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كليـــة العلـــــوم
قسم الأمن السيبراني

Subject: Programming Fundamentals

First Stage

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Lecture (6)

Switch Case Selection

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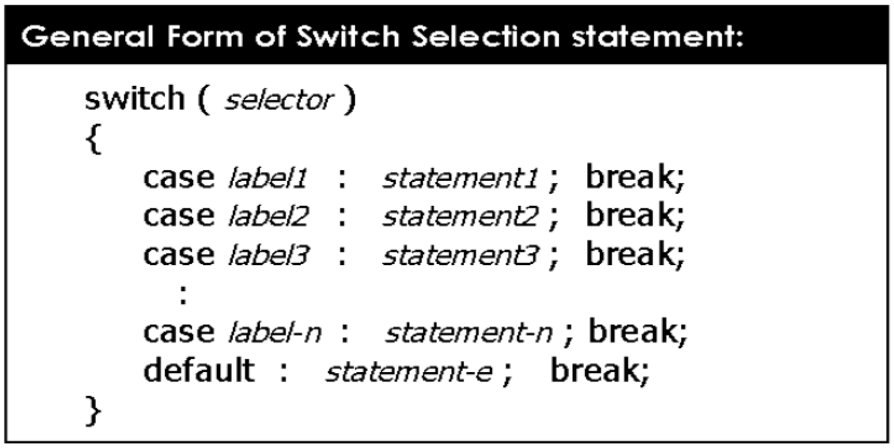
1. Introduction to the `switch` Statement

Definition: The `switch` statement in C++ is a control structure used to execute one block of code out of many options, based on the value of an expression.

Key Characteristics:

- Suitable for situations with multiple discrete choices.
- Provides a cleaner alternative to multiple `if-else` statements.

2. Structure of the `switch` Statement



General Form of Switch Selection statement:

```
switch ( selector )
{
    case label1  :   statement1 ;  break;
    case label2  :   statement2 ;  break;
    case label3  :   statement3 ;  break;
      :
    case label-n :   statement-n ; break;
    default  :  statement-e ;  break;
}
```

Syntax:

```
switch (expression) {
    case value1:
        // Code to execute if expression == value1
        break;
    case value2:
        // Code to execute if expression == value2
        break;
    ...
    default:
        // Code to execute if no case matches
        break;
}
```

Components:

1. **Expression:** A value or variable evaluated to determine which case to execute.
2. **Case Labels:** Define values to compare against the expression.

3. **Break Statement:** Exits the `switch` block to prevent fall-through.
4. **Default Case:** An optional catch-all block executed if no case matches.

3. Rules and Guidelines for Using `switch`

- The expression must evaluate to an integer, character, or enumerated type.
- Case labels must be constants or literals (e.g., `case 1:` or `case 'A':`).
- The `break` statement is essential to prevent fall-through.
- Avoid using floating-point or string types as expressions in `switch`.

4. Advantages and Limitations

Advantages:

- Improves readability compared to nested `if-else`.
- Executes faster for large, discrete sets of choices.

Limitations:

- Limited to discrete values (no ranges or complex conditions).
- Does not support expressions with logical or relational operators.

5. Examples with Code and Explanation of switch

Example 1: Write a program to print the day of the week based on a number input.

```
#include <iostream>
using namespace std;
int main() {
    int day;
    cout << "Enter a number (1-7): ";
    cin >> day;

    switch (day) {
        case 1:
            cout << "Monday";
            break;
        case 2:
            cout << "Tuesday";
            break;
        case 3:
            cout << "Wednesday";
            break;
        case 4:
            cout << "Thursday";
            break;
        case 5:
            cout << "Friday";
            break;
        case 6:
            cout << "Saturday";
            break;
        case 7:
            cout << "Sunday";
            break;
        default:
            cout << "Invalid input! Please enter a number between 1 and 7.";
            break;
    }
    return 0;
}
```

Explanation:

- The `switch` block evaluates the variable `day`.
- Each `case` corresponds to a day of the week.
- The `default` block handles invalid inputs.

