

# Conditional Execution and Loops in C

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# Conditional Execution

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# Conditional Execution in C

- **Conditional execution** allows a program to take different actions based on certain conditions
- Conditions are expressed using `if`, `else`, and `else if` statements
- Condition expressions must evaluate to `true` (non-zero) or `false` (zero)

# if Statement

## Syntax:

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

## Example:

```
int x = 10;  
if (x > 0) {  
    printf("Positive number\n");  
}
```

# if-else Statement

```
if(condition){  
    // commands to execute if true  
} else{  
    // commands to execute if false  
}
```

## if-else Example

```
int age = 18;

if(age >= 18){
    printf("Eligible to vote\n");
} else{
    printf("Not eligible to vote\n");
}
```

## else if Ladder

```
if(condition1){  
    ...  
} else if(condition2) {  
    ...  
} else{  
    ...  
}
```



## else if Ladder Example

```
int marks = 75;

if(marks >= 90){
    printf("Grade A\n");
} else if(marks >= 75){
    printf("Grade B\n");
} else{
    printf("Grade C\n");
}
```

# Boolean Algebra in `if` Statements

- There can be multiple conditions
- Need to perform Boolean algebra on these conditions, because `if` statement expects only a single value
- Boolean operations on multiple conditions evaluate to a single value (true or false)
- Boolean operators:
  - AND (`&&`): Code runs only if all conditions are true
  - OR (`||`): Code runs if at least one condition is true
  - NOT (`!`): Negates a condition (flips true to false, and vice-versa)

## Example: Loan Eligibility (AND operator)

```
if((age >= 18) && (income >= 20000)){  
    printf("Eligible for loan");  
} else{  
    printf("Ineligible for loan");  
}
```

## Example: Age Check (AND operator)

```
if((age >= 13) && (age <= 19)){  
    printf("The user is a teenager");  
} else{  
    printf("The user is not a teenager");  
}
```

## Example: Sports Eligibility (OR operator)

```
if((age >= 16) || (weight >= 60)){  
    printf("Eligible");  
} else{  
    printf("Not eligible");  
}
```

## Nested `if` Statements

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## Nested if Statements

Sometimes, it necessary to put an if statement inside another. This is called nested statements. Can have as many levels of nesting as necessary.

```
if(cond1){  
    // code that gets executed if cond1 is true  
    if(cond2){  
        // executed if both cond1 and cond2 are true  
    } else{  
        // executed if both cond1 is true and cond2 is false  
    }  
    // code that gets executed if cond1 is true  
}
```

## Example: Loan Eligibility (revisited)

```
if (age >= 18) {  
    if(income >= 20000){  
        printf("Eligible for loan");  
    } else{  
        printf("Not eligible: income too low");  
    }  
} else{  
    printf("Not eligible: under 18");  
}
```



# Loop

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# Loops in C

- Loops are used to execute a block of code repeatedly.
- Types of loops in C:
  - `for` loop: when number of iterations is known
  - `while` loop: when condition is checked before each iteration
  - `do-while` loop: condition checked *after* executing loop body

In `do-while` loop, the body of the loop is always executed at least once.

# for Loop

```
for(initialization; condition; update){  
    // statements  
}
```

The elements (initialization, condition and update) inside the for keyword, can be omitted. For example,

- Initialization can be performed before the for keyword
- Condition and update can be moved inside the loop body
- `for(;;){...}` creates an infinite loop

## for Loop Example

```
for(int i = 1; i <= 5; i++){  
    printf("%d ", i);  
}
```

## for Loop Example (cont.)

```
int i = 1;

for(;;){
    if(i > 5){
        break;
    }
    printf("%d", i);
    i++;
}
```

