CS 121 Lab 8

`rand()` function in C++ Paul Cao

In this lab, we will learn how to use `rand()` function provided in C++. As a case study, a dice game will be coded. The code is due before midnight on 11/02/2010 for CS121A and 11/04/2010 for CS121B.

Pre-lab

Read the following explanations. You don't have turn in anything for this prelab.

In C++, the `cstdlib` library provides a function `rand` which generates a random integer between `0` and a predefined constant, `RAND_MAX`. In our programming environment, `RAND_MAX` equals `2147483647`. The prototype of `rand` function is `int rand (void)`. This number is generated by an algorithm that returns a sequence of apparently non-related numbers each time it is called. This algorithm uses a seed to generate the series, which should be initialized to some distinctive value using function `srand`. The reason why a seed function is needed before `rand()` is theoretically, no one can generate truly random numbers. To improve randomness, a seed (i.e. the starting point of `rand()`) is designed. The most commonly used method is to use the current system time as a seed. To do this, another function from `cstdlib, time(0)` will be used. `time(0)` will return the current system time. Keep in mind that the srand function is only needed to be called once in the whole code and it is usually done in the beginning of your code.

A typical way to generate pseudo-random numbers in a determined range using rand is to use the modulo of the returned value by the range span and add the initial value of the range. The following statements show the typical use of `rand()`

```
int n1, n2;
n1=rand()%10; // Generate a random number between 0 and 9 and assign it to n1
n2=rand()%6+1; // Generate a random number between 1 and 6 and assign it to n2
```

As an example, the following code generates two random numbers between 1 and 6. Compare the two numbers and output the result.

```
#include <iostream>
#include <ctime>// to use function time()
#include <cstdlib>// to use function rand() and srand()
using namespace std;

int main(){
     int n1, n2;
     srand(time(0));// generate a seed based on the current system time.

     n1=rand()%6+1;
     n2=rand()%6+1;
     if(n1>n2){
       cout << "The first random number is bigger!\n";
     }
     else if(n1<n2){
       cout << "The second random number is bigger!\n";
     }
     else{
       cout << "The two random numbers are the same!\n";
     }
     return 0;
}
```

In-lab activity

Dice game between human and computer

We will write a code that allows the user and the computer to play dice games. To be fair, we use the random number generating function to simulate the result a dice cast (an integer between 1 and 6). In a single game, the user should first tell the computer how many dice casts he/she prefers. Then the computer will generate that number of dice casts for the user and the same number of dice casts for itself. The score of a game is the total points obtained in dice casts.

Your code should allow user to continue playing games until he/she decides to quit. After the user quits the game, your program should display the total number of games the user has won, the total number of wins by the computer, and the total number of ties.

Sample Output

```
Let's play dice!
How many casts do you want to play in this game? Input here: 2
Here are the dice values you have got
The dice value is 6
The dice value is 5
Here are the dice values the pc has got
The dice value is 6
The dice value is 6
The computer won the game!
Do you want to play again? (y for yes and n for no): y

Let's play dice!
How many casts do you want to play in this game? Input here: 1
Here are the dice values you have got
The dice value is 1
Here are the dice values the pc has got
The dice value is 1
We are tied here!
Do you want to play again? (y for yes and n for no): y

Let's play dice!
How many casts do you want to play in this game? Input here: 3
Here are the dice values you have got
The dice value is 4
The dice value is 1
The dice value is 3
Here are the dice values the pc has got
The dice value is 2
The dice value is 4
The dice value is 1
You have won the game!
Do you want to play again? (y for yes and n for no): n

Here is a summary of game results,
Games user won: 1
Games pc won: 1
Games tied: 1
```