JavaScript: Getting Started

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For additional materials, please see http://www.coreservlets.com/. The JavaScript tutorial section contains complete source code for all examples in the entire tutorial series, plus exercises and exercise solutions for each topic.

For customized training related to JavaScript or Java, email hall@coreservlets.com
Marty is also available for consulting and development support

Taught by lead author of *Core Servlets & JSP*, co-author of *Core JSF* (4th Ed), and this tutorial.

Available at public venues, or custom versions can be held on-site at your organization.

- **Courses developed and taught by Marty Hall**
  - JavaScript, jQuery, Ext JS, JSF 2.3, PrimeFaces, Java 8 programming, Spring Framework, Spring MVC, Android, GWT, custom mix of topics
  - Courses available in any state or country.
  - Maryland/DC companies can also choose afternoon/evening courses.
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Topics in This Section

- **Intro**
- **Interactive JavaScript practice**
- **Variables**
- **Operators**
- **Functions: basics**

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Intro

Overview of JavaScript

- **Used primarily for Web pages (i.e., runs in browser)**
  - To make them more interactive
  - To get updates from the server without reloading the page (Ajax)
- **Use growing in contexts other than Web browsers**
  - Node.js for running JavaScript on server
  - Mozilla Rhino for running JavaScript on desktop
- **Simpler than most other programming languages (arguably)**
  - So a good starting point for beginning programmers
- **Second-most popular language behind Java (arguably)**
  - So many jobs available
- **Not closely related to Java**
 - Despite the similar-sounding names

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JavaScript Popularity: Job Postings
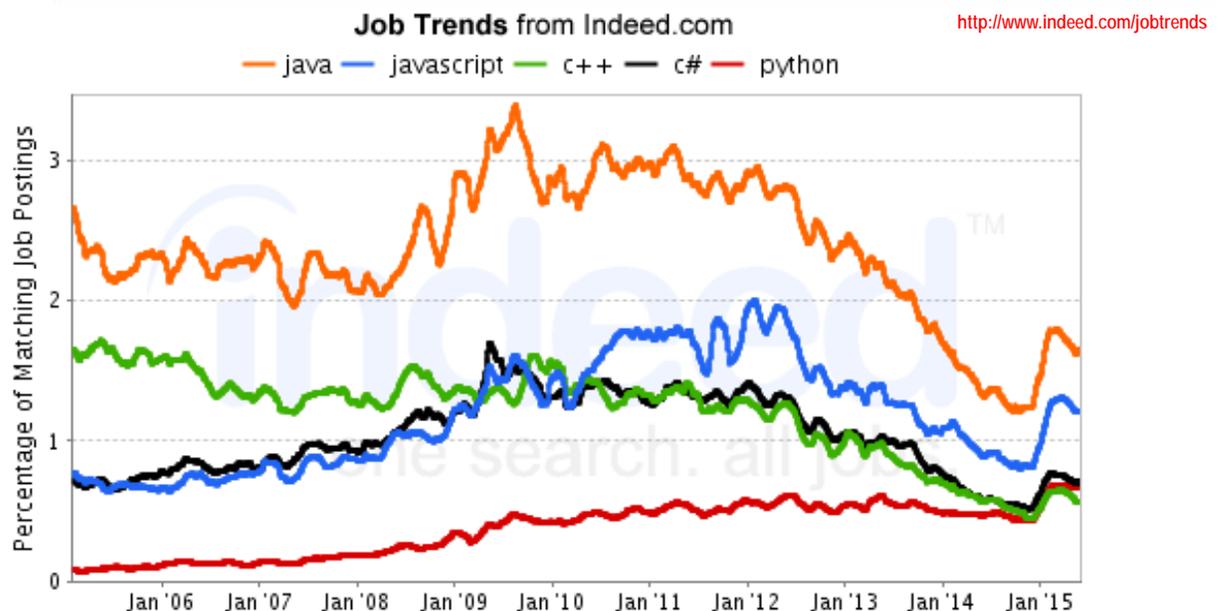
Y axis tracks percent of total job postings, not absolute numbers. So, for example, when all the curves go down, it is likely due to a stronger economy with many more teacher and construction jobs. Only the relative values are important.

