

Set 5: Methods of the Math Class

Skill 5.1: Use the java Math class to perform mathematical operations

Skill 5.2: Apply the *random()* method to create a random integer in a specified range

Skill 5.3: Familiarize yourself with additional methods in the java Math class

Skill 5.1: Use the java Math class to perform mathematical operations

Skill 5.1 Concepts

The math class is a powerful class of methods for performing mathematical computations. An example of how the math class can be applied is illustrated below. The example below computes the square root of 17. The result is assigned to the double variable *p* because square roots typically do not result in integer values.

Code	Output
<pre>double p = Math.sqrt(17); System.out.println(p);</pre>	4.123105625617661

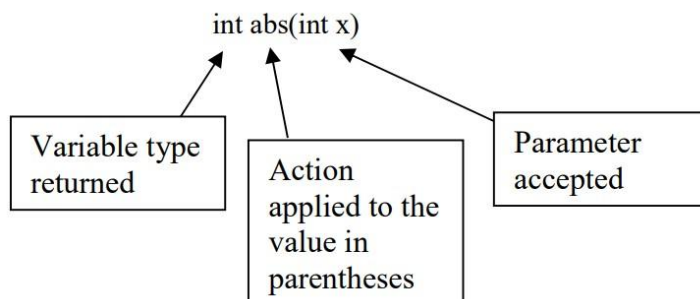
In the above example,

- *double p* is the variable to which the result of the Math operation is assigned
- *Math.* is the notation we use to access the library of Math functions in java
- *sqrt(17)* is the operation we want to perform on the number 17. In this case, it is the square root.

```
double p = Math.sqrt(17);
```

The Math class is indicated using the word "Math". The mathematical method to be performed is indicated with a "." followed by the method. The number in parentheses is the parameter sent to the method.

Java provides an extensive library of Math operations. Below is a description of some of them. Notice that each method has a corresponding *signature*. The *signature* of a method can be interpreted as follows,



Method	Signature	Description
abs	int abs(int x)	Returns the absolute value of x
abs	double abs(double x)	Returns the absolute value of x
pow	double pow(double d, double e)	Returns d raised to the e power
sqrt	double sqrt(double x)	Returns the square root of x
ceil	double ceil(double x)	Returns next highest whole number from x
floor	double floor(double x)	Returns next lowest whole number from x
min	double min(double a, double b)	Returns the smaller of a and b
max	double max(double a, double b)	Returns the larger of a and b
min	int min(int a, int b)	Returns the smaller of a and b
max	int max(int a, int b)	Returns the larger of a and b
random	double random()	Returns a random double (range $0 < r < 1$)
round	long round(double x)	Returns x rounded to the nearest whole number
PI	double PI	Returns 3.1459625...

Below are examples of each of the methods described above,

Code	Output
<code>double d = -379.22; System.out.println(Math.abs(d));</code>	379.22
<code>double d = 42.01; double e = 3.728; System.out.println(Math.pow(d,e));</code>	1126831.027
<code>double d = 2034.56; System.out.println(Math.sqrt(d));</code>	45.106097148833435
<code>double d = 1.4; System.out.println(Math.ceil(d));</code>	2.0
<code>double d = -1.6; System.out.println(Math.ceil(d));</code>	-1
<code>double d = 1.4; System.out.println(Math.floor(d));</code>	1.0
<code>double d = -1.6; System.out.println(Math.floor(d));</code>	-2.0
<code>double d = 7.89; System.out.println(Math.log(d));</code>	2.065596134857783 <u>NOTE</u> : log is base e
<code>double x = 2038.5; double y = -8999.0; System.out.println(Math.min(x, y));</code>	-8999.0
<code>double x = 2038.5; double y = -8999.0; System.out.println(Math.max(x, y));</code>	2038.5

<pre>double a = 148.2; long aResult = Math.round(a); System.out.println(Math.round(aResult)); float b = 148.7f; int bResult = Math.round(b); System.out.println(Math.round(bResult));</pre>	148 149 NOTE: The Math.round method in Java returns different datatypes depending on the argument: <ul style="list-style-type: none"> • If you pass a float, it returns an int. • If you pass a double, it returns a long.
<pre>System.out.println(Math.PI);</pre>	3.141592653589793
<pre>System.out.println(Math.random());</pre>	prints a random double between 0 and 1 where 0 is inclusive, but 1 is not inclusive

[Skill 5.1 Exercise 1](#)

Skill 5.2: Apply the *random()* method to create a random integer in a specified range

Skill 5.2 Concepts

Many applications you will create will require a random number. For example, what if you needed to write a program to generate a number that represented a face from a 6-sided die, or a card from a 52 card deck?

The *random()* method in the Math class generates a random double type number between 0 and 1, where 0 is inclusive, but 1 is not. The below code is illustrative,

Code	Output
<pre>System.out.println(Math.random());</pre>	prints a random double between 0 and 1 where 0 is inclusive, but 1 is not inclusive

To create a number in a different range, say 0 up to 10, simply multiply the result of Math.random() by the desired range. An example is shown below,

Code	Output
<pre>System.out.println(Math.random()*10);</pre>	prints a random double from 0 up to 10

Recall, however that the random() method returns a double. The below code illustrates how to generate a random int from 0 up to 10,

Code	Output
<pre>int randomNumber = (int)(Math.random()*10); System.out.println(randomNumber);</pre>	prints a random int from 0 up to 10

The above examples, illustrate how to scale the random() method to a specified range. The example below illustrates how to shift the range of the random number.

Code	Output
<pre>int randomNumber = (int)(Math.random()*10)+100; System.out.println(randomNumber);</pre>	prints a random int from 100 up to 110

[Skill 5.2 Exercise 1](#)

Skill 5.3: Familiarize yourself with additional methods in the java Math class

Skill 5.3 Concepts

In addition to the methods above, the java Math class has many more useful methods.

Method	Signature	Description
log	double log(double x)	Returns log base e of x
sin	double sin(double a)	Returns the sin of angle a in radians
cos	double cos(double a)	Returns the cos of angle a in radians
tan	double tan(double a)	Returns the tangent of angle a in radians
asin	double asin(double x)	Returns the arcsine of x in the range $-\pi/2$ to $\pi/2$
acos	double acos(double x)	Returns the arctan of x in the range $-\pi/2$ to $\pi/2$
toDegrees	double toDegrees(double angRad)	Converts radians to degrees
toRadians	double toRadians(double angDeg)	Converts degrees to radians

[Skill 5.3 Exercises 1](#)