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Research Article

METHODOLOGY FOR SOLVING A NUMBER OF PROBLEMS IN PYTHON AND C++ LANGUAGES WITH THE APPLICATION OF MATHEMATICAL KNOWLEDGE

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ABSTRACT

Python programming language and C++ language are studied comparatively. The method of using and teaching cyclic and conditional operators in Python and C++ languages is investigated. The rules of using both preconditioned and post-conditioned cycle operators in solving mathematical problems are explained in detail.

The methodology of solving mathematical problems in Python and C++ programming languages is investigated, and the problems of finding the greatest common divisor and prime divisors of a given number n are solved in both Python and C++ languages, and the differences in the syntax of these programming languages are studied.

The article teaches the rules for calculating expressions with the participation of logarithms. Emphasizes the importance of writing the math.h directive when using math functions.

KEYWORDS

Prime numbers, Python, C++, greatest common divisor, prime divisor, programming, mathematical problems, cyclic operators, conditional operators.

INTRODUCTION

Simple numbers mean numbers divisible by 1 and itself. 1 is neither a simple nor a complex number. In programming, the approach to solving the problem is slightly different. That is, to find prime numbers from 1 to n, we must look at the number of divisors of the number, and look for divisors from the numbers up to the number itself (including n itself). In this case we should use period within period.

```
#include<iostream>
```

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```
#include<math.h>

using namespace std;

int main()

{int i,j,k,n;

cin>>n;

for (i=1;i<=n;i++){k=0;

if (n%i==0){

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

if (i%j==0)k++;}

if (k==2)

cout<<"i="<<i<<endl;}}

return 0;

}
```

The program for this problem in Python will be as follows.

```
import math

a=int(input("a="))

for i in range(1,a+1):

  k=0

  if a%i==0:

    for j in range(1, i+1):

      if i%j==0:

        k=k+1

  if k==2:

    print(i)
```

As we can see, although the algorithm is the same, the programs are very different in terms of language syntax. Thus, the writing of the cycle operator and input-output operators is quite different [3,4]. Also, in the Python programming language, 4 spaces are placed after the for and if operators, which if not done in place, the execution of the program leads to an incorrect result. while in C++ it is written as, for example, k++ or inc(k), in Python it is expressed as k=k+1.[2]

We know that in mathematics, to find the greatest common divisor(GCD), numbers are divided into prime factors, and then the product of the common factors is taken. In programming, there is a well-known Euclidean algorithm to solve this type of problem, which we use. Now, let's design programs for solving this problem in Python and C++ languages.

Let's recall this algorithm again. If the numbers are different, we take the smaller number from the larger number and add it to the larger number and compare the numbers again. We continue this process until the numbers are equal to each other. When the numbers are equal, GCD the is taken equal to that number. For example, if we compare 18 and 12, since 18>12, then 18-12=6. Comparing 12 and 6, it becomes 12-6=6, then since 6=6 greatest common divisor becomes 6. Let's compile the program of this problem.

```
#include <iostream>

using namespace std;

int main()
```

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```
{int a,b;
cin>>a>>b;
while(a!=b)
{if (a>b)
a=a-b;
else
b=b-a;}
if (a==b)
cout<<" GCD ="<<a<<endl;
return 0;
}
```

Let's write this program with the help of the conditional do-while operator:

```
#include <iostream>
using namespace std;
int main()
{int a,b;
cin>>a>>b;
if (a==b)
cout<<" GCD ="<<a<<endl;
do
{
if (a>b)
a=a-b;
else
b=b-a;}
while (a!=b);
if (a==b)
cout<<" GCD ="<<a<<endl;
return 0;
}
```

There are two types of loop operators in the Python programming language, the enumerated loop operator and the conditional loop operator. [1] The Python program for this problem can be written using the conditional loop operator as follows:

```
import math
a=int(input("a-ni daxil edin:"))
b=int(input("b-ni daxil edin:"))
while a!=b:
    if a>b:
        a=a-b
    elif b>a:
        b=b-a
GCD =a
print(GCD)
```

This program also uses an extended version of the if conditional operator in Python—the case with the elif variant. As we have seen, solving mathematical problems in programming is not at all the same as in

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mathematics. However, the formulation of the algorithm in one programming language makes it possible to program the problem in other languages as well.

Now let's look at the problems of calculating some mathematical expressions using logarithms. Suppose we need to calculate the value of the following expressions:

$$1.\ z = \frac{\sqrt[3]{x} + |x|}{\log_2 x + 2y}$$

```
#include <iostream>

#include<math.h>

using namespace std;

int main()

{float z;int x,y;

cin>>x>>y;

z=((pow(x,1./3)+abs(x))/(log2(x)+2*y));

cout<<"z="<<z<<endl;

return 0;

}
```

Note. Pay attention to writing 1./3 in the calculation of the above expression. If a dot is not placed after 1, the answer will be wrong.
Now let's look at the calculation of the natural logarithm:

$$z = \frac{e^x + \ln(x)}{\sin^2 x + \sqrt{x^3}}$$

```
#include <iostream>
#include<math.h>
using namespace std;
int main()
{float z;int x;
cin>>x;
z=(exp(x)+log(x))/(pow(sin(x),2)+ pow(x, (3/2)));
cout<<"z="<<z<<endl;
return 0;
```

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}

Note that to calculate the decimal logarithm, we must write log10(x).

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