Announcements

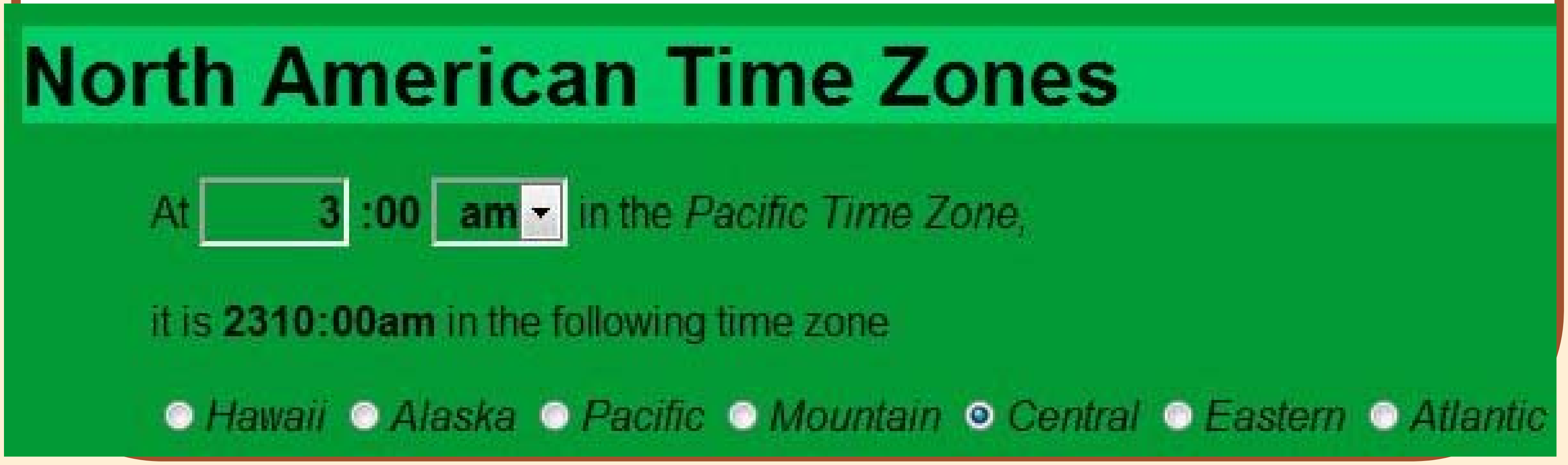
- Extra credit (40 points each)
  - Labs 8/9
    - Upload to Catalyst Collect It (new dropbox)
  - Living Computer Museum
    - 1-page reflection paper OR
    - 1-minute podcast
- Do either, both, or none (optional)

Announcements

- Project 2A and Labs 8/9 due Wednesday at 10pm

Announcement

- Labs 8/9—Last page
  - Added some instructions
    - It is **2310:00am**…



North American Time Zones

At 3 :00 am in the *Pacific Time Zone,*

it is **2310:00am** in the following time zone

○ *Hawaii* ○ *Alaska* ○ *Pacific* ○ *Mountain* [✓ *Central*] ○ *Eastern* ○ *Atlantic*

Project 2A

- MadLib Examples
  - http://www.eduplace.com/tales/content/wwt_003.html
  - http://courses.washington.edu/fit100/projects/key/storytellerForm_2A_KEY.html
- Your ten replacement words
  - Nine text boxes
  - One dropdown menu / select box (gender)

Conditionals, Branches, or Tests

Adding logic to an algorithm

D.A. Clements

Conditional Statement Syntax

```
if ( <Boolean expression> )
    <then-statement>;
```

- Boolean expression is a relational expression
- then-statement is any JavaScript statement

Example

```
if (today == "Friday")
{
   reading = "Fluency, chapter 21";
}
else if (today == "Monday")
{
   reading = "Fluency, chapter 19 and JavaScript
   Phrasebook, ch 8 Forms";
}
```

If Statements Control Flow

- The Boolean statement is evaluated, producing a true or false outcome
- If the outcome is true, the then-statement is performed
- If the outcome is false, the then-statement is skipped
- Then-statement can be written on the same line as the Boolean or on the next line

Compound If Statements

- Sometimes we need to perform more than one statement on a true outcome of the predicate test
- Group these statements using curly braces { }
  - { and } are delimiters just like
    - < and > in HTML
    - " and " for strings

Example Compound If-Else

```
if (age <=19 && age > 12)
{
  group = teenagers;
}
```

if/else Statements

- To execute statements if a condition is false

```
if ( <Boolean expression> )
{
  <then-statements>;
}
else
{
  <else-statements>;
}
```