Example 2 : Write a program to classify grades into categories based on score ranges.

```
#include <iostream>
using namespace std;
int main() {
    int grade;
    cout << "Enter your grade (0-100): ";
    cin >> grade;

    switch (grade / 10) {  // Divide by 10 to categorize into ranges
        case 10:
            cout << "Excellent +";
            break;
        case 9:
            cout << "Excellent";
            break;
        case 8:
            cout << "Very Good";
            break;
        case 7:
            cout << "Good";
            break;
        case 6:
            cout << "Satisfactory";
            break;
        default:
            if (grade >= 0 && grade < 60)
```

```
                cout << "Fail";
            else
             cout << "Invalid grade! Please enter a value between 0 and
100.";
            break;
    }
    return 0;
}
```

Explanation

1. **Grade Categorization:** The input grade is divided by 10, grouping it into ranges like 90-100, 80-89, etc.
2. **Case Labels:**
   - 10 and 9: "Excellent" for scores between 90 and 100.
   - 8: "Very Good" for scores between 80 and 89.
   - 7: "Good" for scores between 70 and 79.
   - 6: "Satisfactory" for scores between 60 and 69.
   - default: Handles scores below 60 as "Fail" or invalid values outside the 0-100 range.

Example 3: Write a C++ program that reads two integer numbers, an operation, and performs the selected operation using a switch statement

```
#include <iostream>
using namespace std;
int main() {
    int a, b;
    char x;

    // Prompt user for input
    cout << "Enter two numbers:\n";
    cin >> a >> b;

    // Display menu options
    cout << "+ for addition\n";
    cout << "- for subtraction\n";
    cout << "* for multiplication\n";
    cout << "/ for division\n";
    cout << "Enter your choice:\n";
    cin >> x;

    // Perform operation based on user's choice
    switch (x) {
        case '+':
            cout << "Result: " << a + b << endl;
            break;
        case '-':
            cout << "Result: " << a - b << endl;
            break;
        case '*':
            cout << "Result: " << a * b << endl;
            break;
        case '/':
            if (b != 0)
                cout << "Result: " << a / b << endl;
            else
             cout << "Error: Division by zero is not allowed!" <<
endl;
            break;
        default:
            cout << "Invalid operation! Please select +, -, *, or /." <<
endl;
            break;
    }

    return 0;
}
```

Explanation of the Code

1. **Input:**
   - The program prompts the user to enter two integers (`a` and `b`).
   - It also prompts the user to choose an operation (`+`, `-`, `*`, `/`).
2. **Menu Options:**
   - Displays all valid operations for clarity.
3. **`switch` Statement:**
   - Checks the operation entered by the user (`x`) and performs the corresponding arithmetic.
   - The `case` labels handle specific operations:
     - `+` for addition.
     - `-` for subtraction.
     - `*` for multiplication.
     - `/` for division.
   - The `default` block handles invalid input for the operation.
4. **Division by Zero Check:**
   - Ensures safe execution of division to avoid errors when dividing by zero.
5. **Output:**
   - Displays the result of the operation or an error message if the input is invalid.

6. Conditional (Ternary) Operator(?)

The conditional (ternary) operator is a compact alternative to simple `if-else` statements. It evaluates a condition and returns one of two values based on the result.

Syntax:

```
condition ? expression1 : expression2;
```

Example 4: Write a C++ program to find the larger of two integers using Ternary Operator.

```
#include <iostream>
using namespace std;

int main() {
    int a, b;
    cout << "Enter two numbers: ";
    cin >> a >> b;

    int max = (a > b) ? a : b;
    cout << "The larger number is: " << max;

    return 0;
}
```

Explanation:

- The expression `(a > b) ? a : b` evaluates whether `a` is greater than `b`.
- If true, it assigns `a` to `max`; otherwise, it assigns `b`.

Use Cases:

- Simple condition-based assignments.
- Avoid overusing it for complex logic to maintain code readability.

Advantages and Limitations

Advantages:

- Improves readability compared to nested `if-else`.
- Executes faster for large, discrete sets of choices.

Limitations:

- Limited to discrete values (no ranges or complex conditions).
- Does not support expressions with logical or relational operators.

Practice Questions

1. Write a `switch` statement to output the corresponding month name for a given number (1-12).
2. Write a c++ program for using a ternary expression to check if a given integer n is even or odd. The expression should return "Even" if n is even and "Odd" if n is odd.