Chapter 06
JavaScript Basics

Open Source SW Development
CSE22300

Javascript

What is Programming Language?

- **A programming language**
  - **A set of codes that we can use to give a computer instructions to follow.**

- **Popular and well-known programming languages**
  - **Include Java, C++, PHP, JavaScript and more.**

- **Modern programming languages share a large number of common concepts**
  - **Variables, arrays, loops, conditionals, and functions.**

Server-side Scripting

- Server-side scripting is a web server technology
- Running a script directly on the web server
  - Generates dynamic HTML pages.
  - Interactive web sites that interface to databases.
  - The ability to highly customize the response
  - Written in languages such as Perl and PHP
  - The documents produced by server-side scripts may contain client-side scripts.
  - The user cannot see the script's source code

Client-side Scripting

- **Client-side scripting are executed on client-side**
  - **By the user's web browser, instead of server-side.**
  - **Web authors write client-side scripts in languages such Client-side JavaScript or VBScript.**
  - **Web browser must understand the scripts.**
  - **The users may be able to see its source code**

JavaScript

- Dynamic computer programming language
  - Lightweight and most commonly used as a part of web pages
  - Allows client-side script to interact with the user and make dynamic pages.
  - Interpreted programming language with object-oriented capabilities.

Advantages

- Less server interaction
  - Validates user input before sending the page off to the server.
  - Saves server traffic, which means less load on your server.

- Immediate feedback to the visitors
  - They don't have to wait for a page reload to see if they have forgotten to enter something.

- Increased interactivity
  - You can create interfaces that react when the user hovers over them with a mouse or activates them via the keyboard.

- Richer interfaces
  - You can use JavaScript to include such items as drag-and-drop components and sliders to give a Rich Interface to your site visitors.

Disadvantages

- **Client-side JavaScript does not allow the reading or writing of files.**
  - **This has been kept for security reason.**

- **JavaScript doesn't have any multithreading or multiprocessor capabilities.**

- **However, server side script by Node.js**

Syntax

Script

- **JavaScript can be implemented using JavaScript statements that are placed HTML tags in a web page.**
  - **<script>... </script>**

- **Two Important Attributes**
  - **Language: This attribute specifies what scripting language**
  - **Type: This attribute indicates the scripting language**

```
<script language="javascript" type="text/javascript">
  JavaScript code
</script>
```

First Script Codes

- **document.write which writes a string into our HTML document.**

```
<html>
<body>
<script language="javascript" type="text/javascript">
   document.write ("Hello World!")
</script>
</body>
</html>
```

Whitespace and Line Breaks

- **JavaScript ignores**
  - **Spaces, tabs, and newlines that appear in JavaScript programs**

- **You can use spaces, tabs, and newlines freely**
  - **You are free to format and indent your programs**
  - **It makes the code easy to read and understand.**

Semicolons are Optional

```
var1 = 10
var2 = 20
```

```
var1 = 10; var2 = 20;
```

Case Sensitive

- JavaScript is a case-sensitive language
  - This means that the language keywords, variables, function names, and any other identifiers must always be typed with a consistent capitalization of letters.
- So the identifiers Time and TIME will convey different meanings in JavaScript.

