## 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 – pow((7-4),2) * 3 = ?
( ) first:     = 3 * 8 / 12 – 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 |
| = | 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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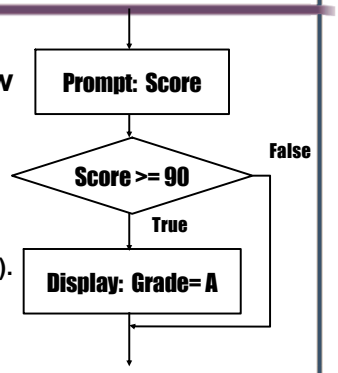
## if Selection Control Structure

- 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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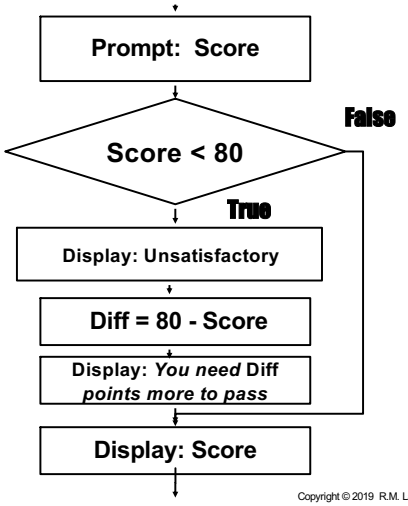
## *if Compound Selection Control Structure*



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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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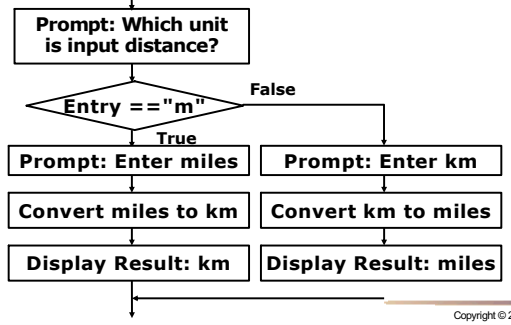
## if - else Selection Structure

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



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## if - else Selection Structure

```
<!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 = Entry * 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>
```



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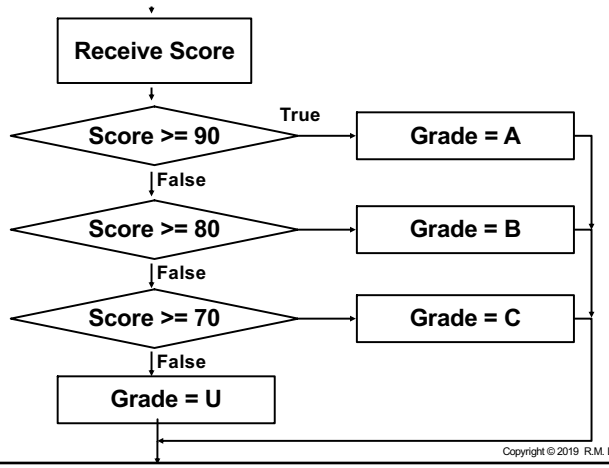
## if - else if - else Structure



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## if - else if – else Selection Structure

```
<!DOCTYPE html>
<html lang="en">
  <head>
    <meta charset="utf-8">
    <title>Grade Determination</title>
    <script  type="text/javascript">
      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>
  </head>
  <body></body>
</html>
```



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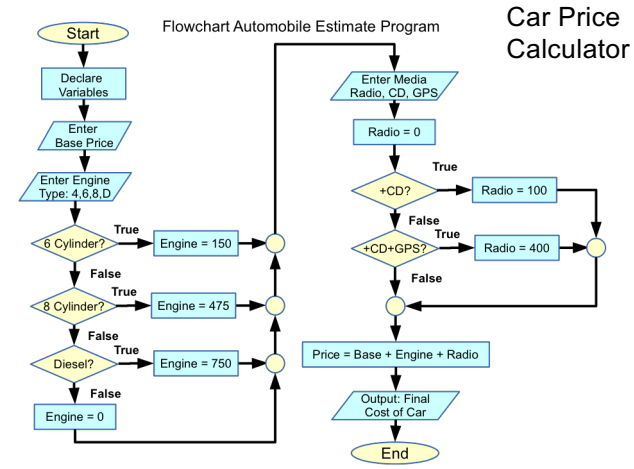
## Car Price Calculator



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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   "
         + "[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*

*function definition and function call*

```
<!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>");
}
```

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



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