The if-else Statement

- Selects between two statements based on the results of a comparison
- General form:

if (expression) statement1;

else statement2;

- If the value of expression is true, statement1 is executed
- If the value is false, statement2 is executed

```
Program 4.1
#include <iostream>
#include <iomanip>
using namespace std;
int main()
{
  double taxable, taxes;
  cout << "Please type in the taxable income: ";
  cin >> taxable;
  if (taxable <= 20000.0)
    taxes = 0.02 * taxable;
  else
    taxes = 0.025 * (taxable - 20000.0) + 400.0;
  cout << setiosflags(ios::fixed)</pre>
       << setiosflags(ios::showpoint)
       << setprecision(2)
       << "Taxes are $ " << taxes << endl;
  return 0;
}
```

The if-else Statement (cont'd.)

- Program 4.1 run twice with different input data
 - Result 1:

Please type in the taxable income: 10000 Taxes are \$ 200.00

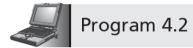
- Result 2:

Please type in the taxable income: 30000 Taxes are \$ 650.00

Compound Statements

Sequence of single statements between braces

```
if (expression)
{
 statement1; // as many statements as necessary
  statement2; // can be put inside the braces
  statement3; // each statement must end with a ;
}
else
 statement4;
  statement5;
 last statement;
}
```



```
#include <iostream>
#include <iomanip>
using namespace std;
// a temperature conversion program
int main()
{
  char tempType;
  double temp, fahren, celsius;
  cout << "Enter the temperature to be converted: ";
  cin >> temp;
  cout << "Enter an f if the temperature is in Fahrenheit";</pre>
  cout << "\n or a c if the temperature is in Celsius: ";</pre>
  cin >> tempType;
  // set output formats
  cout << setiosflags (ios::fixed)</pre>
       << setiosflags (ios::showpoint)
       << setprecision(2);
  if (tempType == 'f')
  {
    celsius = (5.0 / 9.0) * (temp - 32.0);
    cout << "\nThe equivalent Celsius temperature is "</pre>
         << celsius << endl;
  }
  else
  {
    fahren = (9.0 / 5.0) * temp + 32.0;
    cout << "\nThe equivalent Fahrenheit temperature is "
         << fahren << endl;
  }
  return 0;
}
```

Compound Statements (cont'd.)

• Output of Program 4.2

Enter the temperature to be converted: 212 Enter an f if the temperature is in Fahrenheit or a c if the temperature is in Celsius: f

The equivalent Celsius temperature is 100.00

Block Scope

- Block of code: all statements contained within a compound statement
- Any variable declared within a block has meaning only between its declaration and the closing braces of the block
- Example with two blocks of code

Block Scope (cont'd.)

```
{ // start of outer block
   int a = 25;
   int b = 17;
   cout << "The value of a is " << a << " and b is " <<
b << endl;</pre>
   { // start of inner block
                  double a = 46.25;
                  int c = 10;
                  cout << "a is now " << a
                          << " b is now " << b
                          << " and c is " << c << endl;
   }
                  // end of inner block
   cout << "a is now " << a << " and b is " << b <<
   endl;
} // end of outer block
```

Block Scope (cont'd.)

• Output of block scope example:

The value of a is 25 and b is 17 a is now 46.25 b is now 17 and c is 10 a is now 25 and b is 17

One-Way Selection

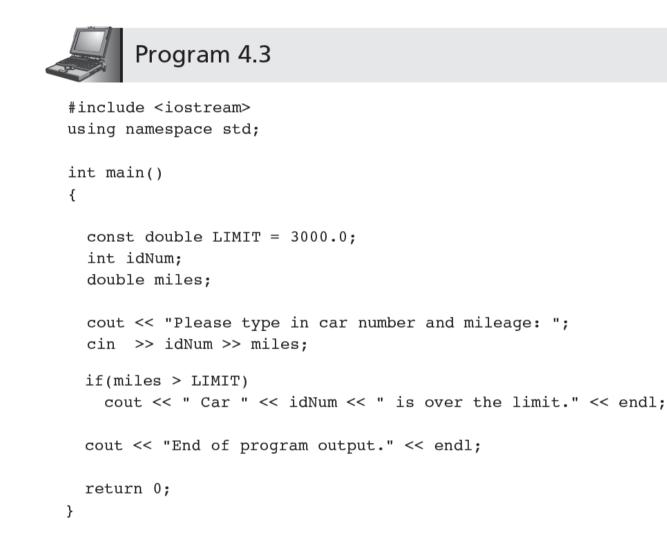
- A modification of if-else that omits else part
 - if statement takes the form:

if (expression)

statement;

- Modified form called a one-way statement
 - The statement following if (expression) is executed only if the expression is true
 - The statement may be a compound statement

One-Way Selection (cont'd.)



One-Way Selection (cont'd.)

- Program 4.3 run twice with different input data
 - Result 1:

Please type in car number and mileage: 256 3562.8 Car 256 is over the limit. End of program output.

- Result 2:

Please type in car number and mileage: 23 2562.8 End of program output.

Problems Associated with the if-else Statement

- Most common problems:
 - Misunderstanding what an expression is
 - Using the assignment operator, =, in place of the relational operator, ==
- Example:
 - Initialize age = 18
 - The expression (age = 40) sets age to 40
 - Does not compare age to 40
 - Has a value of 40 (true)
 - Produces invalid results if used in if-else statement

Problems Associated with the if-else Statement (cont'd.)

- Example (cont'd.):
 - The expression (age == 40) compares age to 40
 - Has a value of 0 (false)
 - This expression will produce a valid test in an ${\tt if-}$ else statement