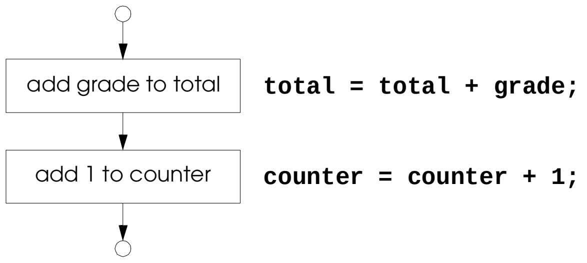

add grade to total
total = total + grade;
add 1 to counter
counter = counter + 1;

| JavaScript Keywords | | | | |
|---|---|---|---|---|
| `break` | `case` | `continue` | `delete` | `do` |
| `else` | `false` | `for` | `function` | `if` |
| `in` | `new` | `null` | `return` | `switch` |
| `this` | `true` | `typeof` | `var` | `void` |
| `while` | `with` | | | |
| *Keywords that are reserved but not used by JavaScript* | | | | |
| `catch` | `class` | `const` | `debugger` | `default` |
| `enum` | `export` | `extends` | `finally` | `import` |
| `super` | `try` | | | |

Fig. 9.1 JavaScript keywords.

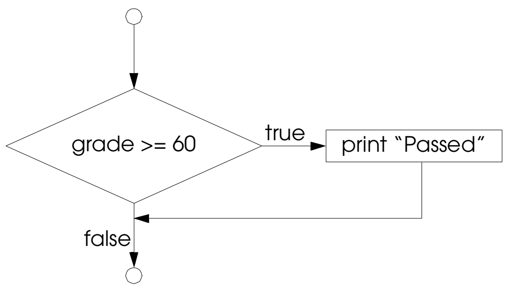


**Fig. 9.2** Flowcharting the single-selection `if` structure.

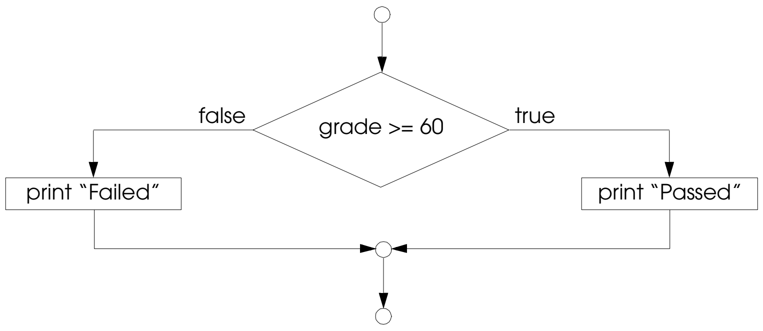


Fig. 9.3 Flowcharting the double-selection **`if/else`** structure.

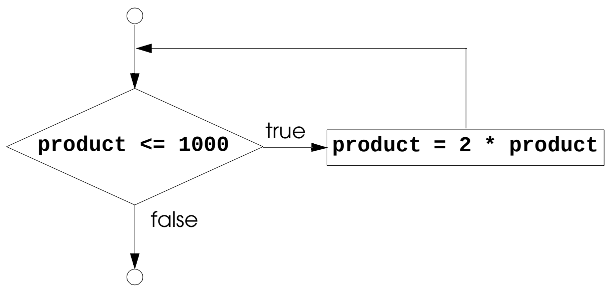
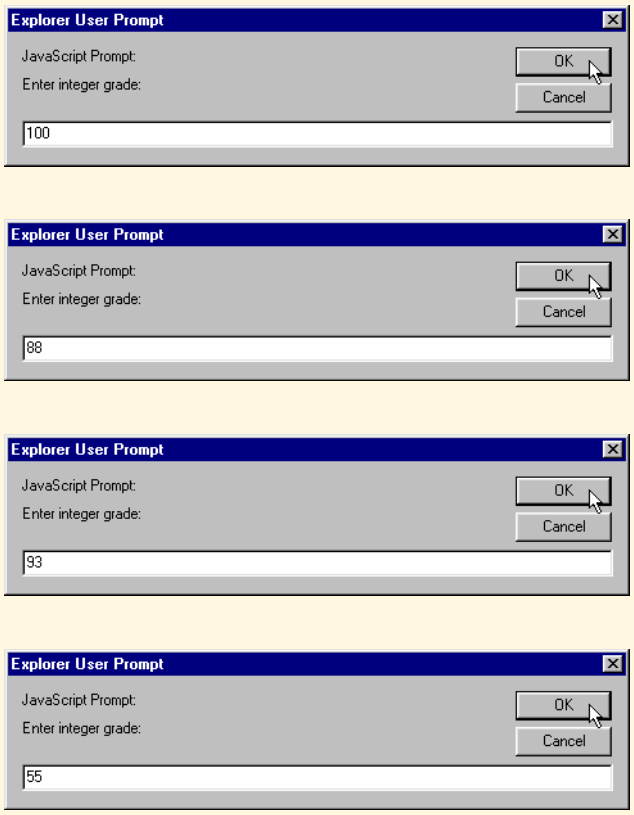


