

Introduction to Computer Science 1

ASSIGNMENT 3

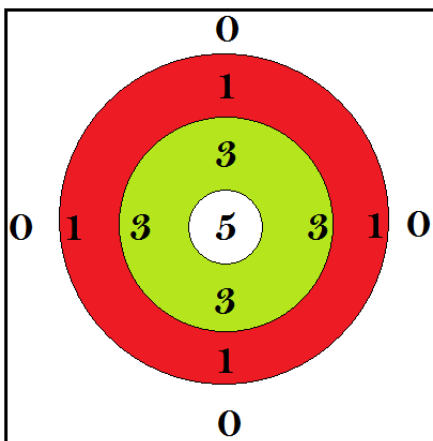
Due: Sunday, 04-03-2016, 11:59 pm

1 Overview

You will develop and implement a program that simulates an archery target shooting game. The primary objective of this assignment is for students to gain experience in using: [function decomposition to simplify implementing a program](#); and [random number generation with the library functions rand, srand, and time](#).

2 Program

The goal of the simulation is to shoot an arrow at a target consisting of three concentric circles as shown below:



Hitting the white region (the center) is worth 5 points; hitting the green region is worth 3 points; and hitting the red region is worth 1 point. 0 points for missing all the 3 regions.

Please notice that you are going to develop “a game simulator”, not an actual game. So, we will not have a real player and the arrows to shoot.

Instead, your program will use a random number generator to determine where the arrows land. That is why we call this exercise as “a simulation”. We basically simulate what happens after a player shoots.

After each arrow is shot (that is after a random number is generated), your program displays a message describing the result. After each round (i.e., a set of 5 shootings) is completed, the total score for that round is displayed. In addition, you should ask the user if s/he wants to continue the simulation. The program continues the simulation as long as the user wants. At each round, the player shoots 5 arrows from different distances: 10, 20, 30, 40, and 50.

3 Functions

We use functions to break a problem into smaller sub-problems. This reduces program complexity. In this assignment you are supposed to implement 4 distinct functions.

- main
- chance
- shoot
- play

The main function will be the driver of the program. You should create the loop that controls the rounds in the main function. After each iteration of the loop body, it should ask the player if s/he wants to continue. Please notice that you should start every iteration by calling the predefined functions `srand` and `time`. This will ensure that your simulator generates random numbers properly. However, please notice that you will generate the random number in the function `chance`.

Introduction to Computer Science 1

The header (i.e., function declaration) of the function `chance` should be as follows:

```
double chance();
```

The function `chance` simply returns a random value between 0.0 and 1.0.

The third function you need to develop is called `shoot`. This function takes the `distance` as an argument. It returns the score of the shooting by using the random value returned by the `chance` function and the distance based on the following table below.

distance	score:5	score:3	score:1	score:0
10	$0.0 \leq \text{chance} < 0.50$	$0.50 \leq \text{chance} < 0.90$	$0.90 \leq \text{chance} < 0.95$	$0.95 \leq \text{chance} \leq 1.0$
20	$0.0 \leq \text{chance} < 0.40$	$0.40 \leq \text{chance} < 0.80$	$0.80 \leq \text{chance} < 0.90$	$0.90 \leq \text{chance} \leq 1.0$
30	$0.0 \leq \text{chance} < 0.30$	$0.30 \leq \text{chance} < 0.60$	$0.60 \leq \text{chance} < 0.75$	$0.75 \leq \text{chance} \leq 1.0$
40	$0.0 \leq \text{chance} < 0.20$	$0.20 \leq \text{chance} < 0.40$	$0.40 \leq \text{chance} < 0.60$	$0.60 \leq \text{chance} \leq 1.0$
50	$0.0 \leq \text{chance} < 0.10$	$0.10 \leq \text{chance} < 0.20$	$0.20 \leq \text{chance} < 0.45$	$0.45 \leq \text{chance} \leq 1.0$

The header (i.e., function declaration) of the function `shoot` should be as follows:

```
double shoot(int distance);
```

The last function you will develop is the `play` function. The function `play` calls the function `shoot`, and it is responsible for calculating and displaying messages (please see the output below) for a single round (i.e., a set of 5 shootings). The header (i.e., function declaration) of the function `play` should be as follows:

```
void play();
```

Introduction to Computer Science 1

4 Sample Output

Please notice that your output (scores/points) will probably be different because we use random values.

```
Welcome to Archery Shooting Simulator
Round 1:
Distance 10: 5 points, you are awesome!
Distance 20: 1 points
Distance 30: 0 points, what a shame!
Distance 40: 3 points
Distance 50: 5 points, you are awesome!
-----
Total Score:14 points

Enter 0 to exit, any other value to play again: 1

Round 2:
Distance 10: 0 points, what a shame!
Distance 20: 3 points
Distance 30: 0 points, what a shame!
Distance 40: 5 points, you are awesome!
Distance 50: 3 points
-----
Total Score:11 points

Enter 0 to exit, any other value to play again: 0
```

Introduction to Computer Science 1

5 Grading

Your file name must be as follows: **FirstNameLastNameID**.cpp

A correct solution: worth 100 points

Deductions:

ERROR	
Program cannot be compiled	40
Program terminates unexpectedly during runtime	40
User interface does not have required information	5
No prompt for entering invalid data	10
Code is not commented	10
Proper indentation is not used	20
Proper variable types are not used	5
Any missing function (chance, shoot, play) each	25
srand not called in the loop in the main properly	10
Time not called in the loop in the main properly	10
No looping mechanism is used in the main	20
Function chance cannot return random values properly	20
Function shoot cannot return score values properly	25
Function play cannot display the results properly	20

1. Feel free to discuss ideas and implementations with your classmates, however **DO NOT** share code.
2. If you have a question about the assignment, do not wait until the last minute to ask.
3. Normal deductions for late submissions will be in effect. Please see Assignment Guidelines.
4. **ANY** kind of cheating, will result in a grade of 0.