

## Math class in java

The `java.lang.Math` class has methods for performing basic numeric operations like elementary exponential, logarithm, square root, abs, and trigonometric functions and more.

Commonly methods that used in Math class are:

## The Math Class



- ❑ The Math class in the `java.lang` package contains class methods for commonly used mathematical functions.
- ❑ Most methods of the Math class are static and therefore there is no need to instantiate any new object of the Math class before using it.
- ❑ Most Math class methods generate a **double** type, so pay attention to precision error

Method	Description
<code>abs(a)</code>	Absolute value of a
<code>exp(a)</code>	Natural number e raised to the power of a.
<code>log(a)</code>	Natural logarithm (base e) of a.
<code>floor(a)</code>	The largest whole number less than or equal to a.
<code>max(a,b)</code>	The larger of a and b.
<code>min(a,b)</code>	The smaller of a and b
<code>pow(a,b)</code>	The number a raised to the power of b.
<code>sqrt(a)</code>	The square root of a.
<code>sin(a)</code>	The sine of a. (Note: all trigonometric functions are computed in radians) Similarly cos and tan
<code>random()</code>	Returns a double value with a positive sign, greater than or equal to 0.0 and less than 1.0.
<code>round(a)</code>	Returns the closest integer value, if a is double it returns long, if float it returns int
<code>toRadians(a)</code>	Converts the value of a in degrees to radians

## Random Method

This method belongs to Math class. It is used for generating random numbers between 0.0 and 1.0 . The generated number is double that is  $\geq 0.0$  and  $< 1.0$ . In addition, it could be used to generate random numbers that are between a given range, the range is specified by max and min. A standard expression for accomplishing this is:

```
Math.random() * ((max - min)+1) + min
```

### 1- Random Double Within a Given Range

By default, the `Math.random()` method returns a random number of the type `double` whenever it is called. The code to generate a random double value between a specified range is:

```
double x = (Math.random()*((max-min)+1))+min;
```

```
double x;  
double max=10.0;  
double min=5.0;  
  
x= (Math.random()*((max-min)+1))+min;  
System.out.println("Random number is between 5.0 & 10.0 = "+x);
```

### 2- Random Integer Within a Given Range

The code to generate a random integer value between a specified range is this.

```
int x ;  
x= (int)(Math.random()*((6-2)+1))+2;  
System.out.println("Integer between 2 and 6"+x);
```

It produces a random integer between the given range. As `Math.random()` method generates random numbers of `double` type, you need to truncate the decimal part and cast it to `int` in order to get the integer random number.

### 3- Random negative and positive Integer Within a Given Range

200 > y >= -100

```
int y ;  
  
int min=-100;int max=200;  
  
y= (int)(Math.random()*(max-min))+min;  
  
System.out.println("Integer between -100 and 200 "+y);
```

**Pay attention there is no +1 WHY??!**

## LEC6 OOP 2018-2019

### H.W.

1- Generate a random number is in this interval(الفترة):

$$200 \geq y \geq -100$$

2- Interpreted the following java segment(فقرة):

```
int y ;  
int min=-100;  
int max=200;  
y= (int)(Math.random()*(max-min))+min;  
while (y!=200){  
    y= (int)(Math.random()*(max-min))+min;  
    System.out.println("Integer between -100 and 200 "+y);  
}
```

3- Interpreted the following java segment(فقرة):

```
int y ;  
int min=-100;  
int max=200;  
y= (int)(Math.random()*(max-min))+min;  
while (y!=200){  
    y= (int)(Math.random()*(max-min+1))+min;  
    System.out.println("Integer between -100 and 200 "+y);  
}
```

• **Solving more examples regarding with class and objects**

- 1- Define a class which represents any point in the space. This class provides a method to find the distance between any point and the origin. Write a main method to find the smallest distance between each points in a set consists of 10 points and the origin.

```
public class Main {

    public static void main(String[] args) {
        Points p[]=new Points [10];
        Points point=new Points();
        double d,mn;
        p[0]=new Points();
        p[0].put_data(13,12);
        mn=p[0].distance();point=p[0];
        for (int i=1;i<10;i++){
            p[i]=new Points();
            p[i].put_data(Math.random()*20,Math.random()*10);
            d=p[i].distance();
            System.out.println(d);
            if(d<mn) {mn=d;point=p[i];}
        }
        System.out.println(mn);
        point.print(); } }
    Public class Points{
        private double x,y;
        public void put_data(double a, double b){x=a;y=b;}
        public double distance(){ return(Math.sqrt(x*x+y*y));}
        public void print(){
            System.out.println(x+" , "+y);}}

```

- 2- Define a class which describes any item in supermarket. This class contains two private variables (price and number) and two public functions.. print\_data() which used to print the data stored in private variables while set\_data() is used to store data in private variables. Define two items in your supermarket and print the prices of them, Define 100 items in your supermarket and print the prices of them and Define two items in your supermarket and print the summation of their prices. (u need to add get\_data method to return the price also use random for generating int and double values).

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- 3- Write a program contains a class called number; this class has 2 member variables and six methods: addition, subtraction, division, multiplication, set\_data and print\_data. Declare two objects and print the results of addition, subtraction, multiplication and division of their member variables.
  
- 4- Every cylinder has a base and height, where the base is a circle. Design a class cylinder that can capture the properties of a cylinder and perform the usual operations on a cylinder. Some of the operations are: calculate and print the volume, calculate and print a cylinder surface area, set the height, set the radius of the base and set the center of the base.