2. JavaScript – Operators

What is an 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

Let's have a look on all operators one by one.

ARITHMETIC OPERATORS

JavaScript supports the following arithmetic operators –
Assume variable A holds 10 and variable B holds 20, then –

Sr.No.	Operator & 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
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

Note – Addition operator (+) works for Numeric as well as Strings. e.g. "a" + 10 will give "a10".

Example

The following code shows how to use arithmetic operators in JavaScript.

```
<html>
   <body>
   
      <script type = "text/javascript">
         <!--
            var a = 33;
            var b = 10;
            var c = "Test";
            var linebreak = "<br />";
         
            document.write("a + b = ");
            result = a + b;
            document.write(result);
            document.write(linebreak);
         
            document.write("a - b = ");
            result = a - b;
            document.write(result);
            document.write(linebreak);
         
            document.write("a / b = ");
            result = a / b;
            document.write(result);
            document.write(linebreak);
         
            document.write("a % b = ");
            result = a % b;
            document.write(result);
            document.write(linebreak);
         
            document.write("a + b + c = ");
            result = a + b + c;
            document.write(result);
            document.write(linebreak);
         
            a = ++a;
            document.write("++a = ");
            result = ++a;
            document.write(result);
            document.write(linebreak);
         
            b = --b;
            document.write("--b = ");
            result = --b;
            document.write(result);
            document.write(linebreak);
         //-->
      </script>

      Set the variables to different values and then try...
   </body>
</html>
```

Output

```
a + b = 43
a - b = 23
a / b = 3.3
a % b = 3
a + b + c = 43Test
++a = 35
--b = 8
Set the variables to different values and then try...
```

COMPARISON OPERATORS

JavaScript supports the following comparison operators –

Assume variable A holds 10 and variable B holds 20, then –

Sr.No.	Operator & 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.
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.

Example

The following code shows how to use comparison operators in JavaScript.

```
<html>
  <body>
    <script type = "text/javascript">
      <!--
        var a = 10;
        var b = 20;
        var linebreak = "<br />";

        document.write("(a == b) => ");
        result = (a == b);
        document.write(result);
        document.write(linebreak);

        document.write("(a < b) => ");
        result = (a < b);
        document.write(result);
        document.write(linebreak);

        document.write("(a > b) => ");
        result = (a > b);
        document.write(result);
        document.write(linebreak);

        document.write("(a != b) => ");
        result = (a != b);
        document.write(result);
        document.write(linebreak);

        document.write("(a >= b) => ");
        result = (a >= b);
        document.write(result);
        document.write(linebreak);

        document.write("(a <= b) => ");
        result = (a <= b);
```

```
            document.write(result);
            document.write(linebreak);
         //-->
      </script>
      Set the variables to different values and different operators and then try...
   </body>
</html>
```

Output

```
(a == b) => false
(a < b) => true
(a > b) => false
(a != b) => true
(a >= b) => false
a <= b) => true
Set the variables to different values and different operators and then try...
```

LOGICAL OPERATORS

JavaScript supports the following logical operators –

Assume variable A holds 10 and variable B holds 20, then –

Sr.No.	Operator & 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.

Example

Try the following code to learn how to implement Logical Operators in JavaScript.

```
<html>
   <body>
      <script type = "text/javascript">
         <!--
            var a = true;
            var b = false;
            var linebreak = "<br />";
```

```
        document.write("(a && b) => ");
        result = (a && b);
        document.write(result);
        document.write(linebreak);

        document.write("(a || b) => ");
        result = (a || b);
        document.write(result);
        document.write(linebreak);

        document.write("!(a && b) => ");
        result = (!(a && b));
        document.write(result);
        document.write(linebreak);
      //-->
    </script>
    <p>Set the variables to different values and different operators and then
try...</p>
  </body>
</html>
```

Output

```
(a && b) => false
(a || b) => true
!(a && b) => true
Set the variables to different values and different operators and then try...
```

BITWISE OPERATORS

JavaScript supports the following bitwise operators –
Assume variable A holds 2 and variable B holds 3, then –

Sr.No.	Operator & 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. Exclu means that either operand one is true or operand two is true, but not both. **Ex:** (A ^ B) is 1.

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 th operand. New bits are filled with zeros. Shifting a value left by one position is equivalent 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 bit specified by the right operand. **Ex:** (A >> 1) is 1.
7	**>>> (Right shift with Zero)** This operator is just like the >> operator, except that the bits shifted in on the left are a zero. **Ex:** (A >>> 1) is 1.

Example

Try the following code to implement Bitwise operator in JavaScript.

```
<html>
   <body>
      <script type = "text/javascript">
         <!--
            var a = 2; // Bit presentation 10
            var b = 3; // Bit presentation 11
            var linebreak = "<br />";

            document.write("(a & b) => ");
            result = (a & b);
            document.write(result);
            document.write(linebreak);

            document.write("(a | b) => ");
            result = (a | b);
            document.write(result);
            document.write(linebreak);

            document.write("(a ^ b) => ");
            result = (a ^ b);
            document.write(result);
            document.write(linebreak);

            document.write("(~b) => ");
            result = (~b);
```

```
        document.write(result);
        document.write(linebreak);

        document.write("(a << b) => ");
        result = (a << b);
        document.write(result);
        document.write(linebreak);

        document.write("(a >> b) => ");
        result = (a >> b);
        document.write(result);
        document.write(linebreak);
      //-->
    </script>
    <p>Set the variables to different values and different operators and then
try...</p>
  </body>
</html>
```

Output

```
(a & b) => 2
(a | b) => 3
(a ^ b) => 1
(~b) => -4
(a << b) => 16
(a >> b) => 0
Set the variables to different values and different operators and then try...
```

ASSIGNMENT OPERATORS

JavaScript supports the following assignment operators –

Sr.No.	Operator & 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

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

Note – Same logic applies to Bitwise operators so they will become like <<=, >>=, >>=, &=, |= and ^=.