**Fig. 9.4** Flowcharting the **`while`** repetition structure.

```
<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<HTML>
<!-- Fig. 9.7: average.html -->

<HEAD>
<TITLE>Class Average Program</TITLE>

<SCRIPT LANGUAGE = "JavaScript">
   var total,           // sum of grades
       gradeCounter,    // number of grades entered
       gradeValue,      // grade value
       average,         // average of all grades
       grade;           // grade typed by user

   // Initialization Phase
   total = 0;           // clear total
   gradeCounter = 1;    // prepare to loop

   // Processing Phase
   while ( gradeCounter <= 10 ) {  // loop 10 times

      // prompt for input and read grade from user
      grade = window.prompt( "Enter integer grade:", "0" );

      // convert grade from a String to an integer
      gradeValue = parseInt( grade );

      // add gradeValue to total
      total = total + gradeValue;

      // add 1 to gradeCounter
      gradeCounter = gradeCounter + 1;
   }

   // Termination Phase
   average = total / 10;  // calculate the average

   // display average of exam grades
   document.writeln(
      "<H1>Class average is " + average + "</H1>" );
</SCRIPT>

</HEAD>
<BODY>
Click Refresh (or Reload) to run the script again
</BODY>
</HTML>
```

Fig. 9.5 Class-average program with counter-controlled repetition (part 1 of 3).

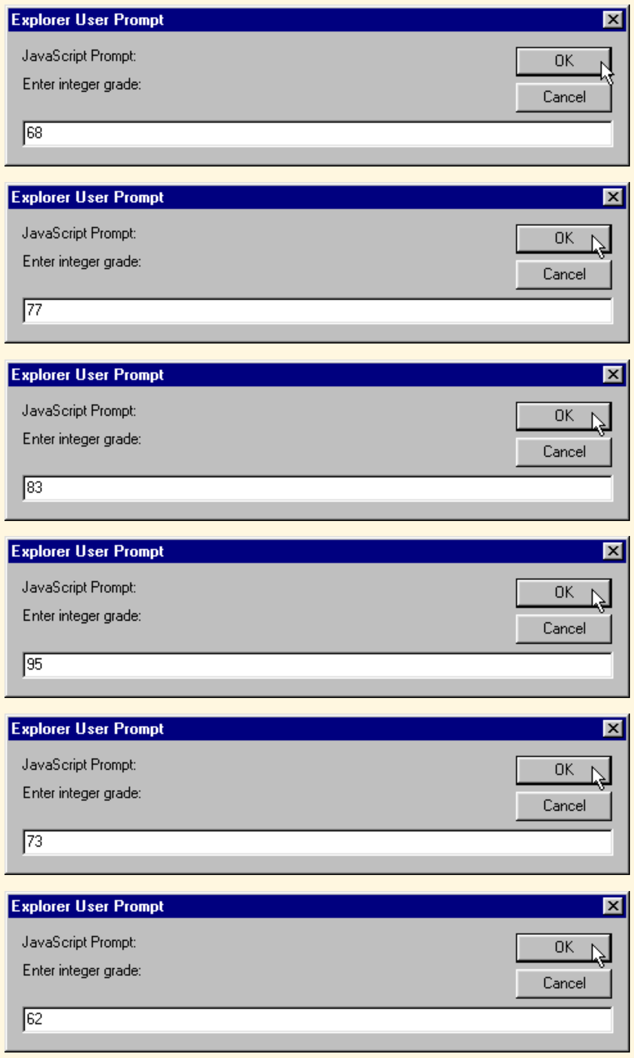

Explorer User Prompt
JavaScript Prompt:
Enter integer grade:
100

Explorer User Prompt
JavaScript Prompt:
Enter integer grade:
88

Explorer User Prompt
JavaScript Prompt:
Enter integer grade:
93

Explorer User Prompt
JavaScript Prompt:
Enter integer grade:
55

Fig. 9.5 Class-average program with counter-controlled repetition (part 2 of 3).



