JavaScript

Part #1

History

- Originally developed by Branden Eich (Netscape), as LiveScript
- Became a joint venture of Netscape and Sun in 1995, renamed JavaScript
- Now standardized by the European Computer Manufacturers Association as ECMA-262 (also ISO 16262)
- Though related through syntax, JavaScript and Java are (very) different
  - JavaScript is dynamically typed
  - JavaScript's support for objects is very different
- JavaScript for Web platform
  - Speed
  - Gadgets
  - Mashups

JavaScript Features - Crockford

- Load and go delivery
- Case sensitive
- Loose typing (or dynamic typing)
- Objects as general containers
  - root object is Object
  - add properties to object, clone objects
  - objects are accessed through references
- Inheritance
  - extends keyword
  - Prototypal
- Lambda

What tools you need to learn JavaScript

- Same as HTML and CSS
  - At least for the moment
- Text editor
- Web browser
- No need for a Web server
  - Having NodeJS will help

General Syntax

- Embed JavaScript code

```
<script type = "text/javaScript">

   //-- JavaScript script -

</script>
```

- Import a JavaScript file

```
<script type = "text/javaScript"
          src = "myScript.js">
</script>
```

- JavaScript comments: both `//` and `/* … */`

Hello World with JavaScript

```
<!DOCTYPE html>
<html lang = "en">
  <head>
    <title> Hello world </title>
    <meta charset = "utf-8" />
  </head>
  <body>
    <script>

      document.write("Hello, SOEN 287!");

    </script>
  </body>
</html>
```

With CSS and JavaScript

```
<!DOCTYPE html>
<html lang="en">
  <head>
    <link rel="stylesheet" href="styles.css" />
    <script type="text/javaScript"
src="scripts.js"></script>
  </head>
  <body></body>
</html>
```

Operations

- Numeric operators `++`, `--`, `+`, `-`, `*`, `/`, `%`
- The `Math` Object provides `floor`, `round`, `max`, `min`, trig functions, etc.
  - e.g., `Math.cos(x)`

The `Number` Object

- `MAX_VALUE`, `MIN_VALUE`, `NaN`, `POSITIVE_INFINITY`, `NEGATIVE_INFINITY`, `PI`
- e.g., `Number.MAX_VALUE`
- An arithmetic operation that creates overflow returns `NaN`
- `NaN` is not `==` to any number, not even itself
- Test for it with `isNaN(x)`
- `Number` object has the method `toString`

String Operations

- Operator: +
- Coercion is used:
  - "Jan " + 2010
  - 7 * '3'
- Explicit conversions
  - Use the `String` and `Number` constructors
  - Use `toString` method of numbers
  - Use `parseInt` and `parseFloat` on string

```
var num = 6;
var str = String(num);
var str2 = num.toString();
var n1 = Number("6");
var n2 = parseInt("6");
```

+: both plus and string concatenation – be careful

```
1 + 2
"1" + 2
1 + "2"
"1" + "2"
1+ " bird"
1+2+ "birds"
```

+: both plus and string concatenation

```
1 + 2
"1" + 2
1 + "2"
"1" + "2"
1+ " bird"
1+2+ "birds"
```

- If both operands are numbers:
  - + is addition
- Otherwise, string concatenation.

+: both plus and string concatenation

```
1 + 2  = 3
"1" + 2
1 + "2"
"1" + "2"
1+ " bird"
1+2+ "birds"
```

- If both operands are numbers:
  - + is addition
- Otherwise, string concatenation.

+: both plus and string concatenation

```
1 + 2  = 3
"1" + 2 = "12"
1 + "2"
"1" + "2"
1+ " bird"
1+2+ "birds"
```

- If both operands are numbers:
  - + is addition
- otherwise, string concatenation.

+: both plus and string concatenation

```
1 + 2  = 3
"1" + 2 = "12"
1 + "2" = "12"
"1" + "2"
1+ " bird"
1+2+ "birds"
```

- If both operands are numbers:
  - + is addition
- Otherwise, string concatenation.

