INTRODUCTION TO COMPUTER PROGRAMMING: FUNDAMENTALS OF C

Gilbert Pajela

Summer 2017

→ Lab 2: Loops

1. Recall that n! (read n factorial) is defined to be (1)(2)(3)(4)...(n-1)(n). Many useful computer science problems require the computation of C(n,k) (read n choose k) which is defined as: n! / (k! * (n-k)!), for $n >= 0$ and $0 <= k <= n$. Implement a program that inputs n and k and then computes C(n,k) directly by first computing the three factorials: n!, k!, and (n-k)!. Hint: You can do this by writing one loop each, mostly copy/paste of the first loop. You should represent variables as ints.

2. For the rest of the exercises, we wish to draw a number of shapes, using "character graphics". For each part of the problem, your program should input all parameters from the keyboard (after prompting the user). Moreover, the program should ensure that inputs are legal for the shape in question. Do not worry about the case where the parameters are too big to be displayed properly in the terminal.

   (a) Draw a w-wide h-high rectangular frame, using asterisks. Ex. (w=5, h=4):

   ```
   *****
   *   *
   *   *
   *****
   ```

   (b) Draw an X where each stroke has len asterisks. Ex. (len=5):

   ```
   *   *
    * *
     *
    * *
   *   *
   ```

1

(c) Draw the lower triangular part of a square, given the side length. Ex. (side=5):

```
*
**
***
****
*****
```

(d) Similar to (c), but draw the upper right triangular part of the square (i.e., the other half of the square).

(e) Similar to (c), but draw the trapezoid with the bottom height elements of the triangle. Ex. (side=5, height=3):

```
***
****
*****
```

(f) Given a radius, draw a circle with that radius. Hint: Recall that a circle of radius r is defined as the set of points (x,y) where $x^2+y^2 < r^2$.

Although we used character graphics for these exercises, the same approaches can be used with individual pixels (or squinting hard enough at the asterisks).

Exercises are adapted from the following source(s):

1. Shankar, S. (2017). CSCI 136 Lab Instructions.