Control Statements I

Outline

Objectives

- In this lesson, you will learn:
  - To understand basic problem-solving techniques.
  - To be able to develop algorithms through the process of top-down, stepwise refinement.
  - To be able to use the `if` and `if...else` selection statements to choose among alternative actions.
  - To be able to use the `while` repetition statement to execute statements in a script repeatedly.
  - To understand counter-controlled repetition and sentinel-controlled repetition.
  - To be able to use the increment, decrement and assignment operators.

8.1 Introduction

- Writing a script
  - Thorough understanding of problem
  - Carefully planned approach
  - Understand the types of building blocks that are available
  - Employ proven program-construction principles

8.2 Algorithms

- Actions to be executed
- Order in which the actions are to be executed

8.3 Pseudocode

- Artificial
- Informal
- Helps programmers develop algorithms

8.4 Control Structures

- Sequential execution
  - Statements execute in the order they are written
- Transfer of control
  - Next statement to execute may not be the next one in sequence
- Three control structures
  - Sequence structure
  - Selection structure
    - `if`
    - `if...else`
    - `switch`
  - Repetition structure
    - `while`
    - `do...while`
    - `for`
    - `for...in`

8.4 Control Structures

- Flowchart
  - Graphical representation of algorithm or portion of algorithm
  - Flowlines
    - Indicate the order the actions of the algorithm execute
  - Rectangle symbol
    - Indicate any type of action
  - Oval symbol
    - A complete algorithm
  - Small circle symbol
    - A portion of algorithm
  - Diamond symbol
    - Indicates a decision is to be made

8.4 Control Structures

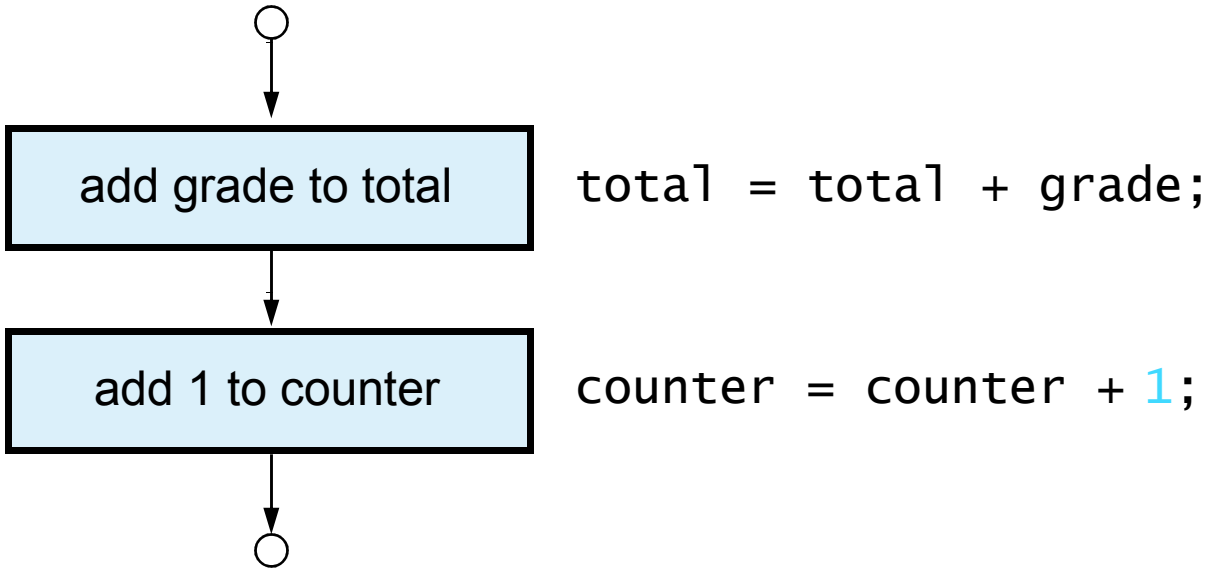


Fig. 8.1 Flowcharting JavaScript's sequence structure.

8.4 Control Structures

JavaScript Keywords				
break	case	catch	continue	default
delete	do	else	finally	for
function	if	in	instanceof	new
return	switch	this	throw	try
typeof	var	void	while	with
Keywords that are reserved but not currently used by JavaScript				
abstract	boolean	byte	char	class
const	debugger	double	enum	export
extends	final	float	goto	implements
import	int	interface	long	native
package	private	protected	public	short
static	super	synchronized	throws	transient
volatile				

Fig. 8.2 JavaScript keywords.

8.5 `if` Selection Statement

- Single-entry/single-exit structure
- Indicate action only when the condition evaluates to `true`

8.5 `if` Selection Statement

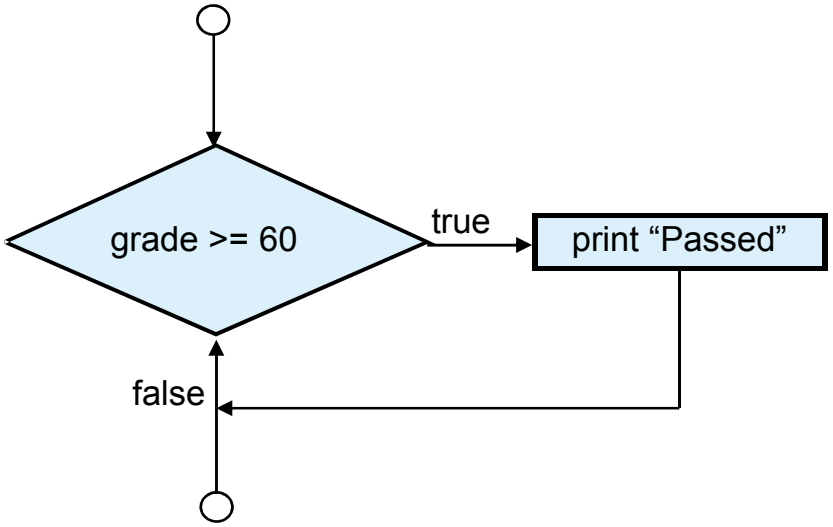


Fig. 8.3 Flowcharting the single-selection `if` statement.

8.6 `if…else` Selection Statement

- Indicate different actions to be perform when condition is `true` or `false`
- Conditional operator (`?:`)
  - JavaScript's only ternary operator
    - Three operands
    - Forms a conditional expression
- Dangling-else problem

8.6 `if…else` Selection Statement

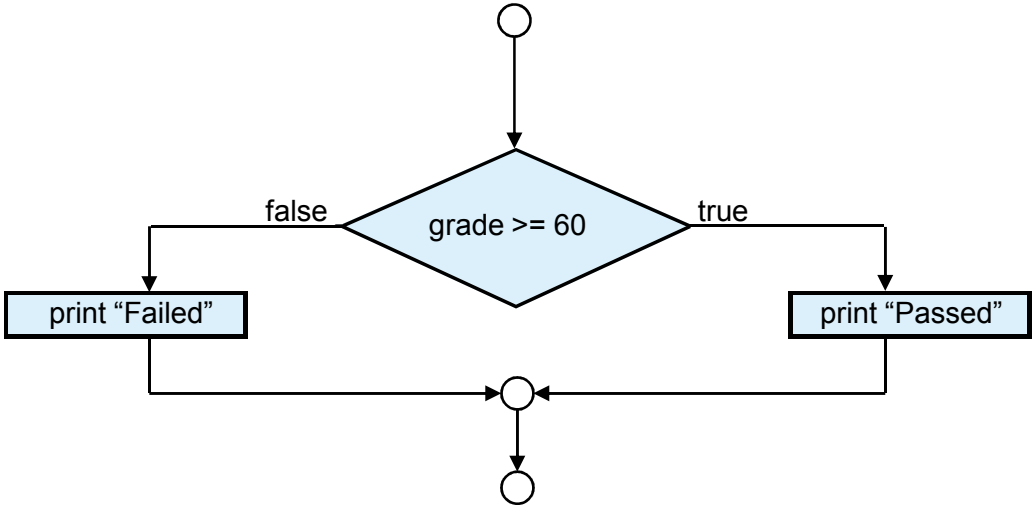


Fig. 8.4 Flowcharting the double-selection `if…else` statement.

8.7 `while` Repetition Statement

- Repetition structure (loop)
  - Repeat action while some condition remains true

8.7 `while` Repetition Statement

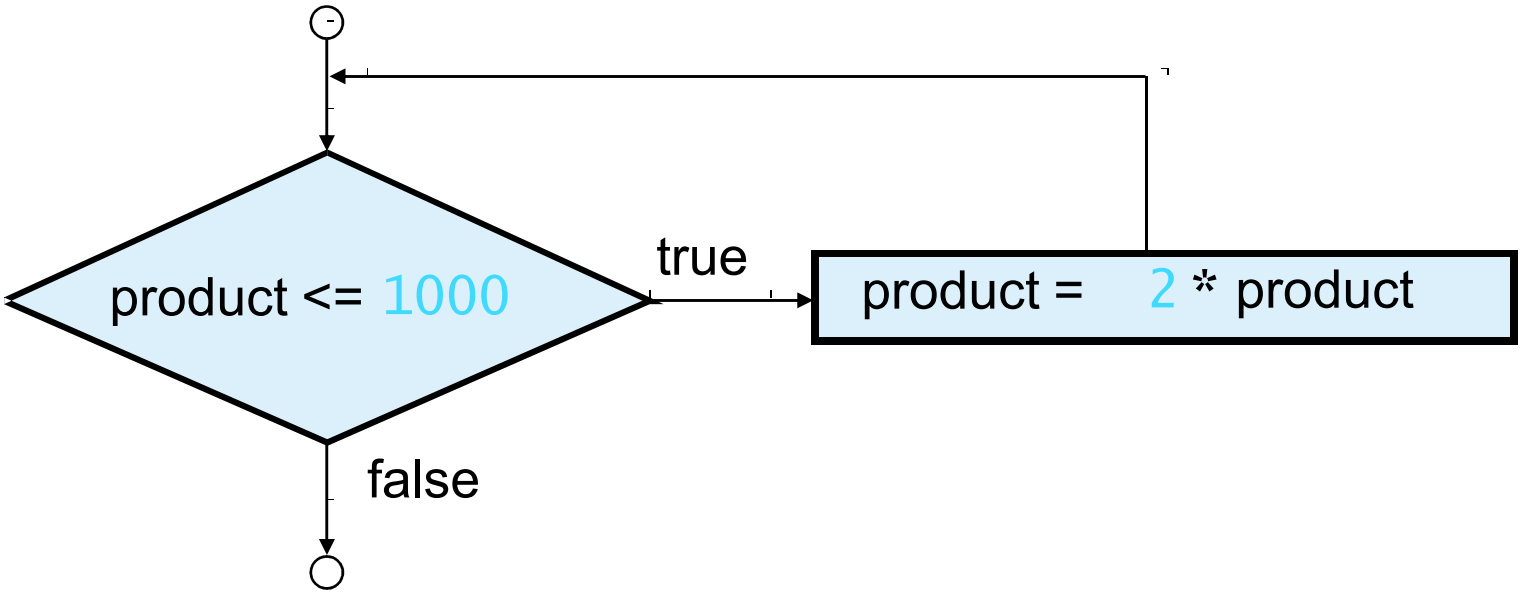


Fig. 8.5 Flowcharting the `while` repetition statement.

8.8 Formulating Algorithms: Case Study 1 (Counter-Controlled Repetition)

- Counter-controlled repetition
  - Counter
    - Control the number of times a set of statements executes
  - Definite repetition

```
1  <?xml version = "1.0"?>
2  <!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
3     "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
4
5  <!-- Fig. 8.7: average.html -->
6  <!-- Class Average Program  -->
7
8  <html xmlns = "http://www.w3.org/1999/xhtml">
9     <head>
10       <title>Class Average Program</title>
11
12       <script type = "text/javascript">
13          <!--
14          var total,          // sum of grades
15              gradeCounter,   // number of grades entered
16              gradeValue,     // grade value
17              average,        // average of all grades
18              grade;          // grade typed by user
19
20          // Initialization Phase
21          total = 0;          // clear total
22          gradeCounter = 1;   // prepare to loop
23
```

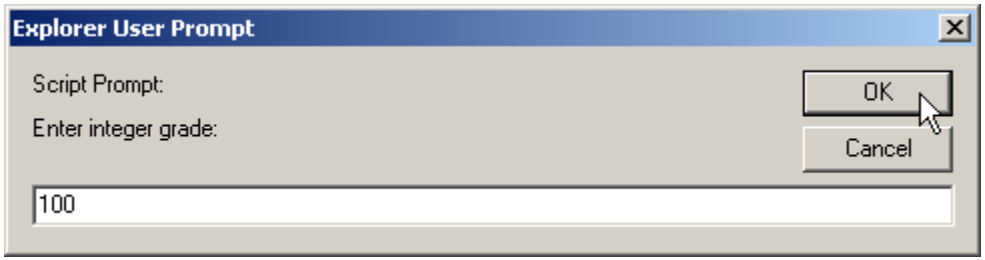
average.html
(1 of 3)

```
24          // Processing Phase
25          while ( gradeCounter <= 10 ) {  // loop 10 times
26
27             // prompt for input and read grade from user
28             grade = window.prompt( "Enter integer grade:", "0" );
29
30             // convert grade from a string to an integer
31             gradeValue = parseInt( grade );
32
33             // add gradeValue to total
34             total = total + gradeValue;
35
36             // add 1 to gradeCounter
37             gradeCounter = gradeCounter + 1;
38          }
39
40          // Termination Phase
41          average = total / 10;  // calculate the average
42
43          // display average of exam grades
44          document.writeln(
45             "<h1>Class average is " + average + "</h1>" );
46          // -->
47       </script>
```

average.html
(2 of 3)

```
48
49      </head>
50      <body>
51         <p>Click Refresh (or Reload) to run the script again<p>
52      </body>
53   </html>
```

average.html (3 of 3)



8.9 Formulating Algorithms with Top-Down, Stepwise Refinement: Case Study 2 (Sentinel-Controlled Repetition)

- Indefinite repetition
  - Sentinel value

```
1  <?xml version = "1.0"?>
2  <!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
3     "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
4
5  <!-- Fig. 8.9: average2.html        -->
6  <!-- Sentinel-controlled Repetition -->
7
8  <html xmlns = "http://www.w3.org/1999/xhtml">
9     <head>
10       <title>Class Average Program:
11           Sentinel-controlled Repetition</title>
12
13       <script type = "text/javascript">
14          <!--
15          var gradeCounter,  // number of grades entered
16              gradeValue,    // grade value
17              total,         // sum of grades
18              average,       // average of all grades
19              grade;         // grade typed by user
20
21          // Initialization phase
22          total = 0;         // clear total
23          gradeCounter = 0;  // prepare to loop
24
```

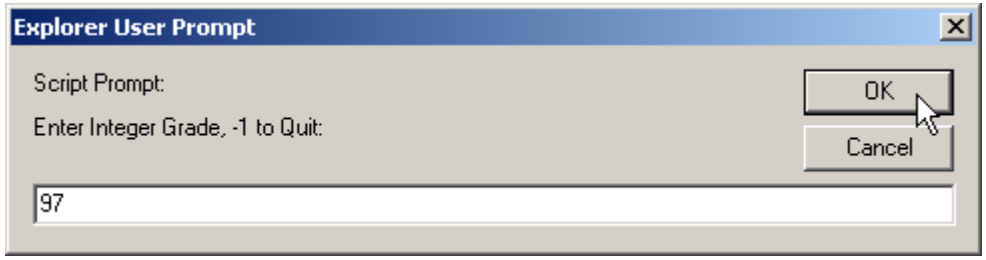
average2.html
(1 of 3)

