

# DSAx30: The DSA Chronicles

## Day 1

**Problem 1:** Given an integer N, print the following pattern

Input Format: N = 3

Result:

3 3 3 3 3

3 2 2 2 3

3 2 1 2 3

3 2 2 2 3

3 3 3 3 3

Input Format: N = 6

Result:

6 6 6 6 6 6 6 6 6 6

6 5 5 5 5 5 5 5 5 6

6 5 4 4 4 4 4 4 4 5 6

6 5 4 3 3 3 3 3 4 5 6

6 5 4 3 2 2 2 3 4 5 6

6 5 4 3 2 1 2 3 4 5 6

6 5 4 3 2 2 2 3 4 5 6

6 5 4 3 3 3 3 3 4 5 6

6 5 4 4 4 4 4 4 4 5 6

6 5 5 5 5 5 5 5 5 6

6 6 6 6 6 6 6 6 6 6

**Problem 2:** Given an integer N, print the following pattern

Input Format: N = 3

Result:

A

ABA

ABCBA

Input Format: N = 6

Result:

A

ABA

ABCBA

ABCDCA

ABCDEDCBA

ABCDEFEDCBA

**Problem 3:** Write a program to enter any number from 2 to 5 (both inclusive) and print all the combinations of digits starting from 1 to that number. There should be one blank space between each digit and each new combination should appear on a new line. Also display the total number of combinations formed for the given input.

**Sample Input:**

Enter any number from 2 to 5 (both inclusive): 3

**Sample Output:**

1 2 3

1 3 2

2 1 3

2 3 1

3 1 2

3 2 1

**Total number of combinations: 6**

**Problem 4:** Write a program to determine if a number n is happy.

A **happy number** is a number defined by the following process:

- Starting with any positive integer, replace the number by the sum of the squares of its digits.
- Repeat the process until the number equals 1 (where it will stay), or it **loops endlessly in a cycle** which does not include 1.
- Those numbers for which this process **ends in 1** are happy.

Return true *if n is a happy number, and false if not.*

**Example 1:**

**Input:** n = 19

**Output:** true

**Explanation:**

$$1^2 + 9^2 = 82$$

$$8^2 + 2^2 = 68$$

$$6^2 + 8^2 = 100$$

$$1^2 + 0^2 + 0^2 = 1$$

**Example 2:**

**Input:** n = 2

**Output:** false

**Problem 5:** Given the two positive integers p and q, where  $p < q$ . Write a program to determine how many Kaprekar numbers are there in the range between p and q (both inclusive) and output them. The input contains two positive integers p and q. Assume  $p < 5000$  and  $q < 5000$ . You are to output the number of Kaprekar numbers in the specified range along with their values in the format specified below.

The following steps can be used to check whether a number is Kaprekar number or not:

(i) Find square of the number (n).

(ii) Divide the square of the number (n) in two parts in such a way that both the parts have equal number of digits (if square number has even number of digits).

In case, square of the number has odd number of digits then divide the number in two parts such that left part may have the number of digits one less than the right part.

(iii) Add both the parts together.

(iv) If sum obtained is equal to the original number (n), then the given number is said to be Kaprekar number.

**Example 1:**

Input number = 45

Square of the number = 2025

Dividing square in two parts:

Left part = 20

Right part = 25

Sum of both the parts = 45

Hence, 45 is a Kaprekar number.

**Example 2:**

297

$297^2 = 88209$ , right-hand piece of 88209 = 209 and left-hand piece of 88209 = 88

Sum =  $209 + 88 = 297$ , i.e. equal to the number.

**Sample Input:**

p = 1

q = 1000

**Sample Output:**

The Kaprekar Numbers are:

1, 9, 45, 55, 99, 297, 703, 999

Frequency of Kaprekar numbers is: 8

