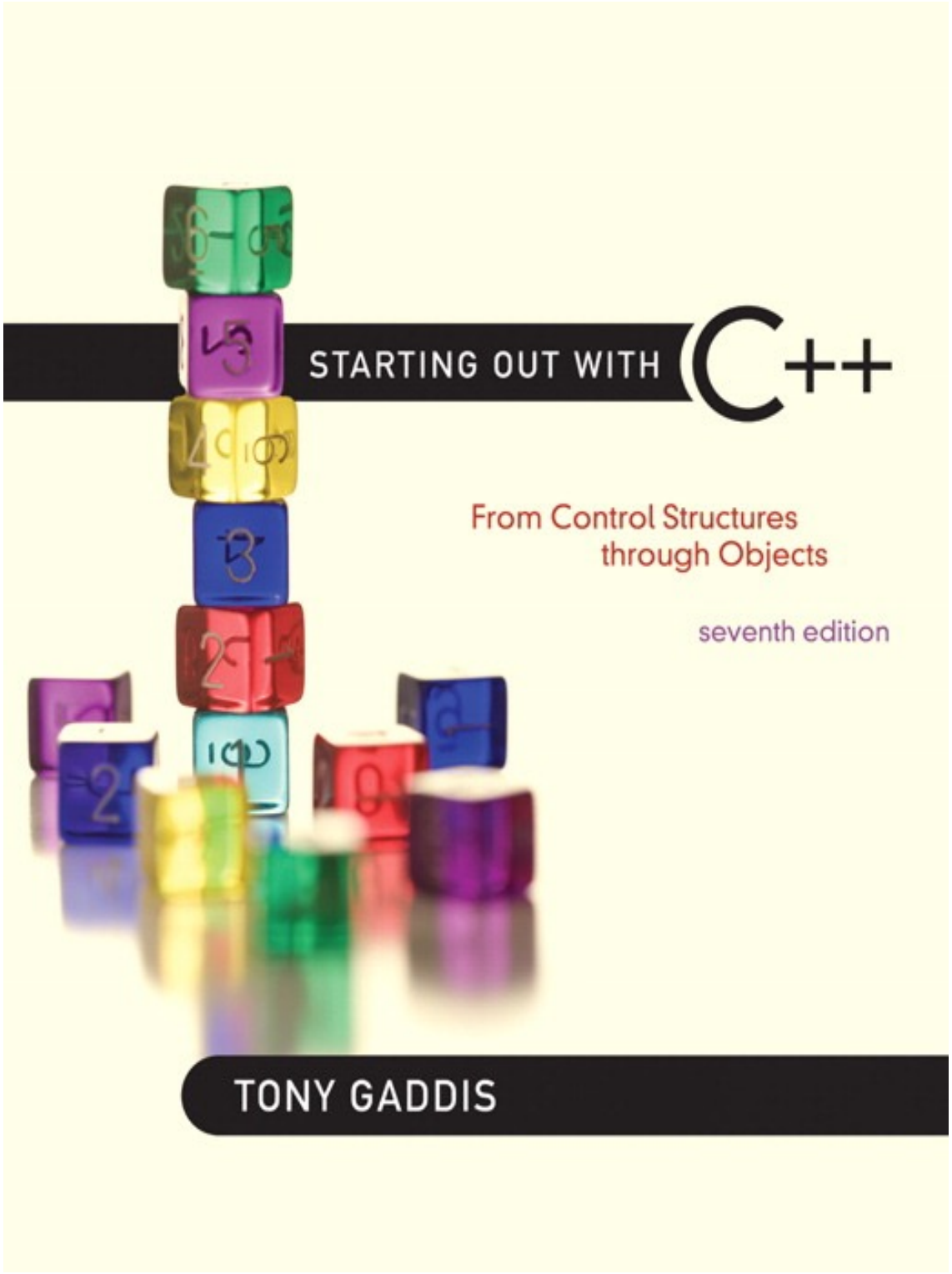
Chapter 4:

Making Decisions



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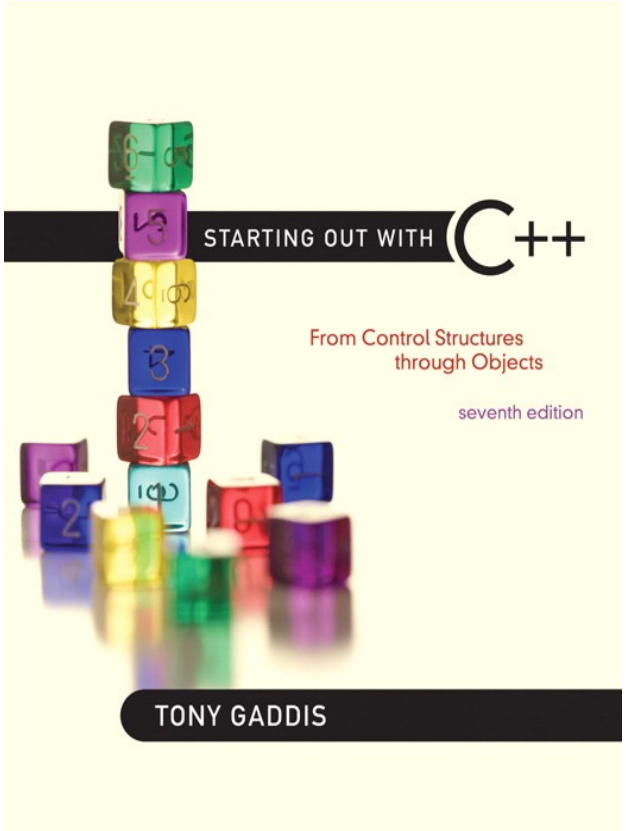


4.1

Relational Operators

Relational Operators

- Used to compare numbers to determine relative order
- Operators:

>	Greater than
<	Less than
>=	Greater than or equal to
<=	Less than or equal to
==	Equal to
!=	Not equal to

Relational Expressions

- Boolean expressions – `true` or `false`
- Examples:

  `12 > 5` is `true`

  `7 <= 5` is `false`

  if `x` is 10, then

  `x == 10` is `true`,

  `x != 8` is `true`, and

  `x == 8` is `false`

Relational Expressions

- Can be assigned to a variable:

```
result = x <= y;
```

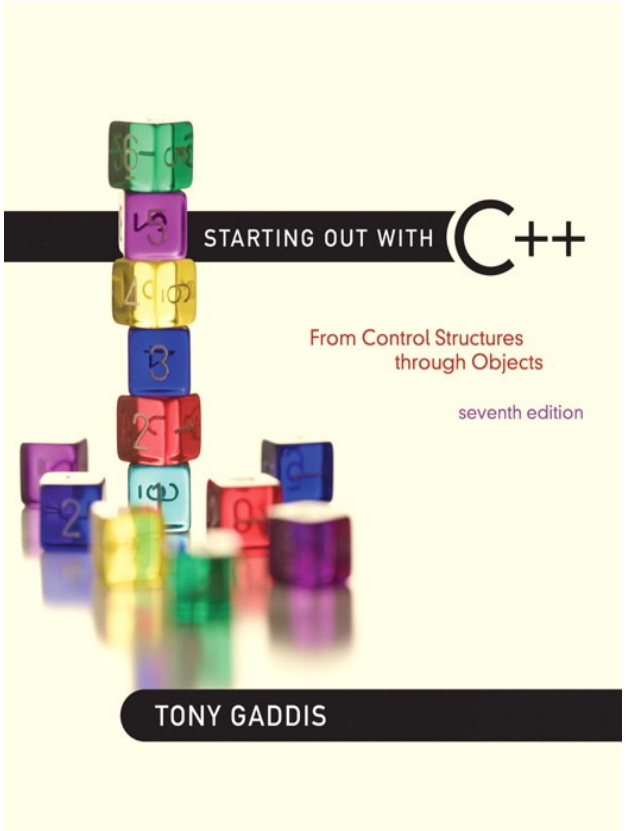
- Assigns `0` for `false`, `1` for `true`
- Do not confuse `=` and `==`

Lab 1

- Compile and Run Program 4.1
- Modify it to test the table

Table 4-3 Statements that Include Relational Expressions
(Assume `x` is 10, `y` is 7, and `z` is an `int` or `bool`.)

Statement	Outcome
`z = x < y`	`z` is assigned 0 because `x` is not less than `y`.
`cout << (x > y);`	Displays 1 because `x` is greater than `y`.
`z = (x >= y);`	`z` is assigned 1 because `x` is greater than or equal to `y`.
`cout << (x <= y);`	Displays 0 because `x` is not less than or equal to `y`.
`z = (y != x);`	`z` is assigned 1 because `y` is not equal to `x`.
`cout << (x == (y + 3));`	Displays 1 because `x` is equal to `y + 3`.



