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Intro to Javascript

What is Javascript?

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- a lightweight programming language ("scripting language")
 - ▣ used to make web pages interactive
 - ▣ insert dynamic text into HTML (ex: user name)
 - ▣ **react to events** (ex: page load user click)
 - ▣ get information about a user's computer (ex: browser type)
 - ▣ perform calculations on user's computer (ex: form validation)

What is Javascript?

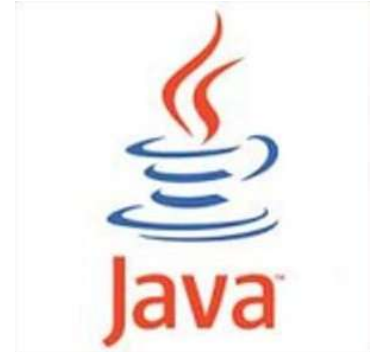
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- a web standard (but not supported identically by all browsers)
- NOT related to Java other than by name and some syntactic similarities

Javascript vs Java

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- interpreted, not compiled
- more relaxed syntax and rules
 - fewer and "looser" data types
 - variables don't need to be declared
 - errors often silent (few exceptions)
- key construct is the function rather than the class
 - "first-class" functions are used in many situations
- contained within a web page and integrates with its HTML/CSS content



Javascript vs Java

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+



=



JavaScript vs. PHP

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- similarities:
 - ▣ both are interpreted, not compiled
 - ▣ both are relaxed about syntax, rules, and types
 - ▣ both are case-sensitive
 - ▣ both have built-in regular expressions for powerful text processing

JavaScript vs. PHP

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□ differences:

- JS is more object-oriented: `noun.verb()`, less procedural: `verb(noun)`
- JS focuses on user interfaces and interacting with a document; PHP is geared toward HTML output and file/form processing
- JS code runs on the client's browser; PHP code runs on the web server

JS <3



Linking to a JavaScript file:

script

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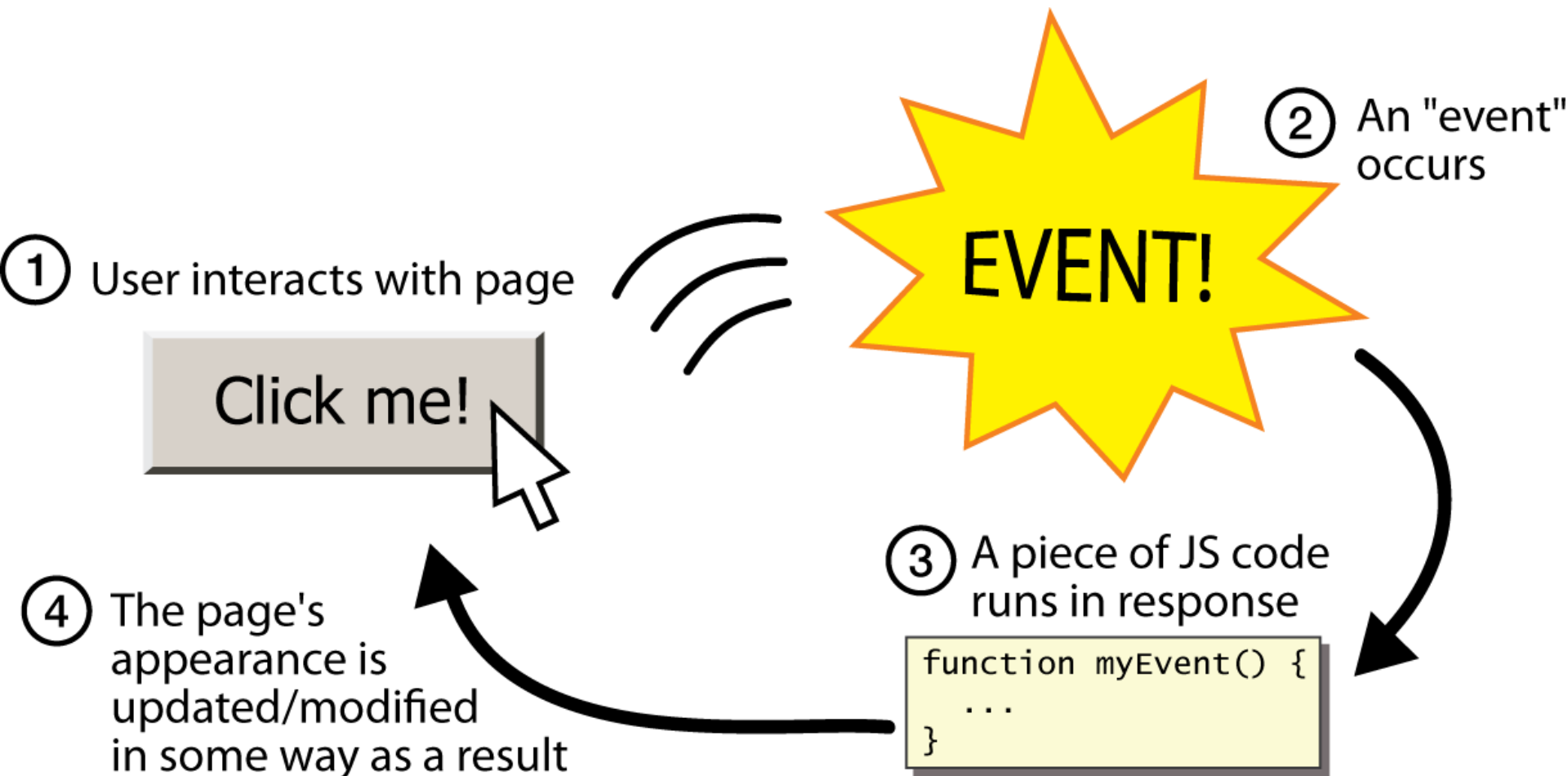
```
<script src="filename" type="text/javascript"></script>
```