# while Loop

## Syntax:

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

## Example:

```
int i = 1;  
while(i <= 5){  
    printf("%d ", i);  
    i++;  
}
```

# do-while Loop

## Syntax:

```
do{  
    // statements  
} while(condition);    // don't forget this semicolon
```

## Example:

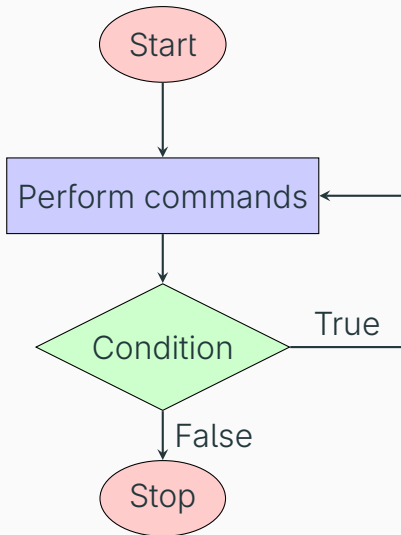
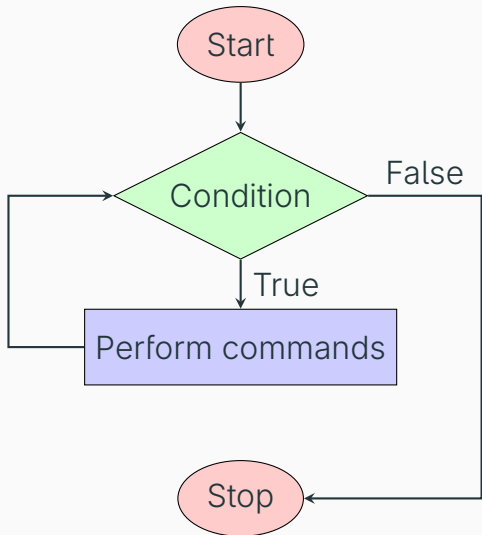
```
int i = 1;  
do{  
    printf("%d ", i);  
    i++;  
} while(i <= 5);
```

# while vs do-while Loop

- `while`: condition checked *before* loop body
- `do-while`: condition checked *after* running the first iteration of the loop, so the loop runs at least once



# Flowchart: While vs Do-While



## **break and continue**

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# The break Statement

- The break statement immediately terminates the loop or switch statement in which it is encountered
- Control of the program then transfers to the statement immediately following the loop or switch
- It is commonly used to exit a loop prematurely based on a certain condition

## break Example

```
for(int i = 1; i <= 10; i++){  
    if(i == 5){  
        break;    // Exit the loop when i is 5  
    }  
    printf("%d ", i);  
}  
printf("\nLoop terminated.\n");
```

# The continue Statement

- The continue statement skips the remaining statements in the current iteration of a loop and proceeds to the next iteration
- It is used when you want to bypass certain parts of the loop's body for specific conditions without exiting the entire loop

## continue Example

```
for(int i = 1; i <= 5; i++){  
    if (i == 3){  
        continue;    // Skip printing when i is 3  
    }  
    printf("%d ", i);  
}  
printf("\nLoop finished.\n");
```

# Nested Loops

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# The `switch` Statement

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# Exercise

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# Exercise

Write C programs:

- ① To check whether a number (user input) is positive or negative or zero
- ② To check whether a year (user input) is a leap year
- ③ To check whether an integer is even or odd
- ④ To find the number of real-valued solution(s) to a quadratic equation, ( $ax^2 + bx + c = 0$ ). Take a, b and c as user inputs. Then calculate the value of the discriminant, then show the appropriate output

## Exercise (cont.)

- ⑤ To print the first  $n$  (user input) natural numbers using a `for` loop. And another program to do the same using a `while` loop
- ⑥ To compute the sum of numbers from 1 to  $n$  using a `for` loop. And another program to do the same using a `while` loop
- ⑦ To find the factorial of an integer (user input)
- ⑧ To print the first  $n$  (user input) terms of the fibonacci series
- ⑨ To print the first  $n$  (user input) terms of the following arithmetic progression sequence: 1, 4, 7, 10, 13...

## Exercise (cont.)

- ⑩ To repeatedly take user input and print its square, until a negative number is entered (use `while` loop)
- ⑪ To repeatedly take user input as exam marks and print the corresponding letter grade, until a negative number is entered (use `while` loop and `if` statement)