4.2

The `if` Statement

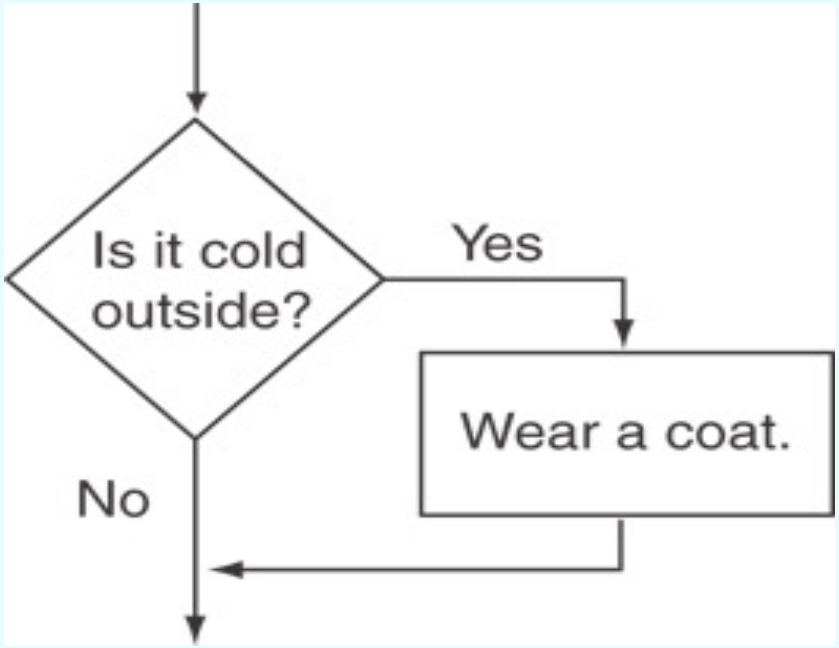
Flow control

- Unless specified otherwise, the order of statement execution through a function is linear: one statement after another in sequence
- Some programming statements allow us to:
  - decide whether or not to execute a particular statement
  - execute a statement over and over, repetitively
- These decisions are based on Boolean expressions (or conditions) that evaluate to true or false
- The order of statement execution is called the flow of control

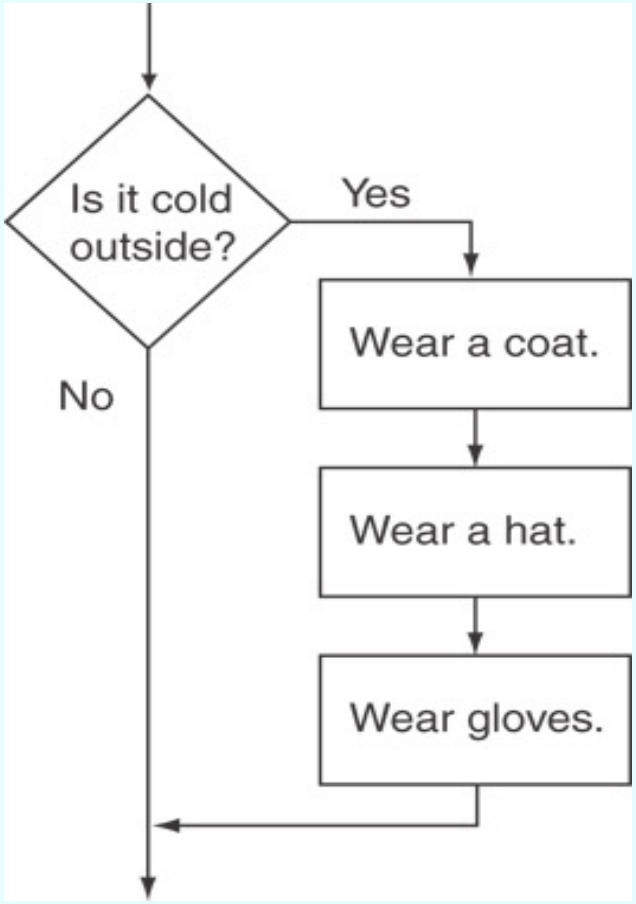
The `if` Statement

- Allows statements to be conditionally executed or skipped over
- Models the way we mentally evaluate situations:
  - "If it is raining, take an umbrella."
  - "If it is cold outside, wear a coat."

Flowchart for Evaluating a Decision



Flowchart for Evaluating a Decision



The `if` Statement

- General Format:

```
if (expression)
      statement;

if (expression){
      statements;
}
```

The if Statement-What Happens

To evaluate:

```
if (expression)
    statement;
```

- If the *expression* is `true`, then *statement* is executed.
- If the *expression* is `false`, then *statement* is skipped.

`if` Statement in Program 4-2

Program 4-2

```
1  // This program averages three test scores
2  #include <iostream>
3  #include <iomanip>
4  using namespace std;
5
6  int main()
7  {
8     int score1, score2, score3;  // To hold three test scores
9     double average;              // To hold the average score
10
```

Continued…

`if` Statement in Program 4-2

Program 4-2 *(continued)*

```
11      // Get the three test scores.
12      cout << "Enter 3 test scores and I will average them: ";
13      cin >> score1 >> score2 >> score3;
14
15      // Calculate and display the average score.
16      average = (score1 + score2 + score3) / 3.0;
17      cout << fixed << showpoint << setprecision(1);
18      cout << "Your average is " << average << endl;
19
20      // If the average is greater than 95, congratulate the user.
21      if (average > 95)
22         cout << "Congratulations! That's a high score!\n";
23      return 0;
24   }
```

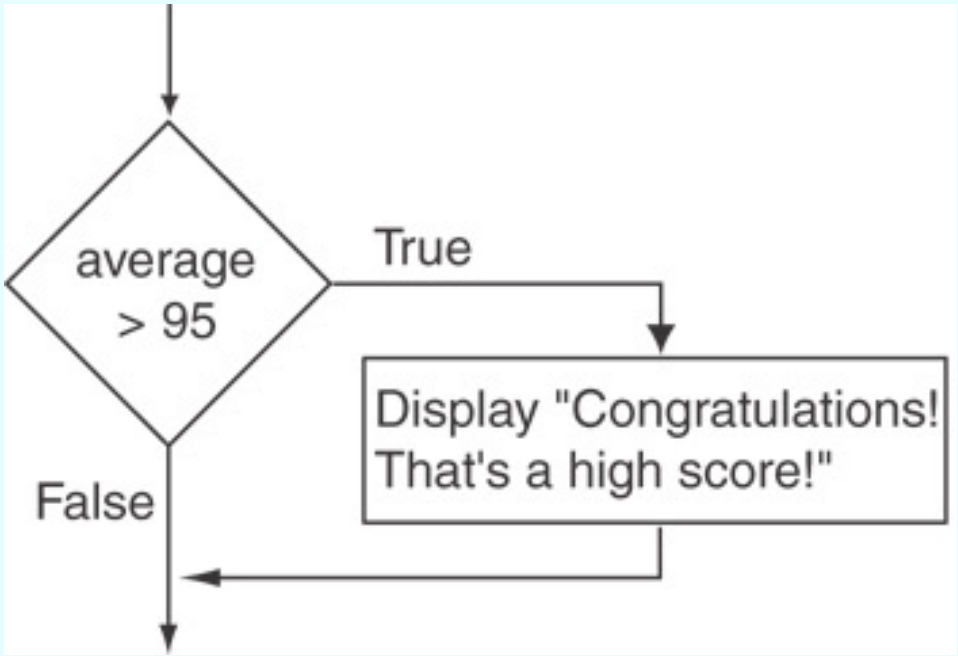
Program Output with Example Input Shown in Bold

```
Enter 3 test scores and I will average them: 80 90 70 [Enter]
Your average is 80.0
```

Program Output with Other Example Input Shown in Bold

```
Enter 3 test scores and I will average them: 100 100 100 [Enter]
Your average is 100.0
Congratulations! That's a high score!
```

Flowchart for Program 4-2 Lines 21 and 22



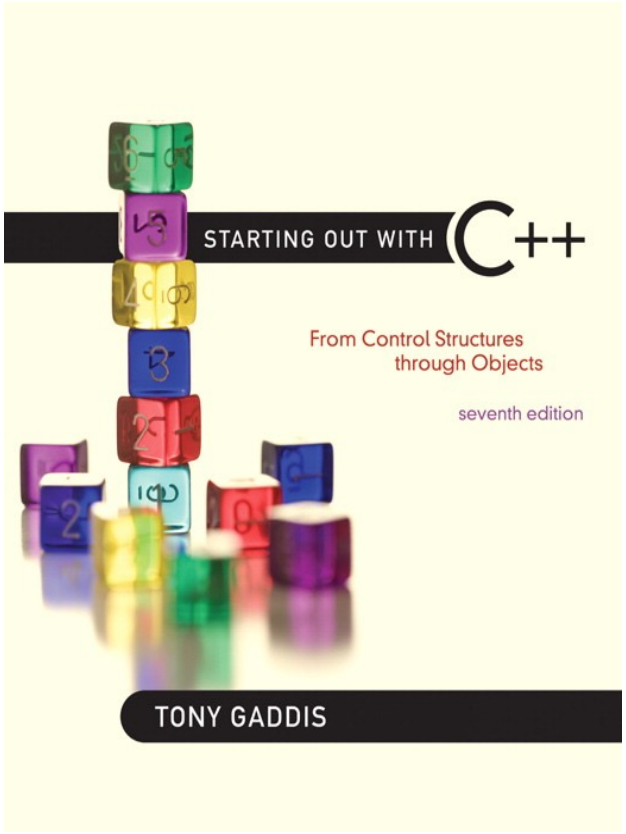
```
if (average >95) {
    cout << “Congratulation! Your score is high.”
      <<endl;
    cout << “your grade is A+.” << endl;
}
```

`if` Statement Notes

- Do not place `;` after `(`*`expression`*`)`
- Place *`statement`*`;` on a separate line after `(`*`expression`*`)`, indented:

```
if (score > 90)
    grade = 'A';
```

