CS101 Lab Quiz 1 - Batch C
15 Feb 2024 - 20:45 hrs to 22:15 hrs
4 Compulsory Questions - 40 Marks

Instructions:

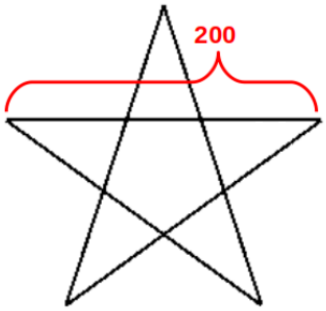
- Keep your ID card on the table for ready reference. If your ID card isn't with you, you won't be allowed to appear for the quiz/exam.
- Keep your phones, tablets, notes, bags, books, etc. near the instructor's platform.
- Rough sheets will be provided to you.
- Create a folder on your `Desktop` and name it `submission_YourRollNumber`
  E.g.: If my roll number is `23k1234` then my folder name is **`submission_23k1234`**
- Create all four programs in the newly created folder.
- Name the program files as mentioned in this pdf only.
- No clarifications will be provided for any question by anyone (TAs/Instructor). When in doubt, make suitable assumptions, state them clearly as comments in your program file itself, and proceed to solve the problem.
- Please note that your answers should NOT include any programming concept that hasn't been covered in the class. You are not allowed to use arrays, functions, strings, or any advanced concepts of C/C++. Such solutions will NOT be graded.
- Marks will be given for each hidden test case that passes.

Filename: LQ01_C_Q1.cpp **(8 Marks)**

Write a program to draw the star given below. The entire figure should be clearly visible on the screen. The length of all the lines is 200. It is also mentioned in the figure for understanding. Do not draw the length marked in red; it is just for illustration purposes.

Rubrics:

- Its ok if the size of the length is not exact. It should look similar to the one below



Solution:

```
#include <simplecpp>
int main()
{
    turtleSim();
      repeat(5) {
        forward(200);
        right(144);
    }
    wait(10);
}
```

Filename: LQ01_C_Q2.cpp **(8 Marks)**

You are given a formula to find the sum of the first n numbers i.e. 1+2+3+…+n. Your task is to write a program to compute the sum using this formula.

$$sum\ of\ the\ first\ n\ numbers\ =\ ((1\ +\ n)\ *\ n)\ /\ 2$$

Input Format
The input consists of a single positive number,

Output Format
Print the sum of the first n numbers.

Constraints (Assume)
1 ≤ n ≤ 10^4

***Note**:*

- Do not write any C++ statements for printing general messages. For example, the following **should NOT** be present in your program:
  a. **cout << "Enter a number:"**,
  b. **cout << "The computed answer is"**, etc.
  In addition, **do not** print unnecessary spaces unless specified in the program.
- You just have to print the result.

Practice Test Cases:

Input	**Output**
1	1
6	21
1000	500500

Evaluate Test case :

Input	Output	2 marks per testcase
190	18145	
15	120	
9000	40504500	
7654	29295685	

Solution

```
#include <simplecpp>
using namespace std;
main_program {
    int n;
    cin >> n;
    cout<<  ((1 + n) * n) / 2;
    return 0;
}
```

Filename: LQ01_C_Q3.cpp **(10 marks)**

Write a program that accepts a number n from the user and performs a specific operation as given below

- If n is negative and even, compute n/2 and print the result
- If n is negative and odd, print the square of n
- If n is positive and even, compute n/3 and print the result.
- If n is positive and odd, print the cube of n
- If n is zero, print the number 0 two times i.e. print 00.

Input format
The input consists of a single integer

Output:
Print the result of the operation as given above

Constraints (Assume)
−10^3 ≤ n ≤ 10^3

***Note**:*

- Do not write any C++ statements for printing general messages. For example, the following **should NOT** be present in your program:
    a. **cout << "Enter a number:"**,
    b. **cout << "The computed answer is"**, etc.
  In addition, **do not** print unnecessary spaces unless specified in the program.
- You just have to print the result.