Example

Try the following code to implement assignment operator in JavaScript.

```
<html>
   <body>
      <script type = "text/javascript">
         <!--
            var a = 33;
            var b = 10;
            var linebreak = "<br />";

            document.write("Value of a => (a = b) => ");
            result = (a = b);
            document.write(result);
            document.write(linebreak);

            document.write("Value of a => (a += b) => ");
            result = (a += b);
            document.write(result);
            document.write(linebreak);

            document.write("Value of a => (a -= b) => ");
            result = (a -= b);
            document.write(result);
            document.write(linebreak);

            document.write("Value of a => (a *= b) => ");
            result = (a *= b);
            document.write(result);
            document.write(linebreak);

            document.write("Value of a => (a /= b) => ");
            result = (a /= b);
            document.write(result);
            document.write(linebreak);

            document.write("Value of a => (a %= b) => ");
            result = (a %= b);
            document.write(result);
            document.write(linebreak);
         //-->
      </script>
      <p>Set the variables to different values and different operators and then
try...</p>
   </body>
</html>
```

Output

```
Value of a => (a = b) => 10
Value of a => (a += b) => 20
Value of a => (a -= b) => 10
Value of a => (a *= b) => 100
Value of a => (a /= b) => 10
Value of a => (a %= b) => 0
Set the variables to different values and different operators and then try...
```

Miscellaneous Operator

We will discuss two operators here that are quite useful in JavaScript: the **conditional operator** (? :) and the **typeof operator**.

CONDITIONAL OPERATOR (? :)

The conditional operator first evaluates an expression for a true or false value and then executes one of the two given statements depending upon the result of the evaluation.

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

Example

Try the following code to understand how the Conditional Operator works in JavaScript.

```
<html>
   <body>
```

```
      <script type = "text/javascript">
         <!--
            var a = 10;
            var b = 20;
            var linebreak = "<br />";

            document.write ("((a > b) ? 100 : 200) => ");
            result = (a > b) ? 100 : 200;
            document.write(result);
            document.write(linebreak);

            document.write ("((a < b) ? 100 : 200) => ");
            result = (a < b) ? 100 : 200;
            document.write(result);
            document.write(linebreak);
         //-->
      </script>
      <p>Set the variables to different values and different operators and then
try...</p>
   </body>
</html>
```

Output

```
((a > b) ? 100 : 200) => 200
((a < b) ? 100 : 200) => 100
Set the variables to different values and different operators and then try...
```

TYPEOF OPERATOR

The **typeof** operator is a unary operator that is placed before its single operand, which can be of any type. Its value is a string indicating the data type of the operand.

The *typeof* operator evaluates to "number", "string", or "boolean" if its operand is a number, string, or boolean value and returns true or false based on the evaluation.

Here is a list of the return values for the **typeof** Operator.

Type	**String Returned by typeof**
Number	"number"
String	"string"
Boolean	"boolean"
Object	"object"
Function	"function"

Undefined	"undefined"
Null	"object"

Example
The following code shows how to implement **typeof** operator.

```
<html>
  <body>
    <script type = "text/javascript">
      <!--
        var a = 10;
        var b = "String";
        var linebreak = "<br />";

        result = (typeof b == "string" ? "B is String" : "B is Numeric");
        document.write("Result => ");
        document.write(result);
        document.write(linebreak);

        result = (typeof a == "string" ? "A is String" : "A is Numeric");
        document.write("Result => ");
        document.write(result);
        document.write(linebreak);
      //-->
    </script>
    <p>Set the variables to different values and different operators and then
try...</p>
  </body>
</html>
```

Output

```
Result => B is String
Result => A is Numeric
Set the variables to different values and different operators and then try...
```

ACTIVITY 2. JAVASCRIPT OPERATORS

Problem 1: Calculate the Area of a Rectangle

Write a function called calculateRectangleArea that takes two parameters, width and height, and returns the area of a rectangle. Use the formula area = width * height.

Problem 2: Check if a Number is Even or Odd

Write a function called isEven that takes a number as a parameter and returns true if the number is even and false if it is odd. Use the modulus operator (%) to determine if a number is even or odd.

Problem 3: Convert Fahrenheit to Celsius
Write a function called convertFahrenheitToCelsius that takes a temperature in Fahrenheit as a parameter and returns the equivalent temperature in Celsius. Use the formula celsius = (fahrenheit - 32) * 5/9.

Submit your activity on our drive link (bit.ly/1AComProg2). Follow the instructions on "ReadMe". You should have 2 Activity folders after this lesson.