Advance Programming Techniques (APT)

Lecture # 5

Ehtisham Rasheed

Department of Computer Science
University of Gurjat, Gujrat

Random Numbers

- The numbers without any sequence
- Real world applications
  - **Games:** Dice rolls, card shuffling, enemy behavior
  - **Simulations:** Scientific modeling, weather forecasting
  - **Security:** Password generation, encryption
  - **Machine Learning:** weight initializing, data shuffling
  - **Testing:** Generating test data

The Random Class

```
// Creating a Random object
Random random = new Random();

// Basic random number generation
int randomNumber = random.Next();
Console.WriteLine($"Random number: {randomNumber}");
```

Common Random Methods

```
// 1. Next() - returns non-negative random integer
int num1 = rand.Next();
Console.WriteLine($"Any non-negative integer: {num1}");

// 2. Next(maxValue) - returns number from 0 to maxValue-1
int num2 = rand.Next(100); // 0 to 99
Console.WriteLine($"0 to 99: {num2}");

// 3. Next(minValue, maxValue) - returns number in range [min, max-1]
int num3 = rand.Next(1, 7); // 1 to 6 (like a dice)
Console.WriteLine($"Dice roll (1-6): {num3}");

// 4. NextDouble() - returns double between 0.0 and 1.0
double probability = rand.NextDouble();
Console.WriteLine($"Probability (0.0 to 1.0): {probability}");
```

Scaling & Shifting Random Numbers

- Generate random values from the sequence (2, 5, 8, 11 and 14)
- Number = 2 + 3 * randomNumbers.Next(5);
- Number = *shiftingValue* + *differenceBetweenValues* * randomNumbers.Next(*scalingFactor*);
- Where *shiftingValue* specifies the first number in the range
- *differenceBetweenValues* is the difference between two consecutive numbers in the sequence
- *scalingFactor* specifies how many numbers are in the range

Random Numbers - Exercise

- Roll a dice 20 times and print the output on screen
- Roll a dice 6000 times and show the frequency of each number

A Game of Chance

- You roll two dice. Each die has six faces, which contain one, two, three, four, five and six spots, respectively. After the dice have come to rest, the sum of the spots on the two upward faces is calculated. If the sum is 7 or 11 on the first throw, you win. If the sum is 2, 3 or 12 on the first throw, you lose. If the sum is 4, 5, 6, 8, 9 or 10 on the first throw, the sum becomes your "point". To win, you must continue rolling the dice until you "make your point". You lose by rolling a 7 before making your point.