Neil Kapoor
Zayas
APCS
12 November 2017

Unit 5 Activity 1

1A. Two constants: Math.E, which is the base of natural logarithms, and Math.PI, which is the ratio of the circumference of a circle to its diameter.
B. There are 54 non inherited methods in the Math class.
C. There are 26 unique method names in the Math class.
D. There are 28 overloaded methods in the Math class.

2. Code for program:

```
/**
 * This program prompts the user to enter an angle, in degrees, and then
 * display the angle in degrees, in radians, and the Sine, Cosine, and Tangent of the angle.
 * @author Neil Kapoor
*/

import java.util.Scanner;

public class Unit5Activity1_2 {
	public static void main(String[] args) {
		Scanner input = new Scanner(System.in);
		System.out.print("Enter an angle in degrees: ");

		double degrees = input.nextDouble();
		System.out.println("Angle in degrees: " + degrees);
		System.out.println("Angle in radians: " + Math.toRadians(degrees));
		System.out.println("Sin of the angle: " + Math.sin(degrees));
		System.out.println("Cos of the angle: " + Math.cos(degrees));
		System.out.println("Tan of the angle: " + Math.tan(degrees));
	}
}
```

3. Code for program:

```
/**
 * This program uses the Math class random() method in a program that generates and displays a
 * sequence of 20 random numbers in the range 1 – 5.
 * @author Neil Kapoor
*/

public class Unit5Activity1_3 {
	public static void main(String[] args) {
		for (int i = 0; i < 20; i++) {
			int num =  (int)(1 + Math.random() * 5);
			System.out.print(num + " " );
		}

		System.out.println();
	}
}

System.out.println();
```

A. The same sequence of random numbers was not generated in each run. Of course, all the numbers were in the range 1 through 5, but the sequence itself was different in each run.
B. The reason why the same exact sequence did not appear was that it was unlikely from a probability perspective. For example, suppose the first number of run 1 is 2. Now the probability of a given number in the range 1 through 5 is ⅕ for the first number of run 2, but the probability that the number printed is *not* 2 is ⅘, and so it is more likely that a number other than 2 will be generated than 2 itself. Note that this probability can be a bit confusing.

4. Code for program:

```
/**
 * This program generates 100 random numbers from the set { 6, 10, 14, 18, 22} and
 * displays the number of 6's, 10's, etc. that are generated.
 * @author Neil Kapoor
*/

import java.util.Random;
```

```
public class Unit5Activity1_4 {
	public static void main(String[] args) {
		int [] counts = new int[5]; // array to store count values for the sequence.


		Random randomNumbers = new Random(); // random class to cycle through
                                                     // random number sequence.

		for (int i = 0; i < 100; i++) { // 100 random numbers
			int num =  6 + 4 * randomNumbers.nextInt(5);

			switch(num) { // check what number was generated, and increment its
                                      // count in the counts array.
				case 6: counts[0]++; break;
				case 10: counts[1]++; break;
				case 14: counts[2]++; break;
				case 18: counts[3]++; break;
				case 22: counts[4]++; break;
			}

		}
		System.out.println();
		// display results.
		for(int i = 0, j = 6; i < counts.length; i++, j += 4) {
			System.out.println("Frequency of " + j + ": " + counts[i] );
		}

	}
}
```

5. Source code for program:

```
/**
 * This program prompts the user to enter two numbers x and y, and displays the
 * value of x/y rounded to an integer value, to one decimal place, to two decimal places,
 * and to three decimal places.
 * @author Neil Kapoor
*/
```

```
import java.util.Scanner;

public class Unit5Activity1_5 {
	public static void main(String[] args) {
		// Math.floor( x * 10N + 0.5 ) / 10N
		Scanner input = new Scanner(System.in);
		System.out.print("Enter a number x: ");
		double x = input.nextInt();
		System.out.print("Enter a number y: ");
		double y = input.nextInt();

		System.out.println("x/y rounded to an integer value is: " + (int)(x/y));

		// to one decimal place:
		double one = Math.floor( (x/y) * 10 + 0.5 ) / 10;
		System.out.println("x/y rounded to one decimal place is: " + one);

		// to two and three decimal places:

		double two = Math.floor( (x/y) * 10 * 10 + 0.5 ) / (10 * 10);
		System.out.println("x/y rounded to two decimal places is: " + two);

		double three = Math.floor( (x/y) * 10 * 10 * 10 + 0.5 ) / (10 * 10 * 10);
		System.out.println("x/y rounded to three decimal places is: " + three);

	}
}
```