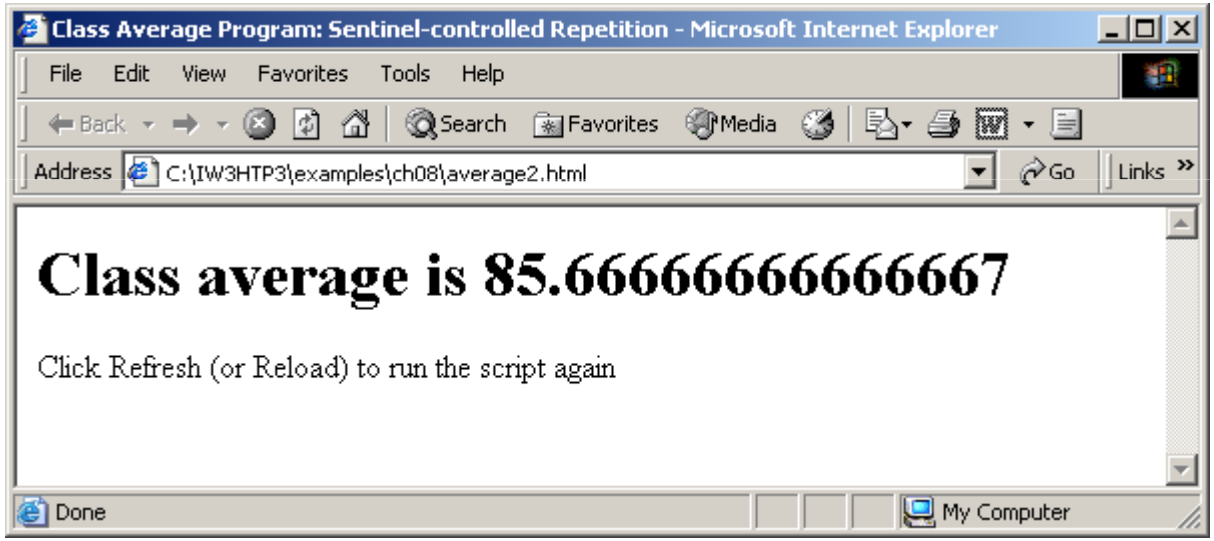
```
25          // Processing phase
26          // prompt for input and read grade from user
27          grade = window.prompt(
28               "Enter Integer Grade, -1 to Quit:", "0" );
29
30          // convert grade from a string to an integer
31          gradeValue = parseInt( grade );
32
33          while ( gradeValue != -1 ) {
34             // add gradeValue to total
35             total = total + gradeValue;
36
37             // add 1 to gradeCounter
38             gradeCounter = gradeCounter + 1;
39
40             // prompt for input and read grade from user
41             grade = window.prompt(
42                  "Enter Integer Grade, -1 to Quit:", "0" );
43
44             // convert grade from a string to an integer
45             gradeValue = parseInt( grade );
46          }
47
```

average2.html
(2 of 3)

```
48          // Termination phase
49          if ( gradeCounter != 0 ) {
50             average = total / gradeCounter;
51
52             // display average of exam grades
53             document.writeln(
54                "<h1>Class average is " + average + "</h1>" );
55          }
56          else
57             document.writeln( "<p>No grades were entered</p>" );
58          // -->
59       </script>
60    </head>
61
62    <body>
63       <p>Click Refresh (or Reload) to run the script again</p>
64    </body>
65 </html>
```

average2.html
(3 of 3)


Explorer User Prompt
Script Prompt:
Enter Integer Grade, -1 to Quit:
OK
Cancel
97


Class Average Program: Sentinel-controlled Repetition - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address C:\IW3HTP3\examples\ch08\average2.html
Go Links
Class average is 85.66666666666667
Click Refresh (or Reload) to run the script again
Done
My Computer

8.10 Formulating Algorithms with Top-Down, Stepwise Refinement: Case Study 3 (Nested Control Structures)

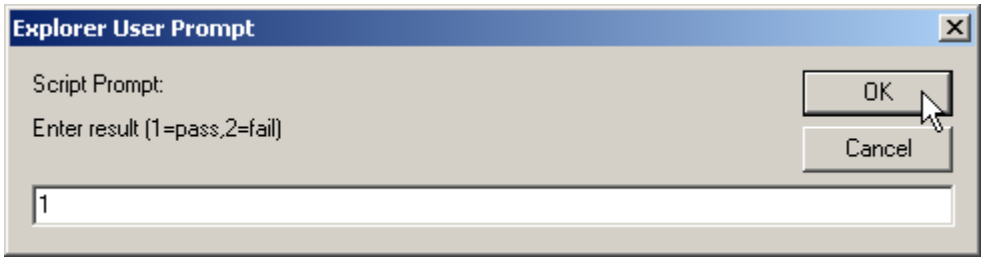
- Consider problem
- Make observations
- Top-down, stepwise refinement

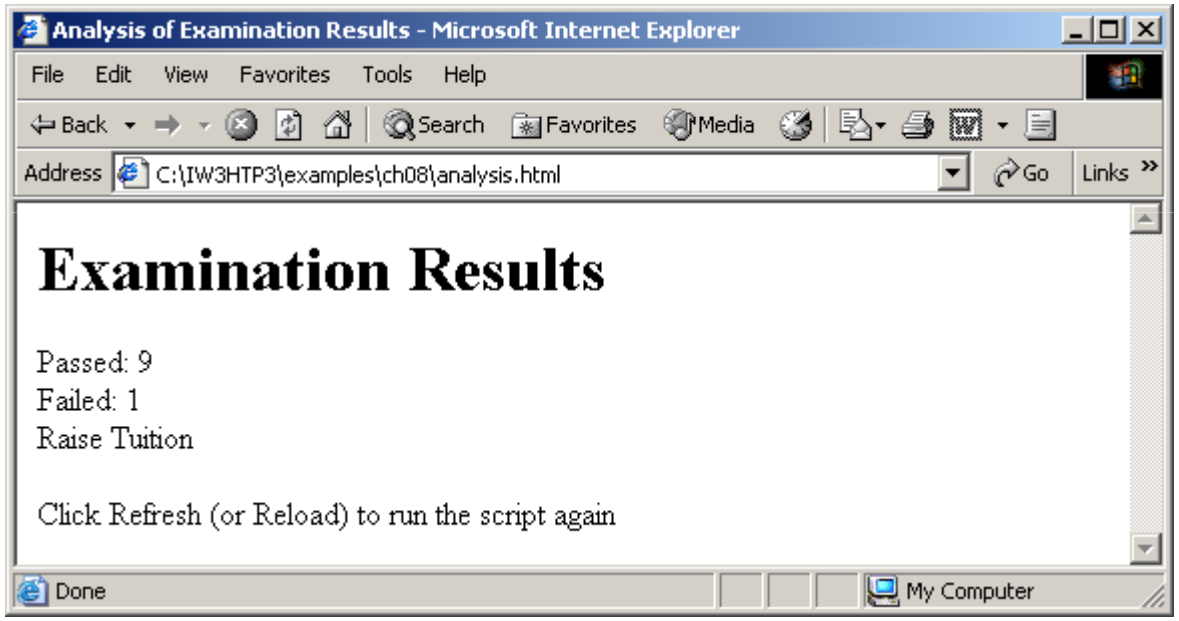
```
1  <?xml version = "1.0"?>
2  <!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
3     "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
4
5  <!-- Fig. 8.11: analysis.html -->
6  <!-- Analyzing Exam Results   -->
7
8  <html xmlns = "http://www.w3.org/1999/xhtml">
9     <head>
10       <title>Analysis of Examination Results</title>
11
12       <script type = "text/javascript">
13          <!--
14          // initializing variables in declarations
15          var passes = 0,      // number of passes
16              failures = 0,    // number of failures
17              student = 1,     // student counter
18              result;          // one exam result
19
20          // process 10 students; counter-controlled loop
21          while ( student <= 10 ) {
22             result = window.prompt(
23                "Enter result (1=pass,2=fail)", "0" );
24
```

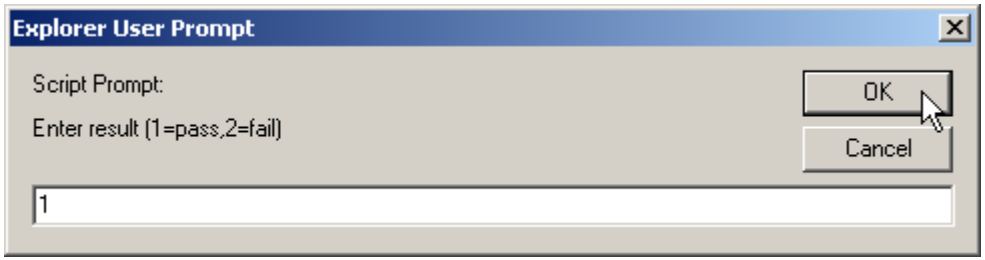
analysis.html
(1 of 2)

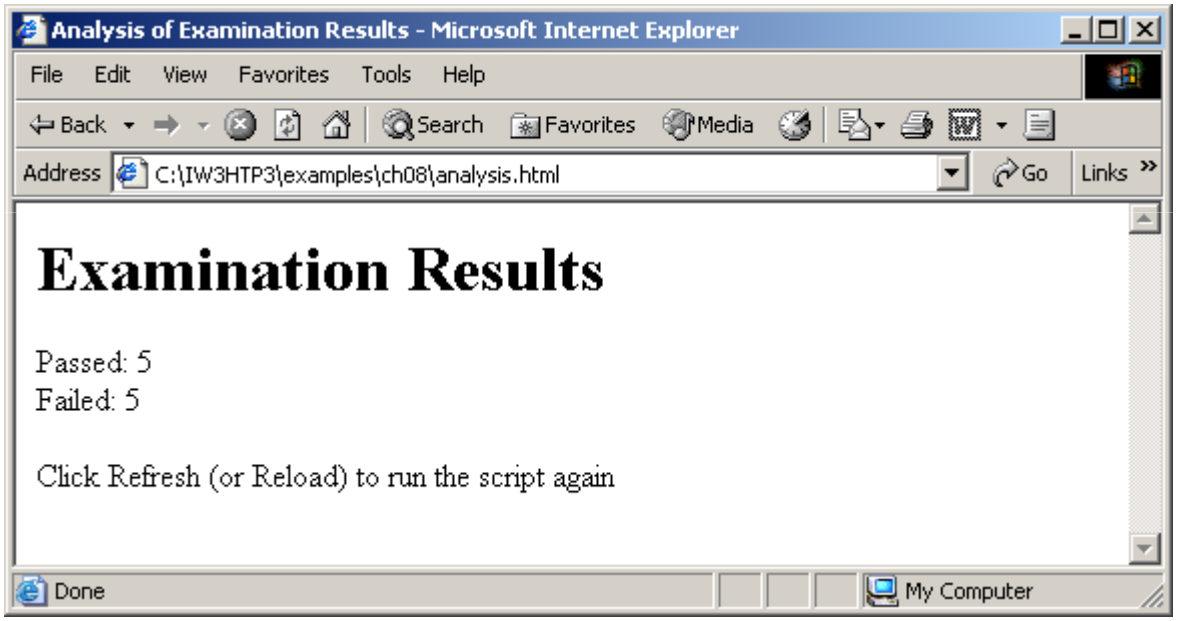
```
25             if ( result == "1" )
26                passes = passes + 1;
27             else
28                failures = failures + 1;
29
30             student = student + 1;
31          }
32
33          // termination phase
34          document.writeln( "<h1>Examination Results</h1>" );
35          document.writeln(
36             "Passed: " + passes + "<br />Failed: " + failures );
37
38          if ( passes > 8 )
39             document.writeln( "<br />Raise Tuition" );
40          // -->
41       </script>
42
43    </head>
44    <body>
45       <p>Click Refresh (or Reload) to run the script again</p>
46    </body>
47 </html>
```

analysis.html
(2 of 2)


Explorer User Prompt
Script Prompt:
Enter result (1=pass,2=fail)
OK
Cancel
1


Analysis of Examination Results - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address C:\IW3HTP3\examples\ch08\analysis.html
Go Links
Examination Results
Passed: 9
Failed: 1
Raise Tuition
Click Refresh (or Reload) to run the script again
Done
My Computer


Explorer User Prompt
Script Prompt:
Enter result (1=pass,2=fail)
OK
Cancel
1


Analysis of Examination Results - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address C:\IW3HTP3\examples\ch08\analysis.html
Go Links
Examination Results
Passed: 5
Failed: 5
Click Refresh (or Reload) to run the script again
Done
My Computer

8.11 Assignment Operators

- Compound assignment operators
  - Abbreviate assignment expressions

8.11 Assignment Operators

Assignment operator	Initial value of variable	Sample expression	Explanation	Assigns
+=	c = 3	c += 7	c = c + 7	10 to c
-=	d = 5	d -= 4	d = d - 4	1 to d
*=	e = 4	e *= 5	e = e * 5	20 to e
/=	f = 6	f /= 3	f = f / 3	2 to f
%=	g = 12	g %= 9	g = g % 9	3 to g

Fig. 8.12 Arithmetic assignment operators.

8.12 Increment and Decrement Operators

- Preincrement or predecrement operator
  - Increment of decrement operator placed before a variable
- Postincrement or postdecrement operator
  - Increment of decrement operator placed after a variable

8.12 Increment and Decrement Operators

Operator	Called	Sample expression	Explanation
`++`	preincrement	`++a`	Increment `a` by 1, then use the new value of `a` in the expression in which `a` resides.
`++`	postincrement	`a++`	Use the current value of `a` in the expression in which `a` resides, then increment `a` by 1.
`--`	predecrement	`--b`	Decrement `b` by 1, then use the new value of `b` in the expression in which `b` resides.
`--`	postdecrement	`b--`	Use the current value of `b` in the expression in which `b` resides, then decrement `b` by 1.