HTML

- script tag should be placed in HTML page's head
- script code is stored in a separate .js file
- JS code can be placed directly in the HTML file's body or head (like CSS)
 - but this is bad style (should separate content, presentation, and behavior)

Event-driven programming

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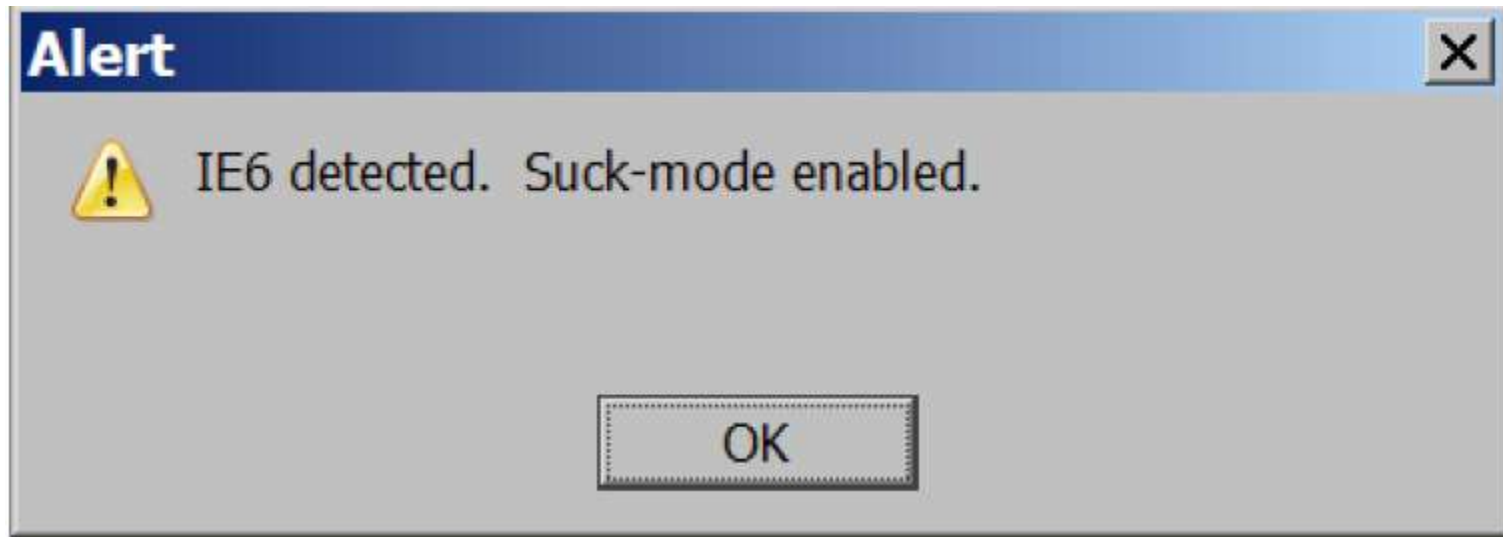