JavaScript Popularity: Google Searches

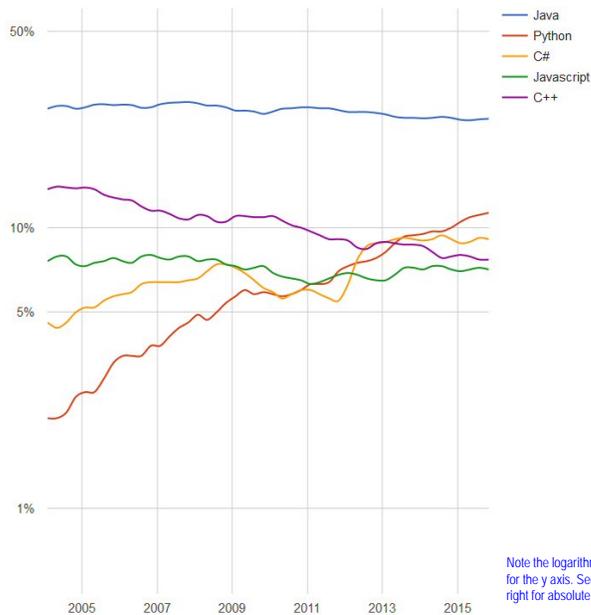| java Search term | javascript Search term | c++ Search term | c# Search term | python Search term |
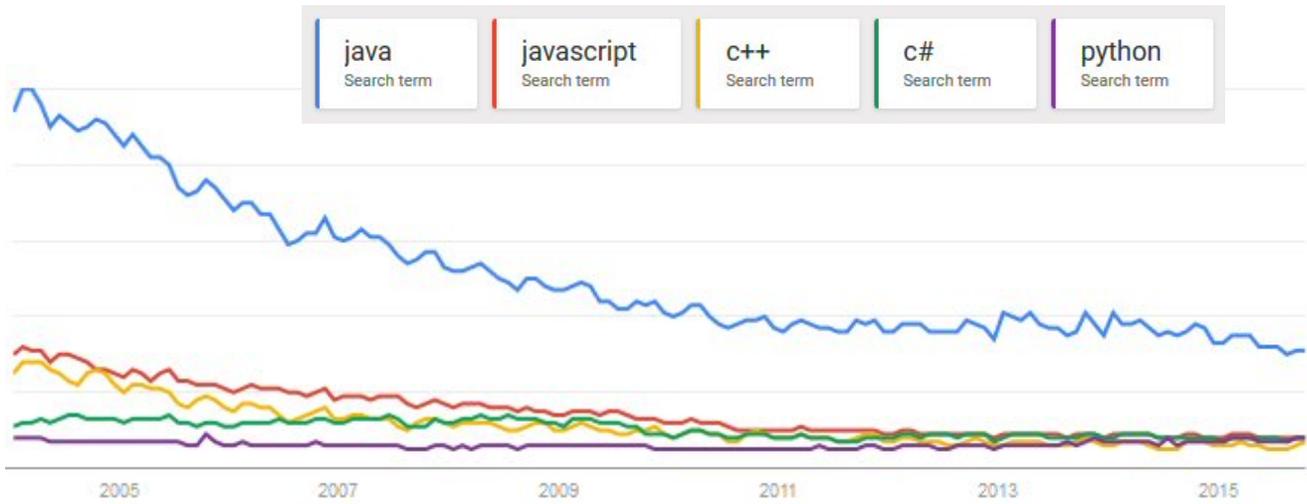
Google is deliberately vague about their y-axis scale, but other testing shows it is not absolute number of searches, but some sort of relative scale.

