* print out value of
                                                                        Gain with format for each f */
        }
        return 0;
}
```

Sample output:

```
Enter resistance: 1000
Enter Capacitance: 2e-6
Frequency       Gain
      0.1      795.6715468
        1      79.56715468
       10      7.956715468
      100      0.7956715468
     1000      0.07956715468
    10000      0.007956715468
   100000      0.0007956715468
  1000000      7.956715468e-005
 10000000      7.956715468e-006
100000000      7.956715468e-007
1000000000     7.956715468e-008
```

6 (b) Your code here, using **while** loop
6 (c) Your code here, using **do-while** loop

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7. (Optional) Additonal Practice

   Design a program to prompt user to enter a 6-digit postal code in Singapore, and print its location based on the first two digits values.

   Add code to check whether the postal code are valid, if not, allow user to enter again, up to 3 times maximum.

- Find the first two digits of the input number with division operation (divided by ___?)
- You may refer to following site to get the location based on the first two digits value in the postal code. (use if-else / switch)
  https://www.ura.gov.sg/realEstateIIWeb/resources/misc/list_of_postal_districts.htm
- Validate the postal code entered. (use if-else and loop)

Sample Run:

Valid postal code entered:

```
Please enter a 6-digit postal code in Singapore:
139651
 You entered postal code 139651.
 The area(s) is / are: Pasir Panjang, Hong Leong Garden, Clementi New Town.
```

Invalid input twice:

```
Please enter a 6-digit postal code in Singapore:
998877
Please enter a valid 6-digit postal code in Singapore:
8773
Please enter a valid 6-digit postal code in Singapore:
823012
Sorry, you've entered invalid postal code 3 time. Bye!
```