Batch: A3	**Roll No.: 16010121045**
Experiment / assignment / tutorial No. 02	
Grade: AA / AB / BB / BC / CC / CD /DD	
Signature of the Staff In-charge with date	

TITLE : Control Statement

AIM: Create a class myMath. The class contains the following static methods.
i) power (x, y) – to compute x y
ii) fact (x) – to compute x!
Write a program to find the following series.

- $e^x = 1 + (x/1!) + (x2/2!) + (x3/3!) + (x4/4!) + \ldots$ upto n terms (n given by user).
- $(1+x)^n = 1 + (nx/1!) + ((n(n-1)x2)/2!)$ ..... upto n terms (n given by user).

(Do not make use of inbuilt functions. Use the functions of user defined class MyMath.)

Expected OUTCOME of Experiment:

CO2: Explore arrays, vectors, classes and objects in C++ and Java.

Books/ Journals/ Websites referred:

1. E. Balagurusamy , “Programming with Java” McGraw-Hill.

2. Sachin Malhotra, Saurabh Choudhary, “Programming in Java”, Oxford Publications.

Pre Lab/ Prior Concepts

Java basic constructs (like if else statement, control structures, and data types
Programming languages provide various control structures that allow for more complicated execution paths.

A loop statement allows us to execute a statement or group of statements multiple times and following is the general form of a loop statement in most of the programming languages −

Sr.No.	Loop & Description

1	**while loop** Repeats a statement or group of statements while a given condition is true. It tests the condition before executing the loop body.
2	**for loop** Execute a sequence of statements multiple times and abbreviates the code that manages the loop variable.
3	**do...while loop** Like a while statement, except that it tests the condition at the end of the loop body.

Loop Control Statements

Loop control statements change execution from its normal sequence. When execution leaves a scope, all automatic objects that were created in that scope are destroyed.

Java supports the following control statements. Click the following links to check their details.

Sr.No.	Control Statement & Description
1	**break statement** Terminates the loop or switch statement and transfers execution to the statement immediately following the loop or switch.
2	**continue statement** Causes the loop to skip the remainder of its body and immediately retest its condition prior to reiterating.

Class Diagram:

Class name	exp2
Variables	-
Functions	main()

Class name	myMath
Variables	-
Functions	power(), fact(), expo(), series()

Algorithm:

1. Start
2. Print 2^5 power : call power()
3. Print 5 factorial : call fact()
4. Take user input for n and x
5. Print result (1+x)^n : call series()
6. Print e^x result : call expo()

power()

1. Start
2. x and n are parameters
3. Initialize ans = 1
4. Loop n times
   a) Ans = ans * x
5. return ans

fact()

1. Start
2. n is a parameter
3. if n>1
   - return n * fact(n-1)
4. else return 1.

series()

1. Start
2. x and n are parameters
3. initialize ans = 0
4. loop n+1 times
   - ans = ans + (power(x, i) * (fact(n) / fact(n - i))) / fact(i)
5. return ans

expo()

1. Start
2. x and n are parameters
3. initialize ans = 0
4. loop n times
    - ans = ans + (power(x, i) / fact(i))
5. return ans

Implementation details:

```
import java.util.Scanner;

class exp2 {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.println("2^5 is: " + myMath.power(2, 5));
        System.out.println("5 factorial is: " +
myMath.fact(5));
        System.out.println("Enter n :");
        int n = sc.nextInt();
        System.out.println("Enter x: ");
        double x = sc.nextDouble();
        System.out.println("(1+x)^n : "+myMath.series(n, x));
        System.out.println("e^x for first n terms:
"+myMath.expo(n, x));

    }
}

class myMath {
    static double power(double x, int y) {
        double ans = 1;
        for (int i = 0; i < y; i++)
            ans = ans * x;
        return ans;
    }

    static int fact(int n) {
        if (n > 1)
            return n * fact(n - 1);
```

```
        else
            return 1;
    }

    static double expo(int n, double x) {
        double ans = 0;
        for (int i = 0; i < n; i++)
            ans = ans + (power(x, i) / fact(i));
        return ans;
    }

    static double series(int n, double x) {
        double ans = 0;
        for (int i = 0; i <= n; i++)
            ans = ans + (power(x, i) * (fact(n) / fact(n -
i))) / fact(i);
        return ans;
    }
}
```

Output:

```
pargat@Router Exp2 % cd "/Users/pargat/Docu
2^5 is: 32.0
5 factorial is: 120
Enter n :
10
Enter x:
1
(1+x)^n : 1024.0
e^x for first n terms: 2.7182815255731922
pargat@Router Exp2 %
```

Conclusion:

Developed custom math functions in java and implement it using static class concept.

Successfully executed the given problem statement.

Date: _____ **Signature of faculty in-charge**

Post Lab Descriptive Questions

Q.1 Write a program to find the largest of three numbers using the if-else construct.

Code:

```
import java.util.Scanner;

class exp2post {
    public static void main(String[] args) {
        Scanner sc=new Scanner(System.in);
        System.out.println("Enter 3 numbers");
        double a=sc.nextDouble();
        double b=sc.nextDouble();
        double c=sc.nextDouble();
        if(a>b){
            if(a>c)
                System.out.println(a+" is the largest");
            else
                System.out.println(c+" is the largest");
        }
        else{
            if(b>c)
                System.out.println(b+" is the largest");
            else
                System.out.println(c+" is the largest");
        }
    }
}
```

Output:

```
pargat@Router Exp2 % cd "/Use
&& java exp2post
Enter 3 numbers
10 -5 70
70.0 is the largest
pargat@Router Practice %
```

Q.2 Write a program to determine the sum of the following series for a given value of n: 1+½+⅓+....+1/n

Code:

```java
import java.util.Scanner;

class ex2post2 {
    public static void main(String[] args) {
        Scanner sc=new Scanner(System.in);
        System.out.print("Enter n: ");
        int n=sc.nextInt();
        double ans=0;
        for(int i=1;i<=n;i++)
            ans=ans + 1.0/i;
        System.out.println("The answer is: "+ans);
    }
}
```

Output:

```
pargat@Router Practice % cd "/User
Enter n: 5
The answer is: 2.283333333333333
pargat@Router Practice %
```