JavaScript Prompt:
Enter integer grade:
68

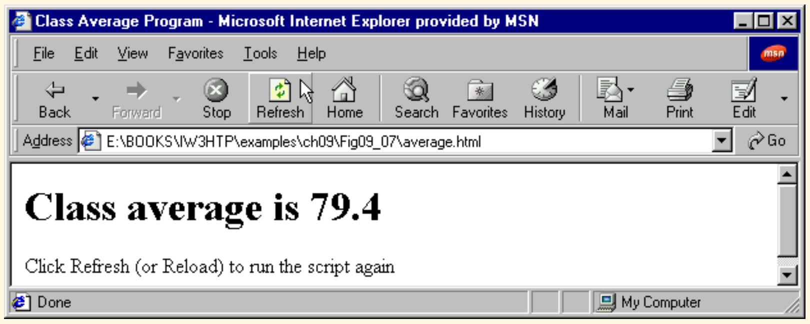
JavaScript Prompt:
Enter integer grade:
77

JavaScript Prompt:
Enter integer grade:
83

JavaScript Prompt:
Enter integer grade:
95

JavaScript Prompt:
Enter integer grade:
73

JavaScript Prompt:
Enter integer grade:
62


Class Average Program - Microsoft Internet Explorer provided by MSN
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites History Mail Print Edit
Address
Go
Done
My Computer

E:\BOOKS\IW3HTP\examples\ch09\Fig09_07\average.html

Class average is 79.4

Click Refresh (or Reload) to run the script again

Fig. 9.5 Class-average program with counter-controlled repetition (part 3 of 3).

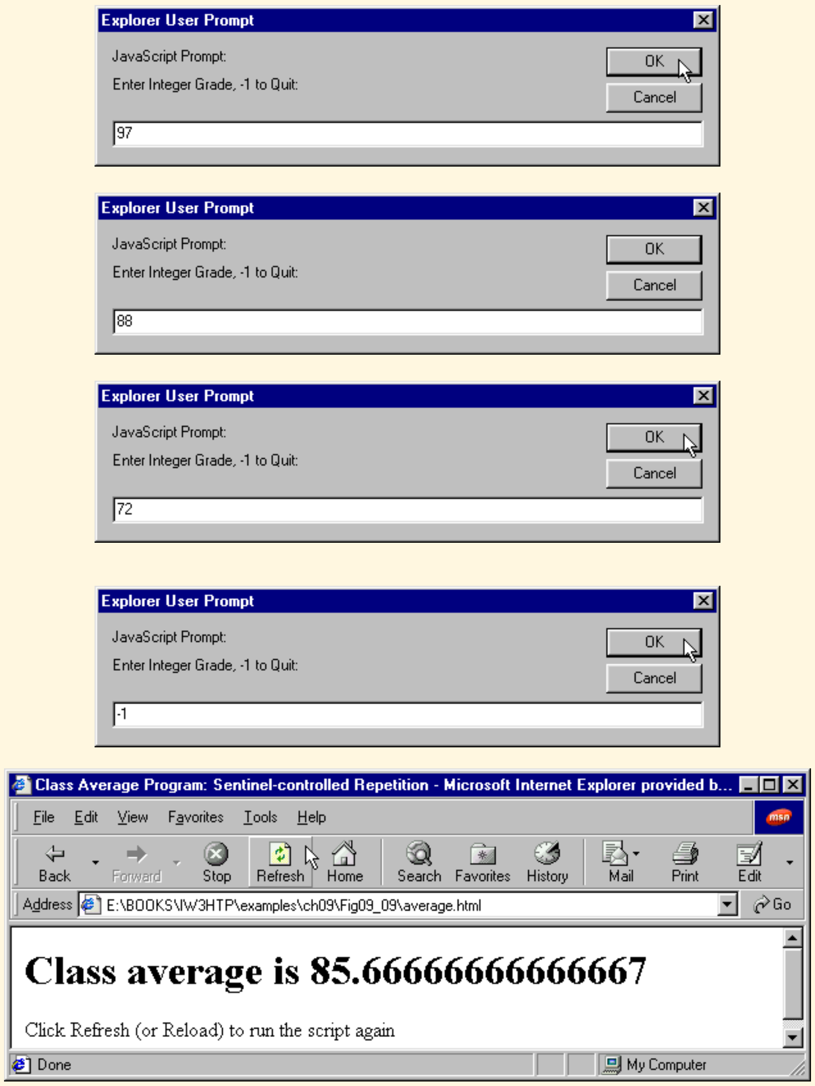
```
Initialize total to zero
Initialize gradeCounter to zero

Input the first grade (possibly the sentinel)
While the user has not as yet entered the sentinel
    Add this grade into the running total
    Add one to the grade counter
    Input the next grade (possibly the sentinel)

If the counter is not equal to zero
    Set the average to the total divided by the counter
    Print the average
else
    Print "No grades were entered"
```

