Conditional Execution and Loops in C

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Conditional Execution

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");
}
```

Nested `if` Statements

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

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

Loop

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 ommitted. For example,

- Initialization can be performed before the `for` keyword
- Condition and update can 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
```

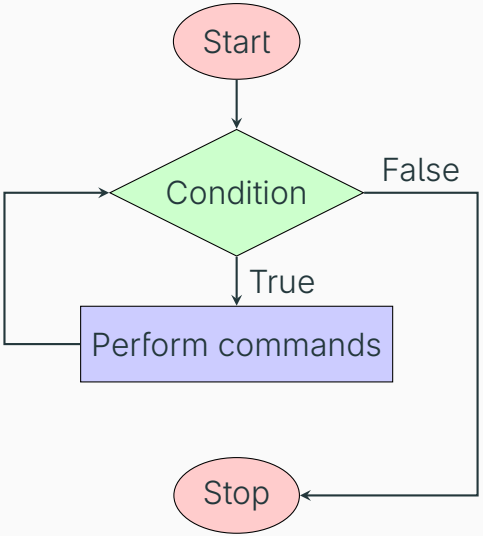
Example:

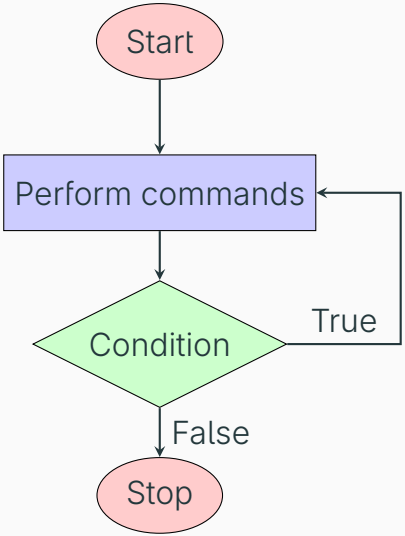
```
int i = 1;
do{
    printf("%d ", i);
    i++;
} while(i <= 5);
```

`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`

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

The `switch` Statement

Exercise

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 intger (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)