The Math Class

Providing Common Mathematical Functions

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The Math Class

Common math methods

► The Math class is a Java standard class which provides a range of common mathematical methods.

Method	Description
int abs(int x)	returns the absolute value
<pre>double abs(double x)</pre>	returns the absolute value
<pre>int max(int a, int b)</pre>	returns the greater of a and b
<pre>int min(int a, int b)</pre>	returns the lesser of a and b
<pre>double sqrt(double x)</pre>	returns the square root of \mathbf{x}
<pre>double random()</pre>	returns a positive double value,
	$0.0 \leq \text{num} < 1.0$
double pow(double b,	returns b raised to the power of e
double e)	

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- The data type in front of the method name indicates the type of data that is returned by the calculation.
- ▶ All of these methods are declared as static, so you must use the name of the class when invoking them: Math

Examples of math methods

```
int n = 0;
double d = 0.0;
n = Math.abs(-17);
d = Math.abs(-39.65);
```

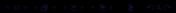
```
d = Math.pow(10, 3);
n = Math.max(25, 50);
n = Math.min(100, 75);
d = Math.sqrt(81);
```

Generating random numbers

- Java's random number generator returns numbers chosen at random for a particular set number interval.
- ► The Math.random() method creates a random double value which is greater than or equal to 0.0, and less than 1.0.
- ▶ In other words: $0.0 \le \text{num} < 1.0$

```
double num = Math.random();
System.out.println("Random number = " + num);
```

► This range can be modified through type casting, multiplication, and addition.



Expanding the interval

- ▶ If you multiply Math.random() by an integer x, the range of the random number interval will expand to: 0.0 < num < x</p>
- ▶ Consider the expansion to: $0.0 \le \text{num} < 6.0$

```
double num = Math.random() * 6;
```

Shifting the interval

- If you add an integer to Math.random(), the range of the random number will be shifted by that amount.
- ▶ Consider the shift to: $2.0 \le \text{num} < 3.0$

```
double num = Math.random() + 2;
```

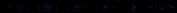
Creating random integers using Math.random()

- I want to create a random number in the range: 1 < num < 21</p>
- ➤ To accomplish this, I will modify the random number by multiplying it by 20, type casting it to an int, and then adding 1.

```
int num = (int) (Math.random() * 20) + 1;
```

Creating random integers using Math.random()

- ► First, Math.random() creates a random double number in the range: $0.0 \le \text{num} < 1.0$
- ► Then, the random number is modified by multiplying it by 20.
- ► This changes the range of the random number to: $0.0 \le \text{num} < 20.0$
- Type casting the random number to an int removes the decimal portion of the answer. This converts the random number to an integer.
- Adding 1 shifts the range of the random number to: $1 \le \text{num} < 21$
- ► This shift affects both the lower and upper bounds of the range.



Creating random integers using Math.random()

- In general, to produce a random number in the range: $p \le num \le p+k-1$
- Use the following code:

```
int num = (int) (Math.random() * k) + p;
```