**Fig. 9.6** Pseudocode algorithm that uses sentinel-controlled repetition to solve the class-average problem.

```
<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<HTML>
<!-- Fig. 9.9: Average2.html -->

<HEAD>
<TITLE>Class Average Program:
       Sentinel-controlled Repetition</TITLE>

<SCRIPT LANGUAGE = "JavaScript">
   var gradeCounter,  // number of grades entered
       gradeValue,    // grade value
       total,         // sum of grades
       average,       // average of all grades
       grade;         // grade typed by user

   // Initialization phase
   total = 0;         // clear total
   gradeCounter = 0;  // prepare to loop

   // Processing phase
   // prompt for input and read grade from user
   grade = window.prompt(
              "Enter Integer Grade, -1 to Quit:", "0" );

   // convert grade from a String to an integer
   gradeValue = parseInt( grade );

   while ( gradeValue != -1 ) {
      // add gradeValue to total
      total = total + gradeValue;

      // add 1 to gradeCounter
      gradeCounter = gradeCounter + 1;

      // prompt for input and read grade from user
      grade = window.prompt(
                 "Enter Integer Grade, -1 to Quit:", "0" );

      // convert grade from a String to an integer
      gradeValue = parseInt( grade );
   }

   // Termination phase
   if ( gradeCounter != 0 ) {
      average = total / gradeCounter;

      // display average of exam grades
      document.writeln(
         "<H1>Class average is " + average + "</H1>" );
   }
   else
      document.writeln( "<P>No grades were entered</P>" );
```

Fig. 9.7 Class-average program with sentinel-controlled repetition (part 1 of 2).

```
</SCRIPT>
</HEAD>

<BODY>
<P>Click Refresh (or Reload) to run the script again</P>
</BODY>
</HTML>
```



Explorer User Prompt
JavaScript Prompt:
Enter Integer Grade, -1 to Quit:
97

Explorer User Prompt
JavaScript Prompt:
Enter Integer Grade, -1 to Quit:
88

Explorer User Prompt
JavaScript Prompt:
Enter Integer Grade, -1 to Quit:
72

Explorer User Prompt
JavaScript Prompt:
Enter Integer Grade, -1 to Quit:
-1

Class Average Program: Sentinel-controlled Repetition - Microsoft Internet Explorer provided b...

Address E:\BOOKS\IW3HTP\examples\ch09\Fig09_09\average.html

**Class average is 85.66666666666667**

Click Refresh (or Reload) to run the script again

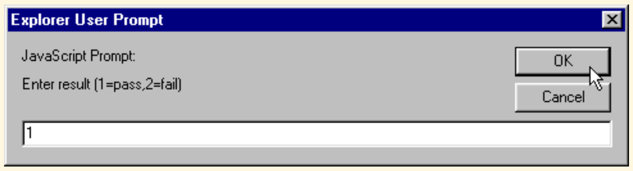
OK
Cancel
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites History Mail Print Edit
Go
Done
My Computer

Fig. 9.7 Class-average program with sentinel-controlled repetition (part 2 of 2).

```
Initialize passes to zero
Initialize failures to zero
Initialize student to one

While student counter is less than or equal to ten
    Input the next exam result

    If the student passed
        Add one to passes
    else
        Add one to failures

    Add one to student counter

Print the number of passes
Print the number of failures
If more than eight students passed
    Print “Raise tuition”
```