JavaScript Popularity: PYPL Index

PYPL PopularitY of Programming Language

Legend:
- Java
- Python
- C#
- Javascript
- C++

Worldwide, Nov 2015 compared to a year ago:

Rank	Change	Language	Share	Trend
1		Java	24.4 %	+0.1 %
2	↑	Python	11.3 %	+1.1 %
3	↓	PHP	10.9 %	-0.6 %
4		C#	9.1 %	+0.3 %
5		C++	7.7 %	-0.4 %
6		C	7.5 %	-0.3 %
7		Javascript	7.1 %	+0.3 %

Note the logarithmic scale for the y axis. See sidebar at right for absolute numbers.

Books

- ***JavaScript the Definitive Guide***
  - By David Flanagan, O'Reilly. The *only* really complete reference on the JavaScript language.
- ***JavaScript: The Good Parts***
  - By Douglas Crockford (of JSON and YUI fame), O'Reilly
  - Outstanding advanced guide to best practices in core JavaScript, especially functions, objects, and regular expressions. *Very* short. No coverage of Ajax or DOM scripting.
  - "The *Effective Java* of JavaScript".
- ***Professional JavaScript for Web Developers***
  - By Nicholas Zakas of Yahoo, Wrox. Good general intro to JavaScript, little Ajax coverage
- ***Pro JavaScript Techniques***
  - By John Resig (of jQuery fame), Apress. Good guide to best practices; not a thorough reference
- ***JavaScript Cookbook***
  - By Shelley Powers, O'Reilly. Gives good examples of many common techniques; not a thorough reference

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Online References

- **JavaScript tutorial (language syntax)**
  - https://developer.mozilla.org/en-US/docs/Web/JavaScript
  - http://www.w3schools.com/js/
- **JavaScript API references (builtin objects)**
  - http://www.w3schools.com/jsref/
  - http://www.devguru.com/technologies/ecmascript/QuickRef/
  - http://www.devguru.com/technologies/JavaScript/
  - http://www.javascriptkit.com/jsref/
  - https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference
- **HTML DOM reference (with JavaScript Examples)**
  - http://www.w3schools.com/htmldom/dom_reference.asp
- **Official ECMAScript specification**
  - http://www.ecma-international.org/publications/standards/Ecma-262.htm

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Interactive JavaScript Practice

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complete source code for all examples in the entire tutorial series, plus exercises and exercise solutions for each topic.

Firebug or Google Chrome Tools

- **Install Firebug in Firefox**
  – http://getfirebug.com/
- **Use Firebug command line for interactive testing**
  – http://getfirebug.com/commandline
- **More details on Firebug usage**
  – http://getfirebug.com/wiki/
- **Chrome development tools also good**
  – Many JavaScript developers say development tools for Google Chrome are now just as good as Firebug
- **Other browsers catching up**
  – Firefox now has decent native JavaScript development and debugging tools
  – Even Internet Explorer and Microsoft Edge now have reasonable tools

One Time Only: Configure Firebug

- **Open Firebug**
  - Open simple HTML file, click Firebug icon or hit F-12, click Console tab
- **Tell Firebug to open in separate window (optional)**
  - Click icon in top right of Firebug window
- **Tell Firebug to use multi-line input editor (optional)**
  - Click icon in bottom right of Console window
- **Tell Firebug to use vertical panels (optional)**
  - Click Firebug icon in top left → Options → Vertical Panels
- **Enter JavaScript in bottom panel, click Run**
 - Results will be shown in the top panel

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Configure Firebug: Details

- **Open Firebug**
  - Open simple HTML file, click Firebug icon or hit F-12, click Console tab

Enter JavaScript commands here, hit ENTER, and see results in the panel above. Or, follow configuration steps shown in next bullets to get larger input area.