Practice Test Cases :

Input	**Output**
-600	-300
-435	189225
0	00
724	241.333
803	517781627

Evaluate Test case :

Input	**Output**	**2 marks per test case**
-324	-162	
-137	18769	
0	00	
638	212.667	
519	139798359	

Solution

```
#include <simplecpp>
main_program {
   int num;
   cin >> num;
   if (num < 0 && num % 2 == 0) {
       cout << num/2.0 << endl;
   }
   else if(num < 0 && num % 2 != 0) {
       cout << num * num << endl;
   }
   else if (num > 0 && num % 2 == 0) {
       cout << num / 3.0 << endl;
   }
   else if (num > 0 && num % 2 != 0) {
       cout << num * num * num << endl;
   }
   else {
       cout << "00" << endl;
   }
}
```

Filename: LQ01_C_Q4.cpp **(14 marks)**

A Pythagorean triple consists of three positive integers a, b, and c, such that $a^2 + b^2 = c^2$. Write a program to accept two numbers from the user 'start' and 'end' and print the triplets (a, b, and c) within the range of start to end, both inclusive, but the triplets should not have any common factor. If no such triplets exist, then print 0. Note that the triplets should be in increasing order. See the example below for more details.

Input format

A single line containing two positive numbers start and end

Output format

Pythagorean triplets (in between `start` and `end`) and having no common factor. The triplet, a, b, and c, should be separated by a space, and each triplet should be printed on a different line.

Constraints (Assume)

1 <= start, end <= 10000
start <= end

Example

start = 1 and end = 20
The Pythogorean triplets i.e. three positive integers a, b, and c, such that $a^2 + b^2 = c^2$ are
3 4 5
5 12 13
6 8 10
8 15 17
9 12 15
12 16 20

However, the triplets, (6, 8, 10) has common factor 2, (9, 12, 15) has common factor 3, and (12, 16, 20) has common factor 4. So, these three triplets should not be included in the output. So, the final output would be
3 4 5
5 12 13
8 15 17

Also note that while printing,

- each triplet should be (a < b < c). E.g. 5 < 12 < 13
- Triplets should be in increasing order. I.e. Let's denote the first triplet as a, b, and c, and the next one as `a' b' c'`. So, a < `a'`. Example: (5, 12, 13) appear before (8, 15, 17), as 5 < 8.

Note:

- Do not write any C++ statements for printing general messages. For example, the following **should NOT** be present in your program:

a. **cout << "Enter a number:"**,
b. **cout << "The computed answer is"**, etc.

In addition, **do not** print unnecessary spaces unless specified in the program.

- You just have to print the result.

Practice Test Cases

Input	Output
40 70	0
1 30	3 4 5 5 12 13 7 24 25 8 15 17 20 21 29
50 100	65 72 97
100 200	104 153 185 119 120 169
500 1000	504 703 865 533 756 925 540 629 829 555 572 797 580 741 941 615 728 953 616 663 905 696 697 985

Evaluate Test Cases (2 marks per test case)
If all triplets are printed even those who have a common factor, then give 50% marks for that test case.

Input	**Output**
70 100	0
20 80	20 21 29 28 45 53 33 56 65 48 55 73
200 400	204 253 325 207 224 305 225 272 353 228 325 397 252 275 373
400 800	400 561 689

	407 624 745 429 460 629 432 665 793 455 528 697 468 595 757 481 600 769 555 572 797
800 1200	832 855 1193
1500 2500	1504 1953 2465 1525 1548 2173 1564 1827 2405 1575 1672 2297 1748 1755 2477
6000 9500	6020 6171 8621 6027 6364 8765 6052 6765 9077 6063 7216 9425 6125 6612 9013 6160 6519 8969 6188 7125 9437 6223 6864 9265 6375 6512 9113 6408 6625 9217 6477 6764 9365 6660 6731 9469

Solution

```
#include <simplecpp>
main_program {
   int start, end, count=0;
   cin >> start >> end;
   for (int a = start; a <= end; a++) {
       for (int b = a + 1; b <= end; b++) {
           int c_square = a * a + b * b;
           int c = sqrt(c_square);
           if (c * c == c_square && c <= end) {
               int common_factor = 1;
               for (int i = 2; i <= a && i <= b; i++) {
                   if (a % i == 0 && b % i == 0) {
                       common_factor = i;
                       break;
                   }
               }
```

```
                if (common_factor == 1) {
                    count++;
                    cout << a << " " << b << " " << c << "\n";
                }
            }
        }
    }
    if(count == 0)
        cout << count;
}
```