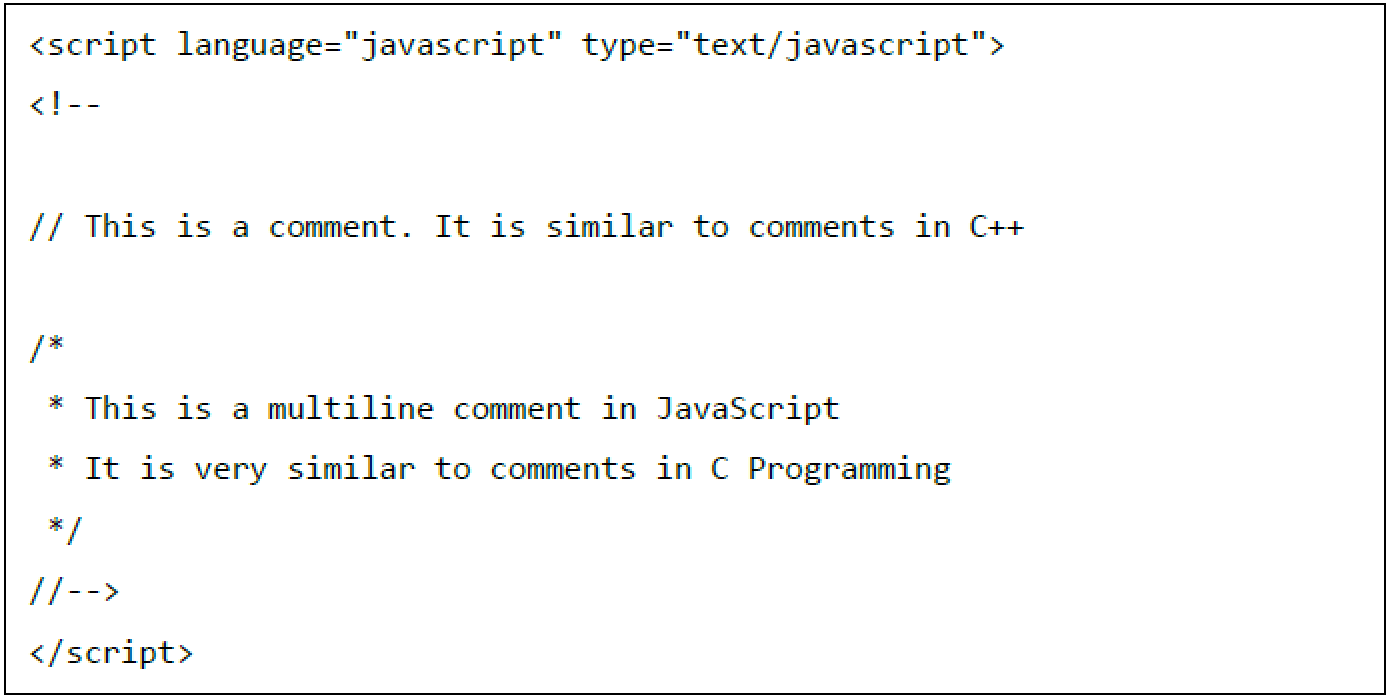
Comments

- **JavaScript supports both C-style and C++-style comments**
  - **Any text between a // and the end of a line is treated as a comment**
  - **Any text between the characters /* and */ is treated as a comment. This may span multiple lines.**

- **JavaScript also recognizes the HTML comment opening sequence <!--.**
  - **JavaScript treats this as a single-line comment,**

- **The HTML comment closing sequence --> is not recognized by JavaScript**
  - **so it should be written as //-->.**

Comments



```
<script language="javascript" type="text/javascript">
<!--

// This is a comment. It is similar to comments in C++

/*
 * This is a multiline comment in JavaScript
 * It is very similar to comments in C Programming
 */
//-->
</script>
```

Variable

We focus on server side scripting with JavaScript

Variables

- **JavaScript has three primitive data types:**
  - **Numbers, e.g., 123, 120.50 etc.**
  - **Strings of text, e.g. "This text string" etc.**
  - **Boolean, e.g. true or false.**

- **JavaScript also defines two trivial data types**
  - **null and undefined**
  - **Difference?**

- **JavaScript supports a composite data type**
  - **Object**

Declare

- **Variables are declared with the var keyword as follows.**

```
var money;
var name;
```

Initialization

- **Variable initialization**
  - **Storing a value at the time of variable creation**

```
var name = "Ali";
var money;
money = 2000.50;
```

- **JavaScript is untyped language**
  - **A variable can hold a value of any data type.**

Scope

- **JavaScript variables have only two scopes.**
  - **Global Variables**
    A global variable has global scope which means it can be defined anywhere in your JavaScript code.
  - **Local Variables**
    A local variable will be visible only within a function where it is defined. Function parameters are always local to that function.

```
var myVar = "global"; // Declare a global variable
function checkscope( ) {
    var myVar = "local"; // Declare a local variable
    document.write(myVar);
}
```

