Course Outline

Lecture 4: Array and Math Objects' Methods

4-1 Array Object

4-2 Additional Array Methods

4-3 Math Object

Arrays Objects

For example, an array called **myArray** containing the data 25 and 35 could be illustrated as the following:

Element Name- **myArray**	Value
myArray[0]	25
myArray[1]	35

★ Notice that the index values start at 0 and not 1.

- in addition to storing data, ***Array*** objects provide a number of useful properties and methods to manipulate the data in the array and
- find out information such as the size of the array

How to Create an Array?

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Example

```
var myArray= new Array(); // Declares a new array with no data
var myArray = new Array("One", "Two", 3);// Array with 3 elements
myArray[3] = "Four"; //  can add new  element to an existing array
myArray[5] = "Six"; // can skip the index,  but the skipped element is also created
```

Note that, as with everything in JavaScript, the code is case-sensitive, so if you type array() rather than Array(), the code won't work.

- Let's look some of the more useful property and methods of Array objects.

Finding Out How Many Elements Are in an Array — The length Property

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- The length property gives you the number of elements within an array,
- Can be used to find the index of the last element in the array

Example:

```
var names = new Array();
names[0] = "Paul";
names[1] = "Jeremy";
names[11] = "Nick";
document.write("The last name is" + names[names.length - 1]);
```

- This property is useful where a JavaScript method returns an array it has built itself.
- **For example, *split()*** method, which splits text into pieces and passes back the result as an Array, without the ***length*** property, there is no way to know what the index is of the last element in the array.

Joining Arrays — The concat() Method

- take two separate arrays and join them together into one big array.
- which is the combination of the two arrays: the elements of the first array, then the elements of the second array.
- use the method on your first array and pass the name of the second array as its parameter.

```
var names = new Array("Paul", "Jeremy", "Nick");
var ages = new Array(31,30,31);
var concatArray = names.concat(ages);
```

Element Index	0	1	2	3	4	5
Value	Paul	Jeremy	Nick	31	30	31

Copying Part of an Array —The slice() Method

- to copy a portion of an array, use the slice() method.
- using the slice() method, can slice out a portion of the array and assign it to a new variable name.
- slice() method has two parameters:
  - index of the first element you want copied
  - index of element marking the end portion you are slicing out (optional)

```
var names = new Array("Paul", "Sarah", "Jeremy", "Adam", "Bob");
var slicedArray = names.slice(1,3);
```

☞ After slicing, result table is like this:

Index	0	1
Value	Sarah	Jeremy

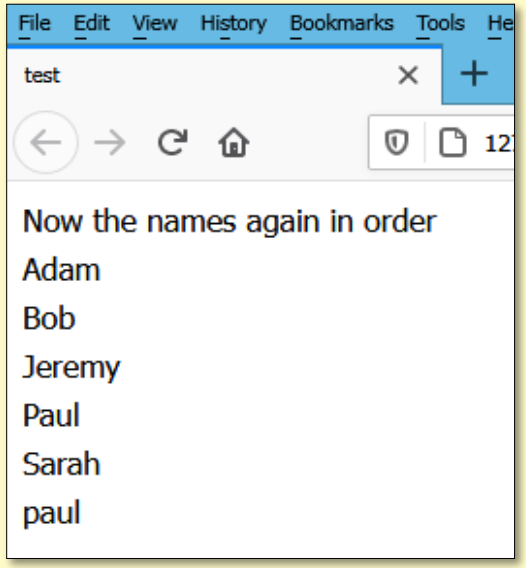
Note: The original array will not be changed.

Putting Your Array in Order — The sort() Method

- Use in alphabetical or numerical order
- In the following code, you define your array and then put it in ascending alphabetical order using names.sort().

Example:

```
var names = new Array("Paul", "Sarah", "Jeremy", "Adam" ,"paul", "Bob");
var elementIndex;
names.sort();
document.write("Now the names again in order" + "<br />");
for (elementIndex = 0; elementIndex < names.length; elementIndex++)
  {
        document.write(names[elementIndex] + "<br />");
  }
```



- Don't forget that the sorting is case sensitive, so **Paul** will come before **paul**.
- Remember that JavaScript stores letters encoded in their equivalent Unicode number, and that sorting is done based on Unicode numbers rather than actual letters.

Putting Your Array into Reverse Order — The reverse() Method

- The final method for the Array object is the reverse() method, which reverses the order of the array so that the elements at the back are moved to the front.

```
var myShopping=new Array("Eggs", "Milk", "Potatoes", "Cereal", "Banana");
myShopping.reverse();
document.write(myShopping);
```

Result:

Banana	Cereal	Potatoes	Milk	Eggs

Removing and Adding Array Elements— The pop() and push() Method

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pop()

Removes the last element from an array and returns that element.

```
var cats = new Array('Bob', 'Willy', 'Mini');
cats.pop();
document.write(cats); // ('Bob', 'Willy')
```

push()

Add one or more elements to the array and returns the array

```
cats = new Array('Bob');
cats.push('Willy','Mini');
document.write(cats); // ('Bob', 'Willy', 'Mini')
```

4.2 New Array Methods

- In 2005, Mozilla updated the JavaScript engine in Firefox.
- They added **seven new methods** to the Array object.
- These seven methods can be divided into two categories: location methods and iterative methods.
- These methods do not work Internet Explorer, however, work in Firefox, Safari, Opera, and Chrome.