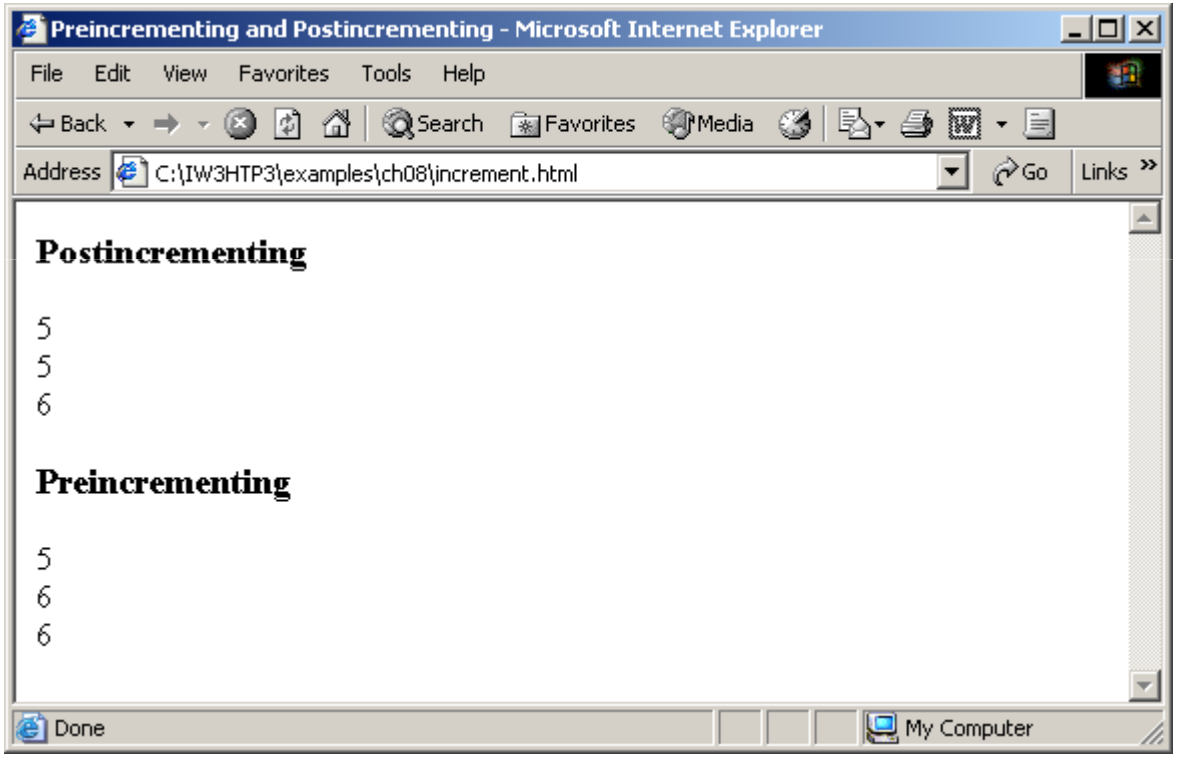
Fig. 8.13 increment and decrement operators.

```
1  <?xml version = "1.0"?>
2  <!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
3     "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
4
5  <!-- Fig. 8.14: increment.html            -->
6  <!-- Preincrementing and Postincrementing -->
7
8  <html xmlns = "http://www.w3.org/1999/xhtml">
9     <head>
10       <title>Preincrementing and Postincrementing</title>
11
12       <script type = "text/javascript">
13          <!--
14          var c;
15
16          c = 5;
17          document.writeln( "<h3>Postincrementing</h3>" );
18          document.writeln( c );            // print 5
19          // print 5 then increment
20          document.writeln( "<br />" + c++ );
21          document.writeln( "<br />" + c );   // print 6
22
23          c = 5;
24          document.writeln( "<h3>Preincrementing</h3>" );
25          document.writeln( c );            // print 5
```

increment.html
(1 of 2)

```
26          // increment then print 6
27          document.writeln( "<br />" + ++c );
28          document.writeln( "<br />" + c );   // print 6
29          // -->
30       </script>
31
32    </head><body></body>
33 </html>
```

increment.html (2 of 2)



8.12 Increment and Decrement Operators

Operator	Associativity	Type
++ --	right to left	unary
* / %	left to right	multiplicative
+ -	left to right	additive
< <= > >=	left to right	relational
== !=	left to right	equality
?:	right to left	conditional
= += -= *= /= %=	right to left	assignment

Fig. 8.15 Precedence and associativity of the operators discussed so far.

8.13 Note on Data Types

- Loosely typed
  - Automatically converts between values of different types

8.14 Web Resources

- www.javascriptmall.com
- developer.netscape.com/tech/javascript
- www.mozilla.org/js/language

Control Statements II

Outline

Objectives

- In this lesson, you will learn:
  - To be able to use the `for` and `do…while` repetition statements to execute statements in a program repeatedly.
  - To understand multiple selection using the `switch` selection statement.
  - To be able to use the `break` and `continue` program-control statements.
  - To be able to use the logical operators.

9.1 Introduction

- Continuation of Chapter 8
  - Theory and principles of structured programming

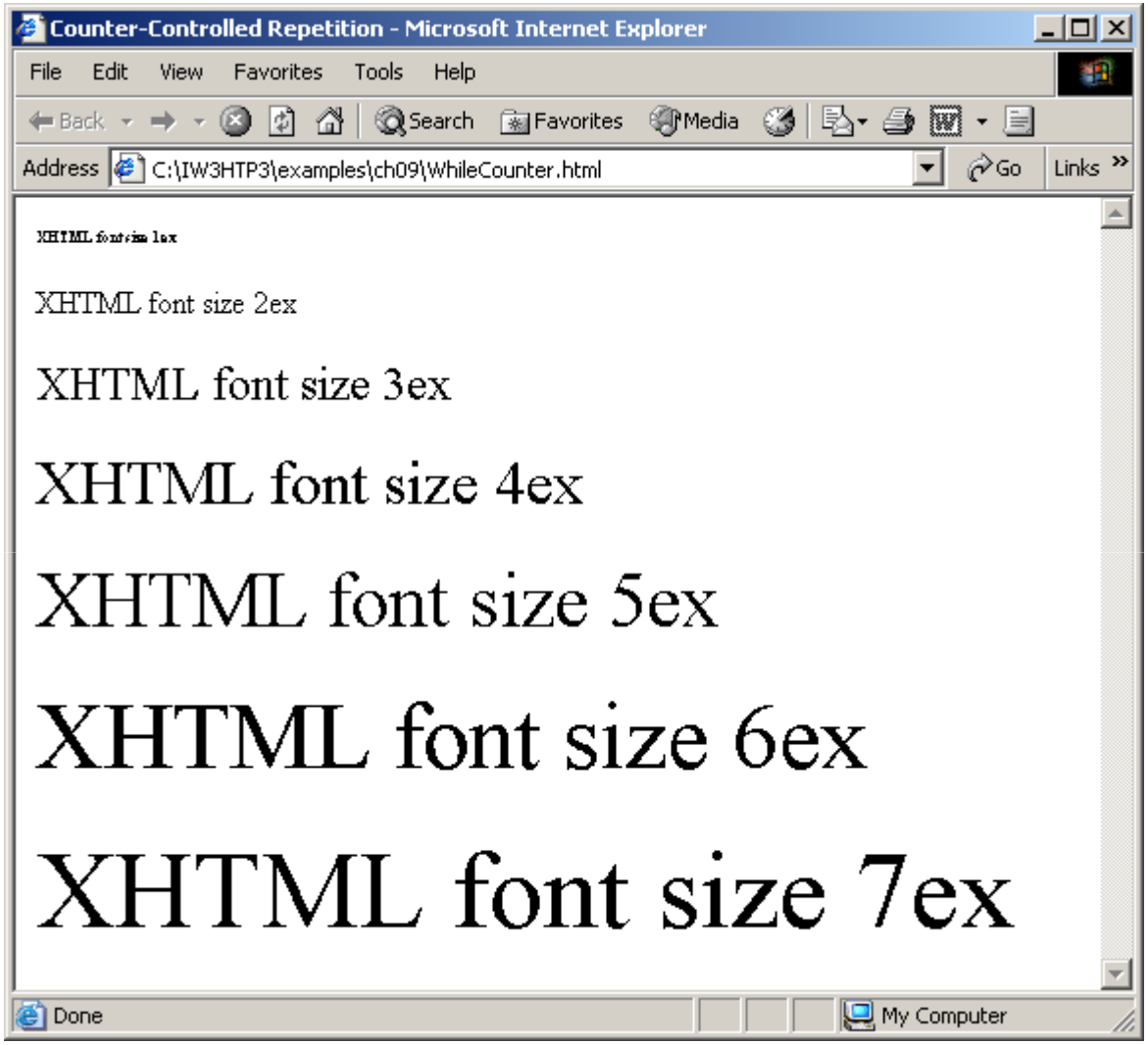
9.2 Essentials of Counter-Controlled Repetition

- Counter-controlled repetition
  - Name of a control
  - Initial value
  - Increment or decrement
  - Final value

```
1  <?xml version = "1.0"?>
2  <!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
3     "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
4
5  <!-- Fig. 9.1: WhileCounter.html   -->
6  <!-- Counter-Controlled Repetition -->
7
8  <html xmlns = "http://www.w3.org/1999/xhtml">
9     <head>
10       <title>Counter-Controlled Repetition</title>
11
12       <script type = "text/javascript">
13          <!--
14          var counter = 1;            // initialization
15
16          while ( counter <= 7 ) {    // repetition condition
17             document.writeln( "<p style = \"font-size: " +
18                counter + "ex\">XHTML font size " + counter +
19                "ex</p>" );
20             ++counter;               // increment
21          }
22          // -->
23       </script>
24
```

WhileCounter.html
(1 of 2)

```
25     </head><body></body>
26  </html>
```



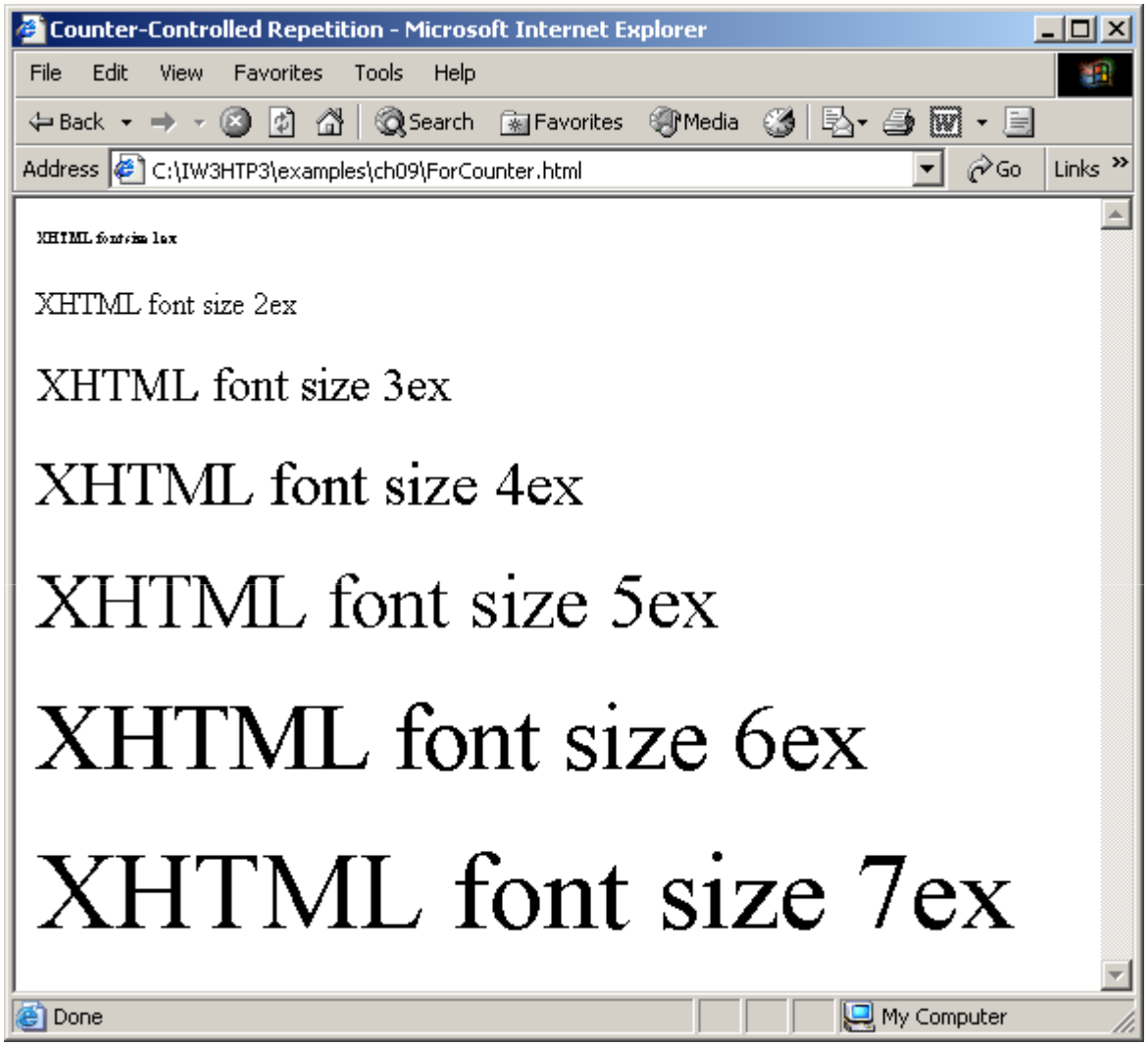
WhileCounter.html
(2 of 2)

9.3 `for` Repetition Statement

- `for` repetition statement
  - Handles all the details of counter-controlled repetition
  - `for` structure header
    - The first line

```
1  <?xml version = "1.0"?>
2  <!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
3     "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
4
5  <!-- Fig. 9.2: ForCounter.html                          -->
6  <!-- Counter-Controlled Repetition with for statement -->
7
8  <html xmlns = "http://www.w3.org/1999/xhtml">
9     <head>
10       <title>Counter-Controlled Repetition</title>
11
12       <script type = "text/javascript">
13          <!--
14          // Initialization, repetition condition and
15          // incrementing are all included in the for
16          // statement header.
17          for ( var counter = 1; counter <= 7; ++counter )
18             document.writeln( "<p style = \"font-size: " +
19                counter + "ex\">XHTML font size " + counter +
20                "ex</p>" );
21          // -->
22       </script>
23
24    </head><body></body>
25 </html>
```

ForCounter.html
(1 of 1)


Counter-Controlled Repetition - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address C:\IW3HTP3\examples\ch09\ForCounter.html
Go Links
XHTML font size 1ex
XHTML font size 2ex
XHTML font size 3ex
XHTML font size 4ex
XHTML font size 5ex
XHTML font size 6ex
XHTML font size 7ex
Done
My Computer

9.3 `for` Repetition Statement

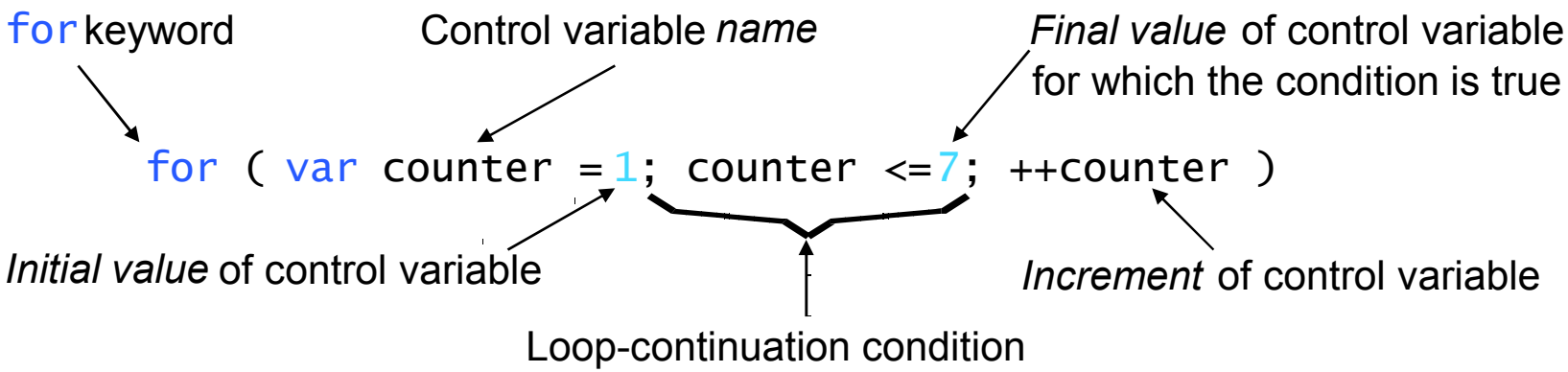


Fig. 9.3 `for` statement header components.

