CSCI205 Computer Science III/Data Structures
Lab Assignment: Stacks and Queues

In this lab you will be implementing a simulation inspired by the popular 80's action movie, Predator. The premise is that "Dutch" and his team of soldiers are trapped in the jungle and are being ruthlessly hunted by a superior alien predator. Their goal is to reach "da choppa" (a famous quote from the movie by the Governator Arnold Schwarzenegger) and be flown away to safety while smoking giant cigars.

In the first stage of the simulation, Dutch and team are chased into a dark, narrow cavern that seemingly goes on forever. This cave is a dead end with only one entrance (which also functions as the exit). The cavern is only wide enough for one person (particularly tough for heavily muscled bone heads) and does not allow people to shift around once they enter. The predator is blocking the exit and the soldiers must fight their way out, one at a time, until either the predator or all of the soldiers are defeated.

If any soldiers survive, they must immediately exit the cavern and race to the perilous gorge that separates them from "da choppa". An old, narrow and frayed wooden rope bridge spans the gorge. The bridge is decrepit and weak and can only support a limited amount of weight. Like the cavern, it is only wide enough for one person to pass (stupid muscles) and as such the soldiers can only traverse the bridge in single file. The bridge also can only hold a limited number of people. Once the bridge reaches critical mass, the person that is closest to the other side will exit and the next soldier can enter the bridge. Time is of the essence, as the predator, upon defeat, activated a self-destruct mechanism that will trigger a large explosion. Thus the soldiers can not afford to lolligag, patiently crossing one at a time, waiting for the person in front to completely clear the bridge before starting to cross.

If the bridge supports the total weight at all times, then the soldiers reach "da choppa" and survive. Otherwise, at some point the bridge collapses, and the soldiers who are currently

on the bridge fall into the ravine below. Those soldiers who made it across the bridge reach “da choppa”. Those who didn’t get a chance to cross the bridge become casualties of the predator’s self-destruct explosion.

You have been provided with some starter code. Use the following objects as characters in your world. Feel free to tweak any of the attributes that have calculated values such as: weight, life, damage infliction . . . etc. There is definitely room for improvement here.

Sim_Object (provided):

- Super class of Soldier and Predator
- Abstract class
- Provides “life” and “absorption of damage”
- Allows for creation of random “life points” when provided with an upper limit
- Abstract damage infliction behavior

Predator object (provided):

- “life points” between 1000 - 2000
- Implementation of damage infliction
- Motto: “Muscles are stupid: All Shall Fall”

Soldier object (provided):

- “life points” between 100 - 200
- Implementation of “damage infliction”
- A name randomly chosen from a list of cool Action Hero Names
- A weight in pounds
- Motto: “Strength in numbers as long as you have cool names”

Objects you must define

Cavern (Student Defined):

- Implement as a user defined Stack. No API structures allowed

Rope Bridge (Student Defined):

- Implement as a user defined Queue
- Must have a “maximum weight”
- Must have a “capacity” that is half the size of the total number of soldiers. When capacity is reached remove first soldier and place him into “da choppa”. Only then can another soldier enter the bridge

Self Destruct Device (Student Defined):

- **Research:** Implement as a thread that includes some form of a count down
- If thread terminates and there are soldiers who have not made it to “da choppa”, explosion occurs and all soldiers still on the wrong side of the gorge are destroyed

Main Program (Student Defined):

- Create a Predator
- Prompt for the total number of soldiers
- Create a Cavern (stack) that will hold that number of soldiers
- Fill the Cavern with correct number of soldiers. The last soldier into the cavern will be the first soldier to fight the predator
- **Predator Battle:** One at a time soldiers should emerge from the cavern and engage in battle with the Predator
    - Taking turns the Predator and Soldier will inflict and take damage from each other
    - When either the Predator or the Soldier’s life becomes negative, they perish.
    - When one soldier dies, another soldier should emerge from the cavern and continue battling the Predator. This will result in one of two scenarios
        - Either all soldiers die, Predator wins and simulation is over OR
        - Predator dies, activates self destruct mechanism and remaining soldiers advance to the next scenario; crossing the rope bridge, to be rescued.
            - The soldier who is currently fighting the Predator when he (Predator) dies should get pushed back on the stack.
- When remaining soldiers emerge from the cavern and approach the bridge, the bridge is empty. There are two conditions that will cause this scenario to end
    1. The bridge breaks from surpassing the maximum weight (accumulation of all soldiers weight)
        - Some soldiers may have made it across to “da choppa”
        - Some soldiers (those on the bridge) plummet to their demise
        - Some soldiers are stranded on the other side of the gorge and get blown up by the self destruct device
        - Display summary information about all three scenarios, including soldier names and their fate
    2. The bridge is emptied prior to the self destruct device exploding, and all soldiers make it safety
        - Display summary information about all three scenarios, including soldier names and their fate

Please feel free to be creative with this assignment. You must meet the minimum requirements but you may also add anything that will make this more awesome. Also, if you have story ideas for me to include in future versions please share!!

For example . . . adding Ice Cube as the ultimate soldier.

Submission:

- Cavern
- Bridge
- Simulation
- If you change any details of the Sim_Object hierarchy submit those as well.
- Any other objects you feel enhance the coolness of the simulation. Just please provide documentation.