Arrays:

Indexing a Collection of Items

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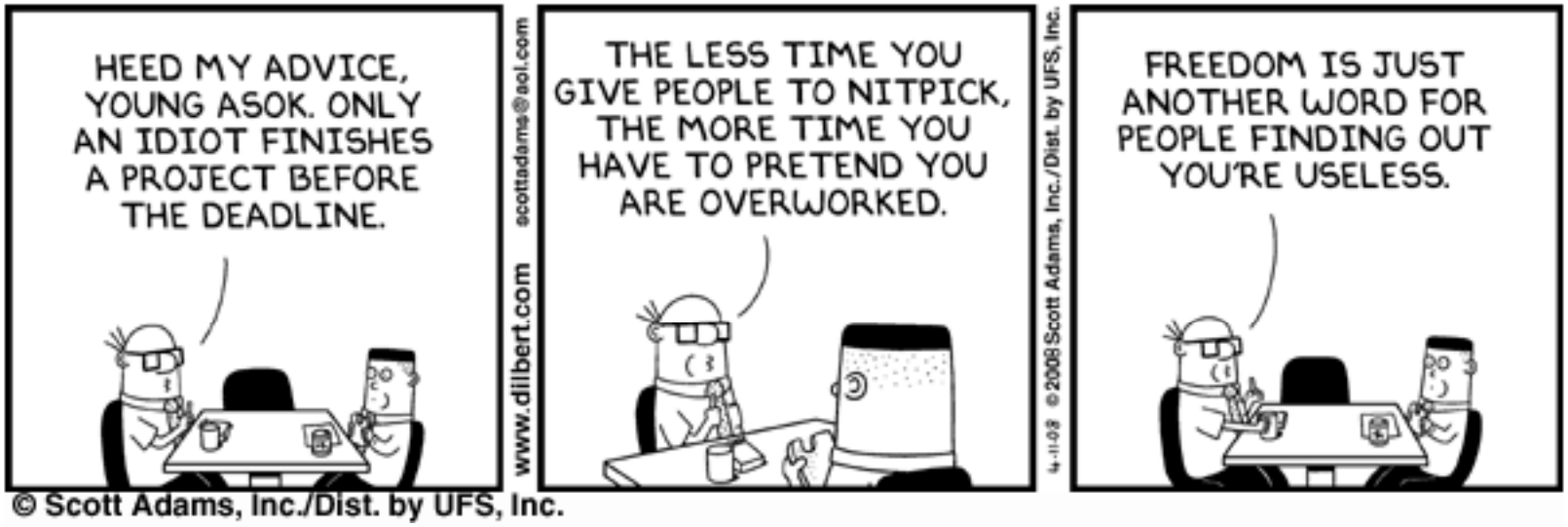
Just a thought…



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

Presidents

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
14. James Buchanan
15. Abraham Lincoln
16. Andrew Johnson
17. Ulysses S. Grant
18. Rutherford B Hayes
19. James Garfield
20. Chester Arthur
21. Grover Cleveland
22. Benjamin Harrison
23. Grover Cleveland
24. William McKinley
25. Theodore Roosevelt
26. William H. Taft
27. Woodrow Wilson
28. Warren Harding
29. Calvin Coolidge
30. Herbert Hoover
31. Franklin D. Roosevelt
32. Harry S. Truman
33. Dwight Eisenhower
34. John Kennedy
35. Lyndon Johnson
36. Richard Nixon
37. Gerald Ford
38. James Carter
39. Ronald Reagan
40. George H. W. Bush
41. William Clinton
42. George W. Bush

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)

Array Reference Syntax

- Array reference is array name together with index enclosed in brackets (non-negative integer or expression or variable that resolves to non-negative integer)

```
array[i]
```

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

Element by element

PROCESSING AN 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**

- Add more fruits to the array with **.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!

- After adding more elements to our array, does our for loop still work?

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

- Yes! **`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 = 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 = 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 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*