Seven New Methods

- indexOf()
- lastIndexOf()

Location Methods

Similar to String Object's Methods

- every()
- some()
- filter()

Testing Methods

- forEach()
- map()

Operation Methods

Iterative Methods

Iterating Through an Array Without Loops

- remaining five methods are called iterative methods because they iterate, or loop, through the array.
- these methods execute a function you define on **every element**
- the function these methods use must accept **three arguments**

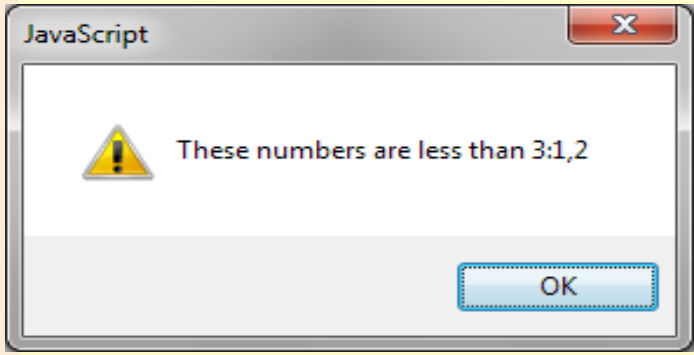
```
function functionName(value, index,
array)
{
        // do something here
}
```

  - the first is the value of the element,
  - next is the index of the element, and
  - finally is the array itself.

Testing Each Element — The every(), some(), and filter() Methods

- The every() method tests whether all elements in the array pass the test in function
- the some() method test only cares if some of the elements pass the test in function

```
var numbers = new Array(1, 2, 3, 4, 5);
function isLessThan3(value, index, array)
{
	var returnValue = false;
	if (value < 3)
	{
		returnValue = true;
	}
	return returnValue;
}
alert(numbers.every(isLessThan3));//  false
alert(numbers.some(isLessThan3));//  true
if (numbers.some(isLessThan3))
{
	var result = numbers.filter(isLessThan3);
	alert("These numbers are less than 3: " + result);
}
```



- ✓ the filter() method executes your function on every element in the array, and
- ✓ if the function returns true for a particular element, that element is added to another array the filter() method returns.

Operating on Elements — The forEach() and map() Methods

- Unlike the previous iterative methods, these two will perform some kind of operation that uses the element in some way.
  - In the following code, the value of each element is doubled, and the result is shown in an alert box using two ways: simple for loop method and forEach method.

```
var numbers = new Array(1, 2, 3, 4, 5);
for (var i = 0; i < numbers.length; i++ )
{
    var result = numbers[i] * 2;
    alert(result);
}
```

```
var numbers = new Array(1, 2, 3, 4, 5);
function doubleAndAlert(value, index, array)
{
    var result = value * 2;
    alert(result);
}
numbers.forEach(doubleAndAlert);
```

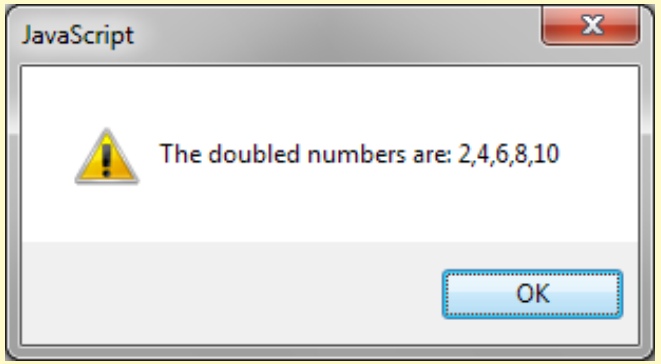
forEach() Method Cont'd

- the doubleAndAlert() function doesn't return a value like the testing methods.
- it cannot return any value; its only purpose is to **perform an operation** on every element in the array.
- while this is useful in some cases, it's almost useless when you want the results of the operation.
- that's where the map() method comes in.

map() Method

❖ the map() method is similar to that of forEach(), except that the results of every operation are stored in another array that the map() method returns.

```
var numbers = new Array(1, 2, 3, 4, 5);
function doubleAndAlert(value, index, array)
{
var result = value * 2;
return result;
}
var doubledNumbers = numbers.map(doubleAndAlert);
alert("The doubled numbers are: " + doubledNumbers);
```



➢ Instead of outputting in and alert box, can show the full result after calling **map()** method

4.3 The Math Object

- Provides a number of useful mathematical functions and number manipulation methods.
- The ***Math*** object is a little unusual in that JavaScript automatically creates it for you.
- There's no need to declare a variable as a ***Math*** object or define a ***new Math*** object before being able to use it.

