

Problem Solving with Code



What we're learning today:

- Common ways Arrays and Objects are used in algorithms
- How to write boolean statements as code
- How to approach problems by thinking algorithmically



**Let's look at some ways Arrays are used
to solve problems**



Iterating over an array

When you build a for loop like this, **array[i]** will point to one thing in the array and **i** will be it's index

```
function iterate(array) {  
    for (var i=0; i < array.length; i++) {  
        var currentItem = array[i];  
        // use currentItem here  
    }  
}
```

Accumulating over an array

If you declare a variable outside of the for loop, you can mess with it in each iteration of the loop

```
function accumulate(array) {  
    var count = 0;  
  
    for (var i=0; i < array.length; i++) {  
        var currentItem = array[i];  
        count += currentItem;  
    }  
  
    return count;  
}
```

Accumulating over an array

If you declare a variable outside of the for loop, you can mess with it in each iteration of the loop

```
function accumulate(array) {  
    var count = "";  
  
    for (var i=0; i < array.length; i++) {  
        var currentItem = array[i];  
        count += currentItem;  
    }  
  
    return count;  
}
```

Searching for one item in an array

Use an **if** statement in your for loop to check each array item

```
function search(haystack, needle) {  
    var foundIndex = -1;  
  
    for (var i=0; i < haystack.length; i++) {  
        var currentItem = haystack[i];  
        if ( currentItem == needle ) {  
            foundIndex = i;  
        }  
    }  
  
    return foundIndex;  
}
```

Divide these problems between the people at your table, discuss your solutions!

1. Given an array of people's names ["Lachlan", "Kim", "Maira"], write a function that logs "Hi, [name]!" for each person.
2. Given an array of a first, middle, and last name ["Adam", "Michael", "Szaruga"], write a function that prints the person's initials
3. Given a list of 0's and 1's, [0, 1, 0, 1, 1, 1, 0, 0], write a function that returns the index of the last 1 in the array
4. Given a list of positive numbers, [1, 5, 25, 3, 99, 20], write a function that returns the biggest number



**Let's look at some ways Objects are used
to solve problems**



Finding unique items in an array

Object keys are unique, whereas
Array items don't have to be
unique

```
function unique(array) {  
    var object = {};  
  
    for (var i=0; i < array.length; i++) {  
        var currentItem = array[i];  
        object[currentItem] = "blah";  
    }  
  
    var uniqueItems = object.keys();  
    return uniqueItems;  
}
```

Counting unique items in an array

Use an if statement to see if the
currentItem has been counted
before - otherwise, just
increment its count

```
function histogram(array) {  
  var object = {};  
  
  for (var i=0; i < array.length; i++) {  
    var currentItem = array[i];  
    if ( !object[currentItem] ) {  
      object[currentItem] = 0;  
    }  
    object[currentItem]++;  
  }  
  
  return object;  
}
```

Divide these problems between the people at your table, discuss your solutions!

1. Given an array of student's birth years, [1991, 1984, 1984, 1989], return the most common birth year
2. Given a string "This is a random string", write a function that returns a count of each character in the string
3. Given an array of olympic race results [{country: "usa", time: 233}, {country: "poland", time: 222}, ...], write a function that returns each country's best time
4. Given a list of numbers, [-1, 5, -25, -3, 99, 20], write a function that returns the count of positive numbers and negative numbers



**Let's look at some ways Arithmetic is
used to solve problems**



Finding multiples of a number

A number is a multiple of **n** if:
number % n == 0

```
function multiple(number, n) {  
  
    for (var i=0; i < n; i++) {  
        if ( i % number == 0 ) {  
            console.log(i)  
        }  
    }  
}
```

Finding the average of a list of numbers

average = sum/count

```
function multiple(numbers) {  
  
    var sum = 0;  
    for (var i=0; i < numbers.length; i++) {  
  
        sum += numbers[i]  
  
    }  
  
    return sum/numbers.length;  
}
```

**Almost every problem you encounter will
require you to convert plain english into
Boolean logic**



“i is less than 20 and greater than 0”

...

“i is less than 20” && “i is greater than 0”

...

i < 20 && i > 0



“i is either a multiple of 5 or 3”

...

“i is a multiple of 5” || “i is a multiple of 3”

...

`i % 5 == 0 && i % 3 == 0`



“myArray is non-empty and has an odd number of elements”

...

“myArray is non-empty” && “myArray has an odd number of elements”

...

myArray.length > 0 && myArray % 2 == 1



9 times out of 10, your algorithms will use some variation of these techniques!

You can become a better problem solver if you master these techniques and recognize which work best for the problem at hand



For example, this problem....

Problem:

Write an algorithm that will add all of the numbers between 0 and some number **n**

Solution:

```
function sum(n) {  
    var sum = 0;  
    for (var i=0; i < n; i++) {  
        sum += i;  
    }  
    return sum;  
}
```



... is pretty much the same as this problem!

Problem:

Write an algorithm that will add add all of the **multiples of 3** between 0 and some number **n**

Solution:

```
function sumMult3(n) {  
    var sum = 0;  
    for (var i=0; i < n; i++) {  
        if (i % 3 == 0) {  
            sum += i;  
        }  
    }  
    return sum;  
}
```



Time to tackle some exercises!

Schoology → Week 2 → Tuesday → Exercises → Problem Solving