9.3 `for` Repetition Statement

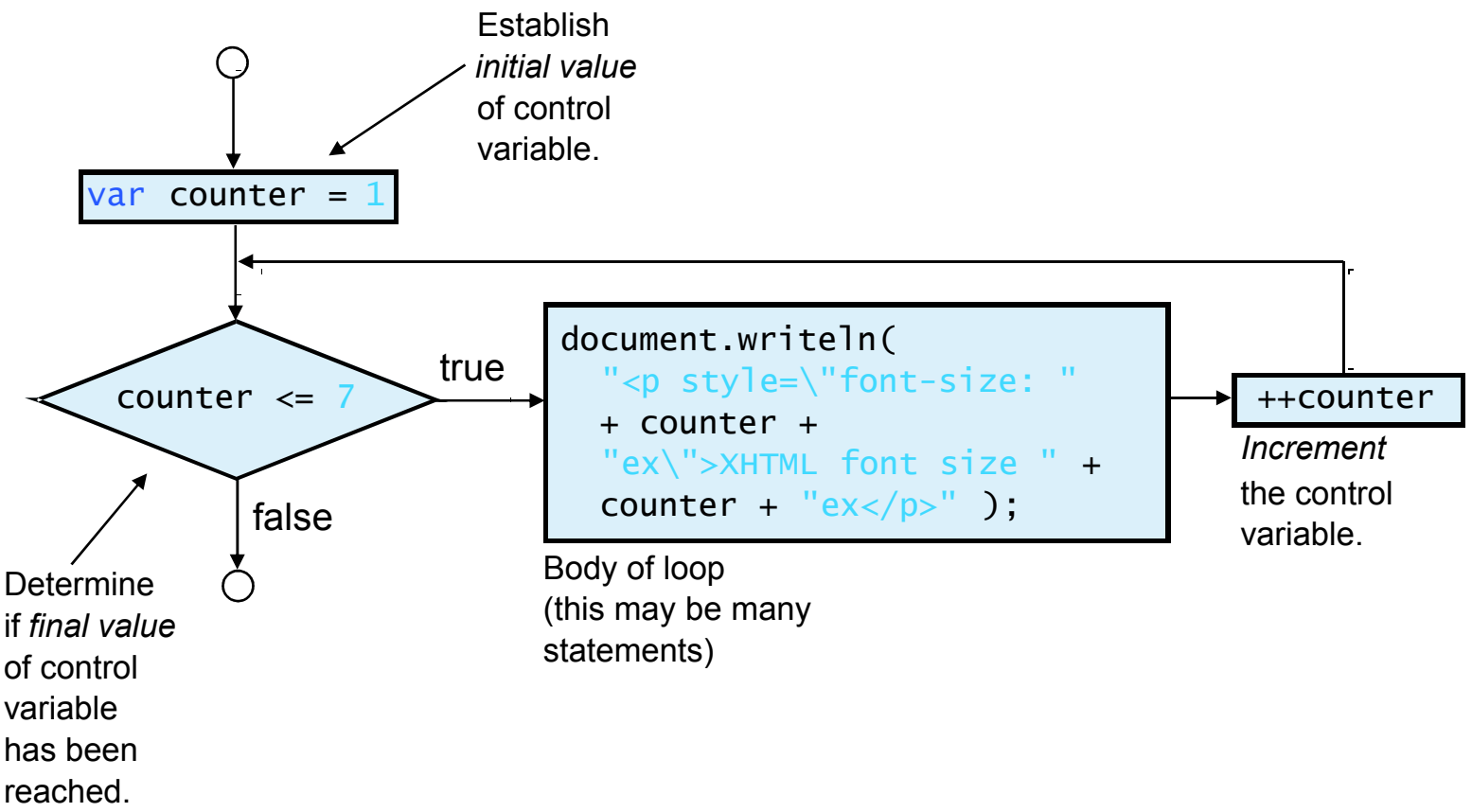


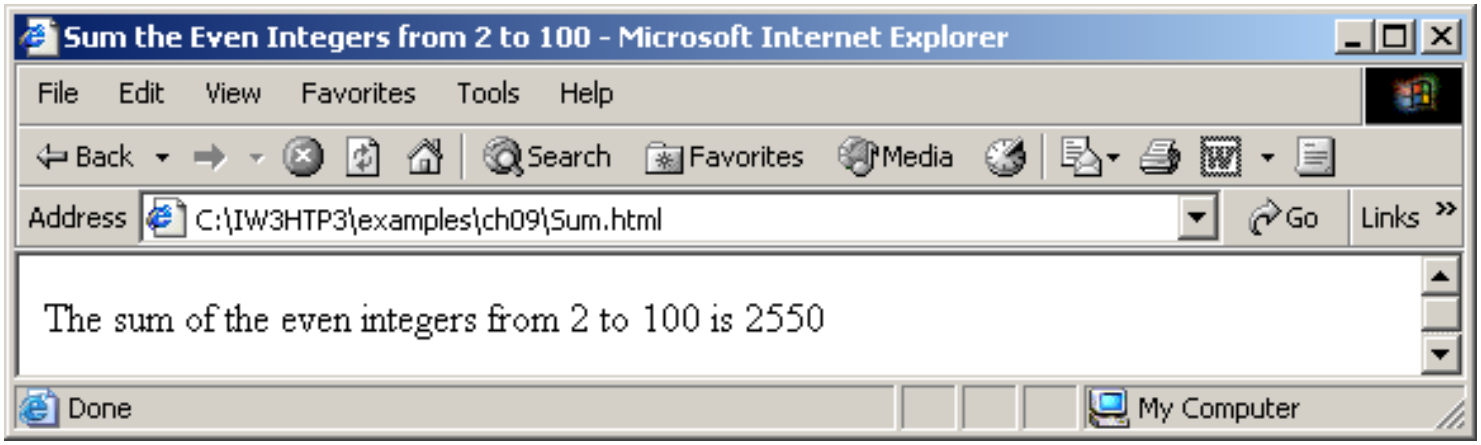
Fig. 9.4 `for` repetition structure flowchart.

9.4 Examples Using the `for` Statement

- Summation with `for`
- Compound interest calculation with `for` loop
  - `Math` object
    - Method `pow`
    - Method `round`

```
1  <?xml version = "1.0"?>
2  <!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
3     "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
4
5  <!-- Fig. 9.5: Sum.html                    -->
6  <!-- Using the for repetition statement -->
7
8  <html xmlns = "http://www.w3.org/1999/xhtml">
9     <head>
10       <title>Sum the Even Integers from 2 to 100</title>
11
12       <script type = "text/javascript">
13          <!--
14          var sum = 0;
15
16          for ( var number = 2; number <= 100; number += 2 )
17             sum += number;
18
19          document.writeln( "The sum of the even integers " +
20             "from 2 to 100 is " + sum );
21          // -->
22       </script>
23
24    </head><body></body>
25 </html>
```

Sum.html
(1 of 1)

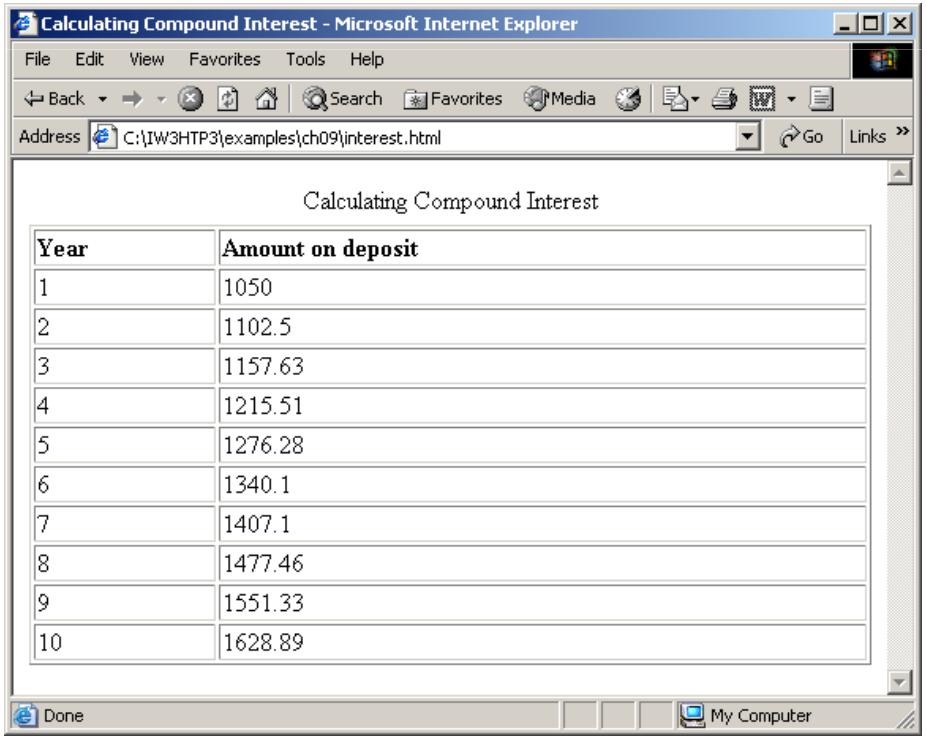

Sum the Even Integers from 2 to 100 - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address C:\IW3HTP3\examples\ch09\Sum.html
Go Links
The sum of the even integers from 2 to 100 is 2550
Done
My Computer

```
1  <?xml version = "1.0"?>
2  <!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
3     "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
4
5  <!-- Fig. 9.6: Interest.html            -->
6  <!-- Using the for repetition statement -->
7
8  <html xmlns = "http://www.w3.org/1999/xhtml">
9     <head>
10       <title>Calculating Compound Interest</title>
11
12       <script type = "text/javascript">
13          <!--
14          var amount, principal = 1000.0, rate = .05;
15
16          document.writeln(
17             "<table border = \"1\" width = \"100%\">" );
18          document.writeln(
19             "<caption>Calculating Compound Interest</caption>" );
20          document.writeln(
21             "<thead><tr><th align = \"left\">Year</th>" );
22          document.writeln(
23             "<th align = \"left\">Amount on deposit</th>" );
24          document.writeln( "</tr></thead>" );
25
```

Interest.html
(1 of 2)

```
26          for ( var year = 1; year <= 10; ++year ) {
27             amount = principal * Math.pow( 1.0 + rate, year );
28             document.writeln( "<tbody><tr><td>" + year +
29                "</td><td>" + Math.round( amount * 100 ) / 100 +
30                "</td></tr>" );
31          }
32
33          document.writeln( "</tbody></table>" );
34          // -->
35       </script>
36
37    </head><body></body>
38 </html>
```

Interest.html
(2 of 2)



9.5 `switch` Multiple-Selection Statement

- Controlling expression
- Case labels
- Default case

```
1  <?xml version = "1.0"?>
2  <!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
3     "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
4
5  <!-- Fig. 9.7: SwitchTest.html  -->
6  <!-- Using the switch statement -->
7
8  <html xmlns = "http://www.w3.org/1999/xhtml">
9     <head>
10       <title>Switching between XHTML List Formats</title>
11
12       <script type = "text/javascript">
13          <!--
14          var choice,             // user's choice
15              startTag,           // starting list item tag
16              endTag,             // ending list item tag
17              validInput = true,  // indicates if input is valid
18              listType;           // list type as a string
19
20          choice = window.prompt( "Select a list style:\n" +
21              "1 (bullet), 2 (numbered), 3 (lettered)", "1" );
22
```

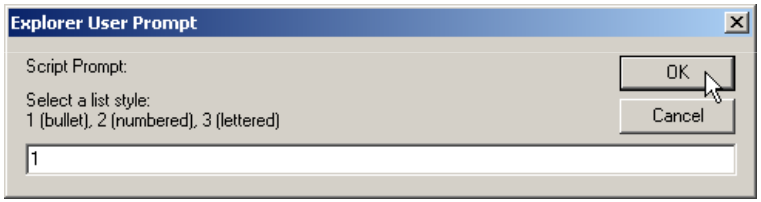
SwitchTest.html
(1 of 3)

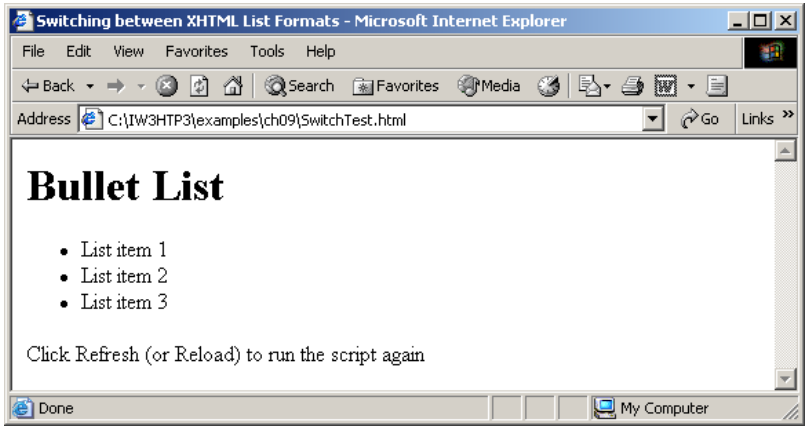
```
23          switch ( choice ) {
24             case "1":
25                startTag = "<ul>";
26                endTag = "</ul>";
27                listType = "<h1>Bullet List</h1>";
28                break;
29             case "2":
30                startTag = "<ol>";
31                endTag = "</ol>";
32                listType = "<h1>Ordered List: Numbered</h1>";
33                break;
34             case "3":
35                startTag = "<ol type = \"A\">";
36                endTag = "</ol>";
37                listType = "<h1>Ordered List: Lettered</h1>";
38                break;
39            default:
40                validInput = false;
41          }
42
43          if ( validInput == true ) {
44             document.writeln( listType + startTag );
45
46             for ( var i = 1; i <= 3; ++i )
47                document.writeln( "<li>List item " + i + "</li>" );
```

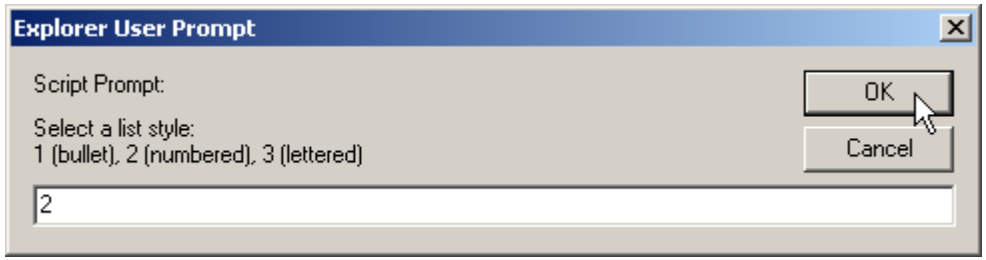
SwitchTest.html
(2 of 3)