- **Tell Firebug to open in separate window (optional)**
 - Click icon in top right of Firebug window
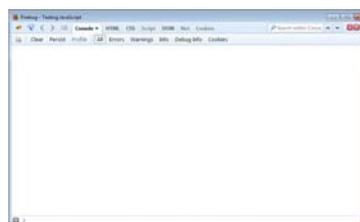
If you are just going to be entering core JavaScript commands, it is more convenient to have a separate Firebug window as here. But, if you are going to enter JavaScript commands that affect the HTML in the page, it is more convenient to attach Firebug to the main window, as above.

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Configure Firebug: Details

- **Tell Firebug to use multi-line input editor (optional)**
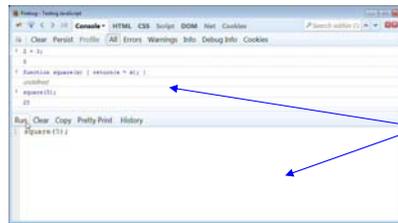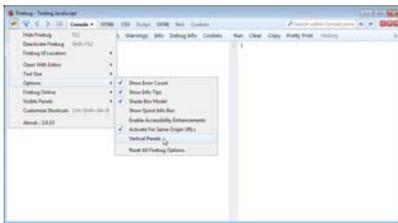 - Click icon in bottom right of Console window
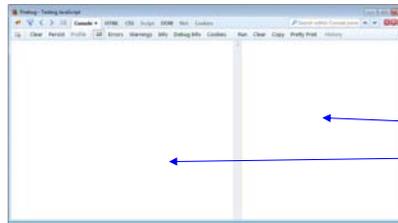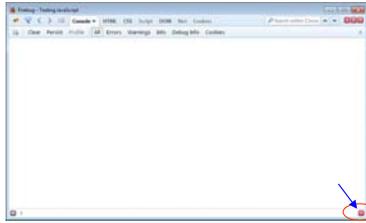
  Enter JavaScript commands here, click Run at the top.
  See results here.

- **Tell Firebug to use vertical panels (optional)**
  - Click Firebug icon in top left → Options → Vertical Panels

  Enter JavaScript commands here, click Run at the top.
  See results here.

Simplest JavaScript Practice: Use Firebug Directly

- **Bring up Firebug**
  - Open Firefox on a Web page you wrote; sample page:
    ```
    <!DOCTYPE html><html>
    <head><title>Testing JavaScript</title></head>
    <body>
    <h1>A Simple Page for Testing</h1>
    </body></html>
    ```
  - Then click on Firebug logo or hit F12
- **Click on Console tab**
  - Enter commands at bottom and see results in main window
  - Or, click arrow at bottom right to expand command line into larger editor region
- **Chrome alternative is similar**
  - Bring up Chrome via Chrome menu, then
    More Tools → Developer Tools, or via Control-Shift-J

- **Make JavaScript file**
  - E.g., my-script.js
- **Make HTML file in same folder**
  - E.g., my-page.html
- **Have HTML file load the JavaScript file**

```
<!DOCTYPE html><html>
<head><title>Testing JavaScript</title>
<script src="scripts/my-code.js"></script>
</head><body></body></html>
```

- **Practice**
  - Put function *definitions* in my-script.js
  - Reload the HTML page in the browser every time you make changes
  - Enter function *calls* in Firebug

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JavaScript Testing

- **Problem**
  - Java: very strict compliance tests to be called "Java"
    - You can have very high confidence that code written in Java 8 on Windows version will run identically (except for some differences in how GUIs look) on Java 8 on MacOS, Linux, Solaris, and other Windows versions. True for Java from Oracle, Apple, IBM, or open source version from Brazil.
  - JavaScript: every browser vendor makes own version, with no outside checks
    - Behavior of same JavaScript program can vary substantially from browser to browser, and even from one release of the same browser to another
- **Consequence**
  - Before final deployment, you must test on all browsers you expect to support
  - Most developers
    - Do initial testing and development on either Chrome or Firefox
    - But test also on Internet Explorer, Microsoft Edge, and Safari before final deployment

