

Flow of Control

❖ **Definition: The sequential execution of statements in a program**

- ◆ **Sequential Control Structure (Top-Bottom)**
 - ◆ It is characterized by a flow chart construct without branches.
- ◆ **Selection Control Structure (Branching)**
 - ◆ Decision making control
 - ◆ Tests an Assertion Statement
 - ▶ Evaluated as True or False (Humans)
 - ▶ Evaluated as Yes or No (Humans)
 - ▶ Evaluated as 1 or 0 (Computers)

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Operators Review

+	Addition	$2 + 3 = 5$
-	Subtraction	$7 - 3 = 4$
-	Negative	$-3 + 7 = 4$
*	Multiplication	$5 * 4 = 20$
/	Division	$12 / 3 = 4$
%	Modulus	$14 \% 3 = 2$

+ Concatenation
"Help " + "Me" = "Help Me"

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Order of Operations

1st: do operations inside innermost parentheses
 2nd: do exponential ^ JavaScript uses [Math.pow\(\)](#)
 3rd: do multiplications, divisions, and modulus (L → R)
 4th: do additions and subtractions (L → R)

$3 * (6 + 2) / 12 - \text{pow}((7-4), 2) * 3 = ?$

() first: = $3 * 8 / 12 - \text{pow}(3, 2) * 3$

^ next: = $3 * 8 / 12 - 9 * 3$

Leftmost * next: = $24 / 12 - 9 * 3$

Division next:= $2 - 9 * 3$

Multiply next: = $2 - 27$

Subtract last: = -25

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Relational Operators

- ❖ Relational operators are used to compare two data objects.
- ❖ The result of the comparison is either **true** or **false**.

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

❖ Note the difference between == and = operator

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Relational Operator Examples

- ❖ **Given:** A = 23, B = 16, Entry = 'y'
- ❖ **Then:**
 - A > B is true
 - A < B is false
 - A >= B is true
 - A <= B is false
 - A != B is true
 - A == B is false
 - (A < 5) && (B > 10) is false
 - (Entry=='y') || (Entry=='Y') is true

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Logical Operators

- ❖ Used in while and if assertions **true/false**
- ❖ There are three logical operators
 - ◆ **AND &&**
 - ◆ **OR ||**
 - ◆ **NOT !**

A	B	A && B
F	F	F
F	T	F
T	F	F
T	T	T

A	B	A B
F	F	F
F	T	T
T	F	T
T	T	T

A	!A
F	T
T	F

Note on Precedence: Evaluate relational first and then logical

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Arithmetic Operators Precedence

(Highest to Lowest)






- ()** Defines order of operation
- Minus (unary)
- * / %** Multiply, Division, Remainder
- + -** Addition, Subtraction
- < <= > >=** } **Relational Operators**
- == !=** } **Logical Operators**
- && || !** } **Logical Operators**
- =** Assignment

http://www.w3schools.com/jsref/jsref_operators.asp

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Flowchart Symbols

Symbol	Name	Description
	Terminator	Represents the start or end of a program or module
	Process	Represents any kind of processing function; for example, a computation
	Input/output	Represents an input or output operation
	Decision	Represents a program branch point
	Connector	Indicates an entry to, or exit from, a program segment

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if Selection Control Structure

❖ Characterized by a diamond shaped flow chart construct, containing an assertions with two possible outcomes branches (True or False).

```

if(Score >= 90)
    document.write("Grade = A");
    
```

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if Compound Selection Control Structure

```

if(Score < 80)
    Display: Unsatisfactory
    Diff = 80 - Score
    Display: You need Diff points more to pass
    Display: Score
    
```

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if Selection Control Structure

[Compound statement syntax]

```

var fScore=parseFloat(window.prompt("Enter Score", "0" ));
if(fScore < 80)
{
    document.write("<h2 style='color: #CC0000\''>"
        + "Exam Result Unsatisfactory</h2>");
    var fDiff = 80 - fScore;
    document.write("<p>You need " + fDiff
        + " more points to continue to next chapter</p>");
}
document.write("<p>Your Exam Score was " + fScore
    + "</p>");
    
```