A JavaScript statement: `alert`

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```
alert("IE6 detected. Suck-mode enabled.");
```

JS



- a JS command that pops up a dialog box with a message

Event-driven programming

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- ❑ you are used to programs start with a main method (or implicit main like in PHP)
- ❑ JavaScript programs instead wait for user actions called *events* and respond to them
- ❑ event-driven programming: writing programs driven by user events
- ❑ Let's write a page with a clickable button that pops up a "Hello, World" window...

Buttons

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```
<button>Click me!</button>
```

HTML

- button's text appears inside tag; can also contain images
- To make a responsive button or other UI control:
 1. choose the control (e.g. button) and event (e.g. mouse 1. click) of interest
 2. write a JavaScript function to run when the event occurs
 3. attach the function to the event on the control

JavaScript functions

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```
function name() {  
  statement ;  
  statement ;  
  ...  
  statement ;  
}
```

JS

```
function myFunction() {  
    alert("Hello!");  
    alert("How are you?");  
}
```

JS

- ❑ the above could be the contents of `example.js` linked to our HTML page
- ❑ statements placed into functions can be evaluated in response to user events

Event handlers

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```
<element attributes onclick="function();">...
```

HTML

```
<button onclick="myFunction();">Click me!</button>
```

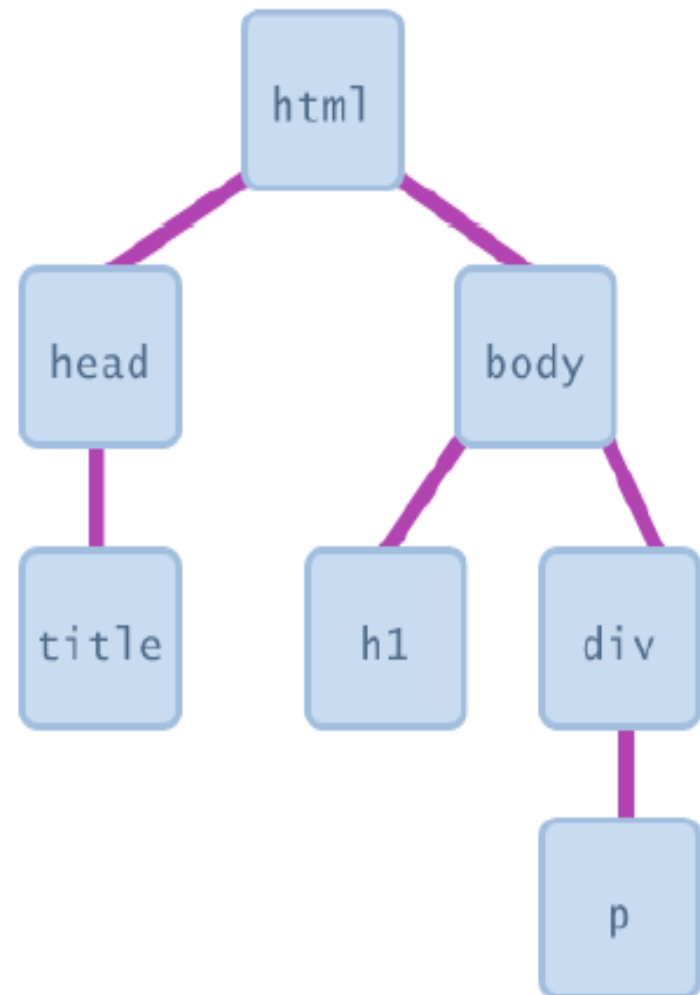
HTML

- JavaScript functions can be set as event handlers
 - ▣ when you interact with the element, the function will execute
- onclick is just one of many event HTML attributes we'll use
- but popping up an alert window is disruptive and annoying
 - ▣ A better user experience would be to have the message appear on the page...

Document Object Model (DOM)

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- most JS code manipulates elements on an HTML page
- we can examine elements' state
 - ▣ e.g. see whether a box is checked
- we can change state
 - ▣ e.g. insert some new text into a div
- we can change styles
 - ▣ e.g. make a paragraph red



DOM element objects

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HTML

```
<p>  
  Look at this octopus:  
    
  Cute, huh?  
</p>
```

DOM Element Object	
Property	Value
tagName	"IMG"
<u>src</u>	"octopus.jpg"
alt	"an octopus"
id	"icon01"

JavaScript

```
var icon = document.getElementById("icon01");  
icon.src = "kitty.gif";
```


Accessing elements:

document.getElementById

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```