- Be careful testing `float`s and `double`s for equality
- `0` is `false`; any other value is `true`



4.3

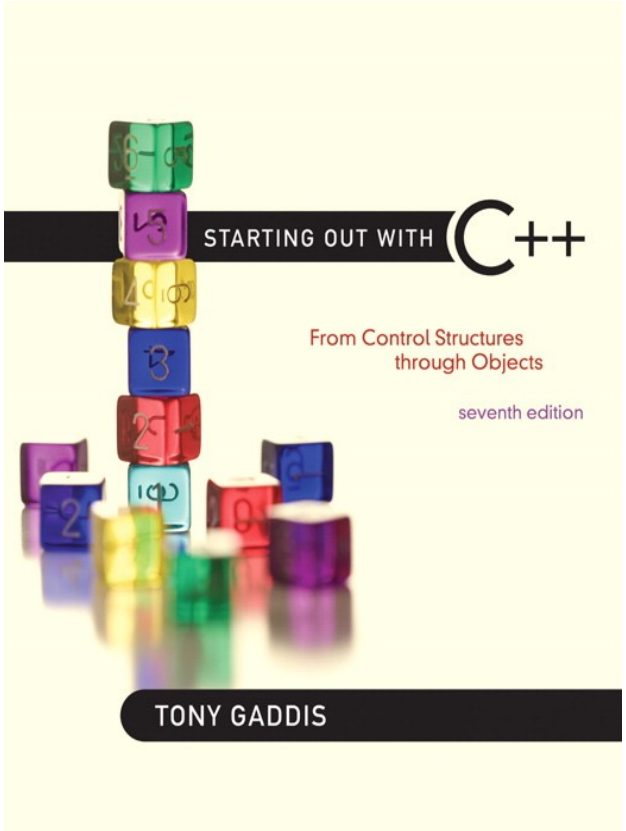
Expanding the `if` Statement

Expanding the `if` Statement

- To execute more than one statement as part of an `if` statement, enclose them in `{ }`:

```
if (score > 90)
{
    grade = 'A';
    cout << "Good Job!\n";
}
```

- `{ }` creates a block of code



4.4

The `if/else` Statement

The `if/else` statement

- Provides two possible paths of execution
- Performs one statement or block if the *`expression`* is true, otherwise performs another statement or block.

The `if/else` statement

- General Format:

```
if (expression)
        statement1;  // or block
else
        statement2;  // or block
```

`if/else`-What Happens

To evaluate:

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

- If the *`expression`* is `true`, then *`statement1`* is executed and *`statement2`* is skipped.
- If the *`expression`* is *`false`*, then *`statement1`* is skipped and *`statement2`* is executed.

The `if/else` statement and Modulus Operator in Program 4-8

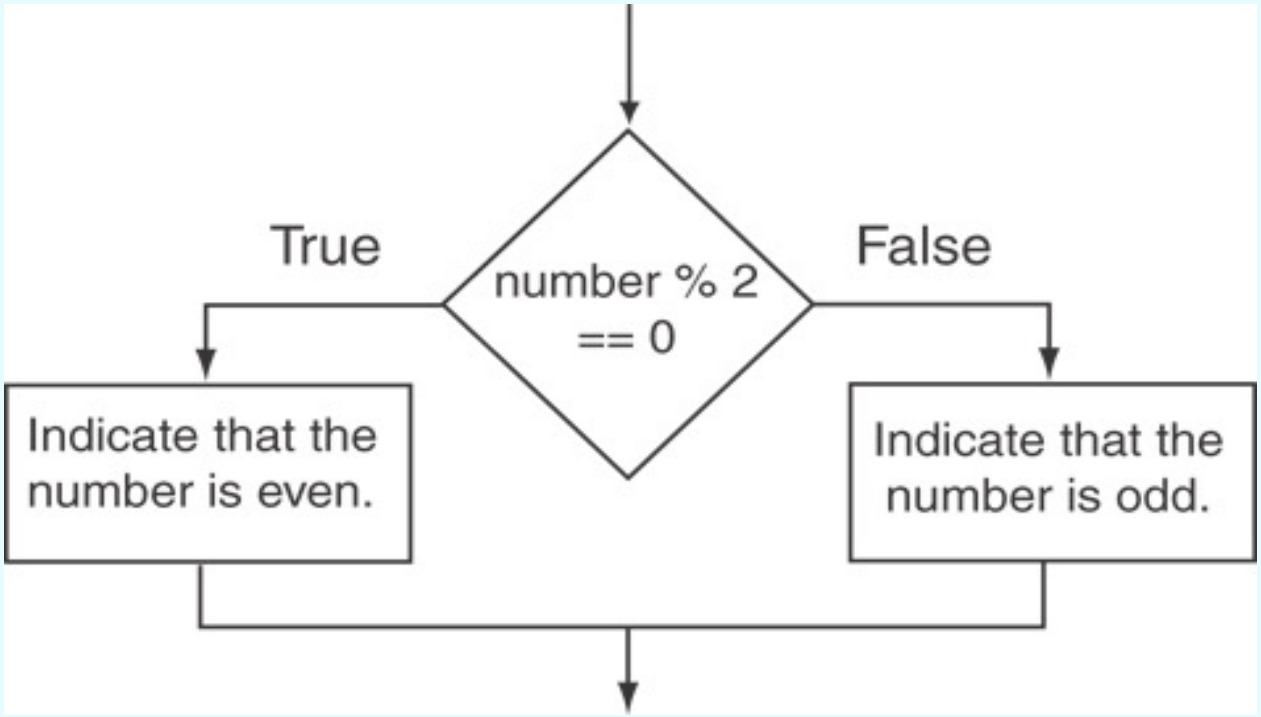
Program 4-8

```
1  // This program uses the modulus operator to determine
2  // if a number is odd or even. If the number is evenly divisible
3  // by 2, it is an even number. A remainder indicates it is odd.
4  #include <iostream>
5  using namespace std;
6
7  int main()
8  {
9     int number;
10
11    cout << "Enter an integer and I will tell you if it\n";
12    cout << "is odd or even. ";
13    cin >> number;
14    if (number % 2 == 0)
15       cout << number << " is even.\n";
16    else
17       cout << number << " is odd.\n";
18    return 0;
19 }
```

Program Output with Example Input Shown in Bold

```
Enter an integer and I will tell you if it
is odd or even. 17 [Enter]
17 is odd.
```

Flowchart for Program 4-8 Lines 14 through 18



Testing the Divisor in Program 4-9

Program 4-9

```
1  // This program asks the user for two numbers, num1 and num2.
2  // num1 is divided by num2 and the result is displayed.
3  // Before the division operation, however, num2 is tested
4  // for the value 0. If it contains 0, the division does not
5  // take place.
6  #include <iostream>
7  using namespace std;
8
9  int main()
10 {
11    double num1, num2, quotient;
12
```

Continued…

Testing the Divisor in Program 4-9

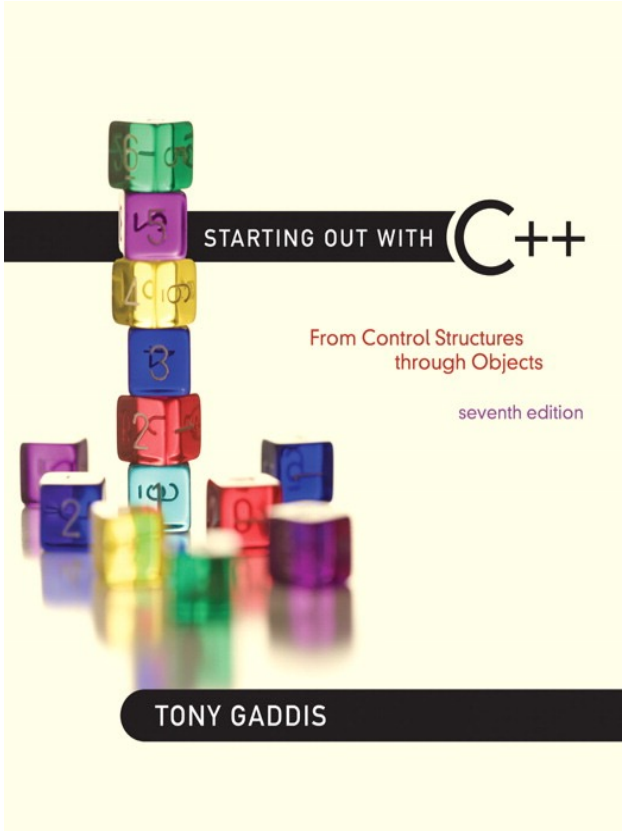
Program 4-9 *(continued)*

```
13      // Get the first number.
14      cout << "Enter a number: ";
15      cin >> num1;
16
17      // Get the second number.
18      cout << "Enter another number: ";
19      cin >> num2;
20
21      // If num2 is not zero, perform the division.
22      if (num2 == 0)
23      {
24         cout << "Division by zero is not possible.\n";
25         cout << "Please run the program again and enter\n";
26         cout << "a number other than zero.\n";
27      }
28      else
29      {
30         quotient = num1 / num2;
31         cout << "The quotient of " << num1 << " divided by ";
32         cout<< num2 << " is " << quotient << ".\n";
33      }
34      return 0;
35   }
```

Program Output with Example Input Shown in Bold

(When the user enters 0 for num2)

```
Enter a number: 10 [Enter]
Enter another number: 0 [Enter]
Division by zero is not possible.
Please run the program again and enter
a number other than zero.
```