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if - else Selection Structure

❖ Characterized by a diamond shaped flow chart construct, containing an assertions with two possible outcomes branches (True or False).

```

if(Entry == "m")
    Prompt: Enter miles
    Convert miles to km
    Display Result: km
else
    Prompt: Enter km
    Convert km to miles
    Display Result: miles
    
```

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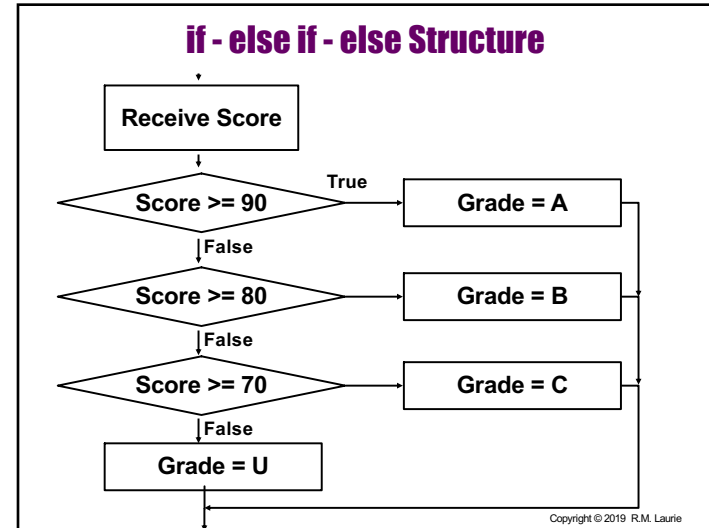
```

<!DOCTYPE html>
<html lang="en">
  <head>
    <meta charset="utf-8">
    <title>Miles or Kilometers Converter</title>
  </head>
  <body>
    <script>
      var sEntry, fEntry, fResult;
      sEntry = window.prompt("Is input distance miles or km? (m or k)", "m");
      if(sEntry == "m")
      {
        fEntry = parseFloat(window.prompt("Enter miles: ", "0"));
        fResult = fEntry * 1.609;
        document.write("<p>"+fEntry+" miles = "+fResult+" km</p>");
      }
      else
      {
        fEntry = parseFloat(window.prompt("Enter kilometers: ", "0"));
        fResult = fEntry / 1.609;
        document.write("<p>"+ fEntry + " km = "+ fResult + " miles</p>");
      }
      document.write("<p>Reload for another conversion</p>");
    </script>
  </body>
</html>
    
```

if - else Selection Structure

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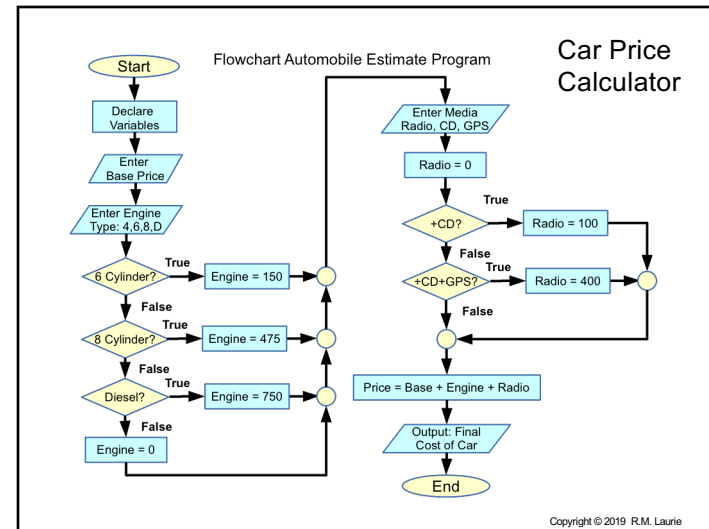
```

<!DOCTYPE html>
<html lang="en">
  <head>
    <meta charset="utf-8">
    <title>Grade Determination</title>
  </head>
  <body>
    <script>
      var fScore, cGrade;
      fScore = parseFloat(window.prompt("Enter Score", "0"));
      if(fScore >= 90)
        cGrade = "A";
      else if(fScore >= 80)
        cGrade = "B";
      else if(fScore >= 70)
        cGrade = "C";
      else
        cGrade = "U";
      document.write("<h2>For the score = " + fScore
        + "<br>Your letter grade is " + cGrade + "</h2>");
    </script>
  </body>
</html>
    
```

