



# Announcements

- Due dates
  - Project 1B—Wednesday by 10pm
    - 1-1-1 rule Thursday by 10pm
      - Only once during quarter!
  - Lab 5—Friday by 10pm
- Next week
  - Labs 6/7—Tuesday by 10pm



# Announcements

- Vocabulary for the week was posted in GoPost
- Reading
  - Ch 18 for today
  - Ch 21 for Friday



# Basic Programming Concepts

*Get with the Program*

**D.A. Clements**



# Objectives

- Learn basic programming concepts common to all programming languages
- Apply them to Web pages using JavaScript
- We'll spend a couple weeks on this journey



# Basic Programming Concepts

- Documenting your code with comments
- Data types (math, string, boolean)
- Variables
- Assigning values to variables
- Expressions
- Conditionals, branches, or tests (all names for same thing)
- Loops, or iterations (both names for same thing)
- Arrays, lists, or collections (all names for same thing)
- Functions and Methods



# Programming Concepts

- Basic concepts have been developed over last 50 years to simplify common programming tasks
- Programming concepts will be implemented in JavaScript in this course
  - Easy syntax
  - Immediate results
  - No special software required beyond NotePad++
  - All the major browsers include JavaScript interpreters



Currency, string, number, boolean, date/time

# DATA TYPES



# Strings

- The quick brown fox jumped over the lazy dog.







# Strings

- String = a sequence of keyboard characters
- Always surrounded by single ( ' ' ) or double quotes ( " " )
  - No smart quotes! (“ ” and ‘ ’)
- Initialize a declaration
  - `var hairColor = "black";`
- Quotes can nest
  - `firstLine = "Johnson called, 'Dude!'";`



# Strings

- Any number of characters allowed in a string
- Minimum number of characters is none ( "" )
  - the *empty string*



# Strings

- How are they stored in the computer?
  - Quotes are removed (they are only used to 'delimit' the string literal)
    - Delimit means to mark the start and end of the literal



# Numbers

- Rules for Writing Numbers
  - No "units" or commas
    - 5884559 NOT \$5,884,559
  - Up to 10 significant digits
  - Range from  $10^{-324}$  to  $10^{308}$



# Boolean Values

- Two logical values: True and False
- They are values, not identifiers or strings
- Used implicitly throughout programming process; only occasionally for initializing variables
  - Mostly used to compare data or make decisions



What's in a name?

# VARIABLES



# Names, Values, and Variables

- Names in a Program Are Called *Identifiers*
- *Variables* store values and give you a handy way to refer to the current value in the variable
  - Like we say “The President” to refer to our current president
- Names Have Changing Values
  - U.S. President
    - current value is George W. Bush
    - previous values were Bill Clinton, George Washington

# Variables

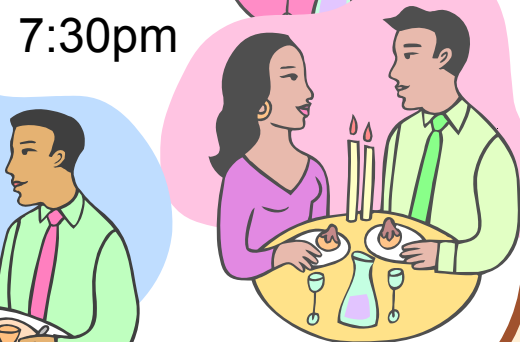
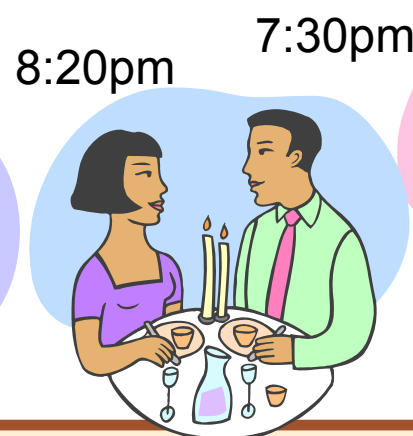
- Variables are named areas in memory
- We can refer to the value in the memory area without knowing its value, just by calling its name





# Variables

- In a restaurant, each table is numbered. All night long the people and the food served at the table change, but the table still has the same number. That table number functions like a variable name.