+: both plus and string concatenation

```
1 + 2  = 3
"1" + 2 = "12"
1 + "2" = "12"
"1" + "2" = "12"
1+ " bird"
1+2+ "birds"
```

- If both operands are numbers:
  - + is addition
- Otherwise, string concatenation.

+: both plus and string concatenation

```
1 + 2  = 3
"1" + 2 = "12"
1 + "2" = "12"
"1" + "2" = "12"
1+ " bird" = "1 bird"
1+2+ "birds"
```

- If both operands are numbers:
  - + is addition
- Otherwise, string concatenation.

+: both plus and string concatenation

```
1 + 2  = 3
"1" + 2 = "12"
1 + "2" = "12"
"1" + "2" = "12"
1+ " bird" = "1 bird"
1+2+ "birds" = "3birds"
```

- If both operands are numbers:
  - + is addition
- Otherwise, string concatenation.

Question

- What is the result of `'$' + 3 + 4` ?

A. $7

B. $34

C. error

D. undefined

Other operators in this case?

```
11 < 2
"11" < 2
11 < "2"
"11" < "2"
11 < "bird"
11 < 2+ "birds"
```

Other operators in this case?

```
11 < 2
"11" < 2
11 < "2"
"11" < "2"
11 < "bird"
11 < 2+ "birds"
```

- If one operand is a number, and the other can be converted to a number, < is a number comparison,
- If one operand is a number, and the other cannot be converted to a number, false all the time.
- If the two operands are string, < is a string comparison

Other operators in this case?

```
11 < 2                  false
"11" < 2
11 < "2"
"11" < "2"
11 < "bird"
11 < 2+ "birds"
```

- If one operand is a number, and the other can be converted to a number, < is a number comparison,
- If one operand is a number, and the other cannot be converted to a number, false all the time.
- If the two operands are string, < is a string comparison

Other operators in this case?

```
11 < 2                  false
"11" < 2                false
11 < "2"
"11" < "2"
11 < "bird"
11 < 2+ "birds"
```

- If one operand is a number, and the other can be converted to a number, < is a number comparison,
- If one operand is a number, and the other cannot be converted to a number, false all the time.
- If the two operands are string, < is a string comparison

Other operators in this case?

```
11 < 2                  false
"11" < 2                false
11 < "2"                false
"11" < "2"
11 < "bird"
11 < 2+ "birds"
```

- If one operand is a number, and the other can be converted to a number, < is a number comparison,
- If one operand is a number, and the other cannot be converted to a number, false all the time.
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Other operators in this case?

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11 < 2                  false
"11" < 2                false
11 < "2"                false
"11" < "2"              true
11 < "bird"
11 < 2+ "birds"
```

- If one operand is a number, and the other can be converted to a number, < is a number comparison,
- If one operand is a number, and the other cannot be converted to a number, false all the time.
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Other operators in this case?

```
11 < 2                  false
"11" < 2                false
11 < "2"                false
"11" < "2"              true
11 < "bird"             false
11 < 2+ "birds"
```

- If one operand is a number, and the other can be converted to a number, < is a number comparison,
- If one operand is a number, and the other cannot be converted to a number, false all the time.
- If the two operands are string, < is a string comparison

Other operators in this case?

```
11 < 2                  false
"11" < 2                false
11 < "2"                false
"11" < "2"              true
11 < "bird"             false
11 < 2+ "birds"         false
```

- If one operand is a number, and the other can be converted to a number, < is a number comparison,
- If one operand is a number, and the other cannot be converted to a number, false all the time.
- If the two operands are string, < is a string comparison

Question

- What is the result of `'$' + 3 < 4` ?

A. false
B. true
C. error
D. undefined

Other operators in this case?

```
11 * 2
"11" * 2
11 * "2"
"11" * "2"
11 * "2bird"
```

Other operators in this case?