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Variables

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Variables

- **Introduce with "var"**
  - For global variables (!) and local variables.
  - No "var" for function arguments
- **You do not declare types**
  - Some people say JavaScript is "untyped" language, but technically it is "dynamically typed" language
  - JavaScript is *very* liberal about converting types
- **There are only two scopes**
  - Global scope
    - Be very careful with this when using Ajax
    - Can cause race conditions
  - Function (lexical) scope
  - There is *not* block scope as in Java

Variables: Examples

```
var firstName = "Jane";                    // String
firstName; → "Jane"
var price = 23.7;                           // Number
var isDiscounted = true;                    // Boolean
var quarterlySales = [12, 18, 15, 9];
  /* Array -- arrays are covered later */
var customer = { firstName: "Jane", lastName: "Doe" };
  /* Object -- objects are covered later */
var x = 5;
function square(x) { return(x * x); }
x; → 5
square(7); → 49
x; → 5
```

Variables: Firebug Examples
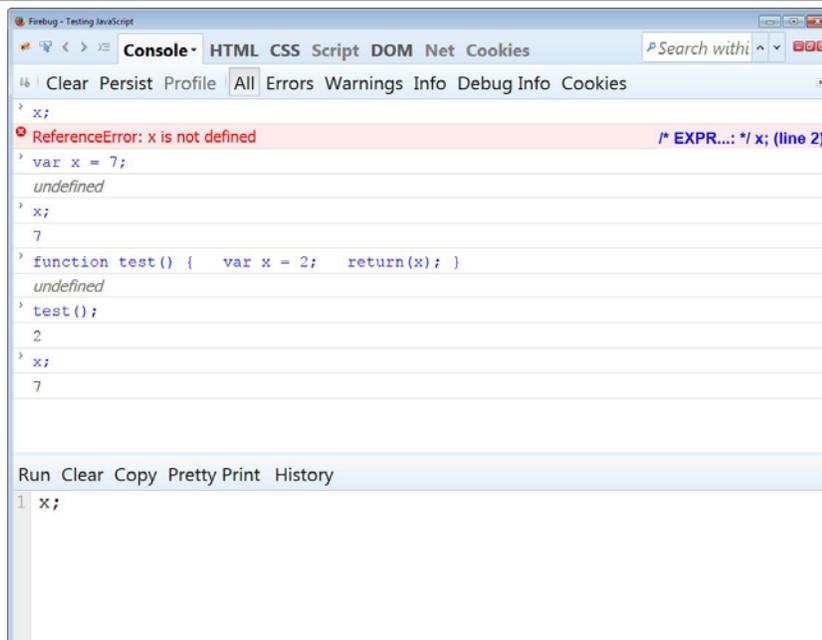
Operators

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Operators and Statements: Overview

- **Almost same set of operators as Java**
  - \+ (addition and String concatenation), -, *, /
  - &&, ||, ++, --, etc
  - The == comparison is more akin to Java's "equals"
  - The === operator (less used) is like Java's ==
- **Statements**
  - Semicolons are technically optional
    - But highly recommended
  - Consider
    - return x
    - return
      x
    - They are not identical! The second one returns, then evaluates x.
    - You should act as though semicolons are required as in Java.
- **Comments**
  - Same as in Java (/* multiline comment */   and   // single-line comment)

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Mathematical Operators

- ***, /, +**
  - Multiply, divide, add
    ```
    var x = 7;
    x * 2;  14
    ```
- **%**
  - Remainder
    ```
    var x = 7;
    x % 6;  1
    ```
- **++**
  - Increment (add one to)
    ```
    var x = 7;
    x;  7
    x++;      // Same as x = x + 1;
    x;  8
    ```

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String and Boolean Operators

- **+**
  - String concatenation; same operator as addition!
    ```
    var s = "Hello";
    s = s + ", World";     // At least one side is a String
    s;  "Hello, World";
    ```
- **==**
  - Test if equal
    ```
    var x = 7;
    x == 7;  true
    x == 8;  false
    ```
- **<, >, !, &&, ||, etc.**
  - Less than test, greater than test, etc.
  - Covered in the section on conditionals
    ```
    var x = 7;
    x < 8;  true
    ```

