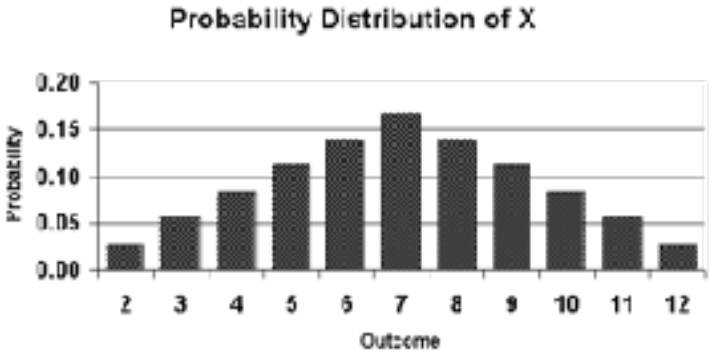
Data Structures and Algorithms
INFO 6205
Homework 2
Due: September 26, 2020

Put all your java, compiled class files and documentation files into a zip file named Homework2.zip and submit it via the dropbox on Canvas before the END of due date. Put your name on all .java files. There will be a short quiz on this homework.

1. Suppose the customers enter a Bank has the following histogram:



a) What is Random variable?

b) What is probability distribution for this distribution throwing two dices?

c) What is Mean and Standard Deviation of Probability distribution?

d) Explain the observed statistics for a Restaurant system.

2. Write the code that results to the following running time. The 3-Sum Triple loop has the following running time estimate.

A) Do Not prove Math. Just want explaining the math, what does it represents and why the result is 1/6 N^3

$$\sum_{i=1}^{N}\sum_{j=i}^{N}\sum_{k=j}^{N} 1 \sim \int_{x=1}^{N}\int_{y=x}^{N}\int_{z=y}^{N} dz\,dy\,dx \sim \frac{1}{6}N^3$$

B) If you have 2-Sum loop, what change would you need to make to Math in (A)

3. What are Stack operations? Explain.

4. Consider String “It was the best of time”. Start with the first word, design a Stack such that when you read back the words, the order of string does not change. Provide code for all necessary operations of Stack. Compile and run the code.

5. Consider following data to build Stack with:

A) LinkedList implementation

B) Array implementation

	A	B	C	D	
1	ID	First Name	Last Name	Course	
2	1	Jack	Irvan	Software Engineering	
3	2	Billy	Mckao	Requirement Engineering	
4	3	Nat	Mcfaden	Multivariate Calculus	
5	4	Steven	Shwimmer	Software Architecture	
6	5	Ruby	jason	Relational DBMS	
7	6	Mark	Dyne	PHP development	
8	7	Philip	namdaf	Microsoft Dot Net Platform	
9	8	Erik	Bawn	HTML & Scripting	
10	9	Ricky	ben	Data communication	
11	10	Van	Mlecky	Computer Networks	
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a) Create file "input.txt" with this data

b) Read input.data into an an ArrayList.

c) Create Stack with LinkedList implementation

d) Write Node data structure of your input data

e) Stack must support all operations of stack

f) Write a Test program to test your linked implementation of Stack:

—push 9 elements into stack

—pop 10 element from stack

—push all elements into stack

—push

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—pop all elements from stack

—push 4 elements into stack

—pop 5 elements from stack

—push all elements into stack

—pop all elements from stack

—Print stack with the goal:

i) reverse order ii) original order as was first read into array list

g) Compile and Run your program

h) what is Stack LinkedList time-complexity?

i) Repeat (a)—(h) with Stack fixed Array Implementation

j) What are the consequences of oversizing or undersizing fixed array size?

6. Consider the following code with Array Stack implementation

A) Explain what this code is doing

B) Why would an application need such a code, Explain

C) What change would you make to this code to correct over-sizing?

```
public ResizingArrayStackOfStrings()
{  s = new String[1];  }


public void push(String item)
{
   if (N == s.length) resize(2 * s.length);
   s[N++] = item;
}


private void resize(int capacity)
{
   String[] copy = new String[capacity];
   for (int i = 0; i < N; i++)
      copy[i] = s[i];
   s = copy;
```