Name

- **You should not use any of the reserved keywords**
  - **break or boolean variable names are not valid.**

- **Variable names should not start with a numeral (0-9)**
  - **They must begin with a letter or an underscore character**
  - **123test is an invalid variable name but _123test is a valid**

- **JavaScript variable names are case-sensitive**
  - **Name and name are two different variables.**

Reserved Keywords

abstract	else	Instanceof	switch
boolean	enum	int	synchronized
break	export	interface	this
byte	extends	long	throw
case	false	native	throws
catch	final	new	transient
char	finally	null	true
class	float	package	try
const	for	private	typeof
continue	function	protected	var
debugger	goto	public	void
default	if	return	volatile
delete	implements	short	while
do	import	static	with
double	in	super	

Operators

What is operator?

- Let us take a simple expression 4 + 5 is equal to 9
  - Here 4 and 5 are called operands and ‘+’ is called the operator

- JavaScript supports the following types of operators.
  - Arithmetic Operators
  - Comparison Operators
  - Logical (or Relational) Operators
  - Assignment Operators
  - Conditional (or ternary) Operators

Arithmetic Operator

- **A holds 10 and B holds 20**

No	Operator and Description
1	+ (Addition) Adds two operands Ex: A + B will give 30
2	- (Subtraction) Subtracts the second operand from the first Ex: A - B will give -10
3	* (Multiplication) Multiply both operands Ex: A * B will give 200
4	/ (Division) Divide the numerator by the denominator Ex: B / A will give 2

Arithmetic Operator

- **A holds 10 and B holds 20**

No	Operator and Description
5	% (Modulus) Outputs the remainder of an integer division Ex: B % A will give 0
6	++ (Increment) Increases an integer value by one Ex: A++ will give 11
7	-- (Decrement) Decreases an integer value by one Ex: A-- will give 9

Comparison Operators

- **A holds 10 and B holds 20**

No	Operator and Description
1	== (Equal) Checks if the value of two operands are equal or not, if yes, then the condition becomes true. Ex: (A == B) is not true.
2	!= (Not Equal) Checks if the value of two operands are equal or not, if the values are not equal, then the condition becomes true. Ex: (A != B) is true.
3	> (Greater than) Checks if the value of the left operand is greater than the value of the right operand, if yes, then the condition becomes true. Ex: (A > B) is not true.

Comparison Operators

- **A holds 10 and B holds 20**

No	Operator and Description
4	< (Less than) Checks if the value of the left operand is less than the value of the right operand, if yes, then the condition becomes true. Ex: (A < B) is true.
5	>= (Greater than or Equal to) Checks if the value of the left operand is greater than or equal to the value of the right operand, if yes, then the condition becomes true. Ex: (A >= B) is not true.
6	<= (Less than or Equal to) Checks if the value of the left operand is less than or equal to the value of the right operand, if yes, then the condition becomes true. Ex: (A <= B) is true.

Logical Operators

- **A holds 10 and B holds 20**

No	Operator and Description
1	&& (Logical AND) If both the operands are non-zero, then the condition becomes true. Ex: (A && B) is true.
2	|| (Logical OR) If any of the two operands are non-zero, then the condition becomes true. Ex: (A || B) is true.
3	! (Logical NOT) Reverses the logical state of its operand. If a condition is true, then the Logical NOT operator will make it false. Ex: ! (A && B) is false.

Bitwise Operators

- **A holds 2 and B holds 3**

No	Operator and Description
1	& (Bitwise AND) It performs a Boolean AND operation on each bit of its integer arguments. Ex: (A & B) is 2.
2	| (BitWise OR) It performs a Boolean OR operation on each bit of its integer arguments. Ex: (A | B) is 3.
3	^ (Bitwise XOR) It performs a Boolean exclusive OR operation on each bit of its integer arguments. Exclusive OR means that either operand one is true or operand two is true, but not both. Ex: (A ^ B) is 1.

