

Spring 2016

Object-Oriented Programming

Programming Assignment #1 - Exponential Calculator

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Class NO : Class_1

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1. Code of Assignment_1

-functions which are used in exponential calculator

```
package OOP_assignment_1;

import java.util.Scanner;

public class expCalculator {

    public static double x=1.0;
    public static double n=10.0;

    public static double pow(double x, double n){

        double powing=1;
        int i=0;

        for(i=0;i<n;i++){

            powing*=x;
        }

        return powing;
    }

    public static double fac(double n){

        double factorial=1;
        int j=1;

        for(j=1;j<=n;j++){

            factorial*=j;
        }

        return factorial;
    }

    public static double exp(double x, double n){

        double expansion=0;
        int z=0;
        for(z=0;z<=n;z++){
            expansion+=pow(x,z)/fac(z);
        }

        return expansion;
    }
}
```

- Main body of program

```
public static void main(String[] args){

    Scanner key=new Scanner(System.in);
    String tmp,free;

    while(true){

        System.out.println("=====Main Menu=====");
        System.out.println("(1) Change x from current value : "+x);
        System.out.println("(2) Change n from current value : "+n);
        System.out.println("(3) Calculate exp");
        System.out.println("(4) Exit the program");
        System.out.println("=====Main Menu=====");

        tmp=key.nextLine();

        if(tmp.equals("1")){
            System.out.println("The a value for x:");
            x=key.nextDouble();
            free=key.nextLine();
        }
        else if(tmp.equals("2")){

            System.out.println("The a value for n:");
            n=key.nextDouble();
            free=key.nextLine();
        }
        else if(tmp.equals("3")){

            System.out.println("The a value for e^"+x+" is : "+exp(x,n));
            System.out.println();
        }
        else if(tmp.equals("4")) {

            System.out.println("Program Exit!");
            return;
        }
        else{
            System.out.println("Please choose the number in the menu!");
        }
    }
}
```

2. Output of Assignment_1

-x=1,n=10

```
=====Main Menu=====
(1) Change x from current value : 1.0
(2) Change n from current value : 10.0
(3) Calculate exp
(4) Exit the program
=====Main Menu=====
3
The a value for e^1.0 is : 2.7182818011463845
```

-x=1,n=100

```
=====Main Menu=====
(1) Change x from current value : 1.0
(2) Change n from current value : 50.0
(3) Calculate exp
(4) Exit the program
=====Main Menu=====
2
The a value for n:
100
=====Main Menu=====
(1) Change x from current value : 1.0
(2) Change n from current value : 100.0
(3) Calculate exp
(4) Exit the program
=====Main Menu=====
3
The a value for e^1.0 is : 2.7182818284590455
```

-x=2,n=50

```
=====Main Menu=====
(1) Change x from current value : 1.0
(2) Change n from current value : 50.0
(3) Calculate exp
(4) Exit the program
=====Main Menu=====
1
The a value for x:
2
=====Main Menu=====
(1) Change x from current value : 2.0
(2) Change n from current value : 50.0
(3) Calculate exp
(4) Exit the program
=====Main Menu=====
3
The a value for e^2.0 is : 7.389056098930649
```

-x=1,n=50

```
=====Main Menu=====
(1) Change x from current value : 1.0
(2) Change n from current value : 10.0
(3) Calculate exp
(4) Exit the program
=====Main Menu=====
2
The a value for n:
50
=====Main Menu=====
(1) Change x from current value : 1.0
(2) Change n from current value : 50.0
(3) Calculate exp
(4) Exit the program
=====Main Menu=====
3
The a value for e^1.0 is : 2.7182818284590455
```

-x=2,n=10

```
=====Main Menu=====
(1) Change x from current value : 2.0
(2) Change n from current value : 100.0
(3) Calculate exp
(4) Exit the program
=====Main Menu=====
2
The a value for n:
10
=====Main Menu=====
(1) Change x from current value : 2.0
(2) Change n from current value : 10.0
(3) Calculate exp
(4) Exit the program
=====Main Menu=====
3
The a value for e^2.0 is : 7.388994708994708
```

-End of Program

```
=====Main Menu=====
(1) Change x from current value : 2.0
(2) Change n from current value : 10.0
(3) Calculate exp
(4) Exit the program
=====Main Menu=====
4
Program Exit!
```

3. Explanation of Assignment_1

- **Functions and else which are used in exponential calculator**
 - **import java.util.Scanner** : In order to get the inputs, I import "java.util.Scanner" at the top of the code.
 - **public class expCalculator** : ExpCalculator is a file which is made for calculates the value of e^x .
 - **public static double variable** : The variable(double type) which I want to use in the class.
 - **public static double pow (double x, double n)** : The function which is used to multiply the variable "x" by itself n times repeatedly. The number which calculated during this process will be saved at the variable "powing",and returned.
 - **public static double fac (double n)** : The function which is used to find the factorial of "n",which is the product of all positive integers less than or equal to n. The number which calculated during this process will be saved at the variable "factorial",and returned.
 - **public static double exp (double x, double n)** : The function which is used to calculate the value of e^x . During this process, the calculations of $(x^z)/z!$ ("z" is a integer which increase from 0 to n.) will be added at the variable expansion n times, and returned.
- **Main body of program**
 - **Scanner key=new Scanner(System.in)** : Declaring the scanner variable to get inputs.
 - **String tmp** : The variable which is used to choose the menu. I use "String type" to handle erroneous input (when "tmp" is not same with 1 or 2 or 3 or 4).
 - **String free** : The variable which is used to clean the "junk" like "\n".
 - **while(true)** : The infinite loop. This loop will never stop until it gets a condition to stop the loop.
 - **variable = Scanner variable.nextThe_Type_Of_Variable()** : This is the way to get a input whatever you want.
 - **(String)variable. equals(" String ")** : The way to compare two Strings.
 - **(Conditional) If statement** : when you choose "1", get a new input into the variable x. When you choose "2", get a new input into the variable n. When you choose "3", calculate the series expansion $e^x=1+x+(x^2/2!)+(x^3/3!)+\dots+(x^n/n!)$ and print the result of calculation. When you choose "4", exit the program. If you choose **others**(whatever except 1,2,3 and 4) , printf the error message.