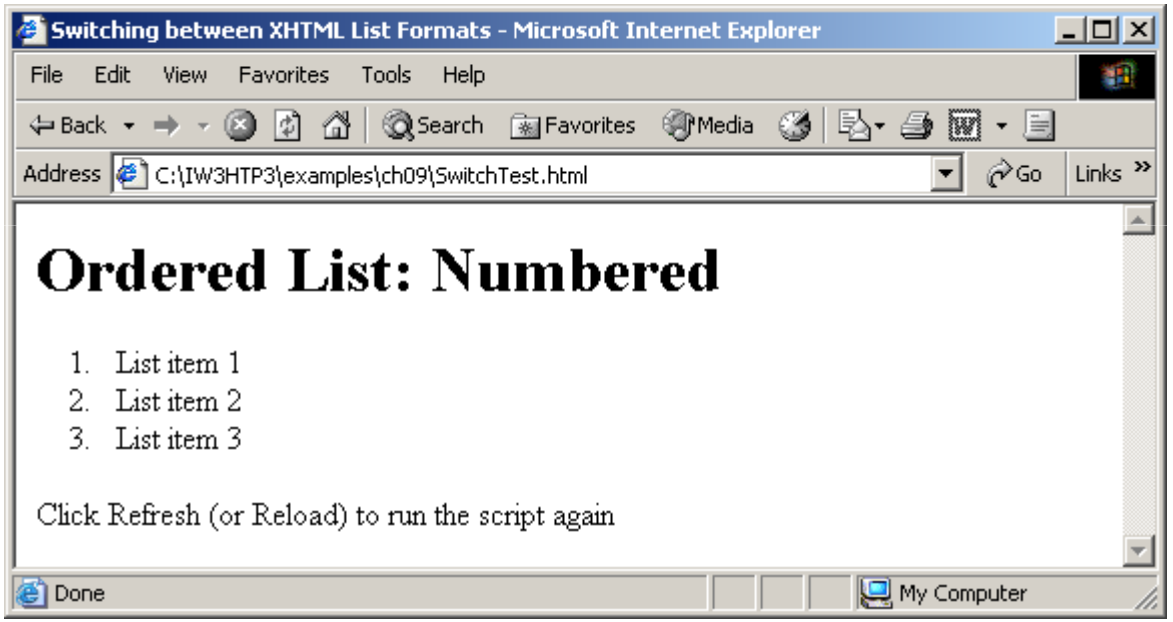
```
48
49             document.writeln( endTag );
50          }
51          else
52             document.writeln( "Invalid choice: " + choice );
53          // -->
54       </script>
55
56    </head>
57    <body>
58       <p>Click Refresh (or Reload) to run the script again</p>
59    </body>
60 </html>
```

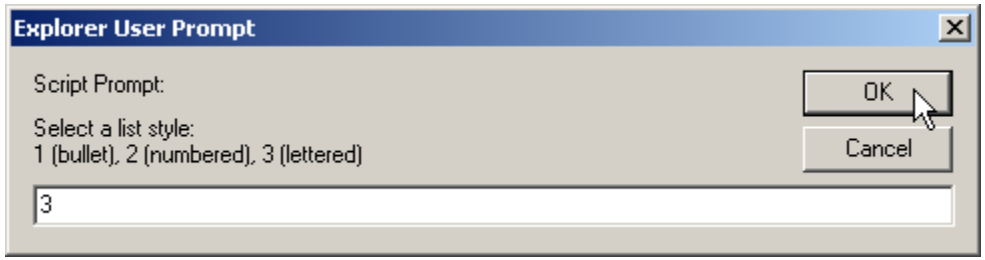
SwitchTest.html (3 of 3)

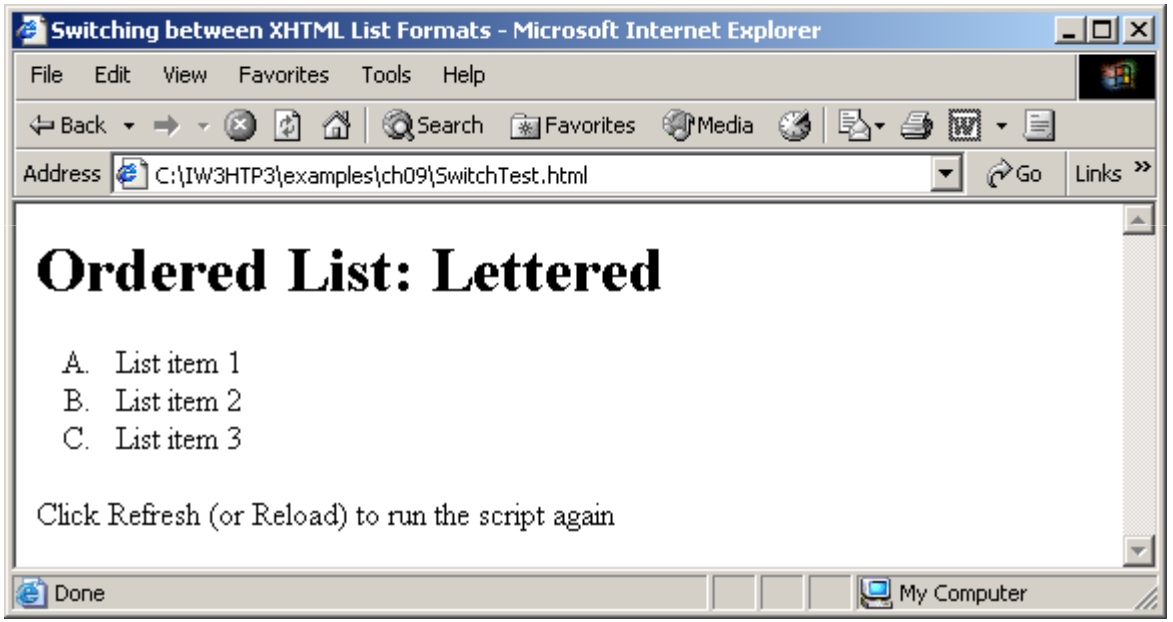




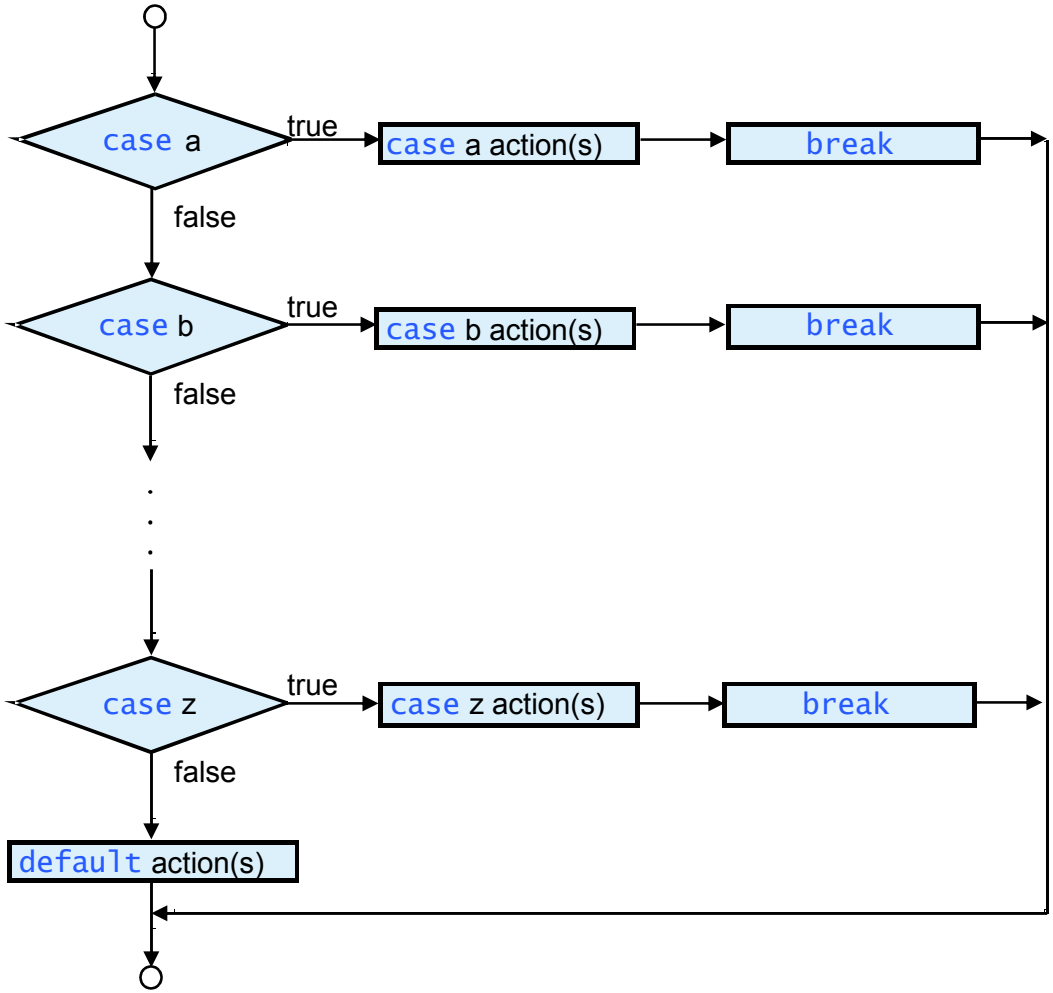

Explorer User Prompt
Script Prompt:
Select a list style:
1 (bullet), 2 (numbered), 3 (lettered)
OK
Cancel
2


Switching between XHTML List Formats - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address C:\IW3HTP3\examples\ch09\SwitchTest.html
Go Links
Ordered List: Numbered
1. List item 1
2. List item 2
3. List item 3
Click Refresh (or Reload) to run the script again
Done
My Computer


Explorer User Prompt
Script Prompt:
Select a list style:
1 (bullet), 2 (numbered), 3 (lettered)
OK
Cancel
3


Switching between XHTML List Formats - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address C:\IW3HTP3\examples\ch09\SwitchTest.html
Go Links
Ordered List: Lettered
A. List item 1
B. List item 2
C. List item 3
Click Refresh (or Reload) to run the script again
Done
My Computer

9.5 `switch` Multiple-Selection Statement



9.6 `do...while` Repetition Statement

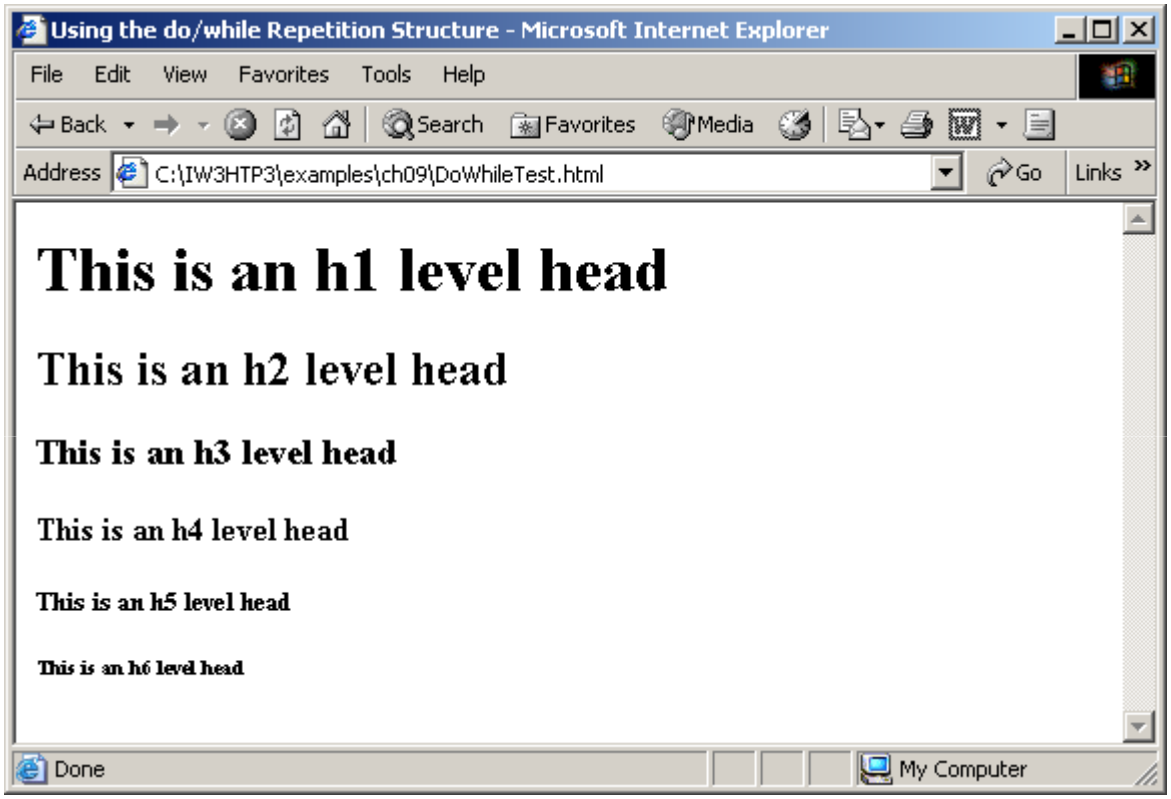
- Similar to the `while` statement
- Tests the loop continuation condition after the loop body executes
- Loop body always executes at least once

```
1  <?xml version = "1.0"?>
2  <!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
3     "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
4
5  <!-- Fig. 9.9: DoWhileTest.html     -->
6  <!-- Using the do...while statement -->
7
8  <html xmlns = "http://www.w3.org/1999/xhtml">
9     <head>
10       <title>Using the do...while Repetition Statement</title>
11
12       <script type = "text/javascript">
13          <!--
14          var counter = 1;
15
16          do {
17             document.writeln( "<h" + counter + ">This is " +
18                "an h" + counter + " level head" + "</h" +
19                counter + ">" );
20
21             ++counter;
22          } while ( counter <= 6 );
23          // -->
24       </script>
```

DoWhileTest.html
(1 of 2)

```
25
26      </head><body></body>
27  </html>
```

DoWhileTest.html
(2 of 2)



9.6 do…while Repetition Structure

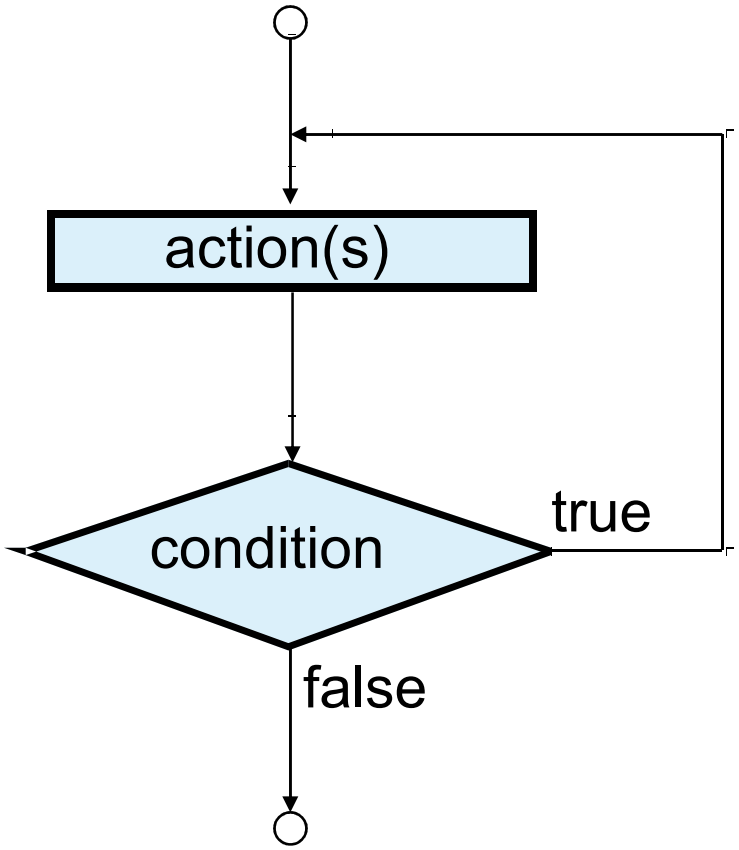


Fig. 9.10 do…while repetition statement flowchart.