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Functions: Basics

Functions

- **Quick summary now**
  - No types for the parameters
  - Declare (global) functions with "function"
  - Use "return" if you want return values
  - Defining a function really just makes a variable whose value is a function

  > **function square(x) { return(x * x); }**
  > **square(10); → 100**
  > **var f = square;**   // *Not* the same as var f = square();
  > **f(10) → 100**

- **More details later**
  - Lots more detail on functions in upcoming section

Variable Scoping

- **Global scope**
  - Variables that are known everywhere; rarely used in real life
    ```
    var x = 7;
    ```
- **Function (lexical) scope**
  - Variables that are known only within a function; common in real life
    ```
    function(x) { … }

    function() {
      var x = 7;
      …
    }
    ```
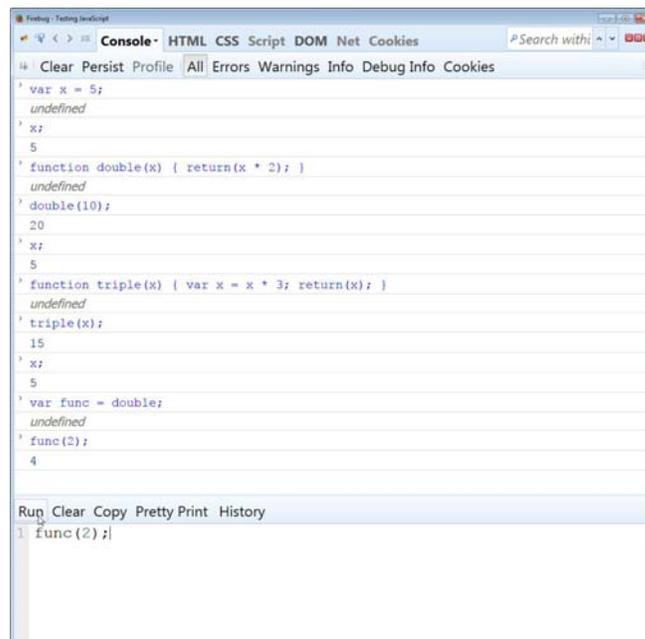- **Usage**
  - Global-scope variables can be seen inside functions and on the outside
  - Function-scope variables can be seen inside their own function but not on outside
  – See interactive example

Functions and Scoping: Examples

Wrap-up

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Summary

- **Use Firebug or Chrome for practice, testing, and debugging**
  – Install Firebug from http://getfirebug.com/
- **Get a reference book**
  – *JavaScript the Definitive Guide* (Flanagan, O'Reilly)
- **Bookmark online references**
  – https://developer.mozilla.org/en-US/docs/Web/JavaScript
  – http://www.w3schools.com/js/
- **Load JavaScript file from Web page**
  ```
  <script src="scripts/some-script.js"></script>
  ```
- **Practice basic JavaScript syntax**
  – Declare local variables with var
  – Use *, /, +, etc., and note + can be either addition or concatenation
  – Declare functions with function

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Questions?

More info:
http://www.coreservlets.com/javascript-jquery-tutorial/ -- Tutorial on JavaScript, jQuery, and jQuery UI
http://courses.coreservlets.com/Course-Materials/java.html – General Java programming tutorial
http://www.coreservlets.com/java-8-tutorial/ – Java 8 tutorial
http://courses.coreservlets.com/java-training.html – Customized Java training courses, at public venues or onsite at *your* organization
http://coreservlets.com/ – JSF 2, PrimeFaces, Java 8, JavaScript, jQuery, Ext JS, Hadoop, RESTful Web Services, Android, HTML5, Spring, Hibernate, Servlets, JSP, GWT, and other Java EE training
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