if - else if - else Selection Structure

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New Car Price Calculator using JavaScript

```

<!DOCTYPE html>
<html lang="en">
  <head>
    <meta charset="utf-8">
    <title>Page Title</title>
  </head>
  <body>
    <script>
      //Display Menu for Engine Selection
      var fBase, sEntry, fEngine, fRadio = 0;
      fBase = parseInt(window.prompt("Enter Base Price of the car", "?"));
      sEntry = window.prompt("Select Engine:\n [4] = 4 cylinder\n "
        + "[6] = 6 cylinder [8] = 8 cylinder [D] = Diesel", "4");
      if(sEntry == "6") fEngine = 150;
      else if(sEntry == "8") fEngine = 475;
      else if(sEntry == "D" || sEntry == "d" ) fEngine = 750;
      else fEngine = 0;
      sEntry = window.prompt("Select Audio:\n[R] = Radio"
        + " [C] = Radio+CD [G] = Radio+CD+GPS", "R");
      if(sEntry == "C" || sEntry == "c") fRadio = 100;
      else if(sEntry == "G" || sEntry == "g") fRadio = 400;
      var fPrice = fBase + fEngine + fRadio;
      document.write("<h2>Cost of Car = " + fPrice + "</h2>");
    </script>
  </body>
</html>
    
```

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Program Style Practices

- ❖ Write structured and modular programs
 - ◆ Use descriptive variable names
 - ◆ Provide a welcome message for the user
 - ◆ Use a prompt before all input
 - ◆ Provide well designed program output
 - ◆ Document programs using comments
- ❖ Test your program thoroughly
 - ◆ Write test data to test all selection paths
 - ◆ Does output support user expectations

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Linking to External JavaScript File that runs before body loads

```

<!DOCTYPE html>
<html lang="en">
  <head>
    <meta charset="utf-8">
    <title>External File Linking</title>
    <script src="MyProg.js"></script>
  </head>
  <body>
    <p>Click reload to run again</p>
  </body>
</html>
    
```

MyProg.js

```

var fScore = parseFloat(window.prompt( "Enter Score", "0" ));
if(fScore < 80)
{
  document.write("<h2 style='color: #CC0000'>"
    + "Exam Result Unsatisfactory</h2>");
  var fDiff = 80 - fScore;
  document.write("<p>You need " + fDiff + " point(s) more"
    + " to continue to next chapter</p>");
}
document.write("<p>Your Exam Score was " + fScore + "</p>");
    
```

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How to preload JS and run after body loads by making a function

```

<!DOCTYPE html>
<html lang="en">
  <head>
    <meta charset="utf-8">
    <title>External File Linking</title>
    <script src="myProg.js"></script>
  </head>
  <body>
    <h2>Test Grader Program</h2>
    <script>testGrader()</script>
    <p>Click reload to run again</p>
  </body>
</html>
    
```

MyProg.js

```

function testGrader() {
  var fScore = parseFloat(window.prompt( "Enter Score", "0" ));
  if(fScore < 80)
  {
    document.write("<h2 style='color: #CC0000'>"
      + "Exam Result Unsatisfactory</h2>");
    var fDiff = 80 - fScore;
    document.write("<p>You need " + fDiff + " point(s) more"
      + " to continue to next chapter</p>");
  }
  document.write("<p>Your Exam Score was " + fScore + "</p>");
}
    
```

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http://www.w3schools.com/js/js_whereto.asp

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