

Q1

- In a counter-controlled while loop it's not necessary to initialize the loop control variable (**false**)
- it is possible that the body of a while loop may not execute at all (**true**)
- In an infinite while loop, the while expression (the decision maker) is initially false, but after the first iteration it is always true (**true**)
- The while loop: terminates if $j > 10$ (**true**)

```
j = 0;
while (j <= 10)
j++
```

- A sentinel-controlled while loop is an event-controlled while loop whose termination depends on a special value (**true**)
- A loop is a control structure that causes certain statements to execute over and over (**true**)

Q2

- What is the output of the following C++ code ?

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

void main() {
    int i = 0;
    int temp = 1;

    while (i < 5) {
        i = i + 1;
        temp = temp * i;
    }

    cout << "i = " << i << " and temp = " <<
temp << endl;
}
```

Answer:

Error, the main cannot return **void**, it must return **int**

- Suppose that the input is **10 30 16 25 76 -1**. What is the output of the following code?

```
#include <iostream>

using namespace std;

int main(){

    // inputs are 10 30 16 25 76 -1

    int num = 0;
    int sum;
    int count = 0;
    cin >> sum; // 10

    while (count < 3){
        cin >> num; // 30, 16, 25,
        sum = sum + num; // 40, 56, 81
        count++; // 1, 2, 3
    }

    cout << "Sum = " << sum << endl; // 81
}
```

Answer:

Sum = 81

- Suppose that the input is **25 36 18 16 -1**. What is the output of the following code?

```

#include <iostream>

using namespace std;

int main(){
    // input are 25 36 18 16 -1

    int num;
    int sum;

    cin >> sum; // 25
    num = sum;

    while (num != -1){
        cin >> num; // 36, 18, 16, -1
        sum = sum + num; // 61, 79, 95, 94
    }

    cout << "Sum = " << sum << endl; // 94
}

```

Answer:

Sum = 94

- Suppose that the input is **25 36 18 16 -1**. What is the output of the following code?

```

#include <iostream>

using namespace std;

int main() {
    // input are 25 36 18 16 -1

    int num;
    int sum;

    cin >> num; // 25
    sum = num; // 25

    while (num != -1) {
        sum = sum + num; //50, 86, 104, 120,
        cin >> num; // 36, 18, 16, -1
    }

    cout << "Sum = " << sum << endl; // 120
}

```

Answer:

Sum = 120

- Suppose that the input is **10 -6 12 -5 -4 0**. What is the output of the following code?

Answer:

```

#include <iostream>

using namespace std;

int main() {
    // input are 10 -6 12 -5 -4 0

    int num;
    int sum = 0;

    cin >> num; // 10

    while (num != 0) {

        if (num > 0)
            sum = sum + num;
        else
            sum = sum - num;

        // sum: 10, 16, 28, 33, 37
        cin >> num; // -6, 12, -5, -4, 0
    }

    cout << "Sum = " << sum << endl; // 37
}

```

- Correct the following code so that it reads and finds the sum of 20 numbers

```

#include <iostream>
using namespace std;
int main(){
    int count = 0;
    int sum = 0;

    cin >> num;

    while(count <= 20);
    {
        cin >> num;
        count++;
        sum = sum + count;
    }
}

```

Answer:

```
#include <iostream>
using namespace std;
int main() {
    int count = 1;
    int sum = 0;
    int num;

    while (count <= 20) {
        cin >> num;

        sum += num;
        count++;
    }

    cout << sum << endl;
}
```

9. Consider the following for loop:

```
int j, s;
s = 0;
for (j = 1; j <= 10; j++)
    s = s + j * (j - 1);
```

Answer ?

s is a sum of the loop
it will be **330** once done

10. What is the output of the following program segment?

```

int num = 1;
int i;
for (i = 0; i < 5; i++){
    num = num * (5 - i);
    cout << num << " ";
}
cout << endl;

```

Answer

5 20 60 120 120

11. Assume that the following code is correctly inserted into a program

```

int s = 0;
int i;
for(i = 0; i < 5; i++)
{
    s = 2 * s + i;
    cout << s << " ";
}

```

- What is the final value of s?
 - 11
 - 4
 - 26
 - none of these
- if a semicolon is inserted after the right parenthesis in the for loop statement, what is the final value of s?
 - 0
 - 1
 - 2
 - 5
 - none of these
- if the 5 is replaced with a 0 in the for loop control expression, what is the final value of s?
 - 0
 - 1
 - 2
 - none of these

Answer

- 26
- 5
- 0

13. Write a for loop statement to add all the multiples of 3 between 3 and 100

Answer

```
#include <iostream>

using namespace std;

int main() {
    int sum = 0;

    for (int i = 3; i <= 100; i += 3)
        sum += i;
}
```

30. What is the output of the following program segment?

```
int count;
int y = 0;

for (count = 1; count <= 5; ++count){
    num = 3 * (count - 1) + (y - count);
    cout << num << " ";
}
cout << count << " " << endl;
```

Answer

num is not defined

32. Suppose that the input is 5 3 8. What is the output of the following code? Assume all variables are properly declared


```

cin >> a >> b >> c;
for (j = 1; j < a; j++){
    d = b + c;
    b = c;
    c = d;
    cout << c << " ";
}
cout << endl;

```

Answer

11 19 30 49

34. Suppose that the input is 3 5 7 -6 10. What is the output of the following code?

