Problem Set 4

1. Find the number of times each of the following loops executes.

        for (i = 1; i <= 10; ++i) ++sum;
        for (i = 1; i < 10; ++i) ++sum;
        for (i = 'a'; i <= 'j'; ++i) ++sum;
        for (i = 0; i < 10; ++i) ++sum;
        for (i = 0; i < 10; ++i) ++i;
        for (i = -5; i < 5; ++i) ++sum;
        for (i = 5; ++i < -5; ++i) ++sum;
        for (i = 5; i < -5; --i) ++sum;
        for (i = 10; i > 0; --i) ++sum;
        for (i = '1'; i >= '0'; --i) ++i;
        for (i = 10; i >= 0; --i) –i;
        i = 0; while (i) ++sum;
        i = 0; while (i < 10) { ++i; ++sum; }
        do { i = 0; } while (++i < 10);
        do { i = 0; i++; } while (++i < 1);

2. Write a program to read integers from user and print their sum in the end. The loop should not accept any input as soon as the sum is >= 100. For instance, 99 2 should print 101, and 90 4 2 3 100 should print 199.

3. Write a program to read integers from user and print the sum of only those numbers that are multiples of 10. For instance, 1 22 10 33 60 70 33 should print 140, and 1 4 2 88 323 should print 0.

4. Write a program to read integers from user and print the sum. The loop should terminate as soon as either -1 is entered or when the sum is >= 100.

5. Read two positive integers x and y from the user and print the value of x^y. Check your answer by printing pow(x, y). Modify the program so it works for negative values of y.

6. Print the following patterns with loops now. Ask for number of characters in the first row from the user.

```
***********      ************    ***********        *************
|         |      ***********     **********         ***********
|         |      **********      *********          ********
***********      *********       ********           ******
                 . . .                  . . .               . . .
                 **                      **                  *
                 *                       *
```

7. What is the output of the following program? Why?

        #include <stdio.h>

        int main() {

```c
        int z = 1;
        int x, y;

        scanf("%d%d", &x, &y);

        do {
                z *= x;
        } while (--y);

        printf("%d\n", z);
    }
```

8. Write a program to print all perfect numbers less than 2^20. A perfect number is a positive integer that is equal to the sum of its proper divisors. For instance, 6 == 1 + 2 + 3. If you are interested, read interesting notes at https://en.wikipedia.org/wiki/Perfect_number

9. Write a program to find N[th] fibonacci number. First and second fibonacci numbers are 0 and 1, and each next fibonacci number is computed using the previous two numbers: fib(N) = fib(N-1) and fib(N-2). The fibonacci sequence is 0 1 1 2 3 5 8 13 21 34 …

10. Write a program to print N! (that is factorial of N). N! = N * (N-1) * (N-2) * … * 1.