



K. J. Somaiya College of Engineering, Mumbai-77

Batch: A3 Roll No.: 1911034

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.

$\cos(x) = 1 - (x^2/2!) + (x^4/4!) - (x^6/6!) + \dots$ upto n terms (n given by user).

$\sin(x) = x - x^3/3! + x^5/5! - x^7/7! + \dots$ 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: Solve problems using Java basic constructs (like if else statement, control structures, and data types, array, string, vectors, packages, collection class).

Books/ Journals/ Websites referred:

1. Ralph Bravaco , Shai Simoson , “Java Programing From the Group Up” Tata McGraw-Hill.

2. Grady Booch, Object Oriented Analysis and Design .

Pre Lab/ Prior Concepts



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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	<u>while loop</u> Repeats a statement or group of statements while a given condition is true. It tests the condition before executing the loop body.
2	<u>for loop</u> Execute a sequence of statements multiple times and abbreviates the code that manages the loop variable.
3	<u>do...while loop</u> 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 detail.

Sr.No.	Control Statement & Description
1	<u>break statement</u> Terminates the loop or switch statement and transfers execution to



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	the statement immediately following the loop or switch.
2	<u>continue statement</u> Causes the loop to skip the remainder of its body and immediately retest its condition prior to reiterating.

Class Diagram:

Class 1. public class myMath
Methods 1. public static void main(String args []) 2. static double power (double x, double y)//for calculation of power 3. static double fact(double x)// for calculation of factorial
Variables int y,n,i,j; double x, res1,res2,num; int ch;

Algorithm:

1. Create a class myMath which has the main method.
2. In the main method , declare a variable for asking the value of the angle from the user in degrees, and convert it into radians for the calculations.
3. Create two recursive static methods inside class myMath , one for the calculation of power and the other for the calculation o factorial.



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4. Using the series expansion formulae for $\sin(x)$ and $\cos(x)$, calculate their values by making use of the recursive methods created earlier.
5. Using the values of $\sin(x)$ and $\cos(x)$ calculate the values of other trigonometric functions by the standard formulae.
6. After asking the user to input the angle in degrees, we can ask the user the number of terms, for greater precision.
7. Using switch and break statements , we ask the user to enter the trigonometric function whose value is to be calculated and calculate the value and give it to the user.



Implementation details:

Code for the program:

```
import java.util.*;

public class myMath
{

    public static void main(String args[])
    {int y,n,i,j;
    double x, res1,res2,num;
    int ch;
    double temp =0;
    res1=0.0; res2=0.0; x=0.0;
    Scanner sc= new Scanner(System.in);
    System.out.println("Enter the angle in degrees");
    num = sc.nextInt();

    x= num*(3.142/180);//the formula used in the calculation of sin(x) and
    cos(x) uses the angles in radians, not degrees.

    System.out.println("Enter the number of terms");
    n = sc.nextInt();
    //for the calculation of cos(x)

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

        res1 = res1 + (power(-1,(i-1))*power(x,2*(i-1)))/fact(2*(i-1));

    }
    // for the calculation of sin(x)
    for(i=1;i<=n;i++)
    {

        res2 = res2 + power(-1,(i-1))*power(x,(2*i-1))/fact(2*i-1);
```



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```
}
System.out.println("Enter your choice");
System.out.println("1. for sin(x)");
System.out.println("2. for cos(x)");
System.out.println("3. for tan(x)");
System.out.println("4. for cot(x)");
System.out.println("5. for sec(x)");
System.out.println("6. for cosec(x)");

ch = sc.nextInt();

switch(ch)
{
case 1:
{
System.out.println("The value of sinx is" +res2);
}
break;

case 2:
{
System.out.println("The value of cosx is" +res1);
}
break;

case 3:
{ temp = res2/res1;
System.out.println("The value of tanx is" +temp);
}
break;
case 4:
{ temp = res1/res2;
System.out.println("The value of cotx is" +temp);
}
break;
case 5:
{ temp = 1/res1;
System.out.println("The value of secx is" +temp);
}
break;

case 6:
{ temp = 1/res2;
```



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```
System.out.println("The value of cosecx is" +temp);
}

}

}

static double power(double x,double y)//recursive function for finding
the power
{
    if(y==0)

return 1;

else return (x*power(x,y-1));

}

static double fact(double x)//recursive function for calculating
factorial
{
    if(x>=1)

return x*fact(x-1);

else return 1;

}

}
```

Output Screenshots

Since the program is menu driven program , we can have 6 different cases.



