CSci 1113: Introduction to C/C++
Programming for Scientists and Engineers
Homework 4
Spring 2020

Due Date: Friday, March 20, 2020 before 11:55pm.

Instructions: This is an individual homework assignment. There are two problem worth 20 points
each. Solve the problem below by yourself (unlike the labs, where you work collaboratively), and
submit the solution as a C++ source code file. Here are a few more important details:

1. Unlike the computer lab exercises, this **is not** a collaborative assignment. You must
design, implement, and test the solution to each problem on your own without the
assistance of anyone other than the course instructor or TAs. In addition, you may
not include solutions or portions of solutions obtained from any source other than
those provided in class: examples from the textbook, lectures, or code you and your
partner write to solve lab problems. Otherwise obtaining or providing solutions to
any homework problems for this class is considered academic misconduct. See the
"collaboration rules" file on the class website page for more details, and ask the instructor
if you have questions.

2. Because all homework assignments are submitted and tested electronically, the fol-
lowing are important:
   • You follow the naming conventions mentioned at the end of the problems.
   • You submit the correct file(s) on gradescope (https://www.gradescope.com/) by the due
       deadline.
   • You follow the example input and output formats exactly given in each problem description.
   • **Regardless of how or where you develop your solutions, your programs compile
       and execute on gradescope computers (which run Linux/Ubuntu operating system
       like the cselabs machines).**

3. The problem descriptions will usually show at least one test case and the resulting
correct output. However, you should test your program on other test cases (that you
make up) as well. Making up good test cases is a valuable programming skill, and is
part of ensuring your code solution is correct.

Problem A: Histogram (20 points)
Make a "histogram.txt" file that indicates with X's for each grade letter the associated grade count in a
file you want to read from (example also below). You will need to go through the file name that you cin
and count how many As (combine A and A-), Bs (combine B+, B and B-), Cs, Ds and Fs there are. The
format of the file will always be:
First name, Last name, Email, Grade, Section

Once you have the counts of the letter grades, you can make the "histogram.txt". The first column
should show how many Xs there are, starting with the highest letter count. Ensure to follow the sample
format exactly.

[Hint: the first step to make the proper histogram format would be to figure out how to print the
numbers vertically. Then figure out a relationship between the numbers and whether or not there is an

X in a grade column. It might be beneficial to review the sample code that couts in a double loop]

Example 1 (<u>user input is underlined</u>):
```
Which file do you want to open?
small.csv
Done making file!
```

Resulting "histogram.txt"
```
1|X
  ABCDF
```

Example 2 (<u>user input is underlined</u>):
```
Which file do you want to open?
med.csv
Done making file!
```

Resulting "histogram.txt"
```
3|X
2|X
1|XX XX
  ABCDF
```

Example 3 (<u>user input is underlined</u>):
```
Which file do you want to open?
large.csv
Done making file!
```

Resulting "histogram.txt"
```
5|X X
4|XXX X
3|XXXXX
2|XXXXX
1|XXXXX
  ABCDF
```

When you are done, name the source code file hw4A.cpp. Then log into gradescope and upload your file for the "Homework 4A" submission. **If you name your file incorrectly it will be unable to compile and run your code, so you will fail all test cases**. You may submit cpp files as many times as you want until the deadline to try and fix the code if you fail a test case. Following rigorous naming conventions and using test cases are something computer programmers often must do in "real life" programming, and so submitting your program with the correct name and functionality is part of doing this assignment correctly.

Problem B: Dice game (20 points)
Suppose you have a game where you roll two dice, that follow these rules:
> Roll 1-11: Get that value
> Roll 12: Reroll and add one to the value

The "roll 12" rule can be hit multiple times. For example, if you roll (6,6) then (6,6) then (1,1), your

total value for that game will be 4 (as 1+1+2=4). Write a program that simulates one iteration of this game (you will need to use srand(time(0)) and rand() again).

Then write a loop and cin how many times you want this loop to run, keeping track of how many of each value you saw, then display the results showing every value and what percent of the time you got that value. Your numbers should be close, but slightly different than the output below.

Example 1 (user input underlined):
```
How many times?
1
Roll 10: 100%
```

Example 2 (user input underlined):
```
How many times?
9
Roll 6: 22.2222%
Roll 7: 11.1111%
Roll 8: 22.2222%
Roll 9: 33.3333%
Roll 10: 11.1111%
```

Example 3 (user input underlined):
```
How many times?
10000000
Roll 2: 2.78351%
Roll 3: 5.6417%
Roll 4: 8.49863%
Roll 5: 11.35%
Roll 6: 14.1775%
Roll 7: 17.0617%
Roll 8: 14.3763%
Roll 9: 11.4944%
Roll 10: 8.65324%
Roll 11: 5.79814%
Roll 12: 0.16008%
Roll 13: 0.00468%
Roll 14: 0.00013%
Roll 15: 1e-05%
```

When you are done, name the source code file hw4B.cpp. Then log into gradescope and upload your file for the "Homework 4B" submission. **If you name your file incorrectly it will be unable to compile and run your code, so you will fail all test cases**. You may submit cpp files as many times as you want until the deadline to try and fix the code if you fail a test case. Following rigorous naming conventions and using test cases are something computer programmers often must do in "real life" programming, and so submitting your program with the correct name and functionality is part of doing this assignment correctly.