```
11 * 2
"11" * 2
11 * "2"
"11" * "2"
11 * "2bird"
```

- If operands are numbers, **or all can be converted to a number**, * is a number multiply
- If one operand is a number, and the other cannot be converted to a number, NaN all the time.

Other operators in this case?

```
11 * 2                  22
"11" * 2
11 * "2"
"11" * "2"
11 * "2bird"
```

- If operands are numbers, **or all can be converted to a number**, * is a number multiply
- If one operand is a number, and the other cannot be converted to a number, NaN all the time.

Other operators in this case?

```
11 * 2                  22
"11" * 2                22
11 * "2"
"11" * "2"
11 * "2bird"
```

- If operands are numbers, **or all can be converted to a number**, * is a number multiply
- If one operand is a number, and the other cannot be converted to a number, NaN all the time.

Other operators in this case?

```
11 * 2                  22
"11" * 2                22
11 * "2"                22
"11" * "2"
11 * "2bird"
```

- If operands are numbers, **or all can be converted to a number**, * is a number multiply
- If one operand is a number, and the other cannot be converted to a number, NaN all the time.

Other operators in this case?

```
11 * 2                  22
"11" * 2                22
11 * "2"                22
"11" * "2"              22
11 * "2bird"
```

- If operands are numbers, **or all can be converted to a number**, * is a number multiply
- If one operand is a number, and the other cannot be converted to a number, NaN all the time.

Other operators in this case?

```
11 * 2                  22
"11" * 2                22
11 * "2"                22
"11" * "2"              22
11 * "2bird"            NaN
```

- If operands are numbers, **or all can be converted to a number**, * is a number multiply
- If one operand is a number, and the other cannot be converted to a number, NaN all the time.

Question

- What is the result of `'$'*3 < 4` ?

A. false
B. true
C. error
D. undefined

String

- Sequence of 0 or more 16-bit characters
- No separate character type
  - Characters are represented as strings with a length of 1
- Strings are immutable (similar to Java!)
- Use == to check if the values of the strings are the same (definitely not in Java!)
- String literals can use single or double quotes
- `String.length`
- `String(value)`: returns `string`
- `new String(value)`: returns `object`
  - You can live without this

Question

- The following code prints

```
var a = "123";
var b = "123";
document.write(a==b);
```

A. true
B. false
C. error
D. undefined

`String` methods

- `charAt`
- `concat`
- `indexOf`
- `lastIndexOf`
- `match`
- `replace`
- `search`
- `split`
- `substring`
- `toLowerCase`
- `toUpperCase`
- …

Boolean

- Boolean values are `true` and `false`
- 0, -0, null, "", false, undefined, or NaN are considered **`false`**
- "0" is **`true!`**
- the `Boolean(value)` function

Question

- What does the following code return?

