



Programming

Fundamentals

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SECTION 1:

FOR Loop

FOR Loop basic Concept

- **Purpose:** Used when number of iterations is known.

Syntax:

```
for(initialization; condition; update) {  
    // body of loop  
}
```

- Flow:

Initialize variable → Check condition →
Execute body → Update → repeat if true.

EXAMPLE

```
#include <stdio.h>
int main() {
    for(int i = 1; i <= 5; i++) {
        printf("%d ", i);
    }
    return 0;
}
```

OUTPUT:

Q1

1. Find the sum of digits of a given number using a for loop.

Hint: num \% 10 = last digit of the number

Q2

2. Find the factorial of a number using a for loop.

Hint: $5! = 5 * 4 * 3 * 2 * 1$



SECTION 2:

NESTED FOR Loop

Nested FOR Loop

- Purpose: Loop inside another loop (useful for patterns, matrices).
- Syntax:

```
for(i = 1; i <= n; i++) {  
    for(j = 1; j <= m; j++) {  
        // inner loop statements  
    }  
}
```


EXAMPLE

```
#include <stdio.h>
int main() {
    for(int i = 1; i <= 3; i++) {
        for(int j = 1; j <= 3; j++) {
            printf("%d ", j);
        }
        printf("\n");
    }
    return 0;
}
```

OUTPUT:

Q1

Q2

Q1. Print pattern:

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

Q1. Print pattern:

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

Q3: Print all factor pairs of a number

Example input: $n = 12$

Output: (1, 12) (2, 6) (3, 4) (4, 3) (6, 2) (12, 1)

Q4: Display pairs whose sum is even (1– n range)

Example input: $n=5$

Output: (1,1) (1,3) (1,5) (2,2) (2,4) (3,1) (3,3) ...



SECTION 3: **WHILE Loop**

WHILE concept

Purpose: Used when number of iterations is not known in advance.

Syntax:

```
while(condition) {  
    // statements  
}
```

Flow: Check condition first → execute body if true → repeat.

EXAMPLE

```
#include <stdio.h>
int main() {
    int i = 1;
    while(i <= 5) {
        printf("%d ", i);
        i++;
    }
    return 0;
}
```

OUTPUT:

Practice

- **Q1: Print all odd numbers between 1 and 20.**
- **Q2: Reverse a number (e.g., 1234 → 4321) using while loop.**



SECTION 3:

Nested WHILE Loop

Nested WHILE concept

Purpose: Repeat one while loop inside another

Syntax:

```
while(condition1) {  
    while(condition2) {  
        // inner loop  
    }  
}
```

Practice

- **Q1: Print the pattern:**

A

B B

C C C

D D D D

E E E E E

- **Q2: Multiplication Table (1 to 5 tables)**



SECTION 3:

DO WHILE Loop

DO WHILE concept

Purpose: Executes at least once even if condition is false.

Syntax:

```
do {  
    // statements  
} while(condition);
```

Practice

- **Q1. Take numbers until user enters 0.**
- **Q2. Sum of digits of a number**



SECTION 3:

