8.1 Package java.lang

- The basic language functions supported by Java are stored in java.lang package. It contains classes and interfaces that are fundamental to the Java programming language.
- Normally, you have to import packages into your program for accessing the classes defined in them, but java.lang package is imported by default by the Java compiler.

8.2 Methods of Math class

- The Math class of the java.lang package contains a lot of generic mathematical functions including geometric and trigonometric functions.

- The generic syntax to access a member method is:
  - Math.MethodName(argument);

- **JAVA math Function**
- Java Math class provides several methods to work on math calculations like min(), max(), avg(), sin(), cos(), tan(), round(), ceil(), floor(), abs() etc

Pow	Math.pow(x,y)	Returns the value of the first argument,raised to the power of the second argument
Squr	Math.sqrt(x)	Return the square root of a double value
Cbrt	Math.cbrt(x)	Returns the cube root of a double value ($\sqrt[3]{x}$).
ceil	Math.ceil(x)	Returns the smallest integer that is greater than or equal to the argument
Floor	Math.floor(x)	Returns the largest integer that is less than or equal to the argument.
round	Math.round(x)	Returns the closest int or long (as per the argument).
abs	Math.abs(a)	Returns the absolute value of the argument

1 pow(x,y)

- Returns the value of the first argument,raised to the power of the second argument. It returns the value of first argument raised to the power to second argument.

Syntax	Math.pow(x,y)
Argument Type	double x, double y
Return Type	double

- System.out.println(Math.pow(2,0));
- System.out.println(Math.pow(2,1));
- System.out.println(Math.pow(3,2));

2 sqrt(x)

- Return the square root of a double value. It is used to return the square root of a number.

Syntax	Math.sqrt(x,y)
Argument Type	double x
Return Type	double

- System.out.println(Math.sqrt(25));
- System.out.println(Math.sqrt(0));
- System.out.println(Math.sqrt(32));

3 cbrt(x)

- Returns the cube root of a double value ($\sqrt[3]{x}$).
- It is used to return the cube root of a number.

Syntax	Math.cbrt(x)
Argument Type	double x
Return Type	double

- System.out.println(Math.cbrt(225));
- System.out.println(Math.cbrt(0));
- System.out.println(Math.cbrt(125));

4 ceil(x)

- Returns the cube root of a double value ($\sqrt[3]{x}$).
- Returns the smallest integer that is greater than or equal to the argument

Syntax	Math.ceil(x)
Argument Type	double x
Return Type	double

- System.out.println(Math.ceil(66.6));//67.0
- System.out.println(Math.ceil(-66.6));//-67.0
- System.out.println(Math.ceil(-0.5));//-0.0

5 Floor(x)

- Returns the largest integer that is less than or equal to the argument.

Syntax	Math.floor(x)
Argument Type	double x
Return Type	double

- System.out.println(Math.floor(66.6));//
- System.out.println(Math.floor(-66.6));//
- System.out.println(Math.floor(-0.6));//
- System.out.println(Math.floor(0.6));//
- System.out.println(Math.floor(-20.11));//
- System.out.println(Math.floor(-20.99));//

6 round(x)

- Returns the closest int or long (as per the argument). It is used to round of the decimal numbers to the nearest value.

Syntax	Math.round(x)
Argument Type	double x or float x
Return Type	Double-return type is long Float-return type is int

- System.out.println(Math.round(-66.1));//
- System.out.println(Math.round(66.8));//67
- System.out.println(Math.round(66.5));//67
- System.out.println(Math.round(66.1));//66
- System.out.println(Math.round(66.4));//66
- System.out.println(Math.round(0.8));//1
- System.out.println(Math.round(0.5));//1
- System.out.println(Math.round(0.2));//0

7 abs(x)

- Returns the absolute value of the argument. If the argument is positive . the argument is returned.

Syntax	Math.abs(x)
Argument Type	Int x or long x or double x or float x
Return Type	The data type of the return value is the same as argument

- System.out.println(Math.abs(66.1));//
- System.out.println(Math.abs(-66.1));//66.1
- System.out.println(Math.abs(-66.5));//66.5

8 max(a,b)

- The Math.max(a,b) Method returns the largest number of two argument

Syntax	Math.max(a,b)
Argument Type	Int x or long x or double x or float x
Return Type	The data type of the return value is the same as argument

- System.out.println(Math.max(66.1,65.3));//
- System.out.println(Math.max(-10,-1));//

9 min(a,b)

- The Math.min(a,b) Method returns the smallest number of two argument

Syntax	Math.max(a,b)
Argument Type	Int x or long x or double x or float x
Return Type	The data type of the return value is the same as argument

- System.out.println(Math.max(66.1,65.3));//
- System.out.println(Math.max(-10,-1));//

10 random()

- The Math.random() Method returns a double value greater than oe equal to 0.0 and less than 1.0 In other words ,the method return a double value r such that 0.0<r<1.0

Syntax	Math.random()
Argument Type	No argument
Return Type	double

- System.out.println(Math.random());//
- System.out.println(Math.random());//

10 Math Constant PI

- The Math.PI return the value of π approximate valu of PI is 3.141592653589793

- A(C)=π r2

e.g double h= Math.PI * radius * radius;

Expression

1. $Y=ax^2+bx+c$

   Java Expression -: Y=a*Math.pow(x,2)+b*x+c;

   1. $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

   Java Expression -: (-b+Math.sqrt(b*b-4.0*a*c))//9(2.0*a);

WAP which uses the Pythagoras theorem to find the hypotenuse of right angle triangle

- Hypotenuse c=$\sqrt{a^2 + b^2}$

Mathematical Expression	Equivalent Java Expression
$y = ax^2 + bx + c$	y = a*x*x + b*x + c OR y = a*Math.pow(x, 2) + b*x + c
$c = \sqrt{a^2 + b^2}$	c = Math.sqrt(a*a + b*b);
$z = x * 2^y$	z = x * Math.pow(2, y);
$x\frac{-b + \sqrt{b^2 - 4ac}}{2a}$	x = (-b + Math.sqrt(b*b – 4.0*a*c))/(2.0*a);
$\sqrt[3]{x^y + x}$	Math.cbrt(Math.pow(x, y) + x);
$area = \sqrt{s(s-a)(s-b)(s-c)}$	area = Math.sqrt(s*(s-a)*(s-b)*(s-c));
$v(1 - e^{-t})$	v * (1 – Math.exp(-t));
$area = \pi r^2 + 2\pi rh$	area = Math.PI * r*r + 2 * Math.PI * r * h;
$\|m\| + \|n\|$	Math.abs(m) + Math.abs(y);
$\|P^y - y\|$	Math.abs(Math.pow(p,y) - y);

- Math.abs()
- It will return the Absolute value of the given value.
- Math.max()
- It returns the Largest of two values.
- Math.min()
- It is used to return the Smallest of two values.
- Math.round()

Math.ceil()

- It is used to find the smallest integer value that is greater than or equal to the argument or mathematical integer.
- Math.random()
- It returns a double value with a positive sign, greater than or equal to 0.0 and less than 1.0.
- Math.rint()
- It returns the double value that is closest to the given argument and equal to mathematical integer.