# Quick Clicks

- One question



# Identifiers and Their Rules

- Case sensitive:

HOME ≠ Home ≠ home

Valid	Invalid	Reason It's Invalid
firstone	1stOne	Begins with number
first1	first-1	JS thinks hyphen is a minus sign
firstOne	first\$1	\$ not allowed
first_one	first One	Space not allowed
first_1	First1!	Exclamation point



# Quick Clicks

- Two questions



Example: `var home;`

# VARIABLE DECLARATIONS



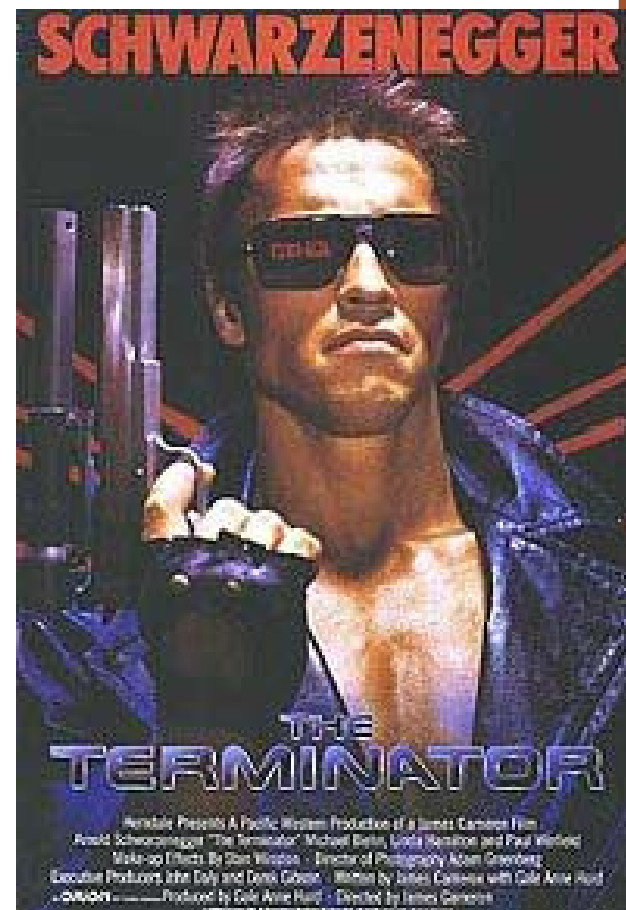
# Variable Declaration Statement

- Declare your variables at the top of your script so you can find them easily
  - State what variables will be used
  - Computer sets aside a named area in memory for each variable
- Declare each variable only *once* in your program
- The declaration is a type of *statement*
  - Command is the word *var*
  - For example, a program to calculate area of circle given radius, needs variables area and radius:
    - `var radius, area;`



# The Statement Terminator

- A program is a list of statements
- End each statement with the *statement terminator* symbol
  - In JavaScript, all statements terminate with the *semicolon* ( ; )





# Quick Clicks

- One question





# Rules for Declaring Variables

- Declare every variable *before* it is used in the program
  - In JavaScript declaration can be anywhere in the program
  - Best practice: Place them at the top of the program
- Declare each variable only *once* in the program
- Undefined values
  - Variable has been declared but does not yet have a value

```
var number1;           // undefined value  
var number2 = 42;     // initialized to the value 42
```



All about assignment statements

# ASSIGNING VALUES TO VARIABLES



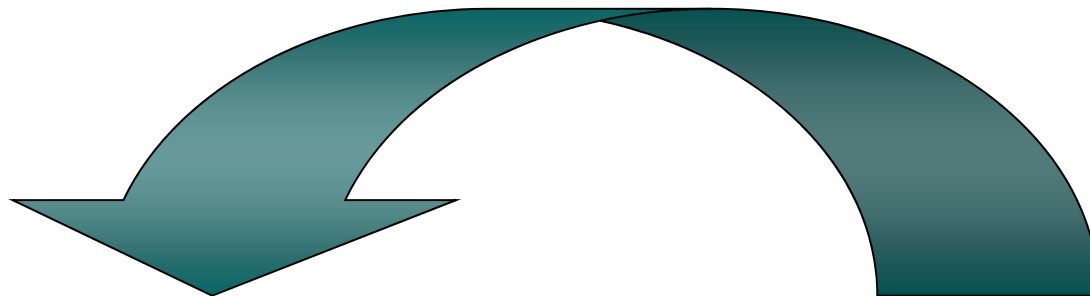
# Assigning Values to Variables

- Assign values to variables with an *assignment operator*.
- We'll use = for now.

```
var yourAge, acctBal, custName;  
yourAge = 32;           //store 32 in yourAge  
acctBal = 100.75;      //store 100.75 in acctBal  
custName = 'Jeff';     //store 'Jeff' in custName  
isCustomer = true;     //store boolean true in isCustomer (no quotes)  
Var yourName = 'Jeff'  //alternate all-in-one line assignment statement
```



# Assignment Statement



**<Variable> <assignment><expression>**

- Flow moves from *right to left*.
- Results of the **<expression>** replace the value stored in the **<variable>**.