Nested DO WHILE

Loop

Nested DO WHILE concept

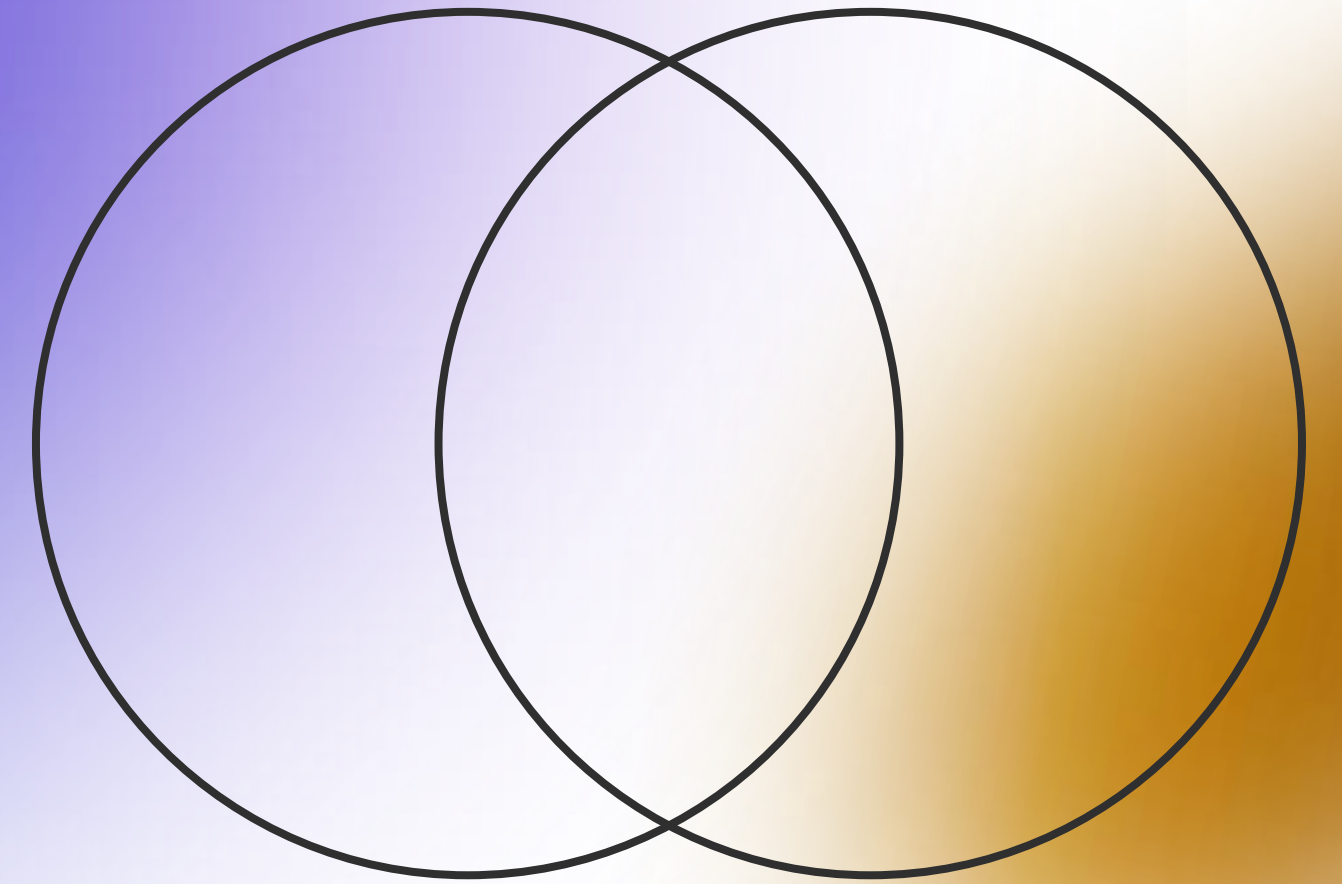
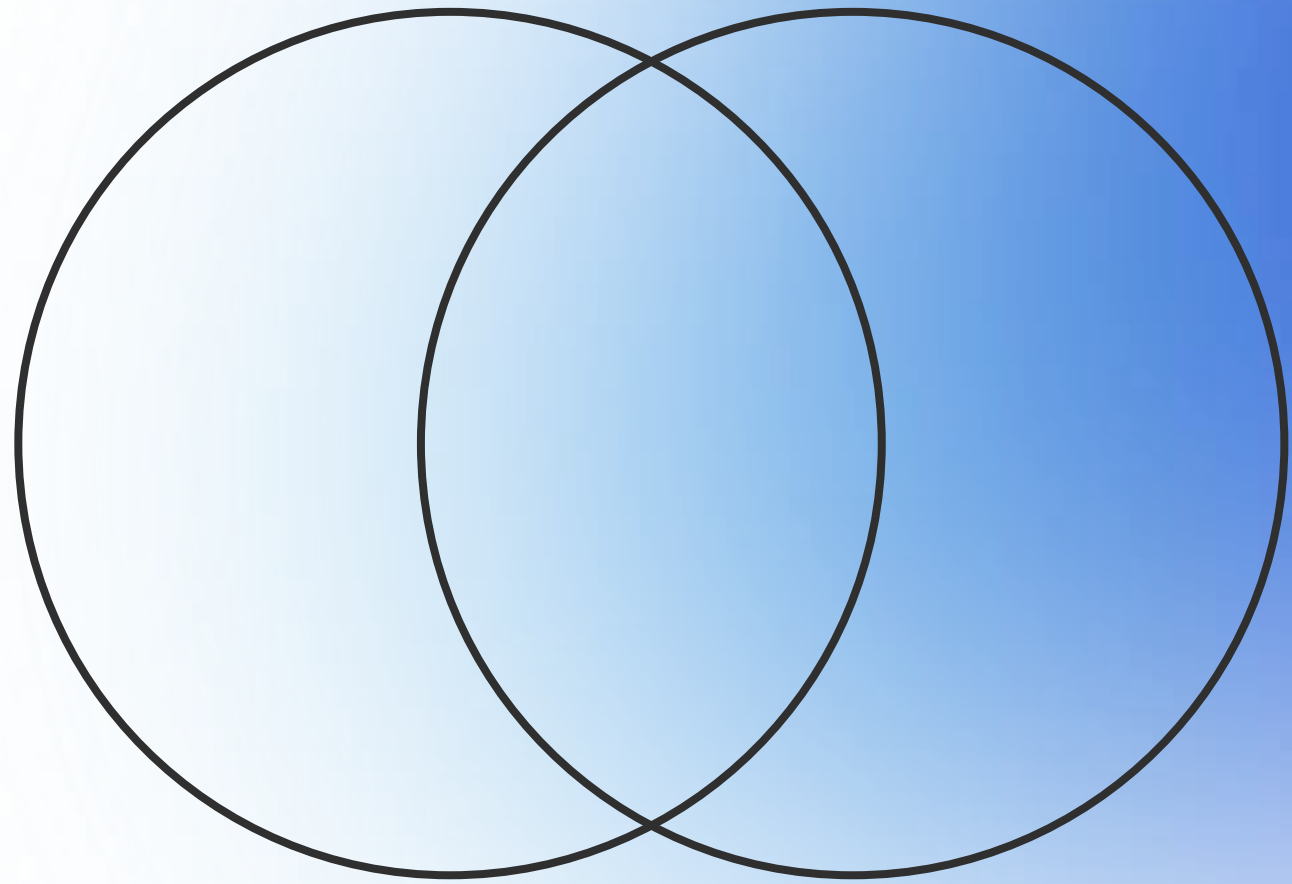
Purpose: Use when inner loop depends on outer loop but must run at least once.

Syntax:

```
do {  
    do {  
        // inner loop body  
    } while(condition2);  
} while(condition1);
```


Practice

**Q1. Find all 3-digit “special numbers” where
sum of digits = 9**



Thank You