9.7 `break` and `continue` Statements

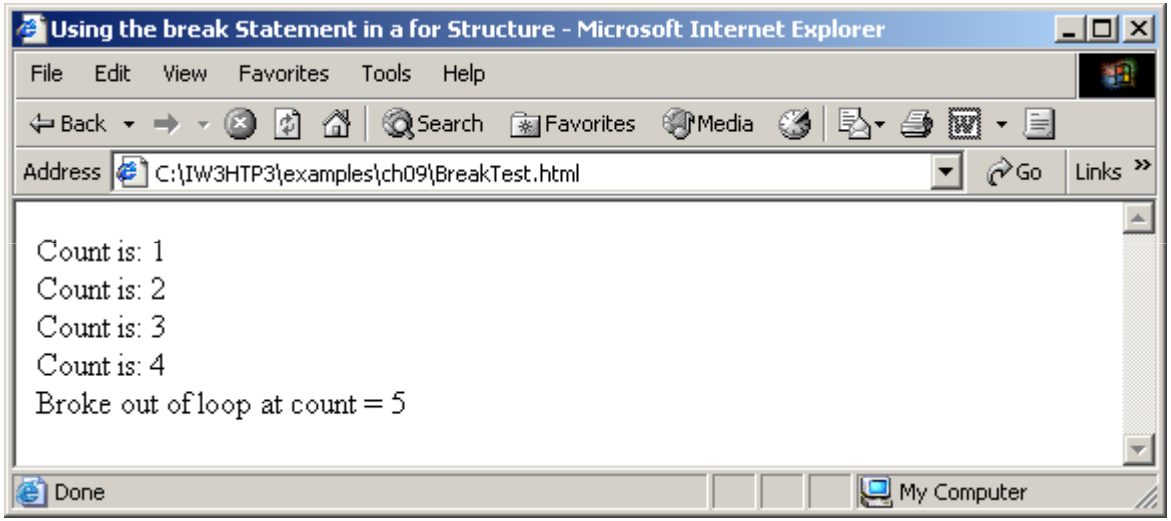
- `break`
  - Immediate exit from the structure
  - Used to escape early from a loop
  - Skip the remainder of a `switch` statement
- `continue`
  - Skips the remaining statements in the body of the structure
  - Proceeds with the next iteration of the loop

```
1  <?xml version = "1.0"?>
2  <!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
3     "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
4
5  <!-- Fig. 9.11: BreakTest.html    -->
6  <!-- Using the break statement    -->
7
8  <html xmlns = "http://www.w3.org/1999/xhtml">
9     <head>
10       <title>
11          Using the break Statement in a for Structure
12       </title>
13
14       <script type = "text/javascript">
15          <!--
16          for ( var count = 1; count <= 10; ++count ) {
17             if ( count == 5 )
18                break;  // break loop only if count == 5
19
20             document.writeln( "Count is: " + count + "<br />" );
21          }
22
```

BreakTest.html
(1 of 2)

```
23          document.writeln(
24             "Broke out of loop at count = " + count );
25          // -->
26       </script>
27
28    </head><body></body>
29 </html>
```

BreakTest.html
(2 of 2)

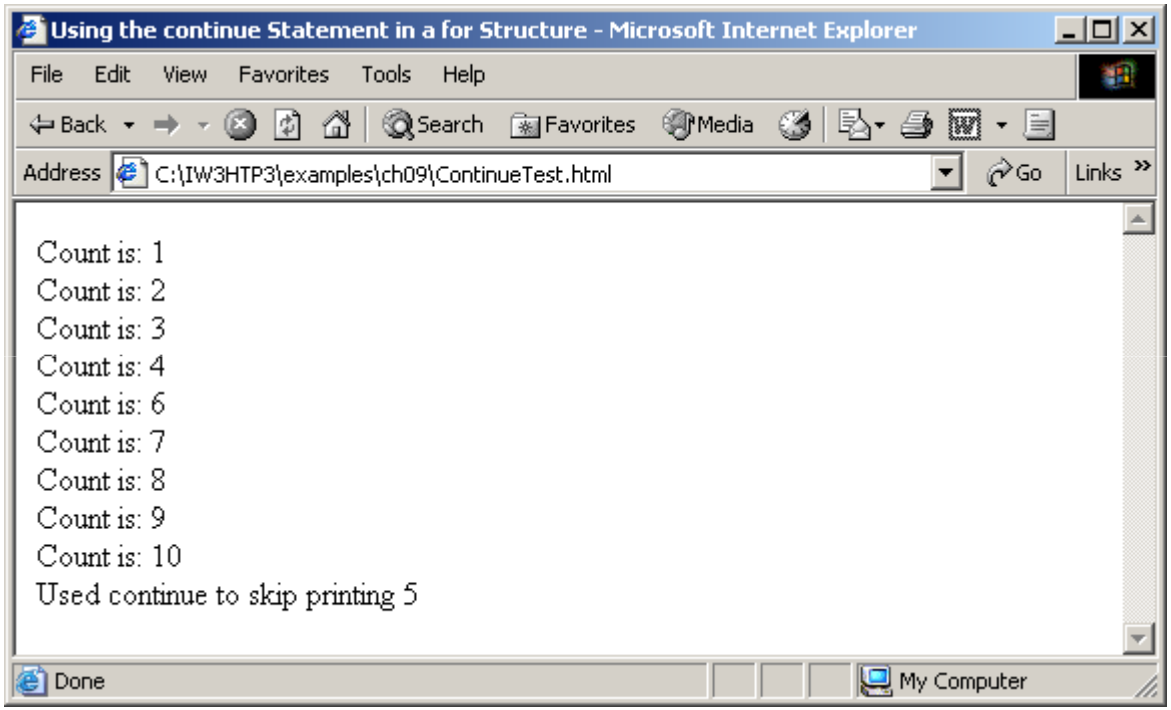


```
1  <?xml version = "1.0"?>
2  <!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
3     "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
4
5  <!-- Fig. 9.12: ContinueTest.html  -->
6  <!-- Using the break statement     -->
7
8  <html xmlns = "http://www.w3.org/1999/xhtml">
9     <head>
10       <title>
11          Using the continue Statement in a for Structure
12       </title>
13
14       <script type = "text/javascript">
15          <!--
16          for ( var count = 1; count <= 10; ++count ) {
17             if ( count == 5 )
18                continue;  // skip remaining code in loop
19                           // only if count == 5
20
21             document.writeln( "Count is: " + count + "<br />" );
22          }
23
```

ContinueTest.html
(1 of 2)

```
24          document.writeln( "Used continue to skip printing 5" );
25          // -->
26       </script>
27
28    </head><body></body>
29 </html>
```

ContinueTest.html (2 of 2)



9.8 Labeled `break` and `continue` Statements

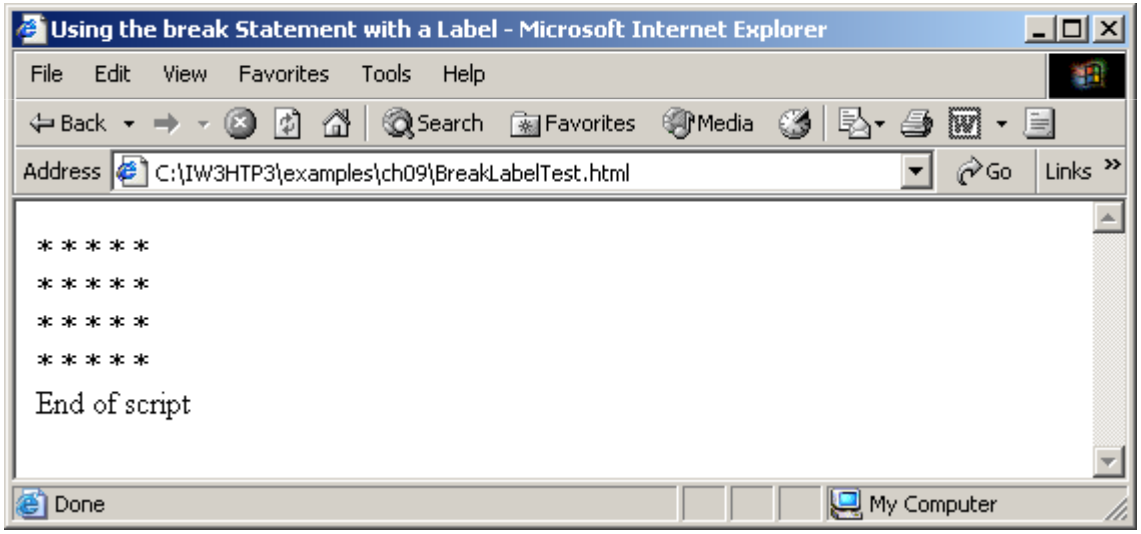
- Labeled `break` statement
  - Break out of a nested set of structures
  - Immediate exit from that structure and enclosing repetition structures
  - Execution resumes with first statement after enclosing labeled statement
- Labeled `continue` statement
  - Skips the remaining statements in structure's body and enclosing repetition structures
  - Proceeds with next iteration of enclosing labeled repetition structure
  - Loop-continuation test evaluates immediately after the `continue` statement executes

```
1  <?xml version = "1.0"?>
2  <!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
3     "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
4
5  <!-- Fig. 9.13: BreakLabelTest.html         -->
6  <!-- Using the break statement with a Label -->
7
8  <html xmlns = "http://www.w3.org/1999/xhtml">
9     <head>
10       <title>Using the break Statement with a Label</title>
11
12       <script type = "text/javascript">
13          <!--
14          stop: {   // labeled block
15             for ( var row = 1; row <= 10; ++row ) {
16                for ( var column = 1; column <= 5 ; ++column ) {
17
18                   if ( row == 5 )
19                      break stop; // jump to end of stop block
20
21                   document.write( "* " );
22                }
23
24                document.writeln( "<br />" );
25             }
```

BreakLabelTest.html
(1 of 2)

```
26
27             // the following line is skipped
28             document.writeln( "This line should not print" );
29          }
30
31          document.writeln( "End of script" );
32          // -->
33       </script>
34
35    </head><body></body>
36 </html>
```

BreakLabelTest.html
(2 of 2)

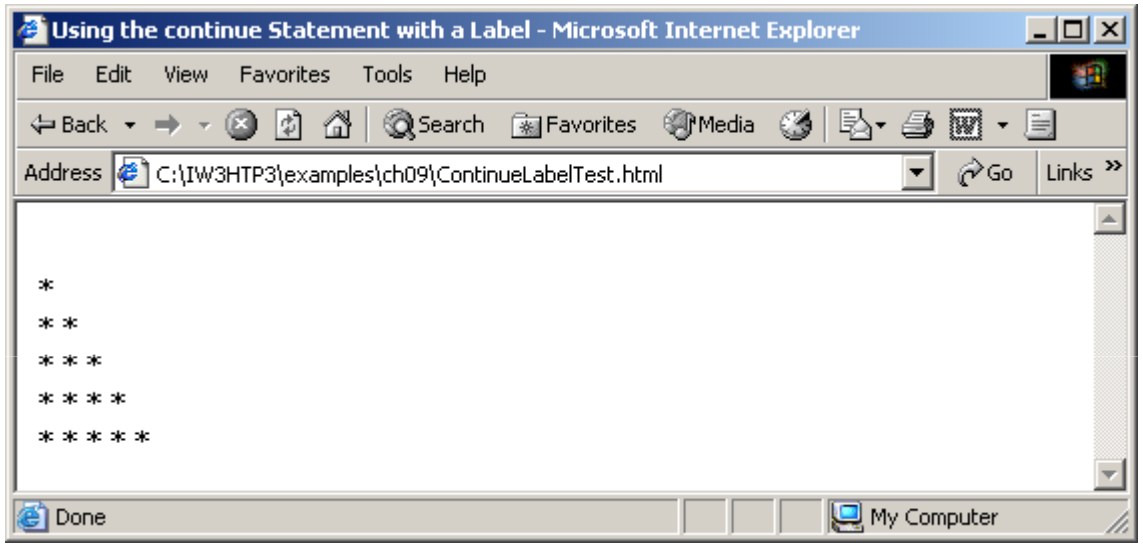


```
1  <?xml version = "1.0"?>
2  <!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
3     "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
4
5  <!-- Fig. 9.14: ContinueLabelTest.html -->
6  <!-- Using the continue statement      -->
7
8  <html xmlns = "http://www.w3.org/1999/xhtml">
9     <head>
10       <title>Using the continue Statement with a Label</title>
11
12       <script type = "text/javascript">
13          <!--
14          nextRow:    // target label of continue statement
15             for ( var row = 1; row <= 5; ++row ) {
16                document.writeln( "<br />" );
17
18                for ( var column = 1; column <= 10; ++column ) {
19
20                   if ( column > row )
21                      continue nextRow; // next iteration of
22                                        // labeled loop
23
24                   document.write( "* " );
25                }
```

ContinueLabelTest.html
(1 of 2)

```
26            }
27         // -->
28      </script>
29
30   </head><body></body>
31 </html>
```

ContinueLabelTest.html
(2 of 2)



9.9 Logical Operators

- More logical operators
  - Logical AND (&&)
  - Logical OR (||)
  - Logical NOT (!)

9.9 Logical Operators

expression1	expression2	expression1 && expression2
false	false	false
false	true	false
true	false	false
true	true	true

Fig. 9.15 Truth table for the && (logical AND) operator.