```

int temp = 0;
int num;
int count;
cin >> temp;
for (count = 0; count <= 3; count++)
{
    cout << temp << " ";
    cin >> num;
    temp = temp + num * (count - 1);
}
cout << endl;

```

Answer

3 -2 -2 -8

35. The following program contains errors that prevents it from compiling and / or running. Correct all such errors.

```
#include <iostream>
using namespace std;
const int SECRET = 111.25;

int main()
{
    int num1, num2;
    double x, y;
    cout >> "Enter two integers: "
    cin << num1 << num2
    cout >> endl;

    for (count = 1 count > Secret; ++count)
    {
        x = (num1 + num2) / 2.0;
        y = (num1 - num2) % 2.0;
        num1: = num1 + num2;
        num2: = num2 + (count - SECRET - 1)
    }
    cout << num1 << " " << num2 << " " << x % 5
    << " " << (y % 7) << endl;
    return;
}
```

Answer

```
#include <iostream>
using namespace std;
const double SECRET = 111.25;

int main()
{
    int num1, num2, count;
    double x, y;
    cout << "Enter two integers: ";
    cin >> num1 >> num2;

    cout << endl;

    for (count = 1; count > SECRET; ++count)
    {
        x = (num1 + num2) / 2.0;
        y = (num1 - num2) % 2;
        num1 = num1 + num2;
        num2 = num2 + (count - SECRET - 1);
    }

    cout << num1 << " " << num2 << " " << int(x) % 5
    << " " << (int(y) % 7) << endl;

    return 0;
}
```

Q:Do these programming exercises with c++ language:

6. Write a program that prints prime number in the range from the user

Answer

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

bool isPrime(int num) {
    if (num <= 1)
        return false; // 0 and 1 are not prime
    for (int i = 2; i * i <= num; i++) {
        if (num % i == 0)
            return false;
    }
    return true;
}

int main() {
    int start, end;

    cout << "Enter the start of the range: ";
    cin >> start;
    cout << "Enter the end of the range: ";
    cin >> end;

    cout << "Prime numbers between " << start << " and " << end << " are:\n";

    for (int num = start; num <= end; num++) {
        if (isPrime(num)) {
            cout << num << " ";
        }
    }
    cout << endl;
    return 0;
}
```

8. Write a program to print the smallest number in a group of numbers entered in the range that the user chooses without using an array, so it with a for loop and while loop and a do while loop

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

void main_operation(bool& at_the_start, int& min, int& i) {
    int current_value;

    cout << "Enter the " << i << " number: ";
    cin >> current_value;

    if (at_the_start) {
        min = current_value;
        at_the_start = false;
    }

    else if (current_value < min) {
        min = current_value;
    }
    i++;
}

int get_count() {
    int count;

    cout << "How much times would be entering number: ";
    cin >> count;

    return count;
}

int with_for_loop() {
    int count = get_count();
    int min;

    bool at_the_start = true;

    for (int i = 1; i <= count; i) {
        main_operation(at_the_start, min, i);
    }
    return min;
}
```

```

int with_while_loop() {
    int count = get_count();
    int min;
    int i = 1;

    bool at_the_start = true;

    while (count >= i) {
        main_operation(at_the_start, min, i);
    }

    return min;
}

int with_do_while_loop() {
    int count = get_count();
    int min;
    int i = 1;

    bool at_the_start = true;

    do {
        main_operation(at_the_start, min, i);
    } while (count >= i);

    return min;
}

int main() {
    int min = with_do_while_loop();

    cout << "The smallest number: " << min << endl;
}

```

14. Write a C++ program that uses while statement and the tab escape sequence \t to print the following table of values then rewrite the program using loops [for - do while – goto]

```
#include <iostream>
#include <math.h>

using namespace std;

void with_for_loop() {
    cout << "N\t10*N\t100*N\t1000*N" << endl;
    for (int i = 1; i <= 5; i++) {
        cout << i << "\t";
        for (int j = 1; j <= 3; j++) {
            cout << i * (pow(10, j)) << "\t";
        }
        cout << endl;
    }
}

void with_while_loop() {
    int i = 1;
    int j = 1;

    cout << "N\t10*N\t100*N\t1000*N" << endl;
    while (i <= 5) {
        j = 1;
        while (j <= 4) {
            cout << i * (pow(10, j)) << "\t";
            j++;
        }
        i++;
        cout << endl;
    }
}
```

```

void with_do_while_loop() {
    int i = 1;
    int j = 1;

    cout << "N\t10*N\t100*N\t1000*N" << endl;
    do {
        j = 1;
        do {
            cout << i * (pow(10, j)) << "\t";
            j++;
        } while (j <= 4);
        i++;
        cout << endl;
    } while (i <= 5);
}

void with_goto() {

    cout << "N\t10*N\t100*N\t1000*N" << endl;

    int i = 1;

    rows_label:
        if (i > 5)
            return;
        cout << i << "\t";

        int j = 1;
        columns_label:
            if (j >= 4){
                i++;
                cout << endl;
                goto rows_label;
            }

            cout << i * (pow(10, j)) << "\t";
            j++;
            goto columns_label;
    }

int main() {
    with_goto();
}

```