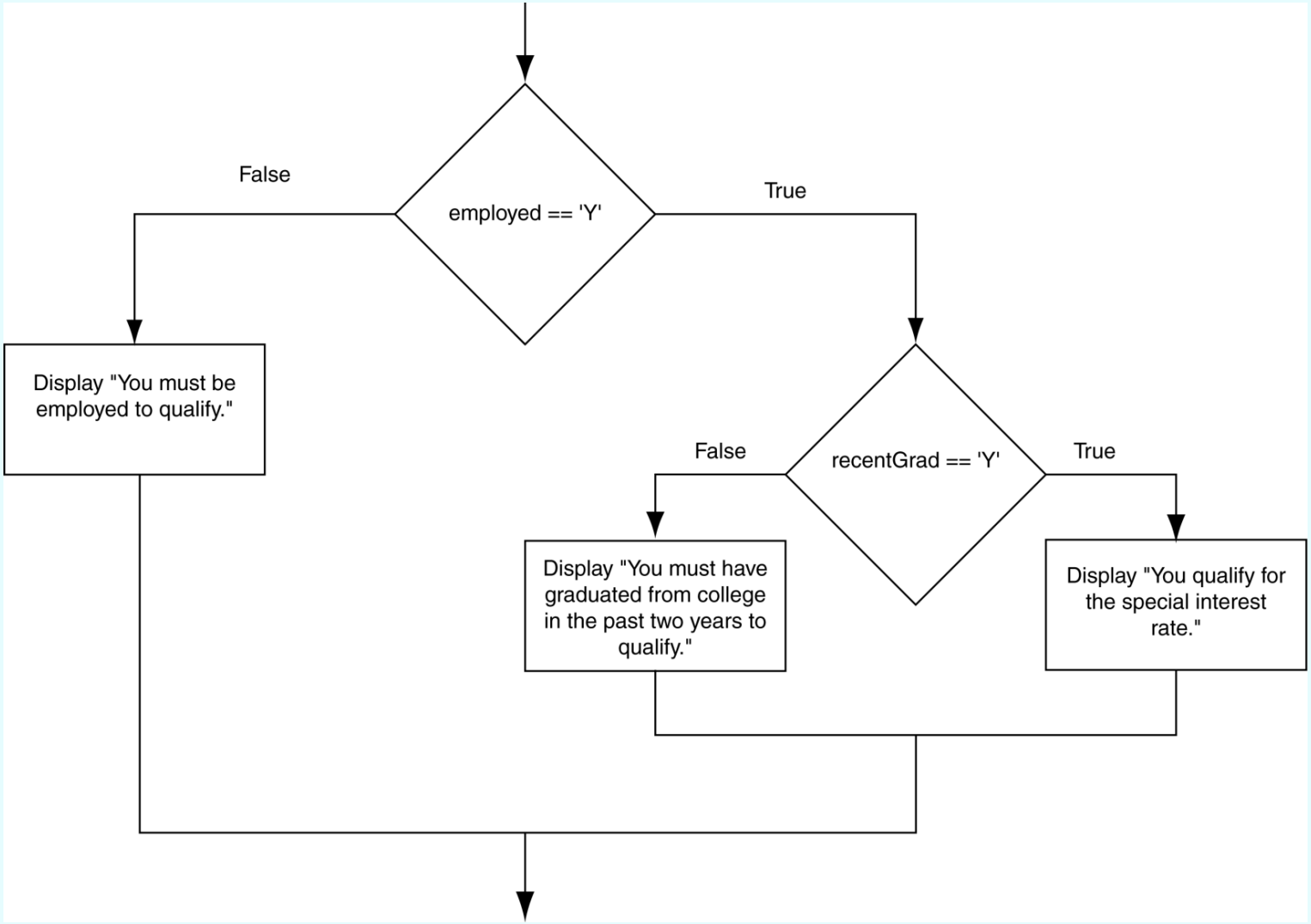
4.5

Nested `if` Statements

Nested `if` Statements

- An `if` statement that is nested inside another `if` statement
- Nested `if` statements can be used to test more than one condition

Flowchart for a Nested `if` Statement



Nested `if` Statements

- From Program 4-10

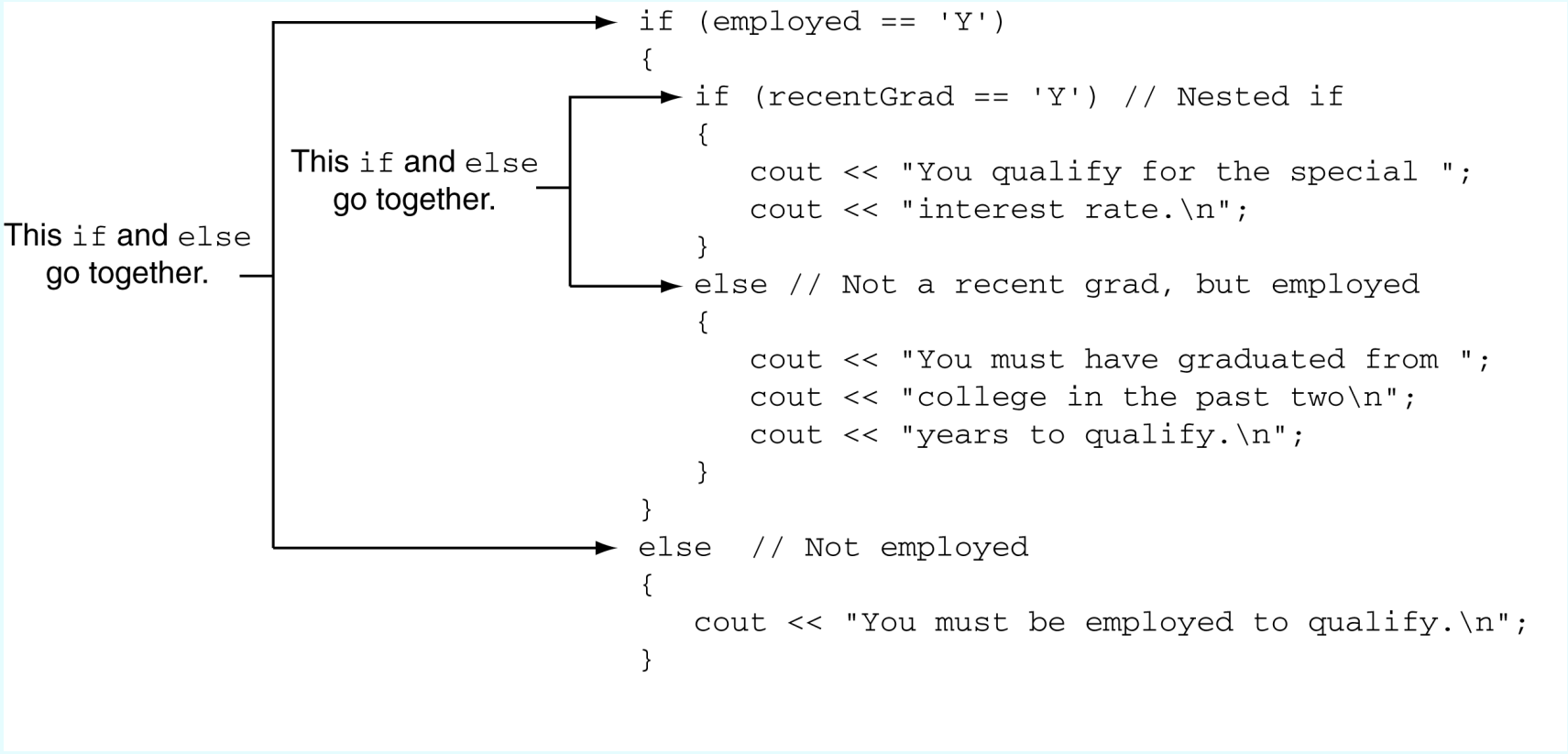
```
20      // Determine the user's loan qualifications.
21      if (employed == 'Y')
22      {
23         if (recentGrad == 'Y') //Nested if
24         {
25            cout << "You qualify for the special ";
26            cout << "interest rate.\n";
27         }
28      }
```

Nested `if` Statements

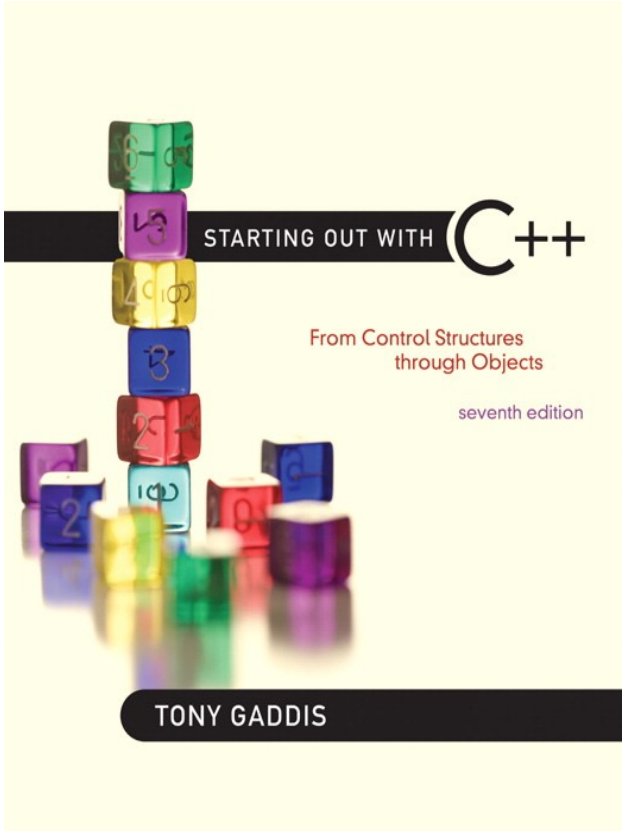
- Another example, from Program 4-1

```
20      // Determine the user's loan qualifications.
21      if (employed == 'Y')
22      {
23         if (recentGrad == 'Y') // Nested if
24         {
25            cout << "You qualify for the special ";
26            cout << "interest rate.\n";
27         }
28         else // Not a recent grad, but employed
29         {
30            cout << "You must have graduated from ";
31            cout << "college in the past two\n";
32            cout << "years to qualify.\n";
33         }
34      }
35      else // Not employed
36      {
37         cout << "You must be employed to qualify.\n";
38      }
```

