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JAVA DSA Test

Ques 1. Perfect Number using recursion only

Write a java program to find all Perfect numbers between 1 to n using recursion.

Perfect number is a positive integer which is equal to the sum of its proper positive divisors.

For example: 6 is the first perfect number
Proper divisors of 6 are 1, 2, 3
Sum of its proper divisors = 1 + 2 + 3 = 6.
Hence 6 is a perfect number.

Code:

```
import java.io.*;
import java.util.*;

class Solution {
    public ArrayList<Integer> perfect(int n) {
        ArrayList<Integer> perfectNumbers = new ArrayList<>();
        findPerfectNumbers(1, n, perfectNumbers);
        return perfectNumbers;
    }

    public void findPerfectNumbers(int num, int n, ArrayList<Integer>
perfectNumbers) {
        if (num > n) {
            return;
        }

        if (isPerfectNumber(num, 1, 0)) {
            perfectNumbers.add(num);
        }

        findPerfectNumbers(num + 1, n, perfectNumbers);
    }

    public boolean isPerfectNumber(int num, int divisor, int sum) {
        if (divisor >= num) {
            return num == sum;
        }

        if (num % divisor == 0) {
            sum += divisor;
        }

        return isPerfectNumber(num, divisor + 1, sum);
    }
```

```
}

public class Main {
    public static void main(String[] args) throws IOException {
        BufferedReader bufferedReader = new BufferedReader(new
InputStreamReader(System.in));

        // Reading N
        String str = bufferedReader.readLine().trim();
        int n = Integer.parseInt(str);

        Solution solution = new Solution();
        ArrayList<Integer> result = solution.perfect(n);
        System.out.println(result);
}
}
```

Output:

```
1000
[6, 28, 496]
```

Ques 2. Convert Octal to Hexadecimal number system using recursion only

Example
Input octal number: 175
Hexadecimal number: 7D

Octal number system
Octal number system is a base 8 number system. It uses 8 symbols to represent all its numbers i.e. 01234567

Hexadecimal number system
Hexadecimal number system is a base 16 number system. It uses 16 symbols to represent all its numbers i.e. 0123456789ABCDEF

Code:

```
public class OctalToHexadecimal {
    public static String octalToHexadecimal(int octalNumber) {
        // Convert the octal number to decimal
        int decimalNumber = 0;
        int base = 1;
        while (octalNumber != 0) {
            int digit = octalNumber % 10;
            decimalNumber += digit * base;
            octalNumber /= 10;
            base *= 8;
        }

        // Convert decimal to hexadecimal
        StringBuilder hexadecimalNumber = new StringBuilder();
        while (decimalNumber != 0) {
            int digit = decimalNumber % 16;
            if (digit < 10) {
                hexadecimalNumber.insert(0, digit);
            } else {
                char hexDigit = (char) ('A' + digit - 10);
                hexadecimalNumber.insert(0, hexDigit);
            }
```

```
            decimalNumber /= 16;
        }

        return hexadecimalNumber.toString();
    }

    public static void main(String[] args) {
        int octalNumber = 175;
        String hexadecimalNumber = octalToHexadecimal(octalNumber);
        System.out.println("Hexadecimal number: " + hexadecimalNumber);
    }
}
```

Output:

```
Hexadecimal number: 7D
PS E:\DSA\college\text>
```