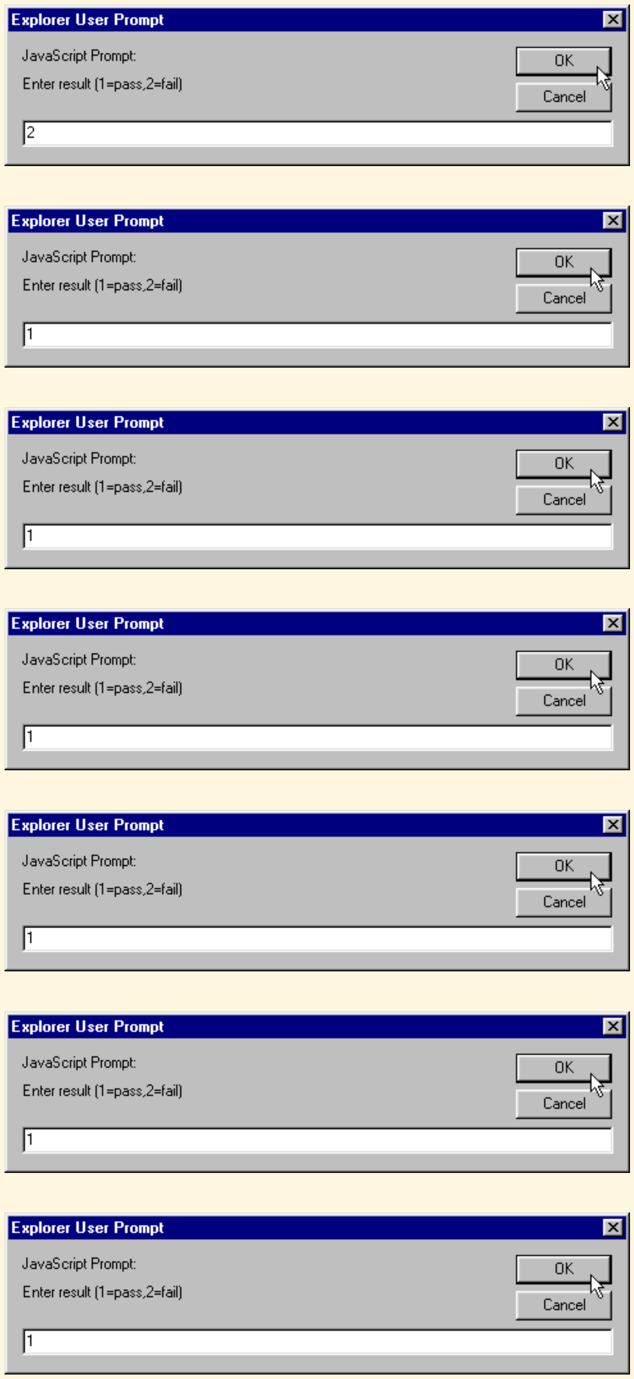
**Fig. 9.8** Pseudocode for examination-results problem.

```
<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<HTML>
<!-- Fig. 9.11: analysis.html -->

<HEAD>
<TITLE>Analysis of Examination Results</TITLE>

<SCRIPT LANGUAGE = "JavaScript">
   // initializing variables in declarations
   var passes = 0,       // number of passes
       failures = 0,     // number of failures
       student = 1,      // student counter
       result;           // one exam result

   // process 10 students; counter-controlled loop
   while ( student <= 10 ) {
      result = window.prompt(
                  "Enter result (1=pass,2=fail)", "0" );

      if ( result == "1" )
         passes = passes + 1;
      else
         failures = failures + 1;

      student = student + 1;
   }

   // termination phase
   document.writeln( "<H1>Examination Results</H1>" );
   document.writeln(
      "Passed: " + passes + "<BR>Failed: " + failures );

   if ( passes > 8 )
      document.writeln( "<BR>Raise Tuition" );
</SCRIPT>

</HEAD>
<BODY>
<P>Click Refresh (or Reload) to run the script again</P>
</BODY>
</HTML>
```



JavaScript Prompt:
Enter result (1=pass,2=fail)
1

Fig. 9.9 JavaScript program for examination-results problem (part 1 of 5).



```
JavaScript Prompt:
Enter result (1=pass,2=fail)
2
```

```
JavaScript Prompt:
Enter result (1=pass,2=fail)
1
```

```
JavaScript Prompt:
Enter result (1=pass,2=fail)
1
```

