CpSc 2120 — Goddard — Spring'18

Lab 9: Templates

You are given an implementation of a template Stack class. In this lab you must add to and use this class.

There is the famous problem of the towers of Hanoi. The idea is that there are 3 poles and a collection of discs of different sizes. The discs have a small hole in them allowing them to be put on a pole. The discs start all on the first pole, in increasing size with the smallest on top. The goal it to move all discs to the third pole. However,

- only one disc can be moved at a time, and
- a bigger disc can never be placed on top of a smaller disc.

There is a famous recursive solution to this problem. (Think about why.) But we will do the Frustrating Tower of Hanoi problem. In this problem the start and goal are the same; but at every time step, ***any*** legal move is chosen at random.

So the tasks for the lab are:

1. Create a class Disc. This stores a single int width. The Disc class should have a standard output mechanism. There should also be a function to compare two discs to see which is smaller.
2. Add a peek function to the template class Stack. (A peek function returns the value on top of the stack but leaves the stack unchanged.)
3. Create a driver program Hanoi. This creates an array of `Stack<Disc*>`'s. It then loads the first Stack with all the discs in order. Then it proceeds to simulate random movements, until all the discs are on the third Stack. The number N of discs is provided on the command-line, and the disc sizes are 1,2,. . . ,N. The driver should print a suitable message for each movement.

Note: In C++, rand() (from cstdlib library) produces a random int.