var name = document.getElementById("id");
```

JS

```
<button onclick="changeText();">Click me!</button>  
<span id="output">replace me</span>  
<input id="textbox" type="text" />
```

HTML

```
function changeText() {  
    var span = document.getElementById("output");  
    var textBox = document.getElementById("textbox");  
  
    textBox.style.color = "red";  
}
```

JS

Accessing elements:

`document.getElementById`

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- ❑ `document.getElementById` returns the DOM object for an element with a given id
- ❑ can change the text inside most elements by setting the `innerHTML` property
- ❑ can change the text in form controls by setting the `value` property

Changing element style:

`element.style`

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Attribute	Property or style object
color	color
padding	padding
background-color	backgroundColor
border-top-width	borderTopWidth
Font size	fontSize
Font famiy	fontFamily

Preetify

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```
function changeText() {  
    //grab or initialize text here  
  
    // font styles added by JS:  
    text.style.fontSize = "13pt";  
    text.style.fontFamily = "Comic Sans MS";  
    text.style.color = "red"; // or pink?  
}
```

JS

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More Javascript Syntax

Variables

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```
var name = expression;
```

JS

```
var clientName = "Connie Client";  
var age = 32;  
var weight = 127.4;
```

JS

- variables are declared with the var keyword (case sensitive)
- types are not specified, but JS does have types ("loosely typed")
 - Number, Boolean, String, Array, Object, Function, Null, Undefined
 - can find out a variable's type by calling `typeof`

Number type

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```
var enrollment = 99;  
var medianGrade = 2.8;  
var credits = 5 + 4 + (2 * 3);
```

JS

- integers and real numbers are the same type (no int vs. double)
- same operators: $+$ $-$ $*$ $/$ $\%$ $++$ $--$ $=$ $+=$ $-=$ $*=$ $/=$ $\%=$
- similar precedence to Java
- many operators auto-convert types: "2" * 3 is 6

Comments (same as Java)

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```
// single-line comment  
/* multi-line comment */
```

JS

- identical to Java's comment syntax
- recall: 4 comment syntaxes
 - HTML: `<!-- comment -->`
 - CSS/JS/PHP: `/* comment */`
 - Java/JS/PHP: `// comment`
 - PHP: `# comment`

Math object

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```
var rand1to10 = Math.floor(Math.random() * 10 + 1);  
var three = Math.floor(Math.PI);
```

JS

- **methods:** abs, ceil, cos, floor, log, max, min, pow, random, round, sin, sqrt, tan
- **properties:** E, PI

