



Programming Basics

When it comes to being precise about an algorithm, a programming language is better than English

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The Plan

We will learn JavaScript over the next few lectures

- JavaScript is used with HTML in Web pages
- JavaScript is a contemporary programming language -- we will learn only its basics
- You will program in NotePad and run your program with your browser

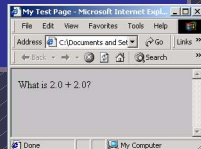
JavaScript is the way to make HTML "active"



Begin with HTML

HTML is static ... the contents of the file are displayed as given

```
<html><head><title>My Test Page</title></head>
<body> <!-- No JavaScript yet, just HTML text -->
  What is 2.0 + 2.0?
</body>
</html>
```



JavaScript Needs HTML

JavaScript must be surrounded by <script> tags in a Web page ...

```
<html><head><title>My Test Page</title></head>
<body>
  What is 2.0 + 2.0?
  <script language="JavaScript">
    Put your JavaScript code here
  </script>
</body>
</html>
```

Script tags can be used anywhere where white space is OK, so use them as needed



Browsers Process JS

When the browser comes to JavaScript, it processes it immediately

```
<html><head><title>My Test Page</title></head>
<body>
  What is 2.0 + 2.0?
  <script language="JavaScript">
    alert(2.0 + 2.0);
  </script>
</body>
</html>
```



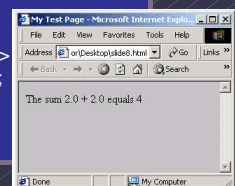
Page not fully loaded



JS Can Build Pages

JavaScript can add to a page using the document.write command ...

```
<html><head><title>My Test Page</title></head>
<body>
  The sum 2.0 + 2.0 equals
  <script language="JavaScript">
    document.write(2.0 + 2.0);
  </script>
</body>
</html>
```

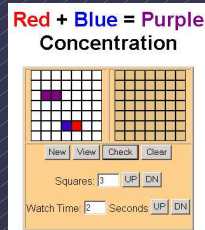




JavaScript is Cool

JavaScript has many slick applications so it's worth taking a couple of lectures to learn it

* We move on now to the basics, but first ...



Names In Programming

In normal language, names, and the things they name -- their values -- usually cannot be separated

- In programming most names change values ... a consequence of finite specification
- Titles (US_Open_Champ), Offices (Mayor), Roles (Juliet), etc. are familiar examples of names that change values
- Rules, Processes and Directions exploit the variable value: "Juliet moves to the window"



Variables

- Names in programming are *identifiers*
 - The things they name are their *values*
- The package -- identifier & value -- is a *variable*, implying a possible change

- Identifiers have a specific structure in every programming language
- JS: letters, digits, _ start with letter, case sen.

```
X x textOut MI5 long_variables_are_OK rate
hypens-not-OK 007 no spaces end
```



Declarations

To *declare variables* is to state what variables will be used

- Required ... put declarations first in program
- Use the word: **var**
- Follow with a list of variables separated by ,
- Terminate all statements with a semicolon ;

```
var x, input1, input2, rate;
Give variables an initial value with =
var interestRate = 4, pi = 3.14159;
```



Values

Programming languages allow several *types of values*: numeric, strings of letters, Boolean

- numbers: 1 0 -433 6.022e+23 .01
- not numbers: 1,000 10⁶ 5% 7±2
- strings: "abc" 'efg' "" "B&B's" ""
- not strings: ' <tab>' "a" "\"
- Boolean: true false
- not Boolean: T F yes no



Assignment

The universal form of assignment:

<variable> <assignment symbol> <expression>

For example ...

```
day = hours/24;
```

- value of the variable on the left is changed to have the new value of expression on right
- read "=" as "is assigned" "becomes" "gets"
- right-to-left value flow

= is different in math and programming



Expressions

Expressions are like "formulas" saying how to manipulate existing values to compute new values, e.g. `hours/24`

- Operators: `+` `-` `*` `/` `%` produce numbers
- Operators: `<` `<=` `==` `!=` `>=` `>` on numbers (or strings for `==` and `!=`) produce Booleans
- Operators: `&&` `||` `!` on Booleans produce Booleans
- Grouping by parentheses is OK and smart
`seconds = ((days*24 + hours)*60 + min)*60`



Overloading Plus

The `+` can be used to add numbers or join strings (concatenate)

- `5 + 5` \Leftrightarrow 10
- `"a" + "b" + "c"` \Leftrightarrow "abc"
- `'5' + '5'` \Leftrightarrow '55'
- The operand type determines the operation
- Combine a number and string???
- `5 + '5'` \Leftrightarrow '55'
- Rule: With an operand of each type, convert number to string, concatenate

\Leftrightarrow is the symbol for "has the value"



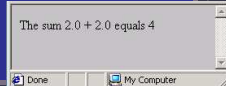
First JS Program, Revisited

Rewrite earlier code with new concepts

```

<html><head><title>My Test Page</title></head>
<body> The sum 2.0 + 2.0 equals
<script language="JavaScript">
var anumber = 2.0, another, answer;
another = 2.0;
answer = anumber + another;
document.write(answer);
</script>
</body>
</html>

```



Conditional

Conditionals test if an expression is true or not

- General form ...
`if (<Boolean expression>)`
 `<Then statement>;`
- For example
`if (day == "Friday")`
 `evening_plan = "party";`



If-Then-Else

Branch both ways with If-Then-Else

```

if (<Boolean expression>)
  <Then statement>;
else
  <Else Statement>;

```

- Example ...

```

if ((year%4)== 0) {
  leapYear = true;
  febDays = febDays+1;
}
else
  leapYear = false;

```



Summary

Programming is the exact specification of an algorithm
JavaScript is typical ... with many rules

- * Learning strategy
 - Do the reading first
 - Practicing is better than memorizing for learning the rules
 - Use the program-save-reload-check plan
 - Precision is your best friend