- The Boolean expression is evaluated first
  - If the outcome is true, the then-statements are executed and the else-statements are skipped
  - If the outcome is false, the then-statements are skipped and the else-statements are executed

Nested if/else Statements

- The then-statement and the else-statement can contain an if/else
- The else is associated with the immediately preceding if
- Correct use of curly braces ensures that the else matches with its if

Nested if/else Statements

```
if (<Boolean exp1>) {
    if (< Boolean exp2>) {
        <then-stmts for exp2>;
    } else {
        <else-stmts for exp2>;
    }
}
```

```
if (<Boolean exp1>) {
    if (< Boolean exp2>) {
        <then-stmts for exp2>;
    }
} else {
    <else-stmts for exp1>;
}
```

Nested if/else Statements

```
if (<Boolean exp1>)
{
    if (< Boolean exp2>)
    {
        <then-stmts for exp2>;
    }
    else
    {
        <else-stmts for exp2>;
    }
}
```

```
if (<Boolean exp1>)
{
    if (< Boolean exp2>)
    {
        <then-stmts for exp2>;
    }
}
else
{
    <else-stmts for exp1>;
}
```

Demo—Nested If-Else

```
if (genderList == "Male")
{
   gender = malePronouns;
     if (age > 19)
     {
          group = adults;
       } else if (age <= 19 && age > 12)
       {
          group = teens;
       } else {
          group = kids;
       }
}
```

Next week's quiz topics

Arrays

Indexing a Collection of Items

D.A. Clements

Arrays

- Indexing
  - Creating and using lists, or arrays
- Processing an array
  - Element by element
- Array methods
  - Quick work with lists

Creating and using lists, or arrays

INDEXING

What is an Array?

- An indexed list of items, or elements
    - Indexed means each element in the list has a number, or index

1. George Washington
2. John Adams
3. Thomas Jefferson
4. James Madison
5. James Monroe
6. John Quincy Adams
7. Andrew Jackson
8. Martin Van Buren
9. William Harrison
10. John Tyler
11. James Polk
12. Zachary Taylor
13. Millard Fillmore
14. Franklin Pierce
15. James Buchanan
16. Abraham Lincoln
17. Andrew Johnson
18. Ulysses S. Grant
19. Rutherford B Hayes
20. James Garfield
21. Chester Arthur
22. Grover Cleveland
23. Benjamin Harrison
24. Grover Cleveland
25. William McKinley
26. Theodore Roosevelt
27. William H. Taft
28. Woodrow Wilson
29. Warren Harding
30. Calvin Coolidge
31. Herbert Hoover
32. Franklin D. Roosevelt
33. Harry S. Truman
34. Dwight Eisenhower
35. John Kennedy
36. Lyndon Johnson
37. Richard Nixon
38. Gerald Ford
39. James Carter
40. Ronald Reagan
41. George H. W. Bush
42. William Clinton
43. George W. Bush
44. Barack Obama

Presidents

Indexing

- Process of creating a sequence of names by associating a base name with a number (like Apollo 13 or Henry VIII)
  - Each indexed item is called an element of the base-named sequence
- Index Syntax
  - index number is enclosed in square brackets `[ ]`
- Iterations can be used to refer to all elements of a name
  - `A[j]` for successive iterations over `j` referring to different elements of `A`

Indexing (cont'd)

- *Index Origin*
  - The point at which indexing begins (the least index)
  - In life, the first element may begin with 1, or have no number (Queen Elizabeth)
  - JavaScript *always* uses index origin 0

Rules for Arrays

- Arrays are variables initialized by

```
new Array (<number of elements>);
```

- <number of elements> is number of items in ;
- Array indexing begins at 0
- Greatest index is
  <number of elements> - 1
- Number of elements is array length
- Index values range from 0 to (length – 1)

Syntax for Arrays

- Initialize array
  - with name and # elements
    ```
    books = new Array (6);
    ```
  - with name and elements
    ```
    books = new Array ('War and
    Peace',
    'Tom Sawyer','Jane Eyre');
    ```
- Add elements
  ```
  books[3] = 'Pride and Prejudice';
  books[4] = 'Moby Dick';
  books[5] = 'Captain Horatio Hornblower';
  ```

Syntax for Arrays

- Reference an element of the array:
  - Index must be a non-negative integer or expression or variable that resolves to non-negative integer

```
array[i]
```

