

Chapter 17 – The If-Else Statement

The *if* statement allows a C++ program to choose to perform or not to perform a single statement or compound statement. The *if-else* statement allows the program to choose between two statements (single or compound). In the *if-else* statement, if the Boolean expression is true (has the value of 1), the first statement is performed and the second statement is ignored. If the Boolean expression is false, the second statement is performed and the first statement is ignored. The *if-else* statement has the following form:

```
if (Boolean expression)
    statement;
else
    statement;
```

The following is an example program that uses an *if-else* to determine if a person is old enough to drive.

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

void main() {
    int age;

    cout << "Enter your age: ";
    cin >> age;
    if (age > 15)
        cout << "You are old enough to drive." << endl;
    else
        cout << "You are not old enough to drive." << endl;
}
```

If the user enters 17 when the above program is run, the run is as follows:

```
Enter you age: 17
You are old enough to drive.
```

If the user enters 12 when the above program is run, the run is as follows:

```
Enter you age: 12
You are not old enough to drive.
```

Compound statements may be used to include multiple statements in the control of an *if* or its *else*, as in the following example:

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

void main( ) {
    int age;

    cout << "Enter your age: ";
    cin >> age;
    if (age > 15)
    {
        cout << "You are old enough to drive." << endl;
        cout << "Have you passed your driving test? (y/n) ";
        char test;
        cin >> test;
        if (test == 'y' || test == 'Y')
            cout << "You may drive!" << endl;
        else
            cout << "You may not drive!" << endl;
    }
    else
        cout << "You are not old enough to drive." << endl;
}
```

Exercises

- 1) For each of the following situations, would a if or if-else statement be more appropriate?
 - a) output if a numeric grade is passing or failing
 - b) when a chemical process completes, output a message stating that it has finished
 - c) if a door is open, call the police
 - d) output if it is raining or not raining

- 2) What will be the output of the following program fragment where:
- Day is greater than Night and Clear is greater than Cloudy
 - Day is less than Night and Clear is less than Cloudy
 - Day is greater than Night and Clear is less than Cloudy
 - Day is less than Night and Clear is greater than Cloudy

```

if (Day > Night)
{
    if (Clear > Cloudy)
        cout << "put on sun glasses";
    else
        cout << "take off sun glasses";
}
else
{
    if (Clear > Cloudy)
        cout << "look at the moon";
    else
        cout << "look at TV";
}

```

- 3) A, B, and C are variables of type int. Give an example set of values for A, B, and C for each possible output of the following program fragment.

```

if (A == B)
{
    if (B == C)
        cout << "all values are the same";
    else
        cout << "values of A and B are the same";
}
else
{
    if (B == C)
        cout << "values of B and C are the same";
    else
    {
        if (A == C)
            cout << "values of A and C are the same";
        else
            cout << "all values are different";
    }
}

```

Programming Assignment 17.1

Implement and use the example program on page 2.

Programming Assignment 17.2

Given a value of the variable *year*, the date for Easter can be computed as follows:

```
a = year % 19;
b = year % 4;
c = year % 7;
d = (19 * a + 24) % 30;
e = (2 * b + 4 * c + 6 * d + 5) % 7;
date = 22 + d + e;
```

If these calculations are performed, *date* will contain the date of Easter for the year. However, this formula returns a value based on the month of March. This is fine if the value of *date* is less than 32. For example, if *date* had the value 27, that would indicate that Easter will fall on March 27 of the year give. But, if *date* contains the value 36, this would indicate that Easter would fall on March 35 of the year give, clearly impossible. Obviously, March 35 is really April 4.

Write a program that accepts a year from the user, then computes and outputs the date of Easter with the correct month, in the form *month day, year*.

Programming Assignment 17.3

A year is a leap year if it meets the following criteria:

- the year is greater than 1582
- the year is evenly divisible by 4
- if the year is evenly divisible by 100 must also be evenly divisible by 400

Write a void function that receives the year in question as a parameter and outputs a message stating that the year is a leap year or not a leap year. Use this function in a program that allows the user to input the year to be tested.

Programming Assignment 17.4

The most common form of account for banking customers is the checking account. Checking accounts may be created with a name, account number, and an initial deposit amount. Account owners may deposit money into the account and, of course write checks against the account. When checks are presented to the bank, money in the account is transferred to the account of the person or enterprise presenting the check, but only if there is enough money in the account to cover the amount of the check. Banks often charge for activity in an account. For example, each check may cost the owner of the account a small fee and checks that are NSF (non-sufficient funds) may each cost the owner of the account a substantial penalty. In addition, the owner of the account may check the account and determine its balance.

Create and use a class *checking* to model this type of checking account. NSF checks are not paid but cost the account owner a \$20.00 penalty each. Each check processed costs the account owner 15 cents. Only allow operations on the account to proceed if the proper id is presented.