Part 4: C++ Selection Statements

Dr. Andi Toce
Lecture Notes for MAC 101 (Introduction to Computer Science)

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1. *if* and *if-else* Statements

Very often we need to make a decision whether to execute one or more statements based on criteria that need to be satisfied.
Most simple if – statement

```
if (condition)
    statement;
```

IfStatementExample.cpp	Output

`#include <iostream>`
`using namespace std;`
 	
`int main()`
`{`
`   int x = 5;`
`   int y = 5;`
 	
`   if  (x==y)`
`          cout << "x and y are equal \n";`
 	
`   cout << "Done!";`
`   return 0;`
`}`
	`x and y are equal`
	`Done!`

Compound if – statement

```
if (condition){
    statement1;
    statement2;
    statement3;
}
```

CompoundIfExample.cpp	Output

`#include <iostream>`
`using namespace std;`
 	
`int main()`
`{`
`   int x = 5;`
`   int y = 5;`
 	
`   if  (x == y){`
`          cout << "x and y are equal \n";`
`          cout << "x is " << x << " and y is " << y << endl;`
`   }`
 	
`   cout << "Done!";`
`   return 0;`
`}`
	`x and y are equal`
	`x is 5 and y is 5`
	`Done!`

Try now: Write a program that inputs three integers from the keyboard and prints the largest value. Use the if-statement.
Example:

```
Input three different integers: 7 23 14
The largest value is: 23
```

if – else statement.
Statement1 is executed if condition is true. Statement2 if condition is false.

```
if (condition)
    statement1;
else
    statement2;
```

IfElseExample.cpp

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

int main()
{
   int x = 5;
   int y = 6;

   if (x == y)
          cout << "x and y are equal \n";
   else
          cout << "x and y are not equal \n";

   cout << "Done!";
   return 0;
}
```

Output

```
x and y are not equal
Done!
```

Try now: Write a program that inputs an integer and prints if the number is even or odd.
Example:

```
Enter an integer: 24
The integer is even
```

2. Comparison Operators and Nested *if-else* Statements

Operator	Comparison	Operator	Comparison
==	Equal to	>	Greater Than
!=	Not Equal to	<=	Less or Equal to
<	Less Than	>=	Greater or Equal to

Example nested if-else statement

ScoreToGrade.cpp

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

// Score to Grade Program
int main()
{
   int score=0; //score on exam
   cout << "Enter Score: ";
   cin >> score;

   cout << "The Grade is: ";
   if ( score >= 90 ) // 90 and above gets "A"
          cout << "A";
   else if ( score >= 80 ) // 80-89 gets "B"
          cout << "B";
   else if ( score >= 70 ) // 70-79 gets "C"
          cout << "C";
   else if ( score >= 60 ) // 60-69 gets "D"
          cout << "D";
   else // less than 60 gets "F"
          cout << "F";

   return 0;
}
```

Output

```
Enter Score: 88
The Grade is: B
```

An alternative to if-else statement (using the ?: operator)

PassFailScore.cpp

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

// Pass or Fail Program
int main()
{
   int score=0; //score on exam
   cout << "Enter Score: ";
   cin >> score;

   cout << ( score >= 60 ? "Passed" : "Failed" );
   return 0;
}
```

Output

```
Enter Score: 76
Passed
```

3. The *switch* Statement

The switch statement is an alternative to if-else. It is commonly used if we have several condition cases. It is easier to write and read.

Example switch statement compared to the equivalent if-else statement.

SwitchWeekDay.cpp

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

// Choose day of week program
int main()
{
   int day = 0; // day of the week
   cout << "Enter a number between 1 and 7 for the day
of the week: ";
   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 << "Not a valid entry";
               break;
     }

   return 0;
}
```

IfElseWeekDay.cpp

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

// Choose day of week program
int main()
{
   int day = 0; // day of the week
   cout << "Enter a number between 1 and 7 for
the day of the week: ";
   cin >> day;

   if (day == 1) cout << "Monday";
   else if (day == 2) cout << "Tuesday";
   else if (day == 3) cout << "Wednesday";
   else if (day == 4) cout << "Thursday";
   else if (day == 5) cout << "Friday";
   else if (day == 6) cout << "Saturday";
   else if (day == 7) cout << "Sunday";
   else cout << "Not a valid entry";

   return 0;
}
```

Try now: Write a program that inputs a number between 1 and 12 and prints the corresponding month of the year. If a different value is entered the program prints: “Not a valid entry!”
Example:
Enter a number between 1 and 12 for the month of the year: 2
The month you selected is: February

4. Logical Operators

Operator	Logical Operation	Example
!	NOT	!(2==2) // evaluates to FALSE
&&	AND	(2==2) && (2==3) //evaluates to FALSE
||	OR	(2==2) || (2==3) //evaluates to TRUE

The logical operator && yields TRUE only if both conditions are TRUE.
The logical operator || yields TRUE if either condition is TRUE.

Logical Tables

&& Operator (AND)		
A	B	A && B
TRUE	TRUE	TRUE
TRUE	FALSE	FALSE
FALSE	TRUE	FALSE
FALSE	FALSE	FALSE

|| Operator (OR)		
A	B	A || B
TRUE	TRUE	TRUE
TRUE	FALSE	TRUE
FALSE	TRUE	TRUE
FALSE	FALSE	FALSE

OR (||) operator example

OrOperatorExample.cpp

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

int main ()
{
    char agree;

    cout << "Would you like to meet me? (y/n): ";
    cin >> agree;

    if (agree == 'y' || agree == 'Y')
        cout << "Great! Looking forward to meeting you!"<< endl;
    else if (agree == 'n'  || agree == 'N')
        cout << "Sorry to hear that! Good luck!" << endl;
    else
        cout << "Please don't play games! Tell me yes or no!" << endl;

    return 0;
}
```

Output

```
Would you like to meet me?
(y/n): Y
Great! Looking forward to
meeting you!
```

AND (&&) operator example

AndOperatorExample.cpp

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

int main ()
{
    int number;
    cout << "I only like numbers between 10 and 20. Enter an integer: ";
    cin >> number;

    if (number >= 10 && number <= 20)
        cout << "You entered "<< number << ". I am happy!" << endl;
    else
        cout << "I don't like the number you entered!" << endl;

    return 0;
}
```

Output

```
I only like numbers
between 10 and 20.
Enter an integer:
15
You entered 15. I
am happy!
```

Try Now: Determine whether the following expressions are true or false. Use a computer program to verify your answers.

a) (4 == 4) && (4 >= 3) =

b) (4 == 4) || (10 < 5) =

c) !(4 == 4) || (10 < 5) =

d) !(4 == 4) || !(10 < 5) =

e) (3 != 4) && (10 < 15) || (4 == 5) =

f) (3 != 4) && (10 < 15) && (4 == 5) =