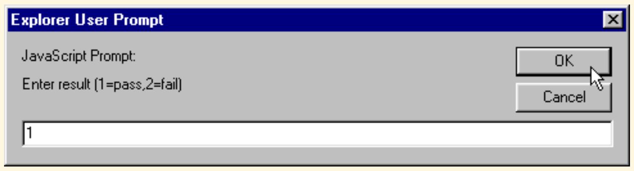
```
JavaScript Prompt:
Enter result (1=pass,2=fail)
1
```

```
JavaScript Prompt:
Enter result (1=pass,2=fail)
1
```

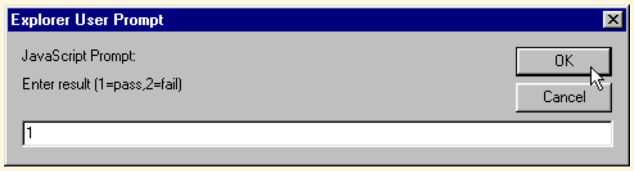
```
JavaScript Prompt:
Enter result (1=pass,2=fail)
1
```

```
JavaScript Prompt:
Enter result (1=pass,2=fail)
1
```

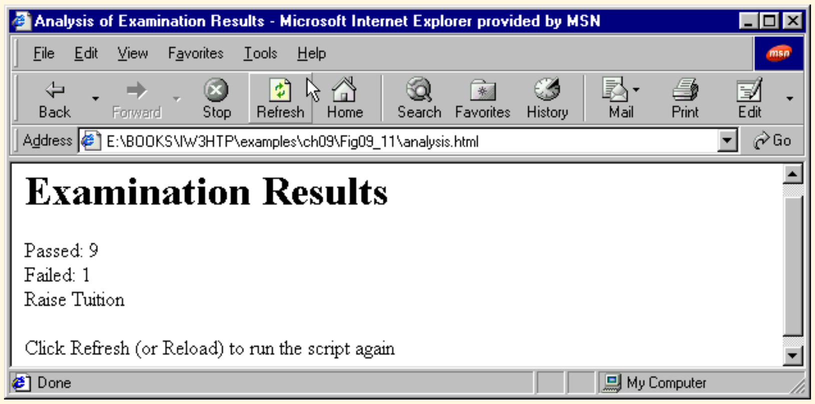
**Fig. 9.9** JavaScript program for examination-results problem (part 2 of 5).



JavaScript Prompt:
Enter result (1=pass,2=fail)
1

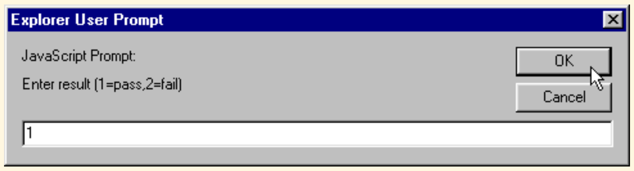


JavaScript Prompt:
Enter result (1=pass,2=fail)
1

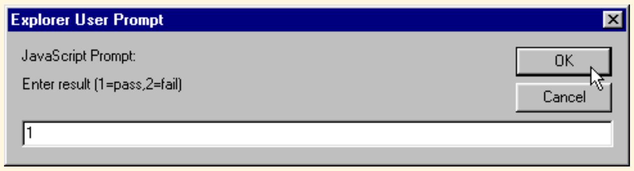

Analysis of Examination Results - Microsoft Internet Explorer provided by MSN
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites History Mail Print Edit
Address E:\BOOKS\IW3HTP\examples\ch09\Fig09_11\analysis.html
Go
Done
My Computer
Examination Results

Passed: 9
Failed: 1
Raise Tuition

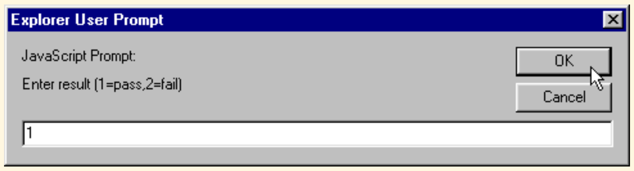
Click Refresh (or Reload) to run the script again



