CSci 1113: Introduction to C/C++
Programming for Scientists and Engineers
Homework 2
Spring 2017

Due Date: Friday, Feb. 17, 2017 before 9:00pm.

Instructions: This is an individual homework assignment. There are two problems 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.

2. Because all homework assignments are submitted and tested electronically, the fol-
lowing are important:
- You follow any naming conventions mentioned in the homework instructions.
- You submit the correct file(s) through Moodle 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 cselabs computers running the Linux operating system.**

3. 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: Artillery/Worms (20 points)
Suppose we are shooting a projectile and can adjust the power/speed and angle of our projectile, then
the distance, d, this projectile travels before impacting the ground can be calculated by:

$$d = 2 \cdot p^2 \cdot \cos(\theta) \cdot \sin(\theta)/9.8$$

... where p is the power and θ is the angle (9.8 is used as we are on Earth).

Make a program display the distance traveled for a range of inputs for this equation. First ask the user
whether they want the range to be for the power or angle. Then ask for the minimum, maximum and
increment size to create the range. Finally, ask for the part of the equation that is fixed (the opposite of
what they chose in the first question). Display the distance traveled for all values in input range.

Example 1 (user input is underlined):
```
Find (p)ower or (a)ngle (in degrees)?
p
Enter minimum:
15
Enter maximum:
25
Enter step size:
1
Enter angle (in degrees):
45
```

```
15: 22.9592
16: 26.1224
17: 29.4898
18: 33.0612
19: 36.8367
20: 40.8163
21: 45
22: 49.3878
23: 53.9796
24: 58.7755
25: 63.7755
```

Example 2 (user input is underlined):
```
Find (p)ower or (a)ngle (in degrees)?
p
Enter minimum:
5
Enter maximum:
10
Enter step size:
0.25
Enter angle (in degrees):
120
5: -2.20925
5.25: -2.4357
5.5: -2.67319
5.75: -2.92173
6: -3.18132
6.25: -3.45195
6.5: -3.73363
6.75: -4.02636
7: -4.33013
7.25: -4.64494
7.5: -4.97081
7.75: -5.30772
8: -5.65568
8.25: -6.01468
8.5: -6.38473
8.75: -6.76582
9: -7.15797
9.25: -7.56115
9.5: -7.97539
9.75: -8.40067
10: -8.83699
```

Example 3 (user input is underlined):
```
Find (p)ower or (a)ngle (in degrees)?
```

```
a
Enter minimum:
10
Enter maximum:
80
Enter step size:
5
Enter power:
100
10: 349
15: 510.204
20: 655.906
25: 781.678
30: 883.699
35: 958.87
40: 1004.91
45: 1020.41
50: 1004.91
55: 958.87
60: 883.699
65: 781.678
70: 655.906
75: 510.204
80: 349
```

When you are done, name the source code file <username>_2A.cpp. Here you replace <username> with your U of M email address; for example, if your email address is smithx1234@umn.edu, your file should be named smithx1234_2A.cpp. Then submit your program using the HW 2 Problem A submission link in Moodle.

Problem B: Going gambling! (losing money) (20 points)
The new hot game in casino's is the Parker Push! In this game there is an initial point value. This point value is then repeatedly either decreased by one or double, each with a probability of 50%. If the value goes over 20, it is reset to the initial point value and the game starts over again. The game ends when either a one or eleven are reached.

Build a program that reads in an initial value, then plays 1,000,000 games of Parker Push. Tell how many games end in 1s and how many end in 11s. You may assume the initial value is positive and less than 20.

Example 1 (user input is underlined):
```
What initial value?
3
1s =
623141
11s =
376859
```

Example 2 (user input is underlined):
```
What initial value?
4
1s =
510069
11s =
489931
```

Example 3 (user input is underlined):
```
What initial value?
4
1s =
510445
11s =
489555
```


When you are done, name the source code file <username>_2B.cpp. Here you replace <username> with your U of M email address; for example, if your email address is smithx1234@umn.edu, your file should be named smithx1234_2B.cpp. Then submit your program using the HW 2 Problem B submission link in Moodle.