

LOGIC BUILDING WITH LOOPS

(BEFORE STARTING DSA)

Phase 1 – While Loop

Phase 2 – do while loop

Phase 3 – For Loop

Phase 4 – Nested loop Logic

Phase 5 – Break / Continue logic

Phase 6 – Mathematical Series

Phase 7 – Mixed Logical Loop Problems

Phase 8 – Star Pattern Printing

Goal: Master loops, iteration, and dry-run thinking.

Topics covered: while, do-while, for, break, continue, mathematical series.

Target Questions: 125+

Phase 1 : While Loop

1. Print all numbers from **1 to 10** using a loop.
2. Print numbers from **10 down to 1** in reverse order.
3. Print **all even numbers** between **1 and 100**.
4. Print **all odd numbers** between **1 and 100**.
5. Print the **multiplication table** of a given number from $n \times 1$ to $n \times 10$.
6. Calculate and print the **sum of the first n natural numbers**.
7. Calculate the **sum of all even numbers** from 1 up to n.
8. Calculate the **sum of all odd numbers** from 1 up to n.
9. Calculate and print the **factorial of a given number**.
10. Find and print the **product of all digits** of a given number.
11. Count and print the **total number of digits** in a given number.
12. Reverse the given number and print the **reversed value**.
13. Check whether the given number is a **palindrome**.
14. Find and print the **sum of digits** of the given number.
15. Check whether the given number is an **Armstrong number**.
16. Check whether the given number is a **Perfect number**.
17. Print **all prime numbers** between **1 and 100**.
18. Check whether the given number is a **prime number**.
19. Print the **Fibonacci series** up to **n terms**.
20. Find and print the **sum of the Fibonacci series** up to **n terms**.
21. Print the **square of each number** from **1 to n**.
22. Print the **cube of each number** from **1 to n**.
23. Print all numbers between **a and b** that are **divisible by 7**.

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- 24. Print **all factors** of the given number.
 - 25. Find and print the **sum of all factors** of the given number.
 - 26. Find the **HCF (Highest Common Factor)** of two given numbers.
 - 27. Find the **LCM (Least Common Multiple)** of two given numbers.
 - 28. Find the **smallest digit** in the given number.
 - 29. Find the **largest digit** in the given number.
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Phase 2 : do - While Loop

- 1. Print all numbers from **1 to 10**.
 - 2. Print the **multiplication table** of a given number.
 - 3. Keep taking numbers from the user until **0 is entered**, then print the **sum of all entered numbers**.
 - 4. Keep taking numbers from the user until **0 is entered**, then print the **largest number** among all inputs.
 - 5. Count and print the **number of digits** in the given number.
 - 6. Reverse the given number and print the **reversed value**.
 - 7. Check whether the given number is a **palindrome**.
 - 8. Check whether the given number is an **Armstrong number**.
 - 9. Calculate and print the **factorial** of the given number.
 - 10. Print the **Fibonacci series** up to the required number of terms.
 - 11. Find the **HCF (Highest Common Factor)** of the given numbers.
 - 12. Create a **menu-driven program** that allows the user to choose and perform different operations.
 - 13. Keep taking numbers from the user until a **negative number is entered**, then count how many **positive numbers** were entered.
 - 14. Find and print the **sum of digits** of the given number.
 - 15. Calculate and print the **sum of even digits** and the **sum of odd digits** of the given number separately.
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Phase 3 : For Loop

- 1. Print all numbers from **1 to 10**.
- 2. Print numbers from **10 down to 1** in reverse order.
- 3. Print **all even numbers** between **1 and 100**.
- 4. Print **all odd numbers** between **1 and 100**.
- 5. Print the **multiplication table** of a given number.
- 6. Calculate and print the **factorial of a given number**.
- 7. Calculate and print the **factorial of every number** from **1 to n**.
- 8. Print **all prime numbers** between **1 and 100**.
- 9. Check whether the given number is a **prime number**.
- 10. Print the **Fibonacci series** up to the required number of terms.

11. Find and print the **sum of the Fibonacci series**.
 12. Print **all factors** of the given number.
 13. Find and print the **sum of all factors** of the given number.
 14. Find the **HCF (Highest Common Factor)** of the given numbers.
 15. Find the **LCM (Least Common Multiple)** of the given numbers.
 16. Print the **square of each number** from 1 to n.
 17. Print the **cube of each number** from 1 to n.
 18. Print all numbers between a and b that are **divisible by 7**.
 19. Find and print the **sum of the first n natural numbers**.
 20. Find and print the **sum of all even numbers** from 1 up to n.
 21. Find and print the **sum of all odd numbers** from 1 up to n.
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Phase 4 : Nested Loop Logic

1. Print the **multiplication tables** for all numbers from 1 to 10.
 2. Print **all possible pairs** (i, j) where both i and j range from 1 to n.
 3. For every number from 1 to n, count and print the **total number of its factors**.
 4. Print **all prime numbers** up to n using **nested loop checking**.
 5. Print the **Fibonacci pattern row by row**, where each row prints the next Fibonacci numbers
 6. Generate and print a **number triangle pattern** using **nested loops**.
 7. Print a **matrix**, then calculate and display the **sum of each row** and the **sum of each column**.
 8. Print **all Pythagorean triplets** whose values are **less than or equal to n**.
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Phase 5 : Break / Continue Logic