JavaScript Prompt:
Enter result (1=pass,2=fail)
1

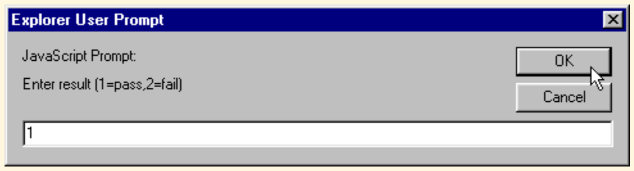


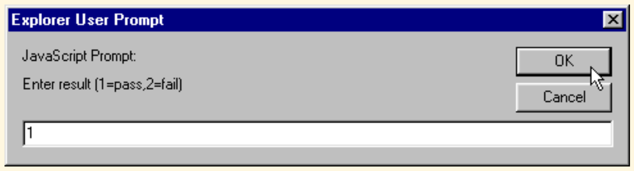
JavaScript Prompt:
Enter result (1=pass,2=fail)
1

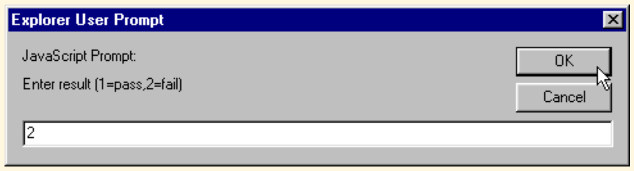


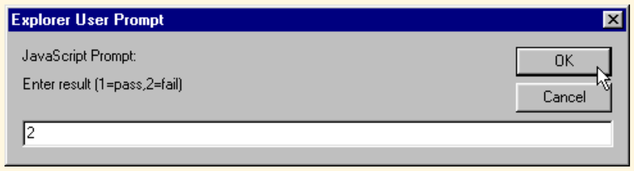
JavaScript Prompt:
Enter result (1=pass,2=fail)
1

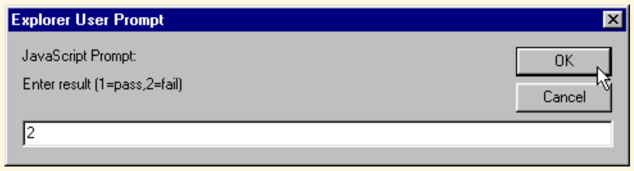
Fig. 9.9 JavaScript program for examination-results problem (part 3 of 5).

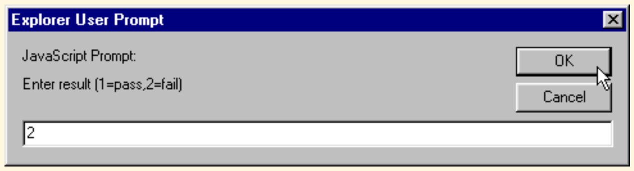

Explorer User Prompt
JavaScript Prompt:
Enter result (1=pass,2=fail)
1


Explorer User Prompt
JavaScript Prompt:
Enter result (1=pass,2=fail)
1


Explorer User Prompt
JavaScript Prompt:
Enter result (1=pass,2=fail)
2


Explorer User Prompt
JavaScript Prompt:
Enter result (1=pass,2=fail)
2


Explorer User Prompt
JavaScript Prompt:
Enter result (1=pass,2=fail)
2


Explorer User Prompt
JavaScript Prompt:
Enter result (1=pass,2=fail)
2

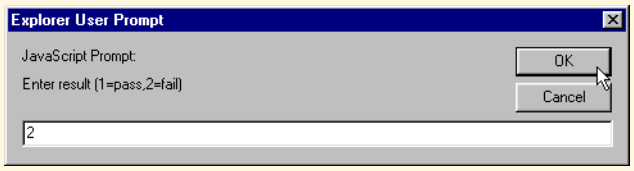
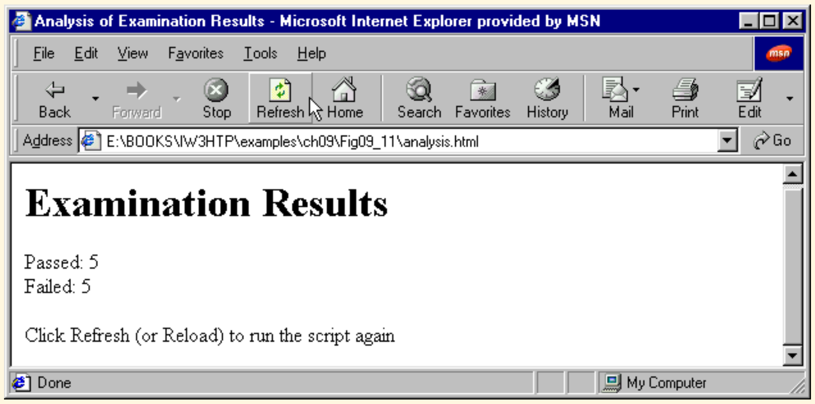