```
Boolean("false");
```

A. true
B. false
C. error
D. undefined

The `Date` Object

- The `Date` Object

`toLocaleString` – returns a string of the date

`getDate` – returns the day of the month

`getMonth` – returns the month of the year (0 – 11)

`getDay` – returns the day of the week (0 – 6)

`getFullYear` – returns the year

`getTime` – returns the number of milliseconds since January 1, 1970

`getHours` – returns the hour (0 – 23)

`getMinutes` – returns the minutes (0 – 59)

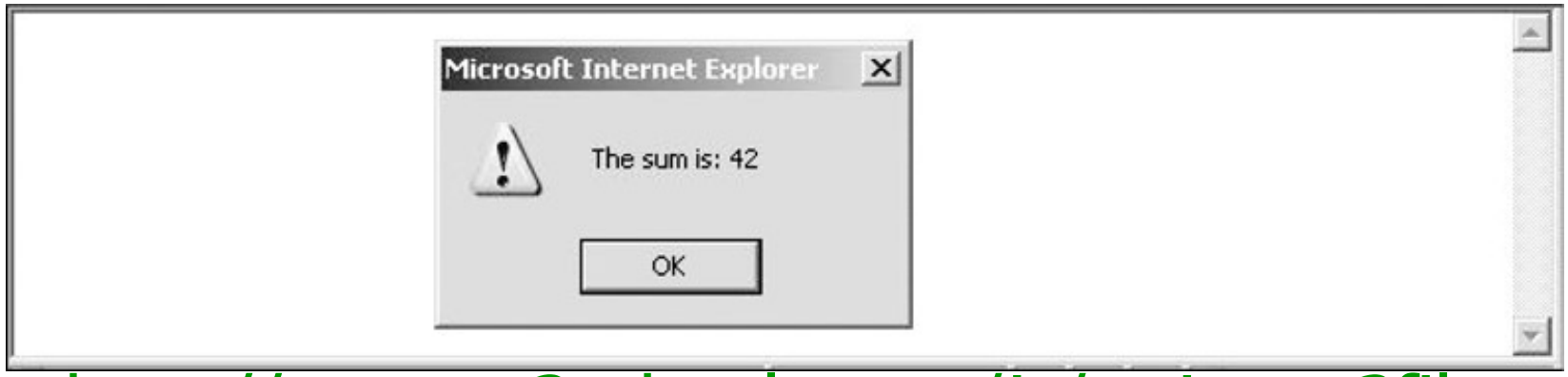
`getMilliseconds` – returns the millisecond (0 – 999)

Screen Output & Keyboard Input

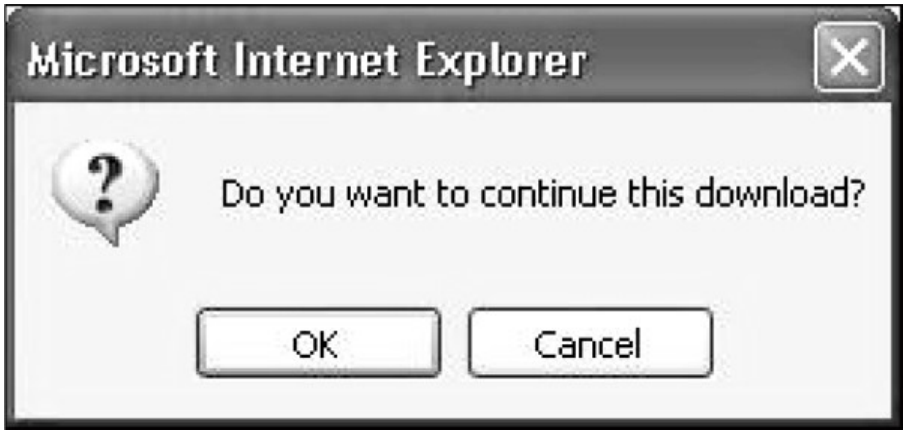
- The model for the browser display window is the `window` object
- The `window` object contains `document` object
- The `document` object has a method, `write`, which dynamically creates content

Screen output

- `alert("The sum is:"+sum+"\n");`



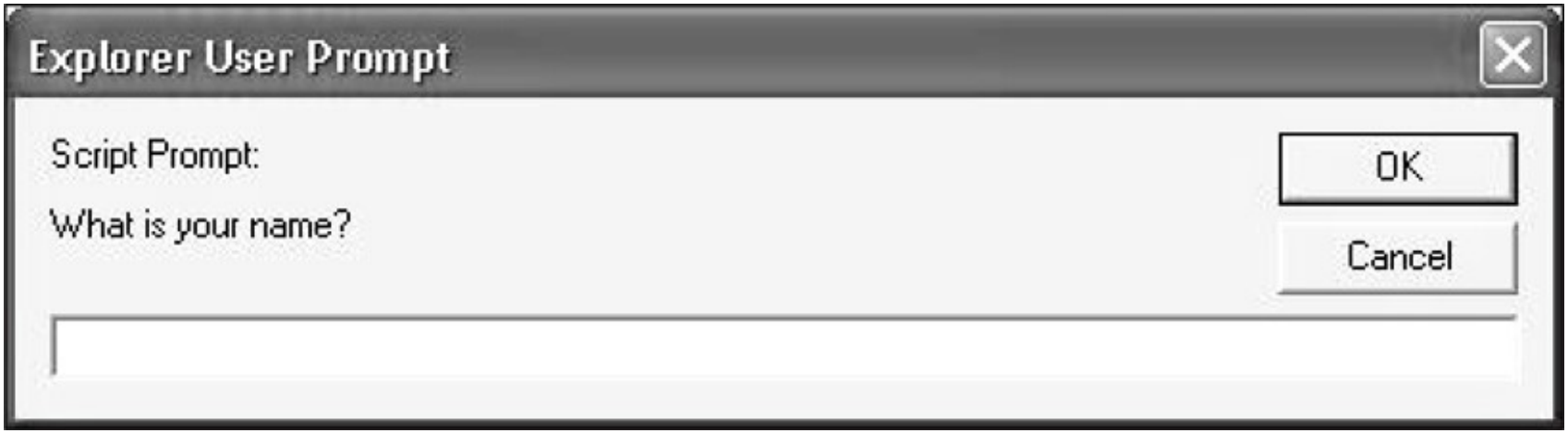
- http://www.w3schools.com/js/tryit.asp?filename=tryjs_alert
- `confirm("Do you want to continue?");`



- http://www.w3schools.com/js/tryit.asp?filename=tryjs_confirm

Get input in a dialog box

- `prompt("What is your name?", "");`



Control expressions