Element by element

PROCESSING AN ARRAY

Array Reference Syntax

- The World-Famous Iteration, or 0-origin loop iteration, is perfect for looping through arrays
  - Start at 0
  - Increment by 1 to process every element in the array
    - Use the incrementing variable as the index for the array element
  - End when you reach the last element in the array

for Loops Rule

- The World-Famous Iteration for looping through an array:

```
for ( i = 0; i < fruits.length; i++ )
{
      alert(fruits[i]);
}
```

- `.length` is a built-in JavaScript property that always gives you the length of an array
  - Length of an array is the number of elements

Demonstration

- Looping through the fruits array

Processing elements in an array

```
var i, text="";                    //declare iteration and other variables
var fruits = new Array(
        'lemons','apples','mangoes','tangerines','kumquats',
        'cantaloupe','peaches','grapefruit','raspberries');
alert("Total number of fruits is " + fruits.length);
for (i=0; i<fruits.length; i++)
{
   text += i + '. ' + fruits[i] + '<br />';
}
document.write("<h1>Elements of Fruits Array:</h1><p>" + text +
"</p>");
```

Array Methods: **.push**

```
var i, text="";                    //declare iteration and other variables
var fruits = new Array(
            'lemons','apples','mangoes','tangerines','kumquats','cantaloupe',
            'peaches','grapefruit','raspberries');
fruits. push('bananas','oranges','pears');
alert("Total number of fruits is " + fruits.length);
for (i=0; i<fruits.length; i++)
{
    text += i + '. ' + fruits[i] + '<br />';
}
document.write("<h1>Elements of Fruits Array:</h1><p>" + text + "</p>");
```

for Loops Rule!

- Now we've added more elements to our array. Do we need to change anything in our for loop?

```
    for ( i = 0; i < fruits.length; i++ )
    {
          alert(fruits[i]);
    }
```

- No! **fruits.length** still takes us to the end of the fruits array—whatever its length.

Array Methods: **push**

- Verify it by looping through the expanded fruits array

Quick work with lists

ARRAY METHODS

Array Methods = Possibilities!

- **push**
  - adds elements to the array

    fruits.push('bananas','nectarines','apples');
- **pop**
  - pulls the last element off of the array

    fruits.pop();
- **concat**
  - combines several arrays into one
  - Note: copies of the arrays are used
  - The original arrays remain and are unaffected

    fruits.concat(citrus,stoneFruit,berries);

Array Methods = More Possibilities!

- **join**
  - combines all elements into a string, separated by commas or as specified
    fruits.join(;);
- **sort**
  - sorts the elements in the array
    fruits.sort(); //always ascending
- **reverse**
  - reverses the elements in an array
  - Used with sort to sort descending

    fruits.sort(); //sorts into ascending order

    fruits.reverse(); //reverses to descending

Array Methods = More Possibilities!

- **toString**
  - converts the array to a string

    fruits.string();

Array Method: **sort**

- Sort with **.sort**
  - Ascending only (A-Z, 0-9)

```
var i, text="";                    //declare iteration and other variables
var fruits = new Array(
          'lemons','apples','mangoes','tangerines','kumquats','cantaloupe',
          'peaches','grapefruit','raspberries');
fruits. push('bananas','oranges','pears');
fruits.sort();
alert("Total number of fruits is " + fruits.length);
for (i=0; i<fruits.length; i++)
{
   text += i + '. ' + fruits[i] + '<br />';
}
document.write("<h1>Elements of Fruits Array:</h1><p>" + text + "</p>");
```

Array Sort

- Demonstration

Sort the Array in Descending Order

- Reverse the sort with `.reverse`

```
var i, text="";                    //declare iteration and other variables
var fruits = new Array(
            'lemons','apples','mangoes','tangerines','kumquats','cantaloupe',
            'peaches','grapefruit','raspberries');
fruits. push('bananas','oranges','pears');
fruits.sort();
fruits.reverse();
alert("Total number of fruits is " + fruits.length);
for (i=0; i<fruits.length; i++)
{
    text += i + '. ' + fruits[i] + '<br />';
}
document.write("<h1>Elements of Fruits Array:</h1><p>" + text + "</p>");
```

Array Method: `reverse`

- Demonstration

End papers…

- Why is programming fun?
  - Second is the pleasure of making things that are useful to other people. Deep within, we want others to use our work and to find it helpful. In this respect the programming system is not essentially different from the child's first clay pencil holder “for Daddy's office.”

Source: Frederick P. Brooks, Jr. *The Mythical Man-Month: Essays on Software Engineering*