9.9 Logical Operators

expression1	expression2	expression1 || expression2
false	false	false
false	true	true
true	false	true
true	true	true

Fig. 9.16 Truth table for the || (logical OR) operator.

expression	!expression
false	true
true	false

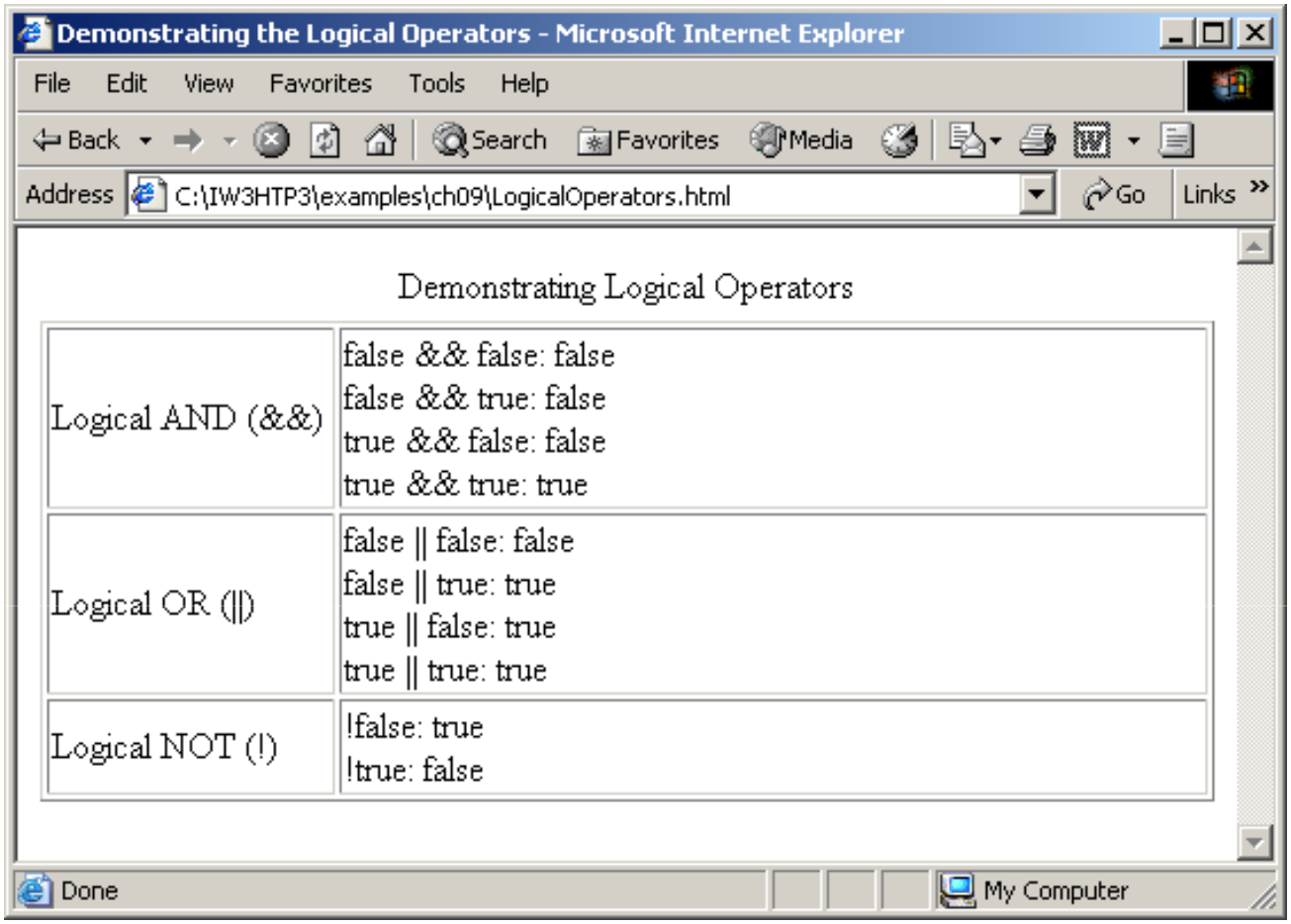
Fig. 9.17 Truth table for operator ! (logical negation).

```
1  <?xml version = "1.0"?>
2  <!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
3     "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
4
5  <!-- Fig. 9.18: LogicalOperators.html  -->
6  <!-- Demonstrating Logical Operators    -->
7
8  <html xmlns = "http://www.w3.org/1999/xhtml">
9     <head>
10       <title>Demonstrating the Logical Operators</title>
11
12       <script type = "text/javascript">
13          <!--
14          document.writeln(
15             "<table border = \"1\" width = \"100%\">" );
16
17          document.writeln(
18             "<caption>Demonstrating Logical " +
19             "Operators</caption" );
20
21          document.writeln(
22             "<tr><td width = \"25%\">Logical AND (&&)</td>" +
23             "<td>false && false: " + ( false && false ) +
24             "<br />false && true: " + ( false && true ) +
25             "<br />true && false: " + ( true && false ) +
```

LogicalOperators.html
(1 of 2)

```
26             "<br />true && true: " + ( true && true ) +
27             "</td>" );
28
29          document.writeln(
30             "<tr><td width = \"25%\">Logical OR (||)</td>" +
31             "<td>false || false: " + ( false || false ) +
32             "<br />false || true: " + ( false || true ) +
33             "<br />true || false: " + ( true || false ) +
34             "<br />true || true: " + ( true || true ) +
35             "</td>" );
36
37          document.writeln(
38             "<tr><td width = \"25%\">Logical NOT (!)</td>" +
39             "<td>!false: " + ( !false ) +
40             "<br />!true: " + ( !true ) + "</td>" );
41
42          document.writeln( "</table>" );
43          // -->
44       </script>
45
46    </head><body></body>
47 </html>
```

LogicalOperators.html
(2 of 2)


Demonstrating the Logical Operators - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address C:\IW3HTP3\examples\ch09\LogicalOperators.html
Go Links
Demonstrating Logical Operators
Logical AND (&&)
false && false: false
false && true: false
true && false: false
true && true: true
Logical OR (||)
false || false: false
false || true: true
true || false: true
true || true: true
Logical NOT (!)
!false: true
!true: false
Done
My Computer

9.9 Logical Operators

Operator	Associativity	Type
++ -- !	right to left	unary
* / %	left to right	multiplicative
+ -	left to right	additive
< <= > >=	left to right	relational
== !=	left to right	equality
&&	left to right	logical AND
||	left to right	logical OR
?:	right to left	conditional
= += -= *= /= %=	right to left	assignment

Fig. 9.19 Precedence and associativity of the operators discussed so far.

9.10 Summary of Structured Programming

- Flowcharts
  - Reveal the structured nature of programs
- Single-entry/single-exit control structures
  - Only one way to enter and one way to exit each control structure
- Control structure stacking
  - The exit point of one control structure is connected to the entry point of the next control structure

9.10 Summary of Structured Programming

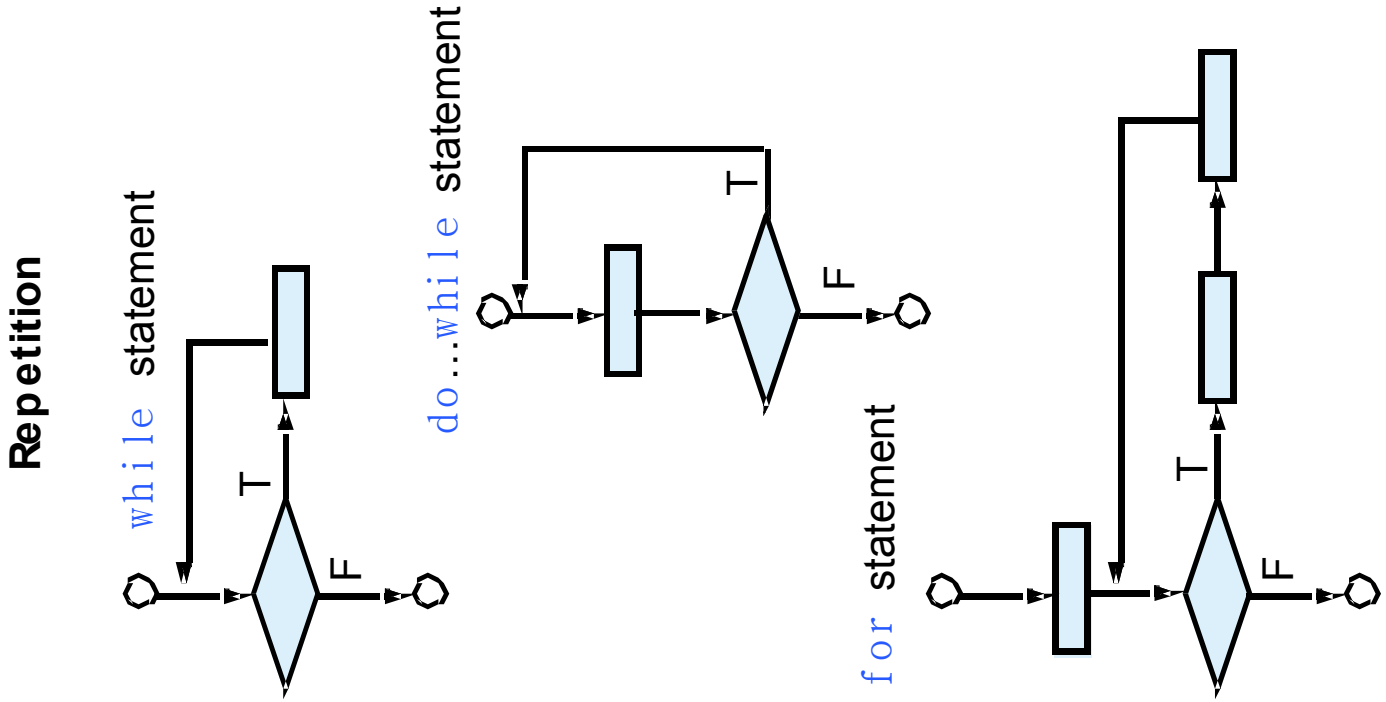


Fig. 9.20 Single-entry/single-exit sequence, selection and repetition structures. (1 of 3)

9.10 Summary of Structured Programming

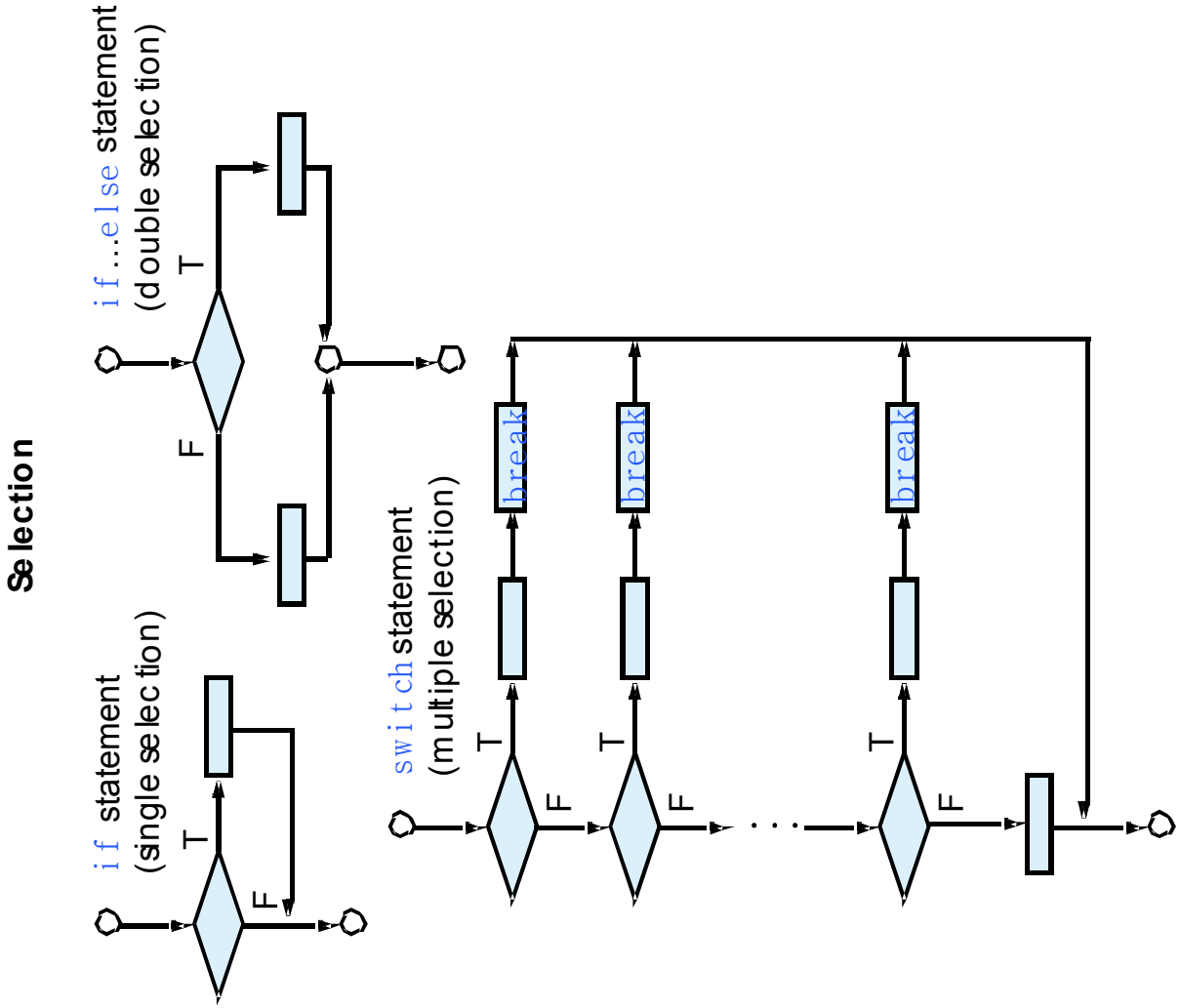


Fig. 9.20 Single-entry/single-exit sequence, selection and repetition structures. (2 of 3)

9.10 Summary of Structured Programming

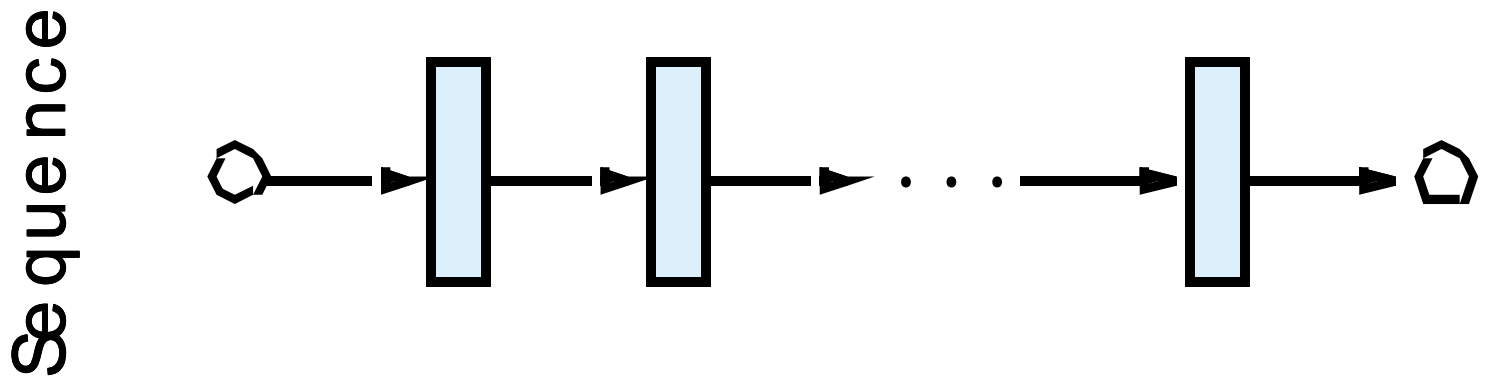


Fig. 9.20 Single-entry/single-exit sequence, selection and repetition structures. (3 of 3)

9.10 Summary of Structured Programming

Rules for Forming Structured Programs	
1)	Begin with the "simplest flowchart" (Fig. 9.22).
2)	Any rectangle (action) can be replaced by two rectangles (actions) in sequence.
3)	Any rectangle (action) can be replaced by any control structure (sequence, `if`, `if...else`, `switch`, `while`, `do...while` or `for`).
4)	Rules 2 and 3 may be applied as often as you like and in any order.