Use Proper Indentation!




```
if (employed == 'Y')
{
   if (recentGrad == 'Y') // Nested if
   {
      cout << "You qualify for the special ";
      cout << "interest rate.\n";
   }
   else // Not a recent grad, but employed
   {
      cout << "You must have graduated from ";
      cout << "college in the past two\n";
      cout << "years to qualify.\n";
   }
}
else  // Not employed
{
   cout << "You must be employed to qualify.\n";
}
```



4.6

The `if/else if` Statement

The `if/else if` Statement

- Tests a series of conditions until one is found to be true
- Often simpler than using nested `if/else` statements
- Can be used to model thought processes such as:

  "If it is raining, take an umbrella,
  else, if it is windy, take a hat,
  else, take sunglasses”

if/else if Format

```
if (expression)
      statement1;  // or block
else if (expression)
      statement2;  // or block
    .
    . // other else ifs
    .
else if (expression)
      statementn;  // or block
```

The `if/else if` Statement in Program 4-13

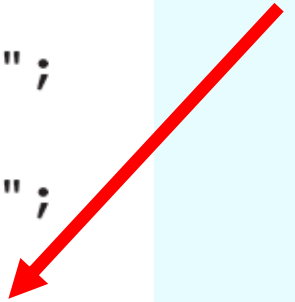
```
21      // Determine the letter grade.
22      if (testScore >= A_SCORE)
23         cout << "Your grade is A.\n";
24      else if (testScore >= B_SCORE)
25         cout << "Your grade is B.\n";
26      else if (testScore >= C_SCORE)
27         cout << "Your grade is C.\n";
28      else if (testScore >= D_SCORE)
29         cout << "Your grade is D.\n";
30      else
31         cout << "Your grade is F.\n";
```

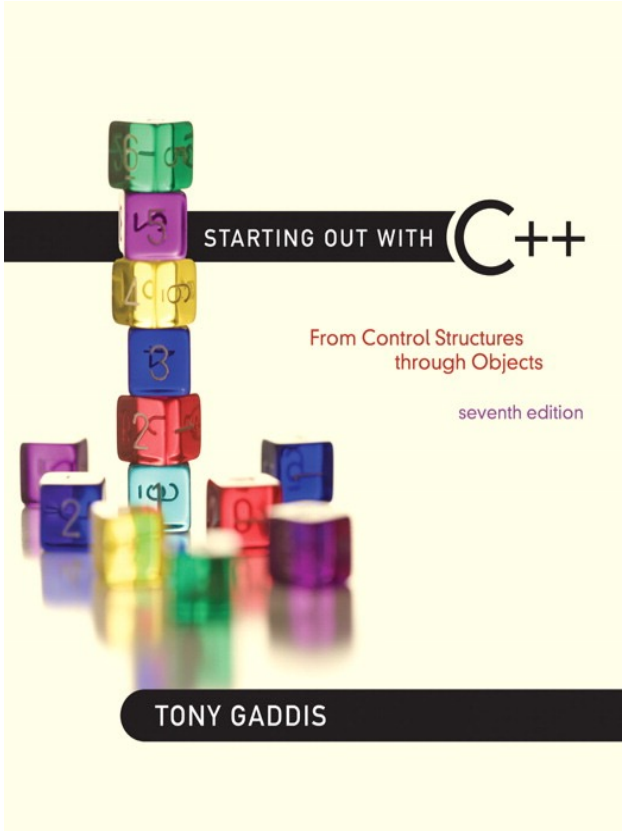
Using a Trailing `else` to Catch Errors in Program 4-14

- The trailing `else` clause is optional, but it is best used to catch errors.

```
21      // Determine the letter grade.
22      if (testScore >= A_SCORE)
23         cout << "Your grade is A.\n";
24      else if (testScore >= B_SCORE)
25         cout << "Your grade is B.\n";
26      else if (testScore >= C_SCORE)
27         cout << "Your grade is C.\n";
28      else if (testScore >= D_SCORE)
29         cout << "Your grade is D.\n";
30      else if (testScore >= 0)
31         cout << "Your grade is F.\n";
32      else
33         cout << "Invalid test score.\n";
```

This trailing `else` catches invalid test scores



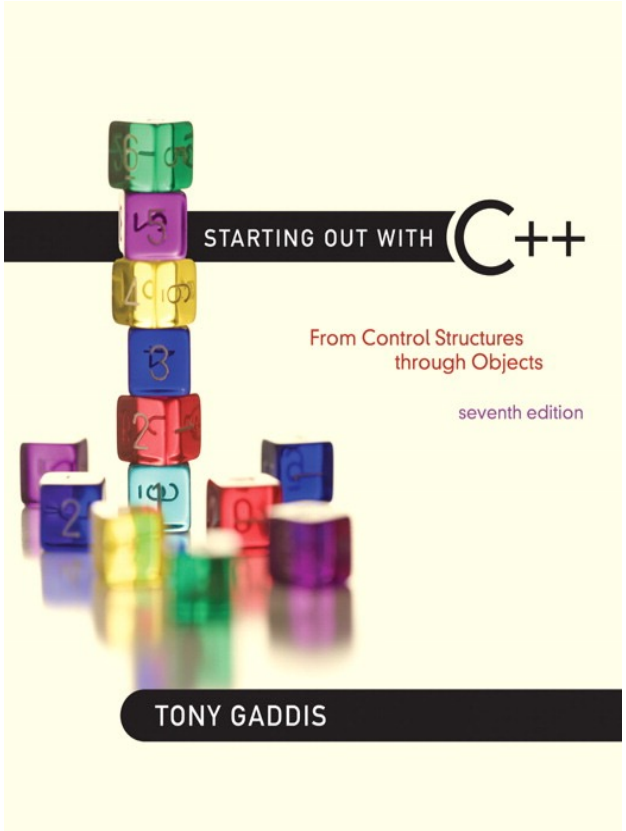


4.7

Flags

Flags

- Variable that signals a condition
- Usually implemented as a `bool` variable
- Can also be an integer
  - The value `0` is considered `false`
  - Any nonzero value is considered `true`
- As with other variables in functions, must be assigned an initial value before it is used



4.8

Logical Operators

Logical Operators

- Used to create relational expressions from other relational expressions
- Operators, meaning, and explanation:

&&	AND	New relational expression is true if both expressions are true
||	OR	New relational expression is true if either expression is true
!	NOT	Reverses the value of an expression – true expression becomes false, and false becomes true

Logical Operators-Examples

```
int x = 12, y = 5, z = -4;
```

`(x > y) && (y > z)`	`true`
`(x > y) && (z > y)`	`false`
`(x <= z) || (y == z)`	`false`
`(x <= z) || (y != z)`	`true`
`!(x >= z)`	`false`

The logical && operator in Program 4-15

```
21    // Determine the user's loan qualifications.
22    if (employed == 'Y' && recentGrad == 'Y')
23    {
24       cout << "You qualify for the special "
25            << "interest rate.\n";
26    }
27    else
28    {
29       cout << "You must be employed and have\n"
30            << "graduated from college in the\n"
31            << "past two years to qualify.\n";
32    }
```

The logical || Operator in Program 4-16

```
23    // Determine the user's loan qualifications.
24    if (income >= MIN_INCOME || years > MIN_YEARS)
25       cout << "You qualify.\n";
26    else
27    {
28       cout << "You must earn at least $"
29            << MIN_INCOME << " or have been "
30            << "employed more than " << MIN_YEARS
31            << " years.\n";
32    }
```

The logical ! Operator in Program 4-17

```
23    // Determine the user's loan qualifications.
24    if (!(income >= MIN_INCOME || years > MIN_YEARS))
25    {
26       cout << "You must earn at least $"
27            << MIN_INCOME << " or have been "
28            << "employed more than " << MIN_YEARS
29            << " years.\n";
30    }
31    else
32       cout << "You qualify.\n";
```

