Programming Basics

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

The Plan

We will learn JavaScript over the next few lectures

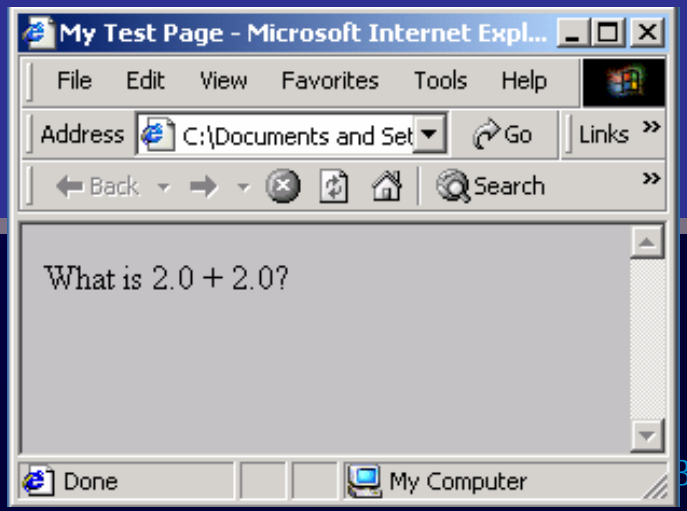
- **JavaScript is used with HTML in Web pages**
- **JavaScript is a contemporary programming language -- we will learn only its basics**
- **You will program in TextPad and run your program with your browser**

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 ...

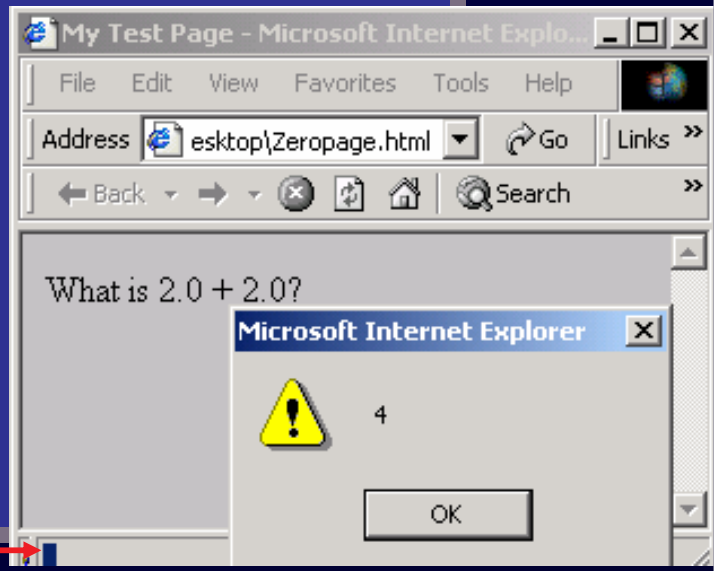
```
<html><head><title>My Test Page</title></head>
  <body>
    What is 2.0 + 2.0?
    <script language="JavaScript">
          Put your JavaScript code here
    </script>
  </body>
</html>
```

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>
```

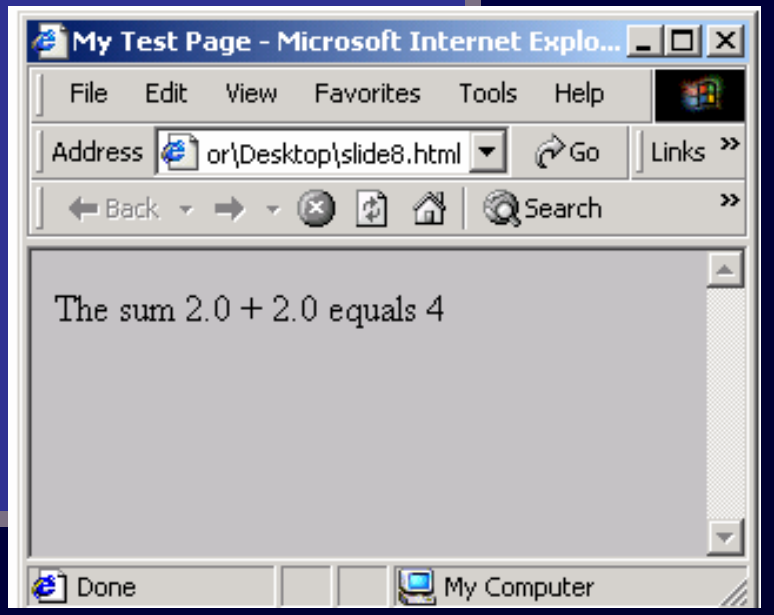


Page not fully loaded

JS Can Build Pages

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

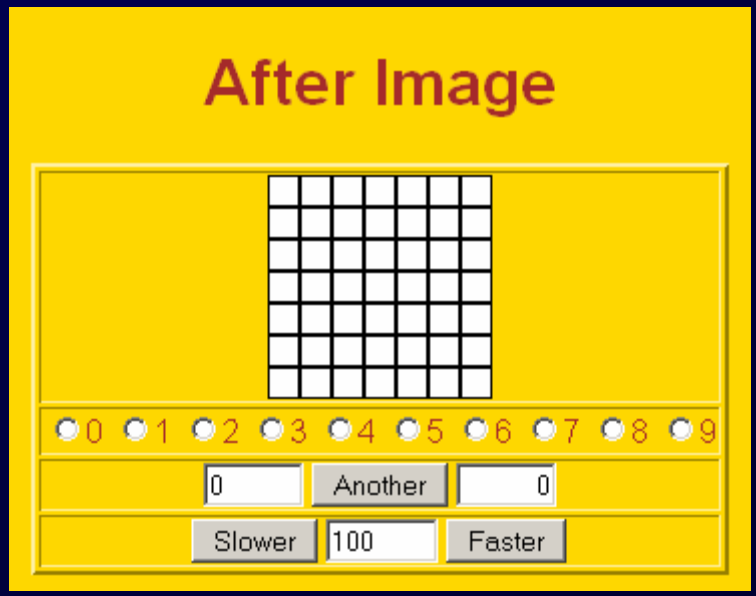
```
<html><head><title>My Test Page</title></head>
 <body>
  The sum  2.0 + 2.0 equals
  <script language="JavaScript">
        document.write(2.0 + 2.0);
  </script>
 </body>
</html>
```



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 10^6 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)

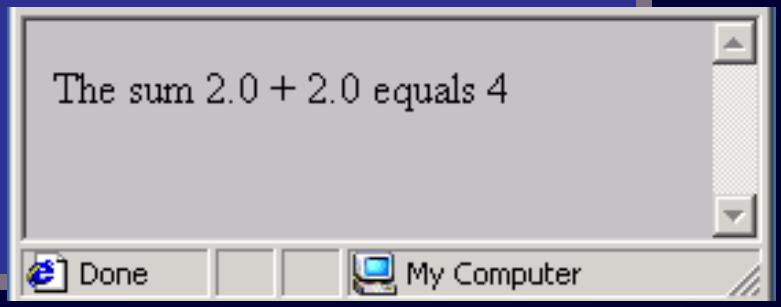
- 5 + 5 ⇔ 10
- "a" + "b" + "c" ⇔ "abc"
- '5' + '5' ⇔ '55'
- The operand type determines the operation
- Combine a number and string???
- 5 + '5' ⇔ '55'
- Rule: With an operand of each type, convert number to string, concatenate

⇔ 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**