Explorer User Prompt
JavaScript Prompt:
Enter result (1=pass,2=fail)
2

**Fig. 9.9** JavaScript program for examination-results problem (part 4 of 5).


Analysis of Examination Results - Microsoft Internet Explorer provided by MSN
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites History Mail Print Edit
Address E:\BOOKS\IW3HTP\examples\ch09\Fig09_11\analysis.html
Go
Done
My Computer

```
Examination Results

Passed: 5
Failed: 5

Click Refresh (or Reload) to run the script again
```

Fig. 9.9 JavaScript program for examination-results problem (part 5 of 5).

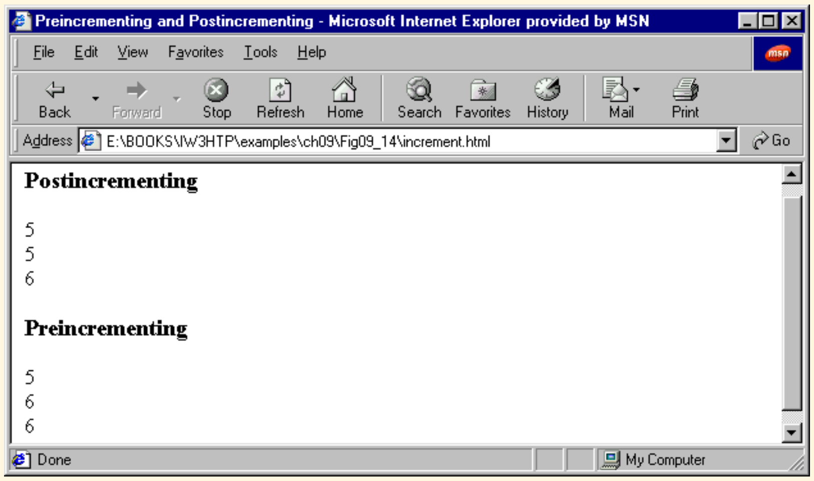
| Assignment operator | Initial variable value | Sample expression | Explanation | Assigns |
|---|---|---|---|---|
| `+=` | `c = 3` | `c += 7` | `c = c + 7` | `10` to `c` |
| `-=` | `d = 5` | `d -= 4` | `d = d - 4` | `1` to `d` |
| `*=` | `e = 4` | `e *= 5` | `e = e * 5` | `20` to `e` |
| `/=` | `f =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

Fig. 9.10 Arithmetic assignment 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. 9.11 The increment and decrement operators.

```
<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<HTML>
<!-- Fig. 9.14: increment.html -->

<HEAD>
<TITLE>Preincrementing and Postincrementing</TITLE>

<SCRIPT LANGUAGE = "JavaScript">
   var c;

   c = 5;
   document.writeln( "<H3>Postincrementing</H3>" );
   document.writeln( c );            // print 5
   document.writeln( "<BR>" + c++ ); // print 5 then increment
   document.writeln( "<BR>" + c );   // print 6

   c = 5;
   document.writeln( "<H3>Preincrementing</H3>" );
   document.writeln( c );            // print 5
   document.writeln( "<BR>" + ++c ); // increment then print 6
   document.writeln( "<BR>" + c );   // print 6
</SCRIPT>

</HEAD><BODY></BODY>
</HTML>
```


Preincrementing and Postincrementing - Microsoft Internet Explorer provided by MSN
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites History Mail Print
Address E:\BOOKS\IW3HTP\examples\ch09\Fig09_14\increment.html
Go
Done
My Computer

```
Postincrementing

5
5
6

Preincrementing

5
6
6
```

Fig. 9.12 Differences between preincrementing and postincrementing .

| Operators | Associativity | Type |
|---|---|---|
| `()` | left to right | parentheses |
| `++ --` | 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. 9.13 Precedence and associativity of the operators discussed so far.