Logical Operator-Notes

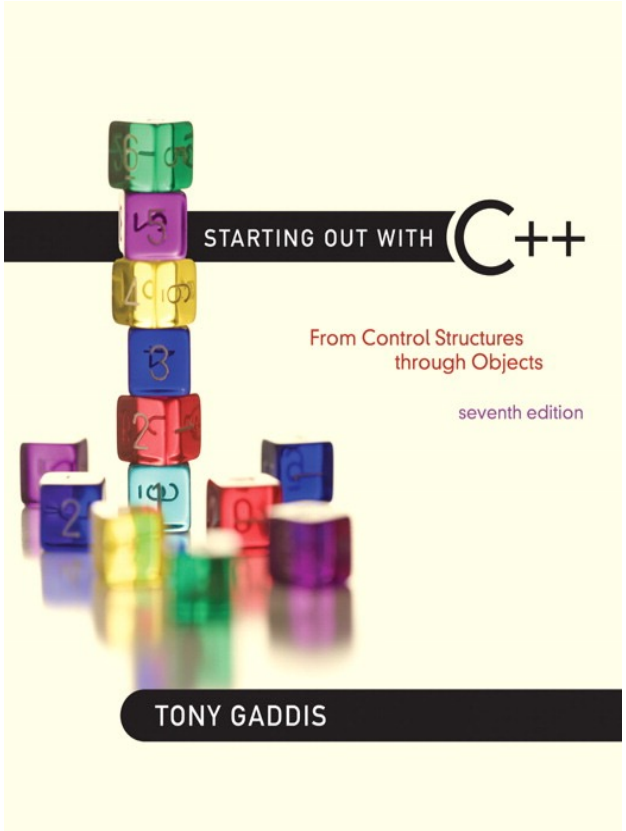
- `!` has highest precedence, followed by `&&`, then `||`
- If the value of an expression can be determined by evaluating just the sub-expression on left side of a logical operator, then the sub-expression on the right side will not be evaluated (*short circuit evaluation*)

Lab

- Write a program that asks the user to check whether an alphabet entered by the user is a vowel or a consonant. Knowing that a, e, i, o and u are vowels. All other alphabets except these 5 alphabets are known as consonants. The inputted letter may be in upper case as well as lower case.

Solution

```
#include <ctype>
int main() {
    char c;
    bool isLowercaseVowel, isUppercaseVowel;
    cout << "Enter an alphabet: ";
    cin >> c;
    isLowercaseVowel = (c == 'a' || c == 'e' || c == 'i' || c == 'o' || c == 'u');
    isUppercaseVowel = (c == 'A' || c == 'E' || c == 'I' || c == 'O' || c == 'U');
    if (!isalpha(c))
      printf("Error! Non-alphabetic character.");
    else if (isLowercaseVowel || isUppercaseVowel)
        cout << c << " is a vowel.";
    else
        cout << c << " is a consonant.";
    return 0;
}
```



4.9

Checking Numeric Ranges with Logical Operators

Checking Numeric Ranges with Logical Operators

- Used to test to see if a value falls **inside** a range:

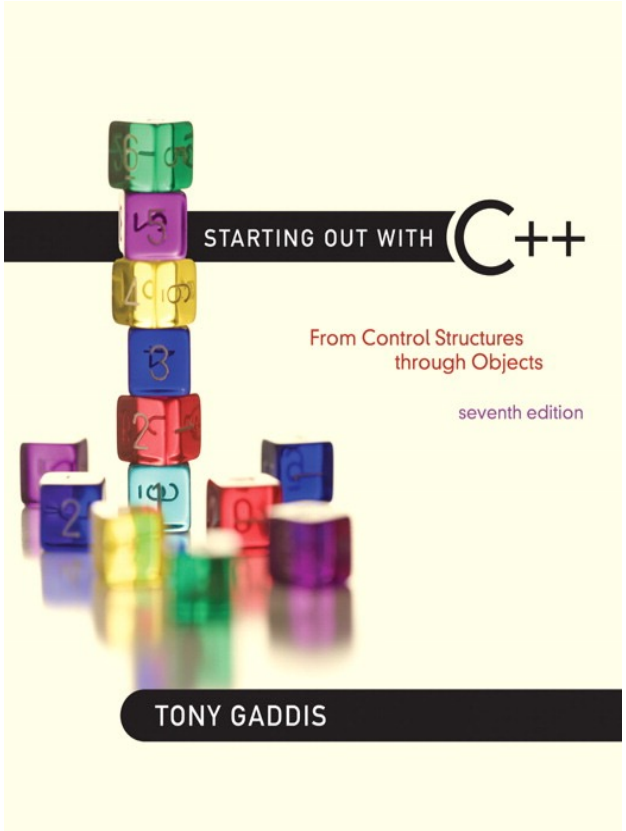
```
if (grade >= 0 && grade <= 100)
   cout << "Valid grade";
```

- Can also test to see if value falls **outside** of range:

```
if (grade <= 0 || grade >= 100)
   cout << "Invalid grade";
```

- Cannot use mathematical notation:

```
if (0 <= grade <= 100) //doesn't work!
```



4.10

Menus

Menus

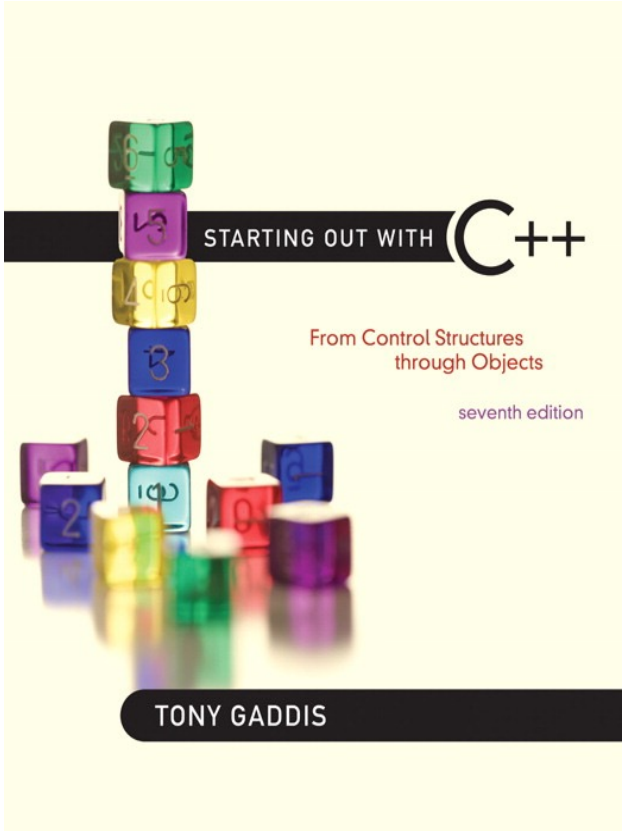
- Menu-driven program: program execution controlled by user selecting from a list of actions
- Menu: list of choices on the screen
- Menus can be implemented using `if/else if` statements

Menu-Driven Program Organization

- Display list of numbered or lettered choices for actions
- Prompt user to make selection
- Test user selection in *`expression`*
  - if a match, then execute code for action
  - if not, then go on to next *`expression`*

Lab

- Implement and Run the program 4-15
- Add a choice numbered 0: Membership rate that displays all membership rate on the screen.



4.11

Validating User Input

Validating User Input

- Input validation: inspecting input data to determine whether it is acceptable
- Bad output will be produced from bad input
- Can perform various tests:
  - Range
  - Reasonableness
  - Valid menu choice
  - Divide by zero

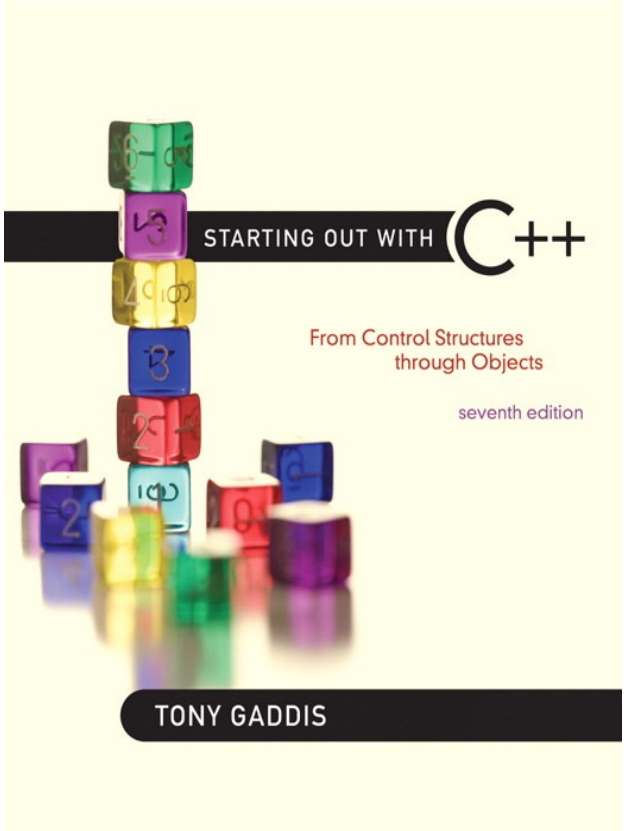
Input Validation in Program 4-19

```
16    int testScore;  // To hold a numeric test score
17
18    // Get the numeric test score.
19    cout << "Enter your numeric test score and I will\n"
20         << "tell you the letter grade you earned: ";
21    cin >> testScore;
22
23    // Validate the input and determine the grade.
24    if (testScore >= MIN_SCORE && testScore <= MAX_SCORE)
25    {
26       // Determine the letter grade.
27       if (testScore >= A_SCORE)
28         cout << "Your grade is A.\n";
29       else if (testScore >= B_SCORE)
30         cout << "Your grade is B.\n";
31       else if (testScore >= C_SCORE)
32         cout << "Your grade is C.\n";
33       else if (testScore >= D_SCORE)
34         cout << "Your grade is D.\n";
35       else
36         cout << "Your grade is F.\n";
37    }
38    else
39    {
40       // An invalid score was entered.
41       cout << "That is an invalid score. Run the program\n"
42            << "again and enter a value in the range of\n"
43            << MIN_SCORE << " through " << MAX_SCORE << ".\n";
44    }
```

Quiz

- Write a program that ask user to input a 2 digits natural number. Display each digit and the sum of them. In the case that the data is not valid, display ERROR MESSAGE – WITH GUIDE and quit.