Special values: null and undefined

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```
var ned = null;  
var benson = 9;  
// at this point in the code,  
// ned is null  
// benson's 9  
// caroline is undefined
```

JS

- `undefined` : has not been declared, does not exist
- `null` : exists, but was specifically assigned an empty or null value
- Why does JavaScript have both of these?

Logical operators

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- `> < >= <= && || ! == != === !==`
- most logical operators automatically convert types:
 - ▣ `5 < "7"` is true
 - ▣ `42 == 42.0` is true
 - ▣ `"5.0" == 5` is true
- `===` and `!==` are strict equality tests; checks both type and value
 - ▣ `"5.0" === 5` is false

if/else statement (same as Java)

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```
if (condition) {  
    statements;  
} else if (condition) {  
    statements;  
} else {  
    statements;  
}
```

JS

- ❑ identical structure to Java's if/else statement
- ❑ JavaScript allows almost anything as a condition

Boolean type

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```
var iLike190M = true;  
var ieIsGood = "IE6" > 0; // false  
if ("web devevelopment is great") { /* true */ }  
if (0) { /* false */ }
```

JS

- any value can be used as a Boolean
 - ▣ "falsey" values: 0, 0.0, NaN, "", null, and undefined
 - ▣ "truthy" values: anything else
- converting a value into a Boolean explicitly:
 - ▣ `var boolValue = Boolean(otherValue);`
 - ▣ `var boolValue = !! (otherValue);`

for loop (same as Java)

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```
var sum = 0;  
for (var i = 0; i < 100; i++) {  
    sum = sum + i;  
}
```

JS

```
var s1 = "hello";  
var s2 = "";  
for (var i = 0; i < s.length; i++) {  
    s2 += s1.charAt(i) + s1.charAt(i);  
}  
// s2 stores "hheellllloo"
```

JS

while loops (same as Java)

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```
while (condition) {  
    statements;  
}
```

JS

```
do {  
    statements;  
} while (condition);
```

JS

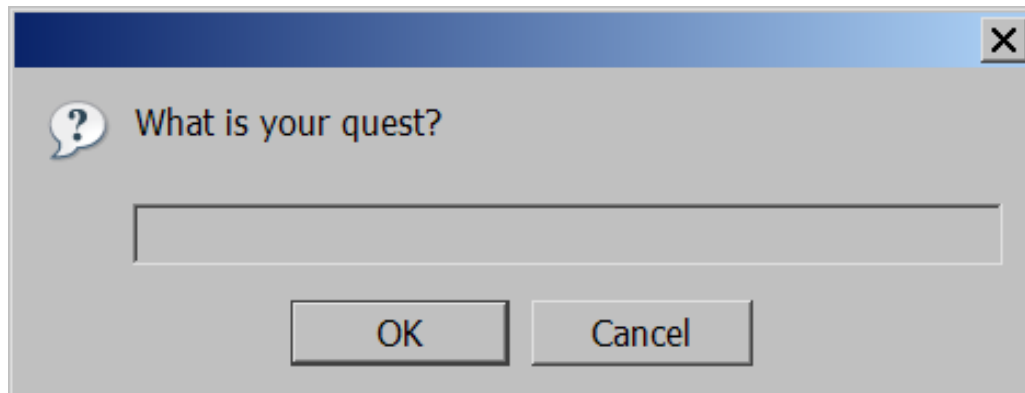
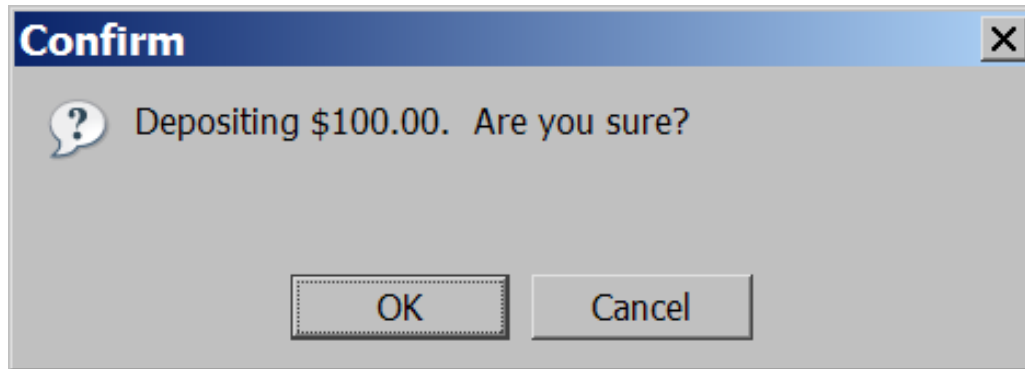
- break and continue keywords also behave as in Java

Popup boxes

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```
alert("message"); // message  
confirm("message"); // returns true or false  
prompt("message"); // returns user input string
```