Bitwise Operators

- **A holds 2 and B holds 3**

No	Operator and Description
4	~ (Bitwise Not) It is a unary operator and operates by reversing all the bits in the operand. Ex: (~B) is -4.
5	<< (Left Shift) It moves all the bits in its first operand to the left by the number of places specified in the second operand. New bits are filled with zeros. Shifting a value left by one position is equivalent to multiplying it by 2, shifting two positions is equivalent to multiplying by 4, and so on. Ex: (A << 1) is 4.
6	>> (Right Shift) Binary Right Shift Operator. The left operand's value is moved right by the number of bits specified by the right operand. Ex: (A >> 1) is 1.

Bitwise Operators

- **A holds 2 and B holds 3**

No	Operator and Description
7	>>> (Right shift with Zero) This operator is just like the >> operator, except that the bits shifted in on the left are always zero. Ex: (A >>> 1) is 1.

Assignment Operators

No	Operator and Description
1	= (Simple Assignment) Assigns values from the right side operand to the left side operand Ex: C = A + B will assign the value of A + B into C
2	+= (Add and Assignment) It adds the right operand to the left operand and assigns the result to the left operand. Ex: C += A is equivalent to C = C + A
3	-= (Subtract and Assignment) It subtracts the right operand from the left operand and assigns the result to the left operand. Ex: C -= A is equivalent to C = C - A

Assignment Operators

No	Operator and Description
4	*= (Multiply and Assignment) It multiplies the right operand with the left operand and assigns the result to the left operand. Ex: C *= A is equivalent to C = C * A
5	/= (Divide and Assignment) It divides the left operand with the right operand and assigns the result to the left operand. Ex: C /= A is equivalent to C = C / A
6	%= (Modules and Assignment) It takes modulus using two operands and assigns the result to the left operand. Ex: C %= A is equivalent to C = C % A

Conditional Operator

No	Operator and Description
1	? : (Conditional) If Condition is true? Then value X : Otherwise value Y

typeof Operator

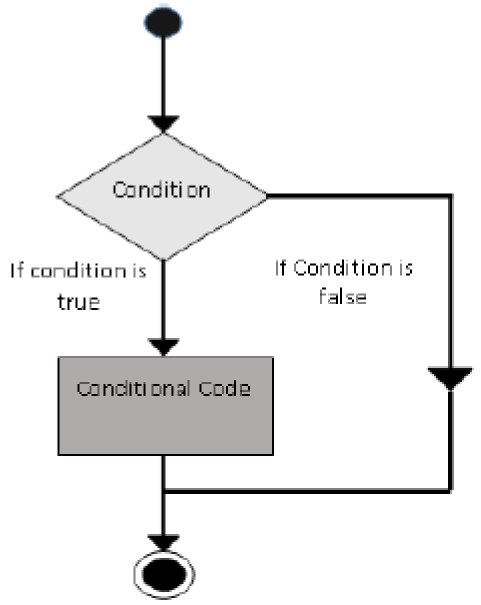
- **The typeof operator is a unary operator**
  - **Its value is a string indicating the data type of the operand**
  - **The typeof operator evaluates to "number", "string", or "boolean**

Type	String Returned by typeof
Number	"number"
String	"string"
Boolean	"boolean"
Object	"object"
Function	"function"
Undefined	"undefined"
Null	"object"

Conditional Statement

If else

- **if statement**
- **if ... else statement**
- **if ... else if ... statement**