```
if(1) {document.write('yes');}
      else {document.write('no');}
if(0) {document.write('yes');}
      else {document.write('no');}
```

- 0, -0, null, "", false, undefined, or NaN are considered **`false`**
- `==, !=, <, >, <=, >=, ===, !==`
- `&&, ||, !`

Equal and not equal

- `==` and `!=` can do type coercion
- `===` and `!==` cannot do type coercion
- Thus

```
"3" == 3: true
"3" === 3: false
```

Question

```
var a = "123";
var b = "123";
if(a==b) {document.write('yes');}
      else {document.write('no');}
```

- What is the output?

  A. yes

  B. no

  C. error

  D. nothing

Question

```
if (3 !== "3") {document.write('yes');}
      else {document.write('no');}
```

- What is the output?

A. yes
B. no
C. error
D. nothing

Question

```
var a = new String("123");
var b = new String("123");
if(a==b) {document.write('yes');}
      else {document.write('no');}
```

- What is the output?

  A. yes

  B. no

  C. error

  D. nothing

Question

```
var a = "123";
var b = "123";
if(a==b) {document.write('yes');}
      else {document.write('no');}
```

- What is the output?

  A. yes

  B. no

  C. error

  D. nothing

A Challenge Question

```
var a = String("123");
var b = new String("123");
if(a==b) {document.write('yes');}
      else {document.write('no');}
```

- What is the output?

  A. yes

  B. no

  C. error

  D. nothing

The logic operators: && and ||

- &&:
  if the first operand is true,
  return the second operand,
  else return the first operand
- ||:
  if the first operand is true,
  return the first operand,
  else return the second operand

```
var last = input || default_value;
```

The logic operators: !

- `!`:

  if the operand is true,

  return `false`,

  else return `true`

Control Statements

- Switch

```
switch (expression) {
     case value_1:
        // value_1 statements
     case value_2:
        // value_2 statements
     …
     [default:
        // default statements]
  }
```

Switch (2)

- Use break at the end of each case
  - Except the last case (optional)
- Switch uses strict comparison (===)
  - switch("1") will not execute the body of case 1
- default does not have to be the last block

Control Statements

- Loop
  - `while`
  - `for`
  - `do-while`