Fig. 9.21 Rules for forming structured programs.

9.10 Summary of Structured Programming

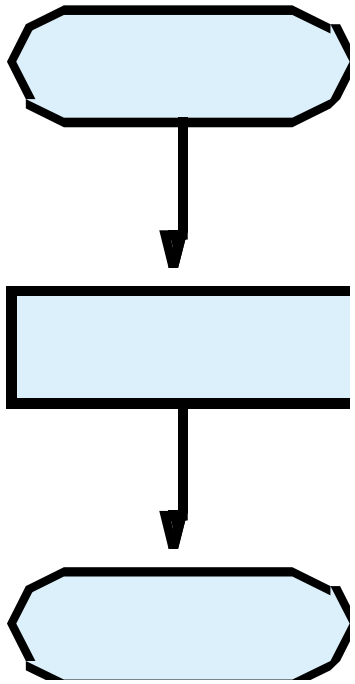


Fig. 9.22 Simplest flowchart.

9.10 Summary of Structured Programming

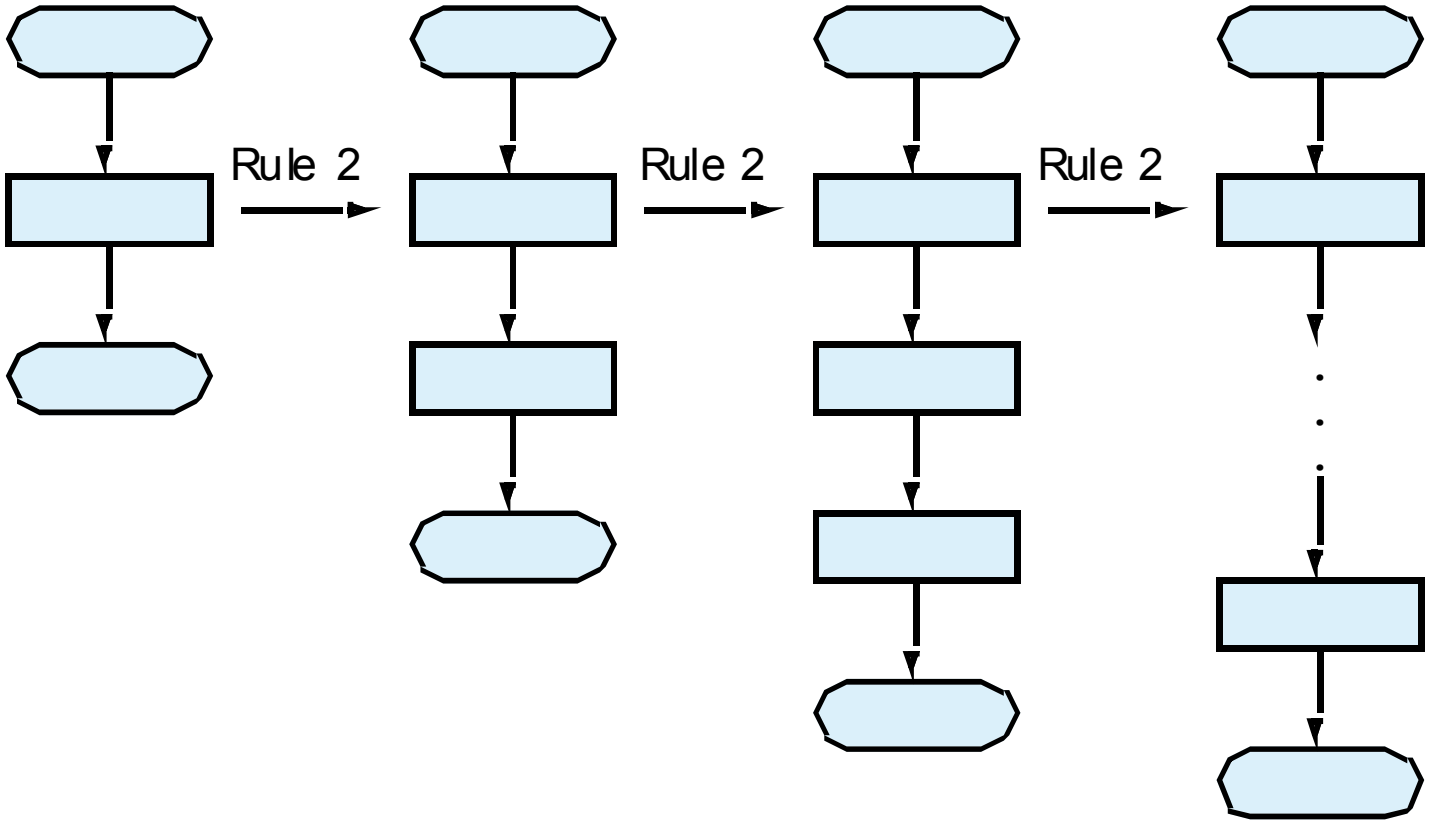


Fig. 9.23 Repeatedly applying rule 2 of Fig. 9.21 to the simplest flowchart.

9.10 Summary of Structured Programming

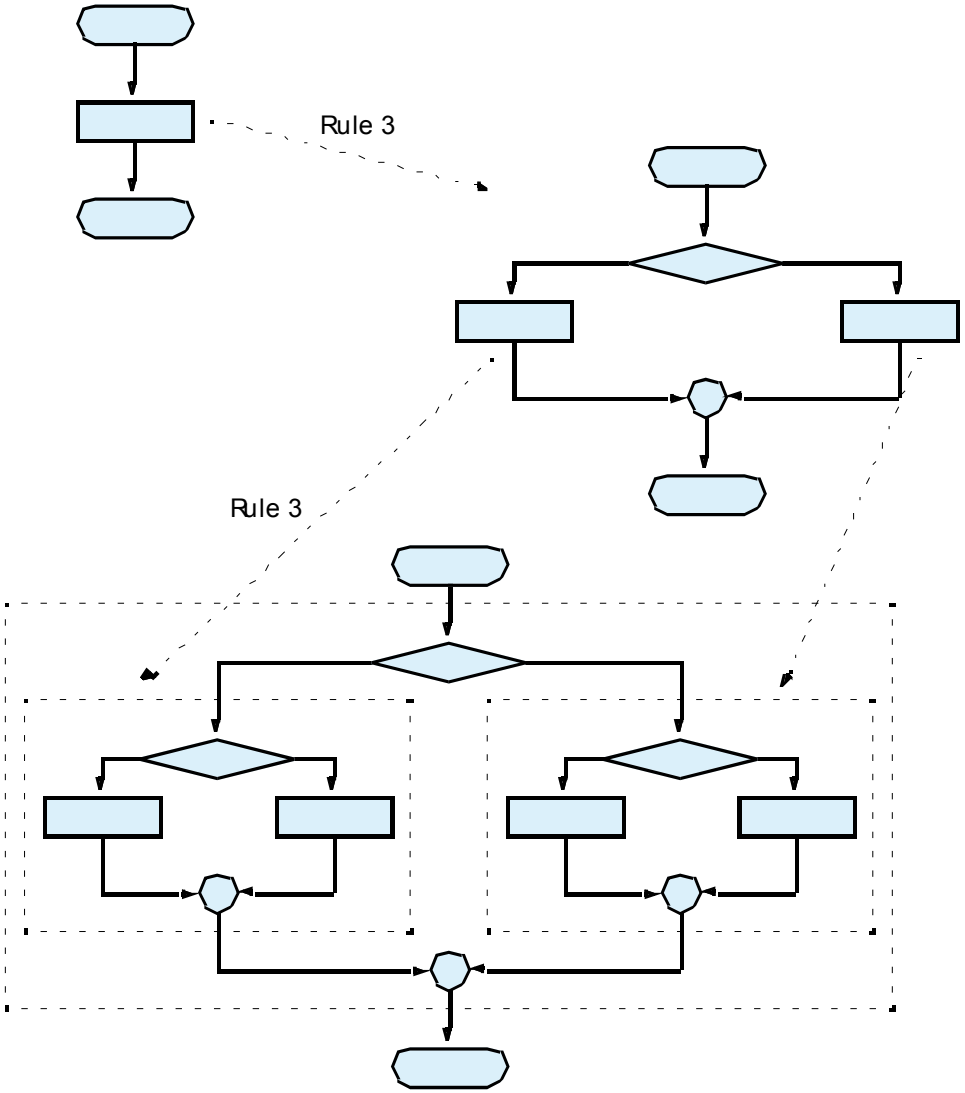


Fig. 9.24 Applying rule 3 of Fig. 9.21 to the simplest flowchart.

9.10 Summary of Structured Programming

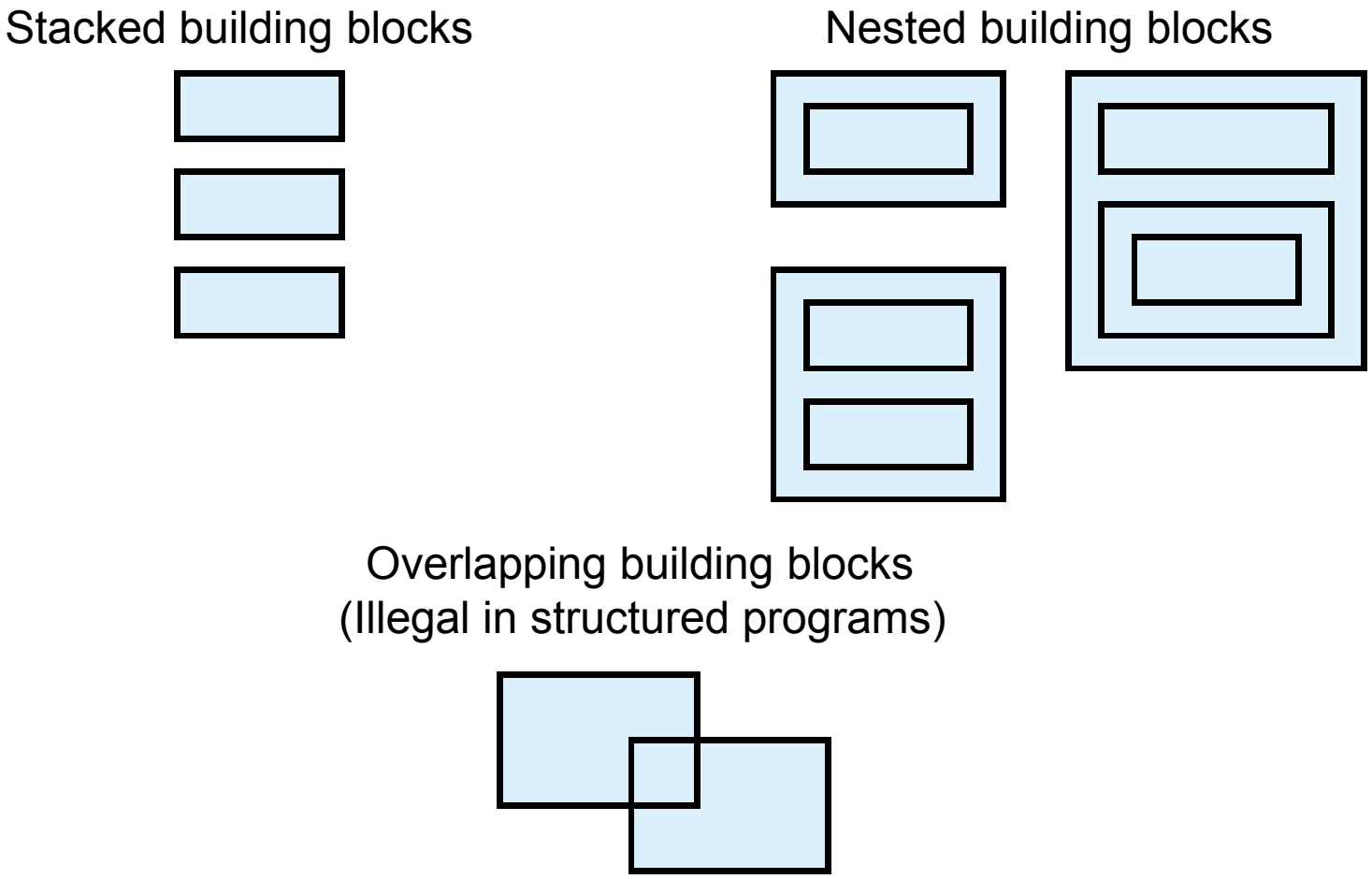


Fig. 9.25 Stacked, nested and overlapped building blocks.

9.10 Summary of Structured Programming

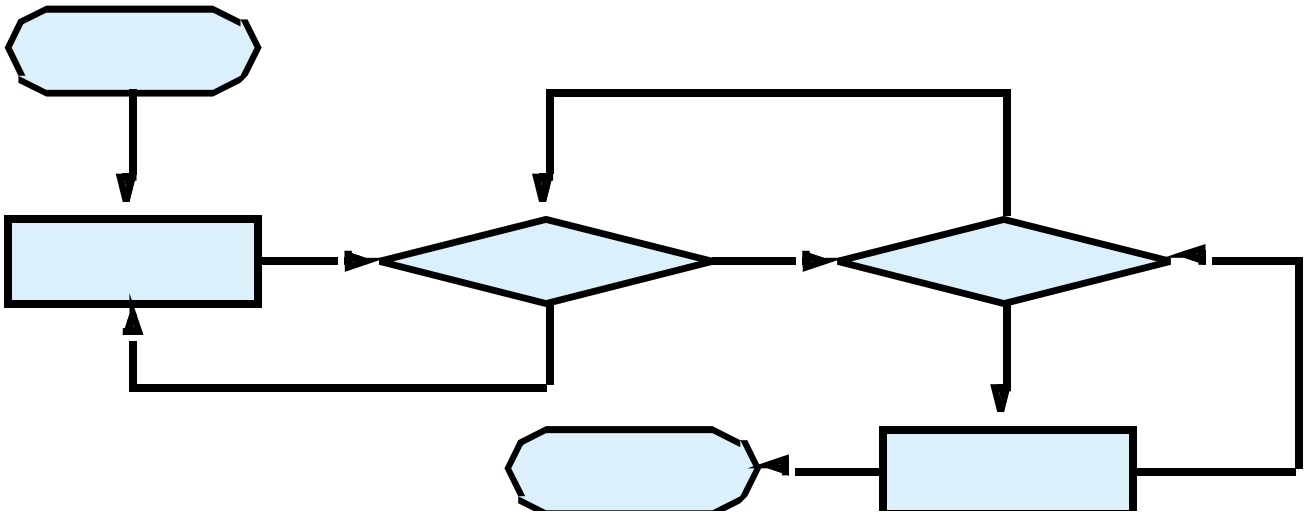


Fig. 9.26 Unstructured flowchart.