# Assigning Values to Variables and Variables to Variables

We can also assign one variable to another:

Line	Assignment Statement	myName	yourName
1	<code>var yourName = "Sarah";</code>		
2	<code>var myName = "Andrea";</code>		
3	<code>yourName = myName;</code>		
4	<code>yourName = "myName";</code>		



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4	<code>yourName = "myName";</code>	Andrea	myName



# Other Assignment Operators

Line	Assignment Statement	Value in myAge
1	<code>var myage = 32;</code>	
2	<code>myAge = myAge + 2;</code>	
3	<code>myAge += 2;</code>	
4	<code>myAge ++;</code>	
5	<code>myAge -= 3;</code>	
6	<code>myAge -- ;</code>	



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Line	Assignment Statement	Value in myAge
1	<code>var myage = 32;</code>	32
2	<code>myAge = myAge + 2;</code>	34
3	<code>myAge += 2;</code>	
4	<code>myAge ++;</code>	
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6	<code>myAge -- ;</code>	



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Line	Assignment Statement	Value in myAge
1	<code>var myage = 32;</code>	32
2	<code>myAge = myAge + 2;</code>	34
3	<code>myAge += 2;</code>	36
4	<code>myAge ++;</code>	
5	<code>myAge -= 3;</code>	
6	<code>myAge -- ;</code>	





# Other Assignment Operators

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1	<code>var myage = 32;</code>	32
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4	<code>myAge ++;</code>	37
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5	<code>myAge -= 3;</code>	34
6	<code>myAge -- ;</code>	33



Calculating values in variables

# **EXPRESSIONS**



# An Expression and its Syntax

- Algebra-like formula called an *expression*
  - Built out of values and *operators*
    - Standard *arithmetic operators* are symbols of basic arithmetic



# Arithmetic Operators

- Multiplication must be given explicitly with the asterisk ( \* ) multiply operator
- Multiply and divide are performed before add and subtract
  - Anything within parentheses is calculated first
  - Within parentheses multiply and divide are performed first
- JavaScript does not have an operator for exponents



# Relational Operators

- Make comparisons between numeric values
- Used in if statements and stop tests in loops
- Outcome is a Boolean value, *true* or *false*
  - < less than
  - <= less than or equal to
  - == equal to
  - != not equal to
  - >= greater than or equal to
  - > greater than

## Note:

### Difference between = and ==

== compares values

= assigns a value to a variable



# Logical Operators

- To test two or more relationships at once
  - Teenagers are older than 12 and younger than 20
- Logical **AND**
  - **Operator is &&**
  - Outcome of a && b is true if both a and b are true; otherwise it is false
- Logical **OR**
  - **Operator is ||**
  - Outcome of a || b is true if either a is true or b is true
- Logical **NOT**
  - **Operator is !**
  - Unary operator. Outcome is opposite of value of operand





# More about the + operator

- Addition
  - Adds numbers
    - $4 + 5$  produces 9
- Concatenation
  - Glues strings together
    - "four" + "five" produces "fourfive"
    - "four" + "5" produces "four5"
    - "four " + "five" produces "four five"



# Quick Clicks

- Two questions



Comments and White Space

# DOCUMENTING YOUR CODE



# Comments

```
//Single-line JavaScript comment
```

```
/*Multi-line JavaScript comment continues  
for more than one line*/
```

- Comments allow you to
  - Annotate your code
    - Remind yourself what you did and why
    - Notes for yourself—or someone else—six months from now when you're making an update!



# End papers...

## Eagleson's law

- Any code of your own that you haven't looked at for six or more months might as well have been written by someone else.



# White Space

- White space is your friend!
- The statements may be run together on a single line
  - Use white space to help you
    - read your code
    - understand your program



# Announcements

- Read chapter 20 for Friday