Basketball Player Accuracy
Lab 8

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for ELEC 3150
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I - Introduction

The goal of this lab was to create a class representation of five basketball players to simulate random shooting during a basketball game. The Player class stores both identifying information, name and number, and the accuracy of the players two and three point shots. Using this class information, the C++ random function, rand, was implemented to randomize both the shooting player and that players corresponding accuracy.

II - Procedure

An array of player objects is created and initialized with each player having a 60% chance of scoring a two point basket and a 40% chance of scoring a three point basket. A hundred shots on the basket are then taken with each shot taken by a random player where each player is equally likely to be chosen to shoot. (Shots are equally likely to be two and three point shots.) The total point count is then updated and the next shooter is selected until all one hundred shots have been simulated.

III - Results

```
bennetts4@turing:~/Lab08$ ./Lab08
Shot 1 : 3 Points - Player 4 Newbie
Total is 3 points.
Shot 2 : 2 Points - Player 2 Dr. Strange
Total is 5 points.
Shot 3 : 3 Points - Player 4 Newbie
Total is 8 points.
Shot 4 : 0 Points - Player 0 John Smith
Total is 8 points.
Shot 5 : 3 Points - Player 2 Dr. Strange
Total is 11 points.
Shot 6 : 0 Points - Player 3 Butterfingers
Total is 11 points.
Shot 7 : 2 Points - Player 1 Tony Stark
Total is 13 points.
Shot 8 : 3 Points - Player 1 Tony Stark
Total is 16 points.
Shot 9 : 0 Points - Player 3 Butterfingers
Total is 16 points.
Shot 10 : 2 Points - Player 2 Dr. Strange
Total is 18 points.
Shot 11 : 0 Points - Player 0 John Smith
Total is 18 points.
Shot 12 : 3 Points - Player 1 Tony Stark
Total is 21 points.
Shot 13 : 2 Points - Player 1 Tony Stark
Total is 23 points.
Shot 14 : 3 Points - Player 3 Butterfingers
Total is 26 points.
Shot 15 : 0 Points - Player 1 Tony Stark
Total is 26 points.
```

Figure 1: Confirmation of changing shooting player. In this sample, the five players took 2, 4, 3, 3, and 2 shots in no apparent pattern, reflective of approximately equal and random distribution.

```
bennetts4@turing:~/Lab08$ ./Lab08
Shot 1 : 2 Points - Player 3 Butterfingers
Total is 2 points.
Shot 2 : 2 Points - Player 0 John Smith
Total is 4 points.
Shot 3 : 0 Points - Player 2 Dr. Strange
Total is 4 points.
Shot 4 : 0 Points - Player 2 Dr. Strange
Total is 4 points.
Shot 5 : 3 Points - Player 4 Newbie
Total is 7 points.
Shot 6 : 2 Points - Player 3 Butterfingers
Total is 9 points.
Shot 7 : 2 Points - Player 0 John Smith
Total is 11 points.
Shot 8 : 2 Points - Player 4 Newbie
Total is 13 points.
Shot 9 : 0 Points - Player 2 Dr. Strange
Total is 13 points.
Shot 10 : 3 Points - Player 1 Tony Stark
Total is 16 points.
Shot 11 : 0 Points - Player 0 John Smith
Total is 16 points.
Shot 12 : 0 Points - Player 4 Newbie
Total is 16 points.
Shot 13 : 0 Points - Player 3 Butterfingers
Total is 16 points.
Shot 14 : 2 Points - Player 4 Newbie
Total is 18 points.
```

Figure 2: Confirmation of shot successes and failure rates. In this sample, 8 of the 14 shots succeeded in no particular order, verifying the approximately 50% shooting accuracy of the five players.

```
bennetts4@turing:~/Lab08$ ./Lab08
Shot 1 : 3 Points - Player 4 Newbie
Total is 3 points.
Shot 2 : 2 Points - Player 2 Dr. Strange
Total is 5 points.
Shot 3 : 3 Points - Player 4 Newbie
Total is 8 points.
Shot 4 : 0 Points - Player 0 John Smith
Total is 8 points.
Shot 5 : 3 Points - Player 2 Dr. Strange
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```

```
bennetts4@turing:~/Lab08$ ./Lab08
Shot 1 : 2 Points - Player 3 Butterfingers
Total is 2 points.
Shot 2 : 2 Points - Player 0 John Smith
Total is 4 points.
Shot 3 : 0 Points - Player 2 Dr. Strange
Total is 4 points.
Shot 4 : 0 Points - Player 2 Dr. Strange
Total is 4 points.
Shot 5 : 3 Points - Player 4 Newbie
Total is 7 points.
Shot 6 : 2 Points - Player 3 Butterfingers
Total is 9 points.
Shot 7 : 2 Points - Player 0 John Smith
Total is 11 points.
Shot 8 : 2 Points - Player 4 Newbie
Total is 13 points.
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Shot 12 : 0 Points - Player 4 Newbie
Total is 16 points.
Shot 13 : 0 Points - Player 3 Butterfingers
Total is 16 points.
Shot 14 : 2 Points - Player 4 Newbie
Total is 18 points.
```

Figure 3: Confirmation of random nature of program by comparing two separate runs. In these samples, both the player shooting and the shots success vary as expected given the use of a variable random seed.

IV - Analysis

One hundred shots are taken by random players during each run of the simulation. The random distribution of the shooting player was confirmed in Figure 1. The resulting rates of random successful shots of a given success rate appear within reason, and can be observed in Figure 2. By comparing multiple runs of the program, as seen in Figure 3, the random implementation can be further verified by noting the changing shooter order and successes.

V - Conclusions

The program functions as expected generating five Player objects, assigning variables to each player, rotating players, and generating both successful and failed shots. Running the program, scores generally appear to be within 110 to 130 points. Future evaluation using Monte Carlo methods would allow a greater understanding of both the average and variance of the chosen probabilities and is one method that could be used to assist in optimizing the statistical values.