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

int main() {
	short n,p,q;
	const int LOWER_BOUND = 10;
	const int HIGHER_BOUND = 99;
	cout << "Enter a 2-digit natural number?";
	cin >> n;
	if (n>=LOWER_BOUND && n<=HIGHER_BOUND) {
		p = n%10;
		q=  n/10;
		cout << "This number has 2 digits: " << q << " and " << p << endl;
		cout << "Their sum is " << p+q << endl;
	}
	else {
		cout << n << " is invalid because it is not between " << LOWER_BOUND << " and " <<
	HIGHER_BOUND <<".\n";
		return 0;
	}
	return 0;
}
```



4.12

Comparing Characters and Strings

Comparing Characters

- Characters are compared using their ASCII values
- 'A' < 'B'
  - The ASCII value of 'A' (65) is less than the ASCII value of 'B'(66)
- '1' < '2'
  - The ASCII value of '1' (49) is less than the ASCI value of '2' (50)
- Lowercase letters have higher ASCII codes than uppercase letters, so 'a' > 'Z'

Relational Operators Compare Characters in Program 4-20

```
10      // Get a character from the user.
11      cout << "Enter a digit or a letter: ";
12      ch = cin.get();
13
14      // Determine what the user entered.
15      if (ch >= '0' && ch <= '9')
16         cout << "You entered a digit.\n";
17      else if (ch >= 'A' && ch <= 'Z')
18         cout << "You entered an uppercase letter.\n";
19      else if (ch >= 'a' && ch <= 'z')
20         cout << "You entered a lowercase letter.\n";
21      else
22         cout << "That is not a digit or a letter.\n";
```

Comparing `string` Objects

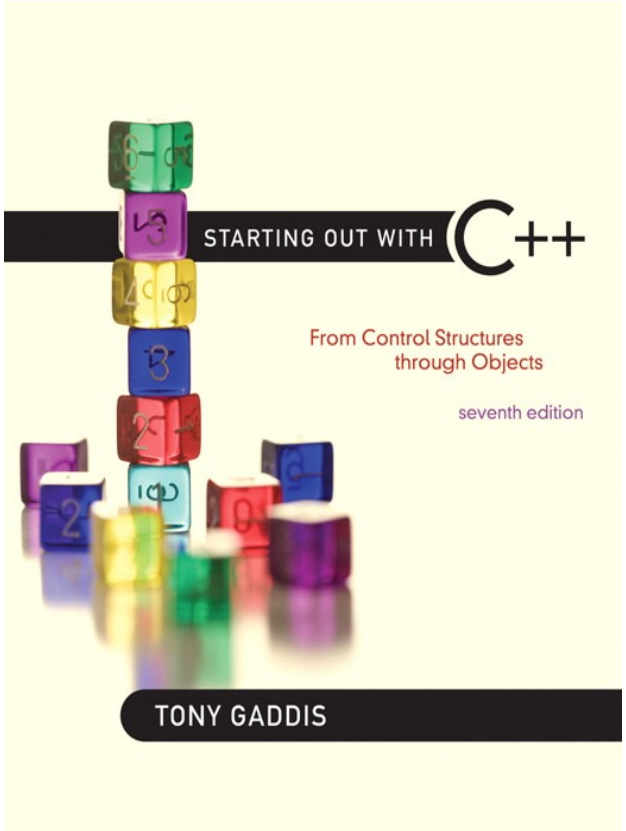
- Like characters, strings are compared using their ASCII values

```
string name1 = "Mary";
string name2 = "Mark";

name1 > name2   // true
name1 <= name2 // false
name1 != name2  // true

name1 < "Mary Jane" // true
```

The characters in each string must match before they are equal

Relational Operators Compare Strings in Program 4-21

```
26      // Determine and display the correct price
27      if (partNum == "S-29A")
28         cout << "The price is $" << PRICE_A << endl;
29      else if (partNum == "S-29B")
30         cout << "The price is $" << PRICE_B << endl;
31      else
32         cout << partNum << " is not a valid part number.\n";
```

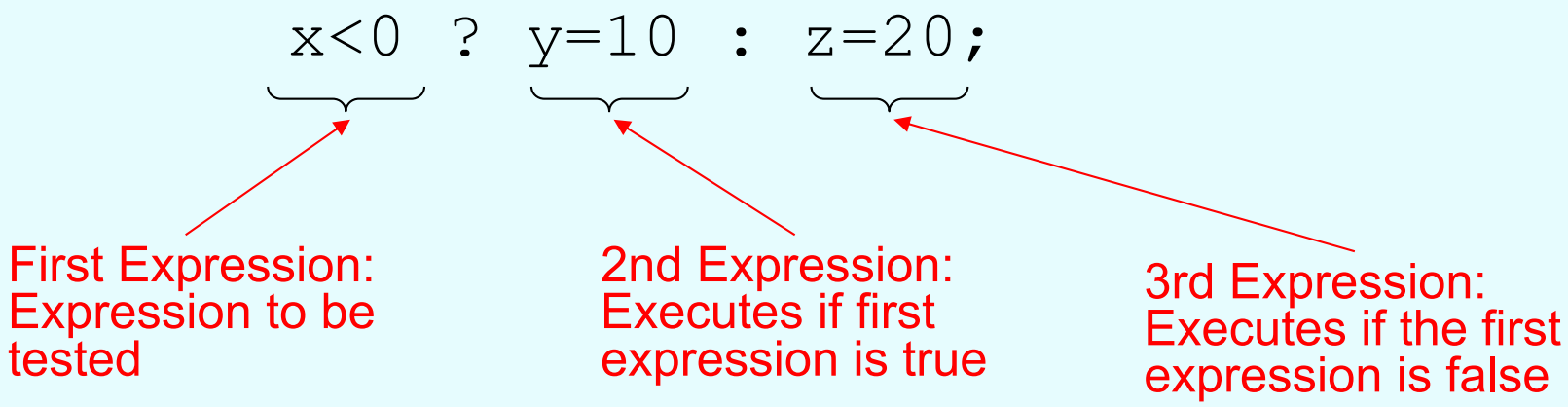


4.13

The Conditional Operator

The Conditional Operator

- Can use to create short `if/else` statements
- Format: `expr ? expr : expr;`

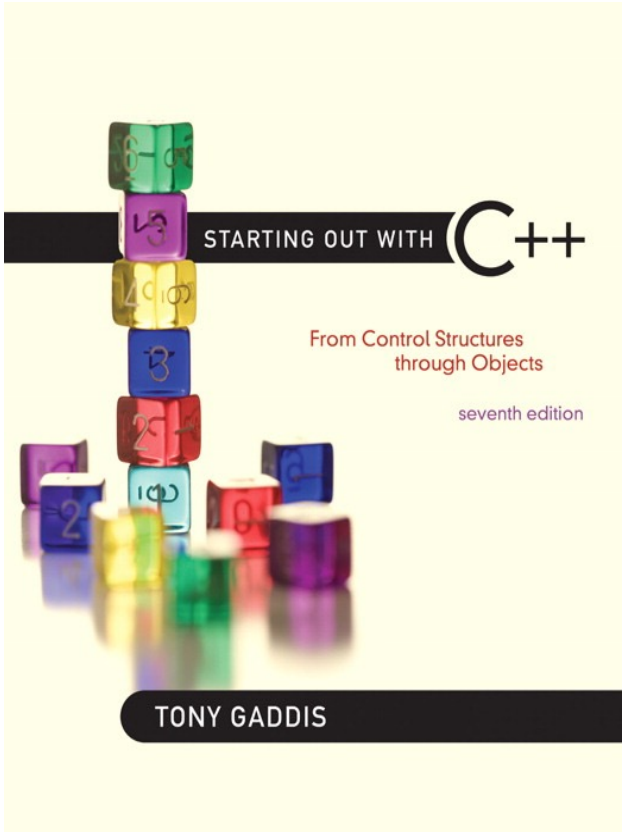


The Conditional Operator

- The value of a conditional expression is
  - The value of the second expression if the first expression is true
  - The value of the third expression if the first expression is false
- Parentheses `()` may be needed in an expression due to precedence of conditional operator

The Conditional Operator in Program 4-22

```
1  // This program calculates a consultant's charges at $50
2  // per hour, for a minimum of 5 hours. The ?: operator
3  // adjusts hours to 5 if less than 5 hours were worked.
4  #include <iostream>
5  #include <iomanip>
6  using namespace std;
7
8  int main()
9  {
10    const double PAY_RATE = 50.0;   // Hourly pay rate
11    const int MIN_HOURS = 5;        // Minimum billable hours
12    double hours,                   // Hours worked
13           charges;                 // Total charges
14
15    // Get the hours worked.
16    cout << "How many hours were worked? ";
17    cin >> hours;
18
19    // Determine the hours to charge for.
20    hours = hours < MIN_HOURS ? MIN_HOURS : hours;
21
22    // Calculate and display the charges.
23    charges = PAY_RATE * hours;
24    cout << fixed << showpoint << setprecision(2)
25         << "The charges are $" << charges << endl;
26    return 0;
27 }
```



4.14

The `switch` Statement

The `switch` Statement

- Used to select among statements from several alternatives
- In some cases, can be used instead of `if/else if` statements

`switch` Statement Format

