Lecture 3

Introduction to Object Oriented Programming

Using Math methods

The `Math` Class

- Code reuse is one of the main benefits of methods
- Write once, use anywhere
- The java library includes a Math class which provides some very useful static methods
- Can be called from any java program

The `Math` Class

- Class constants:
  - `PI`
  - `E`
- Class methods:
  - Trigonometric Methods
  - Exponent Methods
  - Rounding Methods
  - min, max, abs, and random Methods

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Some Exponent Methods

- `pow(double a, double b)`
  Returns `a` raised to the power of `b`.
- `sqrt(double a)`
  Returns the square root of `a`.

```
Examples:

Math.pow(2, 3) returns 8.0
Math.pow(3, 2) returns 9.0
Math.pow(3.5, 2.5) returns
   22.91765
Math.sqrt(4) returns 2.0
Math.sqrt(10.5) returns 3.24
```

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Rounding Methods

- `double ceil(double x)`
  x rounded up to its nearest integer. This integer is returned as a double value.
- `double floor(double x)`
  x is rounded down to its nearest integer. This integer is returned as a double value.
- `double rint(double x)`
  x is rounded to its nearest integer.

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Rounding Methods Examples

```
Math.ceil(2.1) returns 3.0
Math.ceil(2.0) returns 2.0
Math.ceil(-2.0) returns –2.0
Math.ceil(-2.1) returns -2.0
Math.floor(2.1) returns 2.0
Math.floor(2.0) returns 2.0
Math.floor(-2.0) returns –2.0
Math.floor(-2.1) returns -3.0
Math.rint(2.1) returns 2.0
Math.rint(2.0) returns 2.0
Math.rint(-2.0) returns –2.0
Math.rint(-2.1) returns -2.0
Math.rint(2.6) returns 3.0
```

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min, max, and abs

- `max(a, b)` and

  `min(a, b)`

  Returns the maximum or minimum of two parameters.
- `abs(a)`

  Returns the absolute value of the parameter.
- `random()`

  Returns a random `double` value in the range [0.0, 1.0).

```
Examples:

Math.max(2, 3) returns 3
Math.max(2.5, 3) returns
  3.0
Math.min(2.5, 3.6)
  returns 2.5
Math.abs(-2) returns 2
Math.abs(-2.1) returns
  2.1
```

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The random Method

Generates a random double value greater than or equal to 0.0 and less than 1.0 (0 <= Math.random() < 1.0).

Examples:

```
(int)(Math.random() * 10)
```
Returns a random integer between 0 and 9.

```
50 + (int)(Math.random() * 50)
```
Returns a random integer between 50 and 99.

In general,

```
a + Math.random() * b
```
Returns a random number between a and a + b, excluding a + b.

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Generate a random number using Random class

```
//create an object of the Random class call
noGenerator
Random noGenerator = new Random();

int luckyDigit;

//generates a no from 0 (inclusive) to 10(exclusive)
luckyDigit = noGenerator.nextInt(10) ;
System.out.println("Digit is  " + luckyDigit);
```

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The `Math` Class

The Math class shows us two major benefits of using methods

- Code reuse – code written by other programmers usable in our programs
- Encapsulation – complex code hidden away. The programmer just needs to know how to call the method.

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