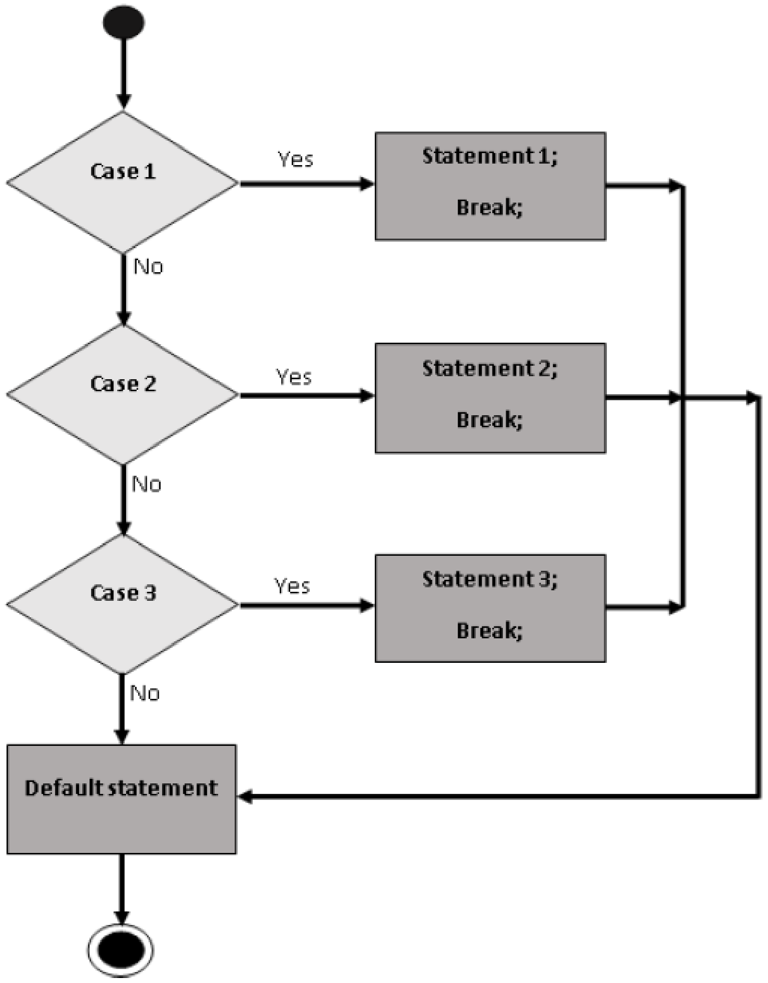
If else

- **The ‘if’ statement is the fundamental control statement that allows JavaScript to make decisions and execute statements conditionally.**

```
if (expression 1){
   Statement(s) to be executed if expression 1 is true
}else if (expression 2){
   Statement(s) to be executed if expression 2 is true
}else if (expression 3){
   Statement(s) to be executed if expression 3 is true
}else{
   Statement(s) to be executed if no expression is true
}
```

Switch

- **Efficient way for multiway branch**



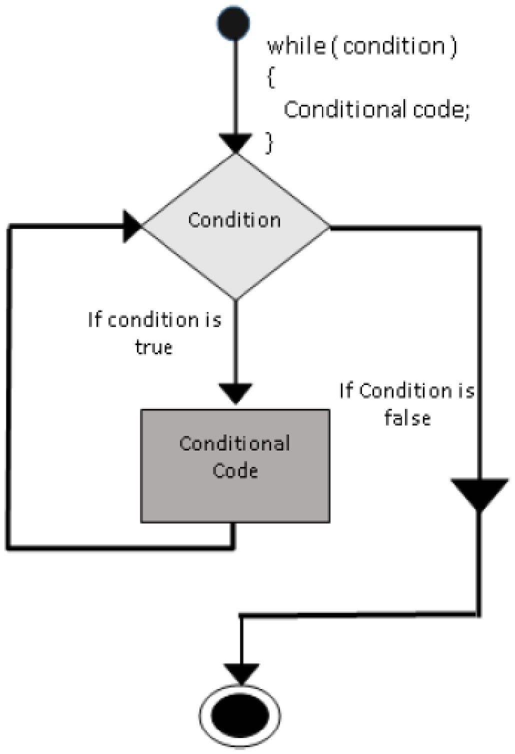
Switch

- **The objective of a switch statement is to give an expression to evaluate and several different statements to execute based on the value of the expression.**

```
switch (expression)
{
  case condition 1: statement(s)
                    break;
  case condition 2: statement(s)
                    break;
   ...
  case condition n: statement(s)
                    break;
  default: statement(s)
}
```