```
switch (expression) //integer
{
  case exp1: statement1;
  case exp2: statement2;
  ...
  case expn: statementn;
  default:   statementn+1;
}
```

```
switch (expression) //integer
{
  case exp1: statement1; break;
  case exp2: statement2; break;
  ...
  case expn: statementn; break;
  default:   statementn+1;
}
```

The `switch` Statement in Program 4-23

Program 4-23

```
1  // The switch statement in this program tells the user something
2  // he or she already knows: the data just entered!
3  #include <iostream>
4  using namespace std;
5
6  int main()
7  {
8     char choice;
9
10    cout << "Enter A, B, or C: ";
11    cin >> choice;
12    switch (choice)
13    {
14       case 'A': cout << "You entered A.\n";
15                 break;
16       case 'B': cout << "You entered B.\n";
17                 break;
18       case 'C': cout << "You entered C.\n";
19                 break;
20       default:  cout << "You did not enter A, B, or C!\n";
21    }
22    return 0;
23 }
```

Program Output with Example Input Shown in Bold

```
Enter A, B, or C: B [Enter]
You entered B.
```

Program Output with Example Input Shown in Bold

```
Enter A, B, or C: F [Enter]
You did not enter A, B, or C!
```

`switch` Statement Requirements

1) *`expression`* must be an integer variable or an expression that evaluates to an integer value
2) *`exp`**`1`*** through *`exp`**`n`*** must be constant integer expressions or literals, and must be unique in the `switch` statement
3) `default` is optional but recommended

`switch` Statement-How it Works

1) *`expression`* is evaluated
2) The value of *`expression`* is compared against *`exp`**`1`* through *`exp`**`n`*.
3) If *`expression`* matches value *`exp`**`i`*, the program branches to the statement following *`exp`**`i`* and continues to the end of the `switch`
4) If no matching value is found, the program branches to the statement after `default:`

`break` Statement

- Used to exit a `switch` statement
- If it is left out, the program "falls through" the remaining statements in the `switch` statement

`break` and `default` statements in Program 4-25

Program 4-25

```
1  // This program is carefully constructed to use the "fall through"
2  // feature of the switch statement.
3  #include <iostream>
4  using namespace std;
5
6  int main()
7  {
8     int modelNum;  // Model number
9
10    // Get a model number from the user.
11    cout << "Our TVs come in three models:\n";
12    cout << "The 100, 200, and 300. Which do you want? ";
13    cin >> modelNum;
14
15    // Display the model's features.
16    cout << "That model has the following features:\n";
17    switch (modelNum)
18    {
19       case 300: cout << "\tPicture-in-a-picture.\n";
20       case 200: cout << "\tStereo sound.\n";
21       case 100: cout << "\tRemote control.\n";
22                 break;
23       default:  cout << "You can only choose the 100,";
24                 cout << "200, or 300.\n";
25    }
26    return 0;
27 }
```

Continued…

`break` and `default` statements in Program 4-25

Program Output with Example Input Shown in Bold

```
Our TVs come in three models:
The 100, 200, and 300. Which do you want? 100 [Enter]
That model has the following features:
   Remote control.
```

Program Output with Example Input Shown in Bold

```
Our TVs come in three models:
The 100, 200, and 300. Which do you want? 200 [Enter]
That model has the following features:
   Stereo sound.
   Remote control.
```

Program Output with Example Input Shown in Bold

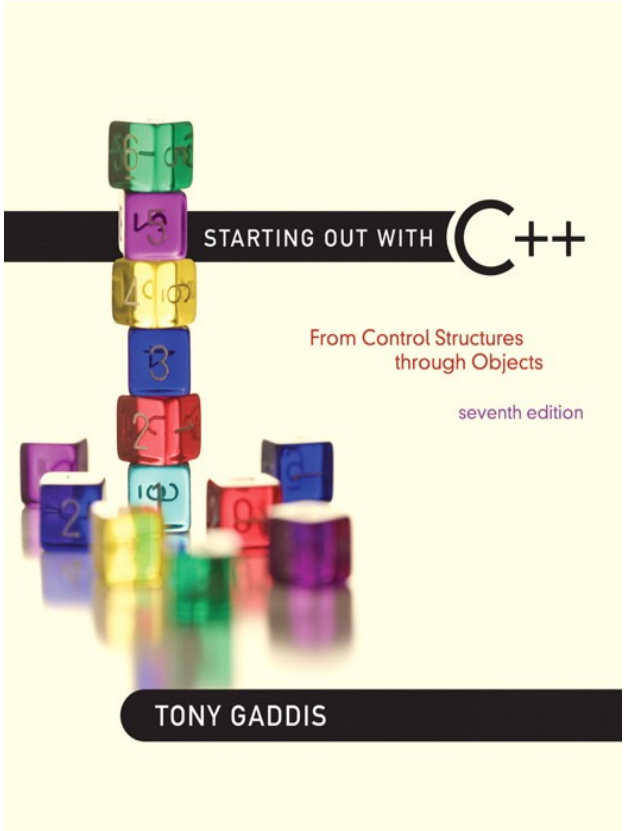
```
Our TVs come in three models:
The 100, 200, and 300. Which do you want? 300 [Enter]
That model has the following features:
   Picture-in-a-picture.
   Stereo sound.
   Remote control.
```

Program Output with Example Input Shown in Bold

```
Our TVs come in three models:
The 100, 200, and 300. Which do you want? 500 [Enter]
That model has the following features:
You can only choose the 100, 200, or 300.
```

Using `switch` in Menu Systems

- `switch` statement is a natural choice for menu-driven program:
  - display the menu
  - then, get the user's menu selection
  - use user input as `expression` in `switch` statement
  - use menu choices as *`expr`* in `case` statements



4.15

More About Blocks and Scope

More About Blocks and Scope

- Scope of a variable is the block in which it is defined, from the point of definition to the end of the block
- Usually defined at beginning of function
- May be defined close to first use

Inner Block Variable Definition in Program 4-29

```
16     if (income >= MIN_INCOME)
17     {
18        // Get the number of years at the current job.
19        cout << "How many years have you worked at "
20             << "your current job? ";
21        int years;     // Variable definition
22        cin >> years;
23
24        if (years > MIN_YEARS)
25           cout << "You qualify.\n";
26        else
27        {
28           cout << "You must have been employed for\n"
29                << "more than " << MIN_YEARS
30                << " years to qualify.\n";
31        }
32     }
```

Variables with the Same Name

- Variables defined inside { } have local or block scope
- When inside a block within another block, can define variables with the same name as in the outer block.
  - When in inner block, outer definition is not available
  - Not a good idea

Two Variables with the Same Name in Program 4-30

Program 4-30

```
1  // This program uses two variables with the name number.
2  #include <iostream>
3  using namespace std;
4
5  int main()
6  {
7     // Define a variable named number.
8     int number;
9
10    cout << "Enter a number greater than 0: ";
11    cin >> number;
12    if (number > 0)
13    {
14       int number;  // Another variable named number.
15       cout << "Now enter another number: ";
16       cin >> number;
17       cout << "The second number you entered was "
18            << number << endl;
19    }
20    cout << "Your first number was " << number << endl;
21    return 0;
22 }
```

Program Output with Example Input Shown in Bold

```
Enter a number greater than 0: 2 [Enter]
Now enter another number: 7 [Enter]
The second number you entered was 7
Your first number was 2
```

Exercise of Lecture 6 (CS16) ED6

- 4.33 (p225) 4.37 (p226)
- Programming challenges:
  - 4.2 (Roman Number), 4.3 (Magic Dates)
  - Cinema ticket problem (given on the class) Skipped for CS16
  - 4.7 (Time Calculator), 4.10 (Software Sales) ; The High/Low game (skipped for CS16)

High/Low game problem

- Write a program to play “High/Low". The program “picks" a number. The human player tries to guess it. The program indicates if the guess is too high, too low, or correct. Then it stops.
- Sample outputs:

Results

```
Guess my number (between 1 and 10): 5
Your guess was too small.
The correct number was 6.
```

- Use rand() function to pick a random number.

Additional Lab 1: Number of days in a month

- Write a program to find total number of days in given month of year. Knowing that the months having 31 days are: January, Mars, May, July, August, October, December. The months having 30 days are: April, June, September, November.
- There are 28 or 29 days in February.

Fortune Teller

With the `rand()` function you learned about in Chapter 3 and the `if/else if` statement, you can now create a simple fortune telling game.

Your program will start by asking users to enter three careers they would like to have some day. The program will then use random numbers to predict their future.

Output

Sample Run with User Input Shown in Bold

```
I am a fortune teller. Look into my crystal screen
and enter 3 careers you would like to have. For example,

      chef
      astronaut
      CIA agent

Then I will predict what you will be.

Career choice 1: radio announcer[Enter]
Career choice 2: sky diving instructor[Enter]
Career choice 3: circus clown[Enter]

You will be a radio announcer.
```