

DAA Lab - L21-L22

Lab Assignment 2

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Question 1: Write a recursive program for the Fibonacci series and find the nth Fibonacci number.

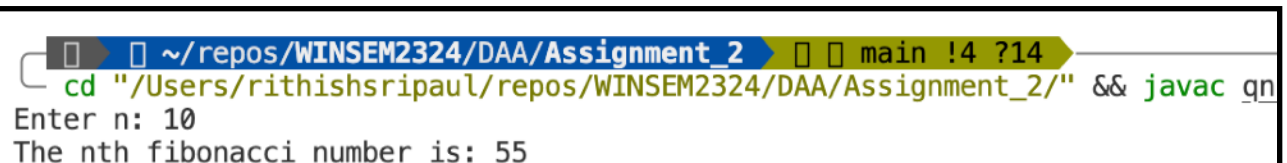
Code:

```
import java.util.Scanner;

public class qn1_fibonacci {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter n: ");
        int count = sc.nextInt();
        System.out.print("The nth fibonacci number is: ");
        System.out.println(fibonacci(1, 1, count));
    }

    public static int fibonacci(int a, int b, int count) {
        if (count <= 3) {
            return a + b;
        }
        return fibonacci(b, a + b, count - 1);
    }
}
```

Output:



```
~/repos/WINSEM2324/DAA/Assignment_2 main !4 ?14
cd "/Users/rithishsrripaul/repos/WINSEM2324/DAA/Assignment_2/" && javac qn
Enter n: 10
The nth fibonacci number is: 55
```

Question 2: Write a recursive program for the Towers of Hanoi problem (input: disks=10 and towers=3)

Code:

```
public class qn2_tower_of_hanoi {
    public static void main(String[] args) {
        int n = 10;
        towerOfHanoi(n, 'A', 'B', 'C');
    }

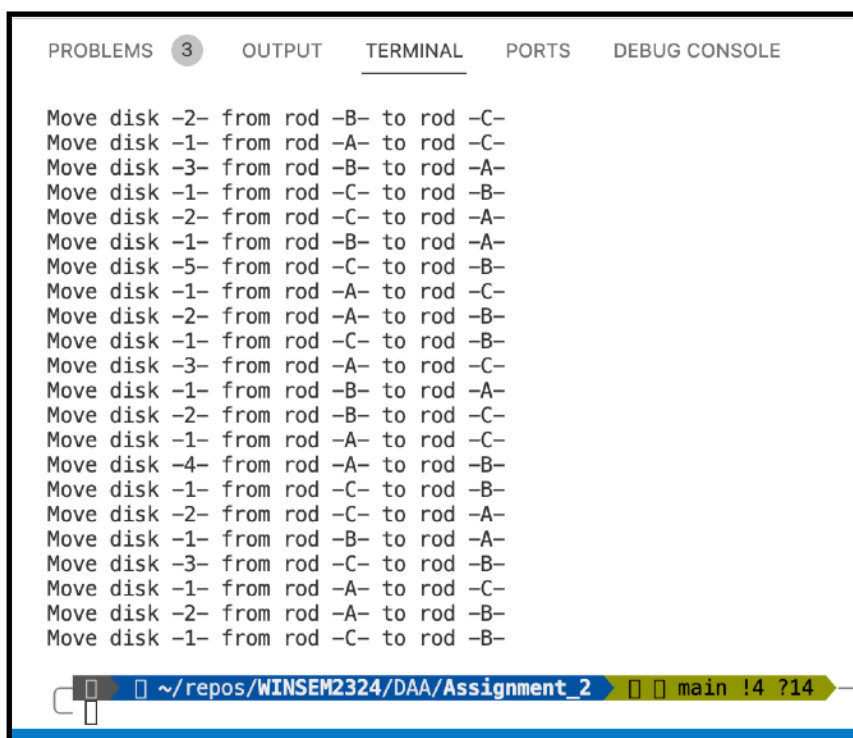
    static void towerOfHanoi(int n, char from_rod, char to_rod, char
aux_rod) {

        if (n == 0) {
            return;
        }
        towerOfHanoi(n - 1, from_rod, aux_rod, to_rod);

        System.out.println("Move disk " + n + " from rod " + from_rod
+ " to rod " + to_rod);

        towerOfHanoi(n - 1, aux_rod, to_rod, from_rod);
    }
}
```

Output:



```
PROBLEMS 3 OUTPUT TERMINAL PORTS DEBUG CONSOLE

Move disk -2- from rod -B- to rod -C-
Move disk -1- from rod -A- to rod -C-
Move disk -3- from rod -B- to rod -A-
Move disk -1- from rod -C- to rod -B-
Move disk -2- from rod -C- to rod -A-
Move disk -1- from rod -B- to rod -A-
Move disk -5- from rod -C- to rod -B-
Move disk -1- from rod -A- to rod -C-
Move disk -2- from rod -A- to rod -B-
Move disk -1- from rod -C- to rod -B-
Move disk -3- from rod -A- to rod -C-
Move disk -1- from rod -B- to rod -A-
Move disk -2- from rod -B- to rod -C-
Move disk -1- from rod -A- to rod -C-
Move disk -4- from rod -A- to rod -B-
Move disk -1- from rod -C- to rod -B-
Move disk -2- from rod -C- to rod -A-
Move disk -1- from rod -B- to rod -A-
Move disk -3- from rod -C- to rod -B-
Move disk -1- from rod -A- to rod -C-
Move disk -2- from rod -A- to rod -B-
Move disk -1- from rod -C- to rod -B-
```

Question 3: Write a recursive program to find the factorial of a given number.

Code:

```
import java.util.Scanner;

public class qn3_factorial_recursive {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter the value of n: ");
        int n = sc.nextInt();
        System.out.print("The factorial of given n is: ");
        System.out.println(factorial(n));
    }

    public static int factorial(int n) {
        if (n == 0) {
            return 1;
        }
        return n * factorial(n - 1);
    }
}
```

Output:

```
~/repos/WINSEM2324/DAA/Assignment_2 main !4 ?14
cd "/Users/rithishsripaul/repos/WINSEM2324/DAA/Assignment_2/"
Enter the value of n: 5
The factorial of given n is: 120
```

```
~/repos/WINSEM2324/DAA/Assignment_2 main !4 ?14
cd "/Users/rithishsripaul/repos/WINSEM2324/DAA/Assignment_2/"
Enter the value of n: 10
The factorial of given n is: 3628800
```

Question 4: Write the iterative program to find the factorial of a given number:

Code:

```
import java.util.Scanner;

public class qn_4_factorial_iterative {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);

        System.out.print("Enter the value of n: ");
        int n = sc.nextInt();

        int ans = 1;
        while (n > 1) {
            ans *= n;
            n--;
        }

        System.out.println("The factorial of the given n is: " + ans);
    }
}
```

Output:

A terminal window screenshot showing the execution of the Java program. The terminal title bar indicates the current directory is ~/repos/WINSEM2324/DAA/Assignment_2 and the command prompt is main !4 ?14. The user has entered the command cd "/Users/rithishsripaul/repos/WINSEM2324/DAA/Assignment_2/" and the program has executed. The output shows the prompt "Enter the value of n: 6" and the result "The factorial of the given n is: 720".

```
~/repos/WINSEM2324/DAA/Assignment_2 main !4 ?14
cd "/Users/rithishsripaul/repos/WINSEM2324/DAA/Assignment_2/"
Enter the value of n: 6
The factorial of the given n is: 720
```