JS



Arrays

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```
var name = []; // empty array  
var name = [value, value, ..., value]; // pre-filled  
name[index] = value; // store element
```

JS

```
var ducks = ["Huey", "Dewey", "Louie"];  
var stooges = []; // stooges.length is 0  
stooges[0] = "Larry"; // stooges.length is 1  
stooges[1] = "Moe"; // stooges.length is 2  
stooges[4] = "Curly"; // stooges.length is 5  
stooges[4] = "Shemp"; // stooges.length is 5
```

JS

Array methods

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```
var a = ["Stef", "Jason"]; // Stef, Jason
a.push("Brian"); // Stef, Jason, Brian
a.unshift("Kelly"); // Kelly, Stef, Jason, Brian
a.pop(); // Kelly, Stef, Jason
a.shift(); // Stef, Jason
a.sort(); // Jason, Stef
```

JS

- ❑ array serves as many data structures: list, queue, stack, ...
- ❑ **methods:** concat, join, pop, push, reverse, shift, slice, sort, splice, toString, unshift
 - ❑ push and pop add / remove from back
 - ❑ unshift and shift add / remove from front
 - ❑ shift and pop return the element that is removed

String type

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```
var s = "Connie Client";  
var fName = s.substring(0, s.indexOf(" ")); // "Connie"  
var len = s.length; // 13  
var s2 = 'Melvin Merchant';
```

JS

- **methods:** `charAt`, `charCodeAt`, `fromCharCode`, `indexOf`, `lastIndexOf`, `replace`, `split`, `substring`, `toLowerCase`, `toUpperCase`
 - ▣ `charAt` returns a one-letter String (there is no char type)
- length property (not a method as in Java)
- Strings can be specified with `""` or `"`
- concatenation with `+` :
 - ▣ `1 + 1` is 2, but `"1" + 1` is "11"

<body>

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<h1>JavaScript String Methods</h1>

<p>The substring() method extract a part of a string and returns the extracted parts in a new string:</p>

<p id="demo"></p>

<script>

let str = "Apple, Banana, Kiwi";

document.getElementById("demo").innerHTML = str.substring(7,13);

</script>

</body>

Output:= Banana

More about String

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□ escape sequences behave as in Java: `\' \\" \& \n \t \\`

□ converting between numbers and Strings:

```
var count = 10;
var s1 = "" + count; // "10"
var s2 = count + " bananas, ah ah ah!"; // "10 bananas, ah ah ah!"
var n1 = parseInt("42 is the answer"); // 42
var n2 = parseFloat("booyah"); // NaN
```

JS

□ accessing the letters of a String:

```
var firstLetter = s[0]; // fails in IE
var firstLetter = s.charAt(0); // does work in IE
var lastLetter = s.charAt(s.length - 1);
```

JS

Splitting strings: split and join

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```
var s = "the quick brown fox";  
var a = s.split(" "); // ["the", "quick", "brown", "fox"]  
a.reverse(); // ["fox", "brown", "quick", "the"]  
s = a.join("!"); // "fox!brown!quick!the"
```

JS

- split breaks apart a string into an array using a delimiter
 - ▣ can also be used with regular expressions (seen later)
- join merges an array into a single string, placing a delimiter between them