Efficient program to calculate e^x

The value of Exponential Function e^x can be expressed using following Taylor Series.

```
e^x = 1 + x/1! + x^2/2! + x^3/3! + ......
```

How to efficiently calculate the sum of above series?
The series can be re-written as

```
e^x = 1 + (x/1) (1 + (x/2) (1 + (x/3) (........) ) )
```

Let the sum needs to be calculated for n terms, we can calculate sum using following loop.

```
for (i = n - 1, sum = 1; i > 0; --i )
    sum = 1 + x * sum / i;
```

Following is implementation of the above idea.

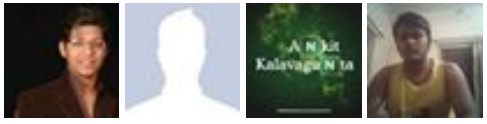
```
// Efficient program to calculate e raise to the power x
#include <stdio.h>

//Returns approximate value of e^x using sum of first n terms of Taylo
float exponential(int n, float x)
{
    float sum = 1.0f; // initialize sum of series

    for (int i = n - 1; i > 0; --i )
        sum = 1 + x * sum / i;

    return sum;
}

// Driver program to test above function
```

```
int main()
{
    int n = 10;
    float x = 1.0f;
    printf("e^x = %f", exponential(n, x));
    return 0;
}
```

Output:

```
e^x = 2.718282
```

This article is compiled by **Rahul** and reviewed by GeeksforGeeks team. Please write comments if you find anything incorrect, or you want to share more information about the topic discussed above

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K.kaushik • 11 months ago

A simple java code for the program:
If any error is there please reply to inform me...

```
//considering calculation upto 10 imes.

public class Exponent {

public static double getExponent(double x, int i)
{
if(i == 0)
return 1; // as e^0 = 0;

if(i > 10)
return 1;

else
{
```

```
double y = getExponent(x, i+1);
return 1 + (x / i) * y;
```

see more

1 ^ | v •

K.kaushik ➦ K.kaushik • 11 months ago

```
For greater accuracy in output while calculating e^x you may r
```

^ | v •

K.kaushik ➦ K.kaushik • 11 months ago

a typo is there : e^0 = 1 .. Sorry for the inconvenience.

^ | v •

A Chakraborty • a year ago

```
/*A more efficient program for calculating e^x (which doesn't involv

Simple Recursion is used.
We know e^x=1+x+x^/2!+....+x^n/n!

Thus the n'th ten Tn=x^n/n!
n+1'th tern Tn-1=x^n-1/n-1!

dividing the two relations we get.

Tn-1=Tn * n/x.

Calculated in Get().
Main() not written! */
#include <stdio.h>
```

705

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```
float Calc(float);
float Get(int, float);
```

see more

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Jitendra Khushwaha • a year ago

@Those who know python :
here is the high precision solution.
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Raison • a year ago

It's may not get good precision, even change to double version. For low precis

Hello • a year ago

You have an error in your for loop after sum = 1. You meant to put a semi-colc

```
/* Paste your code here (You may delete these lines if not writing c
```

Kartik ↗ Hello • a year ago

Thanks for pointing this out. We have replaced comma with semicolon

Akshat Gupta • a year ago

Nicely **done**!!

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