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Case 1: Calculation of $\sin(x)$

```
C:\Users\Aditi Paretkar\Desktop\OOPM JAVA programs>java myMath
Enter the angle in degrees
120
Enter the number of terms
100
Enter your choice
1. for sin(x)
2. for cos(x)
3. for tan(x)
4. for cot(x)
5. for sec(x)
6. for cosec(x)
1
The value of sinx is 0.8658895897159177
C:\Users\Aditi Paretkar\Desktop\OOPM JAVA programs>
```

Case 2: Calculation of $\cos(x)$

```
C:\Users\Aditi Paretkar\Desktop\OOPM JAVA programs>java myMath
Enter the angle in degrees
135
Enter the number of terms
100
Enter your choice
1. for sin(x)
2. for cos(x)
3. for tan(x)
4. for cot(x)
5. for sec(x)
6. for cosec(x)
2
The value of cosx is -0.7073227762405536
C:\Users\Aditi Paretkar\Desktop\OOPM JAVA programs>
```

Case3: Calculation of $\tan(x)$:



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```
C:\Users\Aditi Paretkar\Desktop\OOPM JAVA programs>java myMath
Enter the angle in degrees
60
Enter the number of terms
100
Enter your choice
1. for sin(x)
2. for cos(x)
3. for tan(x)
4. for cot(x)
5. for sec(x)
6. for cosec(x)
3
The value of tanx is1.732594063883025
C:\Users\Aditi Paretkar\Desktop\OOPM JAVA programs>_
```

Case4 : Calculation of cot(x)

```
C:\Users\Aditi Paretkar\Desktop\OOPM JAVA programs>java myMath
Enter the angle in degrees
45
Enter the number of terms
100
Enter your choice
1. for sin(x)
2. for cos(x)
3. for tan(x)
4. for cot(x)
5. for sec(x)
6. for cosec(x)
4
The value of cotx is0.9997963475334679
C:\Users\Aditi Paretkar\Desktop\OOPM JAVA programs>_
```

Case5: Calculation of sec(x):



```
Enter the angle in degrees
60
Enter the number of terms
100
Enter your choice
1. for sin(x)
2. for cos(x)
3. for tan(x)
4. for cot(x)
5. for sec(x)
6. for cosec(x)
5
The value of secx is 2.0004704922099434
C:\Users\Aditi Paretkar\Desktop\OOPM JAVA programs>
```

Case 6: Calculation of cosec(x)

```
Enter the angle in degrees
210
Enter the number of terms
100
Enter your choice
1. for sin(x)
2. for cos(x)
3. for tan(x)
4. for cot(x)
5. for sec(x)
6. for cosec(x)
6
The value of cosecx is -1.9983553086135468
C:\Users\Aditi Paretkar\Desktop\OOPM JAVA programs>
```

Note: here we can take -1.99 as approximately equal to -2, which is the real value of cosec(210). If we increase the number of terms, the accuracy will also increase and the answer will get closer to 2.

Conclusion: In this experiment we have done the following:

1. Using recursion, we have created two static methods inside the class myMath, one for the calculation of factorial and other for the calculation of power.
2. As these methods are static and are in the same class as main, we can call them directly from main.



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3. Using switch case statement and break statement we ask user to select any one of the trigonometric functions , for the calculation of the value.
4. Thus we have learnt the use of control statements through this experiment .

Date: _____

Signature of faculty in-charge

Post Lab Descriptive Questions (Add questions from examination point view)

Q.1 What will be the output of the following program?

```
class Test {
    static String s = "";
public
    static void main(String[] args)
    {
        P:
        for (int i = 2; i < 7; i++) {
            if (i == 3)
                continue;
            if (i == 5)
                break P;
            s = s + i;
        }
        System.out.println(s);
    }
}
```



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Options:

- 1.32
- 2.23
- 3.24
- 4.42

Ans 1. 24

Q.2 What will be the output of the following program?

```
class Test {  
public  
    static void main(String[] args)  
    {  
        int x = 10;  
        if (++x < 10 && (x / 0 > 10)) {  
            System.out.println("hi");  
        } else {  
            System.out.println("hello");  
        }  
    }  
}
```

Options:

- 1.Compiletimeerror
- 2.RuntimeException:ArithmeticException:/byzero
- 3.hi
- 4. Hello

Ans – 4. hello



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