While Loop

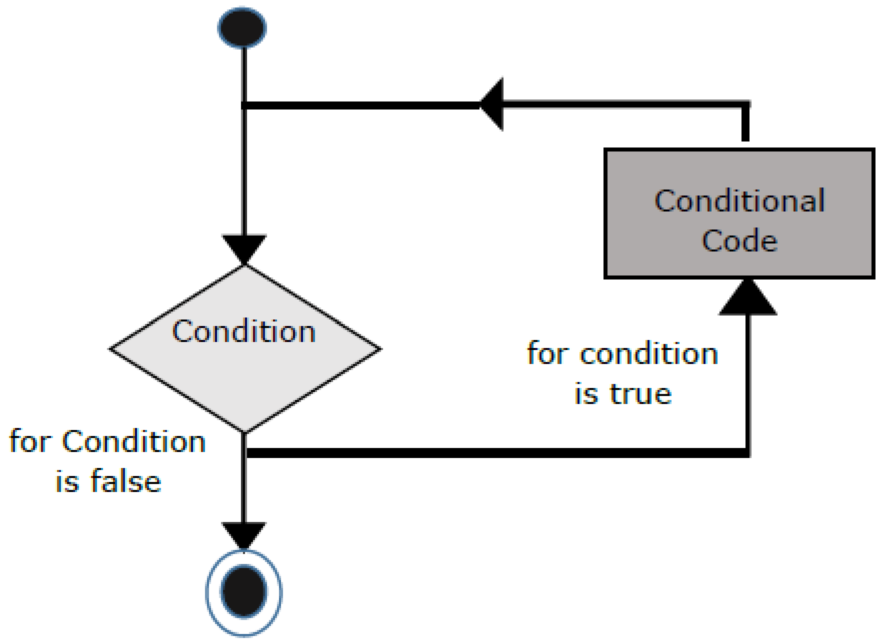
- **Execute a statement or code block repeatedly**



```
while (expression){
   Statement(s) to be executed if expression is true
}
```

For loop

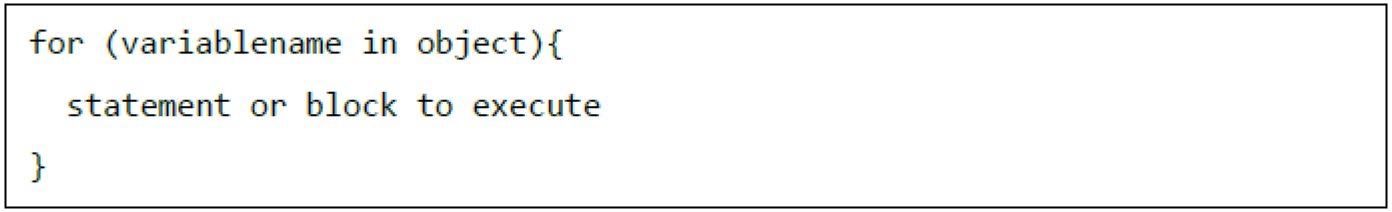
- **Loop initialization**
- **Test statement**
- **Iteration statement**



```
for (initialization; test condition; iteration statement){
     Statement(s) to be executed if test condition is true
}
```

For-In loop

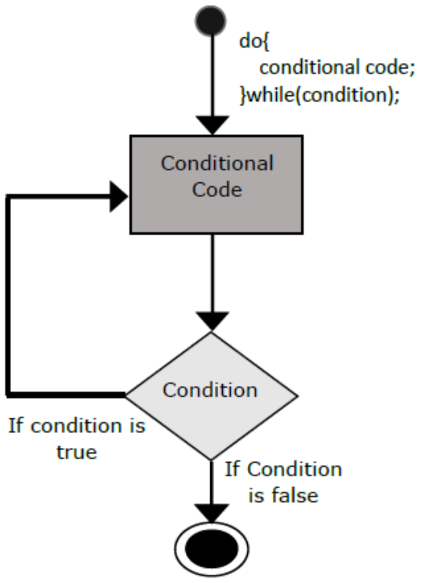
- **Loop through an object's properties.**



```
for (variablename in object){
  statement or block to execute
}
```

Do While Loop

- **Loop will always be executed at least once, even if the condition is false**



```
do{
   Statement(s) to be executed;
} while (expression);
```

Loop Control

- **Break**
  - **Breaks out of loop completely**
- **Continue**
  - **Start immediately the next iteration of the loop and skip the remaining code block**