CMP 1001

INTRODUCTION TO PROGRAMMING

PART 3: CONDITIONAL STATEMENTS IN C++

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CMP 1001

Section 5: Conditional statements in C++

IF STATEMENT

Conditional execution of a program

So far, a C++ program consists of a number of statements that are executed in sequence (i.e., "**sequential statements**"). All of the statements are executed one after another in all conditions.

What if we want to execute some portion of the code based on a condition?

```
if (<comparisons>){
    <statements>
}
```

IF STATEMENT

Comparison Operators

We have "**comparison operators**" in C++ and we can use these operators inside if statements.

```
(x_position > 0)
```

Example:

Write a program which reads the grade of a student. Then, if the grade of the student is greater than or equal to 60, it prints "You passed". If the grade is lower than 60, the program will do nothing.

NOTE: DO NOT put at an ';' at the end of an if statement. This is a VERY COMMON MISTAKE.

IF STATEMENT

Comparison Operators

Primary comparison operators are as below

Operator	Meaning
<	Less than
>	Greater than
<=	Less than or equals
>=	Greater than or equals
==	Equals
!=	NOT equal

NOTE: Writing '=' instead of "==" is a VERY COMMON MISTAKE.
'=' is the assignment operator
"==" is the equals comparison operator

IF ELSE

Conditional Execution with Two Paths

Now suppose that, we **also** want to inform the student if (s)he failed (if grade < 60). Then, we use the optional else.

```
if (<comparisons>){
    <statements>
 }
else{
 <statements>
}
```

Example:

Write a program which reads the grade of a student. Then, if the grade of the student is greater than or equal to 60, it prints "You passed". If the grade is lower than 60, the program will print "You failed!".

IF ELSE

Conditional Execution with Two Paths

Example:

Write a program that calculates the points of a student in a test. The test has 50 math questions and 50 history questions. The program will read three inputs:

- **The correct math answer count (correctMathCount)**
- **The correct history answer count (correctHistCount)**
- **The class of the student (stuClass)**

If s/he is a MATH student, each correct math answer gives 1 points and each correct history answer gives 0.5 points. If s/he is a HISTORY student, each correct math answer gives 0.5 points and each correct history answer gives 1 points. Finally, the program should calculate the point of the student and prints it out.

NOTE: If the class is given ANYTHING ELSE, the program should print out "INCORRECT CLASS"

MULTIPLE COMPARISONS

Inside an “if statement” there can be multiple comparisons.

Each comparison **MUST** be followed by either “**logical AND**” or “**logical OR**” operators.

Logic Symbol	C++ Logical Operator Counterpart
AND	&&
OR	||

```
if (a >= b && a == 0){
    …
}
```

MULTIPLE COMPARISONS

Example:

Write a program which reads three integers from the user. Then, it calculates and prints

- **The average (as double),**
- **The maximum,**
- **The minimum,**
- **The median (the one in the middle).**

NOTE: There is no such thing like “if (a > b > c)”.
Instead you should write “if(a > b && b > c)”

NOTE: Writing ‘&‘ instead of “&&“ is a VERY COMMON MISTAKE.
Writing ‘|‘ instead of “||“ is a VERY COMMON MISTAKE.

NOT OPERATOR

'!' is used as the "**logical not operator**"

```
if(!(x==3)){
   std::cout << "x is not equal to 3.";
}
```

DO NOT forget the parenthesis.

NESTED IF

Multiple If statements in a Chain

The if-else structure is actually a single statement. Therefore, you can use it as one of the statements in the statement block. We use nested if's to encode multiway decisions.

Example:

Write a program that assigns the letter grade of the score as follows; 90 – 100 -> A, 80 – 89 -> B, 70 – 79 -> C, 60 – 69 -> D, 0 – 59 -> F and display a message accordingly.

NESTED IF

Multiple If statements in a Chain

Example:

Write a program that computes and displays the real roots of the quadratic equation ($ax^2+bx+c=0$) whose coefficients (i.e, a, b, and c) are taken from the user. The real roots are computes as the following equation:

$$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Let $\Delta = b^2 - 4ac$. If $\Delta < 0$, there are no real roots. If $\Delta = 0$, there is exactly one root. If $\Delta > 0$, there are two real roots.

SWITCH STATEMENT

Multiway Conditional Statement

"**Switch statement**" is a special case of if statement where there are multiple cases with "==" checks.

ANYTHING CAN BE DONE WITH SWITCH CAN BE DONE WITH IF.

Switch statement can reduce the code size dramatically for certain situations.

Example:
Write a program that reads a month and prints the number of days in that month.

Example:
Write the switch equivalent of the same program.

SWITCH STATEMENT

Multiway Conditional Statement

Example:

Write a program that takes two decimal numbers and one character from the user (in the form of no1 character no2) and design a simple calculator. If the character is +, -, *, or /, your program will perform the corresponding operation and display the results, otherwise your program will give a warning message to the user.

CONDITIONAL OPERATOR

There is also something called the "**conditional operator**" which can be used instead of If – else control structure.

```
std::cout << (studentGrade >= 60 ? "You Passed" : "You Failed");
```

COMING SOON...

Next week on CMP 1001

REPETITION STATEMENTS IN C++