Chapter 4 - Selection

At a Glance

Lesson Contents

Chapter Notes

Overview

Chapter 4 introduces the selection structures available in C. You learn to create and evaluate relational expressions and to use `if` and `if-else` statements. You also learn to use the `switch` statement. In the case study you learn how to use selection structures for data validation. Finally, you learn to identify and avoid common programming and compiler errors.

Objectives

- Relational expressions
- The `if` and `if-else` statements
- The `if-else` chain
- The `switch` statement
- Case study: Data validation
- Common programming and compiler errors

Relational Expressions

Topic Tip	Read the section about De Morgan's laws, as they are useful when writing relational expressions. For more information, see the Historical Note on page 161.

Quick Quiz 1

1. What is "flow of control"?

2. A(n)_____expression consists of a relational operator that compares two operands.

3. Relational expressions are also known as_____.

4. How does the NOT (!) operator work?

The `if` and `if-else` Statements

Topic Tip	Beginner programmers tend to write a single = instead of == in an `if` condition. This leads to unexpected errors that are not detected by the compiler, because the expression is valid in C. For more information, see the Programming Note on page 169.

Topic Tip	A way to avoid the common problem of accidentally using = instead of == in an `if` condition is to code the expression with the constant to the left of the relational operator (see the Programming Note on page175).

Topic Tip	C also provides a shortcut to the `if-else` operator: the ternary conditional operator (`?:`). This operator is very useful, as it allows you to write code like: `int max = (a > b) ? a : b`.

Quick Quiz 2

1 The simplest C selection statement is the_____`if` statement.

2 A(n)_____statement is one or more statements contained between braces.

3 What is a nested `if` statement?

4 Is indentation important in the evaluation of `if-else` statements?

The `switch` Statement

Topic Tip	Do you have previous programming experience with Pascal? If so, note that the equivalent to the `switch` statement is the `case` statement in Pascal.

Quick Quiz 3

1 What is a `switch` statement?

2 Internal to the `switch` statement, the keyword_____identifies the values that will be compared to the value of the `switch` expression.

3 What is the role of the `default` statement in a `switch`?

4 Once an entry point has been located by the `switch` statement, no further `case` evaluations are done; this means that unless a(n) _____statement is encountered, all statements that follow, until the closing brace of the `switch` statement, will be executed.

Additional Resources

1 C Programming Tutorial: C Conditional Statement: IF, IF Else and Nested IF Else with Example:
https://www.guru99.com/c-if-else-statement.html

2 The Use of Braces in C:
http://syque.com/cstyle/ch6.7.htm

3 C Ternary Operator:
https://www.mycplus.com/tutorials/c-programming-tutorials/ternary-operator-in-c/

4 C Tutorial : Switch Statements
https://www.guru99.com/c-switch-case-statement.html

Key Terms

- A **compound statement** 复合语句 is one or more statements contained between braces.
- Relational expressions are also known as **conditions**条件.
- A **debugger** 调试器 program controls the execution of a C program, can interrupt the C program at any point in its execution, and can display the values of all variables at the point of interruption.
- In computer jargon, a program error is referred to as a **bug** 错误, and the process of isolating, correcting, and verifying the correction is called **debugging** 调试.
- **Defensive programming** 防御编程 is a technique where the program includes code to check for improper data before an attempt is made to process it further.
- **Diagnostic** 诊断 **`printf()` statements** can be a considerable help in debugging.
- **Echo printing** 回送打印 is the technique to add temporary code that displays the values of all input data.
- The term **flow of control** 控制流 refers to the order in which a program's statements are executed.
- A nested `if` construction, in which each nested `if` is written in the same line as the previous `else`, is called an **`if-else` chain if-else链**, and is used extensively in many programming problems.
- The defensive programming technique of checking user input data for erroneous or unreasonable data is referred to as **input data validation** 输入数据验证.
- Including one or more `if-else` statements within an `if` or `if-else` statement is referred to as a **nested `if` statement** 嵌套if语句.
- The simplest C selection statement is the **one-way `if` statement** 单向if语句.
- **Program tracing** 程序跟踪 is the technique to imitate the computer and execute each statement by hand, as the computer would.
- A **relational expression** 关系表达式 consists of a relational operator that compares two operands.
- **Short-circuit evaluation** 短路运算 is the feature for the && and || operators that makes the evaluation of an expression stop as soon as it is determined that an expression is false.