Lesson:

Java

More problems on loops

PW SKILLS

Pre-Requisites

- Basic java syntax
- Conditionals
- Understanding of loops (for, while, do while)

List of Concepts Involved

- Loop-based questions

There is no better way to practice loops other than mathematical questions. These kinds of questions not only clear the concepts and working of loops but also help in building the logical abilities for problem-solving in the programming domain.

Are we ready for a few challenges? Of course, we are!
So let us begin!

Topic: Problems involving digits of a number

These questions are based on extracting and working on the individual digits of a number. Let us go through these examples to know more.

Problem 1: Count the number of digits in the given number n.

Approach

1. Fetch the input from the user (n)
2. Create a while loop that iterates until the value of 'n' is not equal to 0.
3. Assume (for example) the value of 'n' is 123.
4. In the first iteration, the value of 'n' will be 123, and the value of count will be incremented to 1.
5. In the second iteration, the value of 'n' will be 12, and the value of count will be incremented to 2.
6. In the third iteration, the value of 'n' will be 1, and the value of count will be incremented to 3.
7. After the completion of the third iteration, the value of 'n' becomes 0, and loop is terminated as it does not satisfy the condition (n!=0).

Number of digits can be many but the approach will remain the same.

Let us implement it now.

Solution:

```
public class Main
{
 public static void main(String[] args) {
  int n=123;
  int count = 0;
        while(n > 0) {
           count++;
           n /= 10;

        }
        System.out.println(count);

 }
}
```

Problem 2: Find the sum of digits in a given number n.

Approach :

1. Fetch the number n from user
2. Compute the modulus/remainder of the n
3. Add the remainder of the n
4. Divide the n by 10
5. Repeat step 2 until n is greater than 0.

Let's implement it in the code.

Solution:

```
public class Main
{
 public static void main(String[] args) {
  int n=123;
     int sum = 0;
      while(n > 0) {
         sum += (n % 10);
          n /= 10;
        }
        System.out.println(sum);

 }
}
```

Problem 3: Reverse the digits of a number.

Approach :

1. First, find the remainder of the given number by using the modulo (%) operator.
2. Multiply the variable ans by 10 and add the remainder to it.
3. Divide the number by 10.
4. Repeat the above steps until the number becomes 0.

This may seem a little difficult to understand in the first go but try to run this program with a number of your choice and you will understand how it works. It is mathematics in coding !

Let us code the approach now :

Solution:

```
public class Main
{
 public static void main(String[] args) {
  int n=123;
   int ans = 0; // reversed number
      while(n > 0) {
        int reminder = n % 10;
        ans = ans * 10 + reminder;
        n /= 10;
}
        System.out.println(ans);
 }
}
```

Topic: Maths problems

This topic would cover problems that are based on the concept of pure mathematical calculations. Let us look at them to know more.

Problem 1: Find the sum of the following series

1 - 2 + 3 - 4 … n

Approach: Observe the pattern here. We can clearly see that the sum of the above series follows a pattern of alternating positive and negative integers starting from 1 to N:

Hence, from the above pattern, we can conclude that:

- when n is odd => ans = ans+i
- when n is even => ans=ans-i

Let's write the code to implement this.

Code:

```
public class Main
{
 public static void main(String[] args) {
  int n=5;
  int ans = 0;
     for(int i = 1; i <= n ; i++) {
       if(i % 2 == 0) ans -= i;
       else ans += i;
      }
      System.out.println(ans);

 }
```

Problem 2: Given 2 numbers a and b. Find a raise to the power b.

Approach :

1. To calculate a^b, we multiply ***a*a*a*a*a......*a*** b times.
2. To get this, let's have a variable which will store the value of the calculated result and name it **ans**. Let's assign **ans** the value of **a**.
3. If we multiply ans with a and assign this value to ans then:
   ans = ans*a = i.e. a^2
   let's multiply again,
   ans = ans*a i.e. a^3 (as power was a^2 with previous multiplication).
4. Similarly, we can obtain an.

Let us see the code implementation

Code:

```
public class Main
{
 public static void main(String[] args) {
  int a=3,b=5;
      int ans = 1;
        for(int i = 1; i <= b; i++) {
          ans *= a;
         }
         System.out.println(ans);

 }
}
```

Problem 3: Print the nth factorial number.

Approach :

- To calculate the factorial of a number, we multiply all the previous numbers to it till 1.
- To get this, let’s have a variable which will store the value of the calculated result and name it **fact**. Let’s assign **fac**t=1.
- Multiply fact with i (loop variable) and assign this value to fact until you reach the number n (for which factorial is to be calculated).
- The final value of fact is the product of all numbers from 1 to n.

Let us see the code implementation

Code:

```
public class Main
{
 public static void main(String[] args) {
     int n=5;
     int fact = 1;
        for(int i = 1; i <= n; i++) {
        fact *= i;}
        System.out.println(fact);
 }
}
```

Hope you enjoyed solving these questions with the help of the given approaches. However, we also encourage you to solve these questions with different approaches.

Upcoming Class Teasers

- Pattern-based questions

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