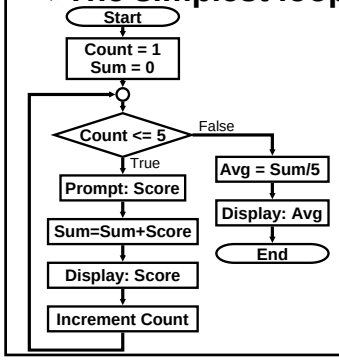
Flow of Control

- Flow of control
  - Definition: The sequence in which the computer executes statements of the program.
- Sequential Control Structure
- Selection (Branching) Control Structure
  - Relational and Logical Operators
- Repetition (Loop) Control Structure
  - while loops

Repetition (Loop) Structure

- Control structure used to repeat a sequence of instructions in a loop.
- The simplest loop structure is the while()

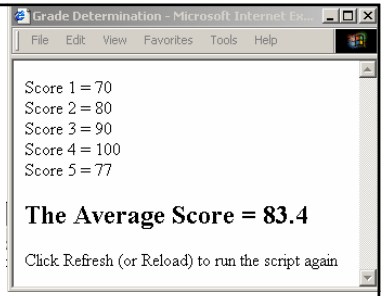



```
var Score, Count = 1, Sum = 0;
while(Count <= 5)
{
  Score = parseFloat(window.prompt(
    "Enter Score "+Count,"0"));
  Sum = Sum + Score;
  document.writeln("<p>Score "+Count
    +" = " +Score+"<\/p>");
  Count = Count + 1;
}
document.writeln("<h3>Average = "
+(Sum/5)+"<\/h3>");
```


while statement loop control

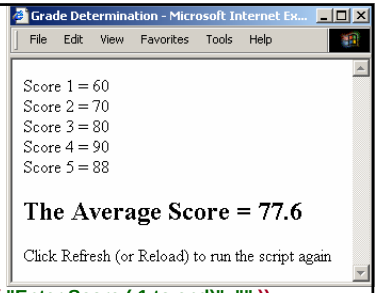
- Contents of loop executed repeatedly while(*assertion)* is true
- Loop terminated when while(assertion) is false.
- Counter-Controlled Repetition Structure
  - Initialize a counter to count loops
  - Increment or decrement counter
  - while(assertion) checks for total loops reached
- Sentinel-Controlled Repetition Structure
  - while(assertion) checks for a sentinel termination value

Counter-Controlled Repetition Structure




```
<head>
  <title>Grade Determination</title>
  <script type="text/javascript">
    var Score=0, ScoreTotal=0,
        Count=0;
    while(Count < 5)
    {
       Score=parseInt(window.prompt("Enter Score",""));
       ScoreTotal = ScoreTotal + Score;
       Count = Count + 1;
       document.writeln("Score " + Count + " = " + Score + "<br \/>");
    }
    document.writeln("<h2>The Average Score = " + ScoreTotal/5+"<\/h2>");
  </script>
</head>
<body>
  <p>Click Refresh (or Reload) to run the script again</p>
</body>
```

Sentinel-Controlled Repetition Structure




```
<head>
  <title>Grade Determination</title>
  <script type="text/javascript">
    var Score=0, ScoreTotal=0;
    var Count=0;
    Score = parseFloat(window.prompt( "Enter Score (-1 to end)", "" ));
    while(Score >= 0)
    {
      ScoreTotal = ScoreTotal + Score;
      Count = Count + 1;
      document.writeln("Score " + Count + " = " + Score + "<br \/>");
      Score = parseFloat(window.prompt( "Enter Score (-1 to end)", "" ));
    }
    document.writeln("<h2>The Average Score = "+ScoreTotal/Count+"<\/h2>");
  </script>
</head>
<body>  <p>Click Refresh (or Reload) to run the script again</p> </body>
```

More Operators

++ **Increment** (Unary)

```
Number++; // Number = Number + 1;
```

-- **Decrement** (Unary)

```
Number--; // Number = Number - 1;
```

Combined Assignment

- **+=** Addition Assignment Operator
- **-=** Subtraction Assignment Operator
- ***=** Multiplication Assignment Operator
- **/=** Division Assignment Operator
- **%=** Remainder Assignment Operator

. **Object Property** (Encapsulated in object)

Select property or method of an object.

Stay tuned for more details…

Operator Examples

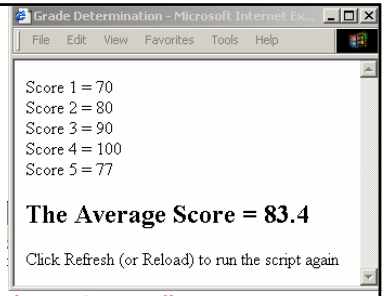
```
Num++; // Num=Num+1 (Post-increment)
++Num; // Num=Num+1 (Pre-increment)
Num--; // Num=Num-1 (Post-decrement)
--Num; // Num=Num-1 (Pre-decrement)

A += 2;    // A=A+2
B -= 1;    // B=B-1
C *= 4;    // C=C*4
D /= 2;    // D=D/2
E %= 5;    // E=E%5
```


Operators Precedence

(Highest to Lowest)

.	Object method or property
( )	Defines order of operation
- ++ --	Minus, Increment, Decrement
* / %	Multiply, Division, Remainder
+ -	Addition, Subtraction
< <= > >= == !=	} Relational Operators
= += -= *= /= %=	Compound Assignment

Counter-Controlled Repetition Structure




```
<head>
  <title>Grade Determination</title>
  <script type="text/javascript">
    var Score=0, ScoreTotal=0,
        Count=0;
    while(Count < 5)
    {
       Score=parseInt(window.prompt("Enter Score",""));
       ScoreTotal += Score;     // was  ScoreTotal = ScoreTotal + Score;
       Count++;                 // was  Count = Count + 1;
       document.writeln("Score " + Count + " = " + Score + "<br />");
     }
     document.writeln("<h2>The Average Score = " + ScoreTotal/5+"</h2>");
  </script>
 </head>
 <body>
  <p>Click Refresh (or Reload) to run the script again</p>
 </body>
```

Filtered Input Application

```
<head>
  <title>Filtered Data Entry</title>
  <script type="text/javascript">
   var Entry, Valid=false;
    while(Valid == false)
    {
      Entry = window.prompt( "Do you like Programming? (y or n)", "" );
      if(Entry == "y")
      {
        document.writeln("<h2>I\'m glad you like programming!<\/h2>");
        Valid = true;
      }
      else if(Entry == "n")
      {
        document.writeln("<h2>You will like it if you study.<\/h2>");
        Valid = true;
      }
      else
        window.alert("You must enter either y or n !");
    }   //  <--  Note that this is the end of the while loop
  </script>
 </head>
 <body>   <p>Click Refresh (or Reload) to run the script again</p> </body>
```

Repetition Structure Exercise 1

- **Practice Exercise:**
  Create a program that will output the first 10 multiples of the number 7 with the format

  1 x 7 = 7
  2 x 7 = 14
  3 x 7 = 21
  4 x 7 = 28
  5 x 7 = 35
  6 x 7 = 42
  7 x 7 = 49
  8 x 7 = 56
  9 x 7 = 63
  10 x 7 = 70

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Repetition Structure Exercise 2

- **Base to Exponent**
  - **Create a program that will prompt for a base number and a maximum exponent**
  - **Output powers of that base from zero to the maximum exponent**
  - **That is for a base of 4 and exponent 3 the output is:**

    $4^0 = 1$
    $4^1 = 4$
    $4^2 = 16$
    $4^3 = 64$

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