Lab 4. Printing Shapes

Task A. Box

Write a program `box.cpp` that asks the user to input `width` and `height` and prints a solid rectangular box of the requested size using asterisks.

Also, print a line `Shape:` between user input and the printed shape (to separate input from output).

Example:

```
Input width: 7
Input height: 4

Shape:
*******
*******
*******
*******
```

Hint:

- First find how to print one row of stars (print the asterisk character `width` times followed by end-of-line).
- Then, once you know how to print one line of stars, repeat it `height` times (using a loop).

Task B. Checkerboard

Write a program `checkerboard.cpp` that asks the user to input `width` and `height` and prints a rectangular checkerboard of the requested size using asterisks and spaces (alternating).

Example:

```
Input width: 11
Input height: 6

Shape:
* * * * * *
 * * * * *
* * * * * *
 * * * * *
* * * * * *
 * * * * *
```

Hint:

You used nested loops in the previous task that looked probably like

```
for (int row = 0; row < height; row++) {
    for (int col = 0; col < width; col++) {

        ...

    }
}
```

Inside the loops, you can add an `if` statement that will be conditionally printing asterisk `*` or `(space)` depending on the coordinates `row` and `col`.

Task C. Cross

Write a program `cross.cpp` that asks the user to input the shape `size`, and prints a diagonal cross of that dimension.

Example:

```
Input size: 8

Shape:
*      *
 *    *
  *  *
   **
   **
  *  *
 *    *
*      *
```

Task D. Lower triangle

Write a program `lower.cpp` that prints the bottom-left half of a square, given the side `length`.

Example:

```
Input side length: 6

Shape:
*
**
***
****
*****
******
```

Task E. Upper triangle

Write a program `upper.cpp` that prints the top-right half of a square, given the side `length`.

Example:

```
Input side length: 5

Shape:
*****
 ****
  ***
   **
    *
```

Task F. Upside-down trapezoid or triangle

Write a program `trapezoid.cpp` that prints an upside-down trapezoid of given `width` and `height`.

However, if the input height is impossibly large for the given width, then the program should report, `Impossible shape!`

Example 1:

```
Input width: 12
Input height: 5

Shape:
************
 **********
  ********
   ******
    ****
```

Example 2:

```
Input width: 5
Input height: 3

Shape:
*****
 ***
```

```
  *
```

Example 2:

```
Input width: 12
Input height: 7

Impossible shape!
```

Hint:

You can start with the number of

```
spaces = 0;
stars = width;
```

On each line, print **that number of spaces** followed by **that number of stars**. After that, the number of spaces gets incremented by 1, while the number of stars gets decremented by 2:

```
spaces += 1;
stars -= 2;
```

Task G. Checkerboard (3x3)

Write a program `checkerboard3x3.cpp` that asks the user to input `width` and `height` and prints a checkerboard of 3-by-3 squares. (It should work even if the input dimensions are not a multiple of three.)

Example 1:

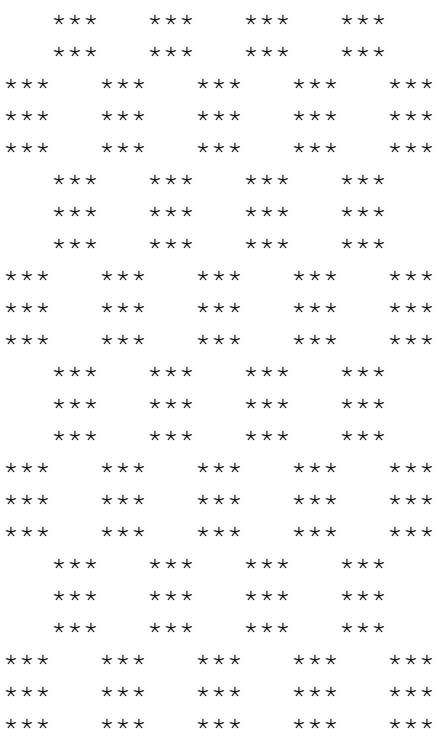
```
Input width: 16
Input height: 11

Shape:
***   ***   ***
***   ***   ***
***   ***   ***
   ***   ***   *
   ***   ***   *
   ***   ***   *
***   ***   ***
***   ***   ***
***   ***   ***
   ***   ***   *
   ***   ***   *
```

Example 2:

```
Input width: 27
Input height: 27

Shape:
***   ***   ***   ***   ***
***   ***   ***   ***   ***
***   ***   ***   ***   ***
   ***   ***   ***   ***
```



How to submit your programs.

Each program should be submitted through Gradescope.

Write separate programs for each part of the assignment.
Submit only the source code (.cpp) files, not the compiled executables.
Each program should start with a comment that contains your name and a short program description, for example:

```
/*
Author: your name
Course: CSCI-136
Instructor: their name
Assignment: title, e.g., Lab1A

Here, briefly, at least in one or a few sentences
describe what the program does.
*/
```