1. Print numbers from 1 to 100, and **stop the loop** as soon as a number **divisible by 17** is encountered.
2. Print numbers from 1 to 100, but **skip** all numbers that are **divisible by 5** and continue printing the rest.
3. Take **5 numbers** as input, **skip any number that is 0** using **continue**, and calculate the **sum of the remaining numbers**.
4. Search for a specific number in a list of inputs, and **terminate the loop** immediately when the number is **found**.
5. Keep taking numbers from the user and **print them until a negative number appears**, then stop the loop.
6. Skip all **odd numbers** and print **only the even numbers**.
7. Continuously add numbers in a loop and **stop the loop** when the **sum becomes greater than 100**

Phase 6 : Mathematical Series

1. Find and print the **sum of the first n natural numbers**.
2. Find and print the **sum of the first n even numbers**.
3. Find and print the **sum of the first n odd numbers**.
4. Print the **first n terms** of an **arithmetic progression** for the given first term and common difference.
5. Print the **first n terms** of a **geometric progression** for the given first term and common ratio.
6. Print the **Fibonacci series** up to the required number of terms.
7. Find and print the **sum of the Fibonacci series** up to the required number of terms.
8. Calculate and print the value of the series
$$1^2 + 2^2 + 3^2 + \dots + n^2.$$
9. Calculate and print the value of the series
$$1^3 + 2^3 + 3^3 + \dots + n^3.$$
10. Calculate and print the value of the series
$$1 + 1/2 + 1/3 + \dots + 1/n.$$
11. Print the series of powers of two:
$$1 + 2 + 4 + 8 + \dots + 2^n.$$
12. Calculate and print the value of the series
$$1! + 2! + 3! + \dots + n!.$$
13. Calculate and print the value of the series
$$1 + x + x^2 + x^3 + \dots + x^n.$$
14. Calculate and print the value of the series
$$x - x^2/2! + x^3/3! - x^4/4! + \dots.$$
15. Check whether the given number is a **Strong number**, where the number equals the **sum of factorials of its digits**.

Phase 7 : Mixed Logical Loop Problems

1. Print all numbers between **1 and 100** whose **sum of digits is even**.
2. Count Total numbers between **1 & 500** are **divisible by 7 but not divisible by 5**.
3. Print **all palindrome numbers** between **1 and 500**.
4. Print all numbers from **1 to 100** whose **sum of digits is a multiple of 3**.
5. Print all numbers from **1 to n** whose **binary representation contains an even number of 1s**.
6. Print a pattern where the **i-th row prints the value i × i**.
7. Find & print the **sum of odd digits** & the **sum of even digits** of the given number.
8. Print **all Armstrong numbers** between **1 and 1000**.
9. Print **all Perfect numbers** between **1 and 1000**.
10. Find the number between **1 and n** that has the **maximum digit sum**, and print that number along with its digit sum.

Phase 7 : Star Pattern Printing

1. Print a Single Star (*)
2. Print Four Stars (****)
3. Print n Stars on Same Line
4. Print Square of Stars ($n \times n$ Stars)

```
*****  
*****  
*****  
*****  
*****
```

5. Print an Increasing Triangle of Stars

```
*  
**  
***  
****  
*****
```

6. Print a Right-Aligned Triangle of Stars

```
 *  
 **  
 ***  
 ****  
 *****
```

7. Print Stars in Even Numbers (2, 4, 6, 8, 10)

```
**  
****  
*****  
*****  
*****
```

8. Print Stars in Odd Numbers (1, 3, 5, 7, 9)

```
*  
***  
*****  
*****  
*****
```

9. Print a Centered Pyramid of Stars

```
*  
***  
*****  
*****  
*****
```

10. Print Stars and Spaces Alternating (Stars and Blank Spaces) (b = blank space here)

```
bbbb*  
bbb*b*  
bb*b*b*  
b*b*b*b*  
*b*b*b*b*
```

11. Print Numbers in an Increasing Sequence (1, 12, 123, 1234, 12345)

```
1  
12  
123  
1234  
12345
```

12. Print Repeated Numbers per Row (Same Number Repeated)

```
1  
22  
333  
4444  
55555
```

13.

```
1  
2 3  
4 5 6  
7 8 9 10  
11 12 13 14 15
```

14.

```
1  
2 3  
4 5 6  
7 8 9 0  
1 2 3 4 5  
5 7 8 9 0 1  
2 3 4 5 6 7 8
```

15.

```
1  
0 1  
0 1 0  
1 0 1 0  
1 0 1 0 1
```

16

```
A  
B C  
D E F  
G H I J  
K L M N O
```

17.

A
B B
C C C
D D D D
E E E E E

18.

A
A B
A B C
A B C D
A B C D E

19.

A
BCD
EFGHI
JKLMNOP
QRSTUVWXYZ

20.

1
12
123
1234
12345

21.

```
1  
121  
12321  
1234321  
123454321
```

22.

```
*  
**  
****  
*****  
****  
***  
**  
*
```

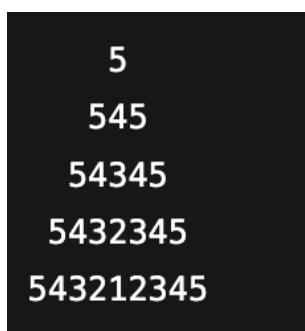
23.

```
*  
**  
***  
****  
*****  
*****  
****  
***  
**  
*
```

24



25.



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