For Example:

```
var myvariable=new Math();
```

Properties of Math Object

- The properties of the ***Math*** object include some useful math constants, such as the PI property
- PI property give the value 3.14159
- To access these properties, as usual, by placing a dot after the object name (**Math**) and then writing the property name
- For example, to calculate the area of a circle, use the following code:

```
var radius = prompt("Give the radius of the circle", "  ");
var area = Math.PI * radius * radius;
document.write("The area is "  + area);
```

The abs() Method

- ✓ The **abs()** method returns the absolute value of the number passed as its parameter.
- ✓ It returns the positive value of the number. So -1 is returned as 1, -4 as 4, and so on.
- ✓ However, 1 would be returned as 1 because it's already positive.

For example, the following code writes the number **101** to the page.

```
var myNumber = -101;
document.write(Math.abs(myNumber));//101
```

Finding the Largest and Smallest Numbers: the Min() and Max() Methods

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- If there are two numbers and want to find either the largest or smallest of the two, the Math object provides the **min()** and **max()** methods
- Both accept at least **two arguments**, all of which must obviously be numbers.

For example:

```
a = Math.max(b, c); //  Returns the greater of two numbers
a = Math.min(b, c); //  Returns the smaller of two numbers
var max = Math.max(21,22); //  result is 22
var min = Math.min(30.1, 30.2); //  result is 30.1
```

★ **max()** and **min()** methods can accept many numbers; **not limited to two**

Rounding Numbers

- The Math object provides a few methods to round numbers, each with its own specific purpose.

ceil() Method

floor() Method

round() Method

- The **ceil(), floor(), and round()** methods all remove the numbers after a decimal point and return just a whole number.

ceil() Method

- always rounds a number up to the next largest whole number or integer.

```
var myNumber = 101.01;
document.write(Math.ceil(myNumber) );//102
document.write(parseInt(myNumber));//101
```

- different from using the ***parseInt()*** function
- ***parseInt()*** simply chops off any numbers after the decimal point to leave a whole number

floor() Method

- removes any numbers after the decimal point, and returns a whole number or integer.
- ***floor()*** always rounds the number down.

```
var myNumber = 10.01;
document.write(Math.floor(myNumber) + “<br />”);//10
var my Number=-9.9;
document.write(Math.floor(myNumber) ;//-10
```

round() Method

- The ***round()*** method is very similar to ***ceil()*** and ***floor(),*** except that instead of always rounding up or always rounding down
- it rounds up only if the decimal part is .5 or greater, and rounds down otherwise.

```
var myNumber = 44.5;
document.write(Math.round(myNumber) + "<br />");//45
myNumber = 44.49;
document.write(Math.round(myNumber));//44
```

random() Method

- returns a random floating-point number in the range between 0 and 1, where 0 is included and 1 is not.

- very useful for displaying random banner images or for writing a JavaScript game

The following example show the rolling of a single dice for 10 times and then, 10 random numbers are written to the page.

```
<script type="text/javascript">
var throwCount;
var diceThrow;
for (throwCount = 0; throwCount < 10; throwCount++)
{
    diceThrow = (Math.floor(Math.random() * 6) + 1);
    document.write(diceThrow + "<br>");
}
</script>
```

to get 10 random number

to ensure random number be between 1 to 6

pow() Method

- The ***pow()*** method raises a number to a specified power.
- It takes two parameters, the first being the number you want raised to a power, and the second being the power itself.

Math.pow(2,8) — the result being 256

Using pow()

Example

```
<script type="text/javascript”>
function fix(fixNumber, decimalPlaces)
{
   var div = Math.pow(10,decimalPlaces);
   fixNumber = Math.round(fixNumber * div) / div;
   return fixNumber;
}
</script>
</head>
```

```
<body>
<script type="text/javascript">

 var number1 = prompt("Enter the number with decimal places you want to fix","");
 var number2 = prompt("How many decimal places do you want?","");

 document.write(number1 + " fixed to " + number2 + " decimal places is: ");
 document.write(fix(number1,number2));

</script>
```

Number Object

- ✓ As with the ***String*** object, ***Number*** objects need to be created before they can be used.
- To create a ***Number*** object, you can write the following:

```
var firstNumber = new Number(123);

var secondNumber = new Number('123');
```

- ✓ You'll look at ***toFixed()*** method of the ***Number*** object, that's the most useful method for everyday use.

toFixed() Method

- The ***toFixed()*** method cuts a number off after a certain point.
- The method's only parameter is the number of decimal places you want your number fixed to.
- The toFixed() method doesn't chop off the digits not required, it also rounds up or down.
- Can only fix a number from 0 to 20 decimal places.

Example:

```
var x = new Number(9.654);
x=x.toFixed(0);          // returns 10
x=x.toFixed(1);          // returns 9.7
x=x.toFixed(2);          // returns 9.65
x=x.toFixed(4);          // returns 9.6540
```

★ toFixed(2) is perfect for working with money.

QUIZ TIME

1

What does Math.random() do?

A Returns a random number more than 0 and less than 1.

B Randomly selects a number 1-10.

C Returns a random number more than 0 up to and including 1.

D Returns a random number from and including 0 to less than 1.