JS Interview Bootcamp

https://github.com/StephenGrider/algocasts

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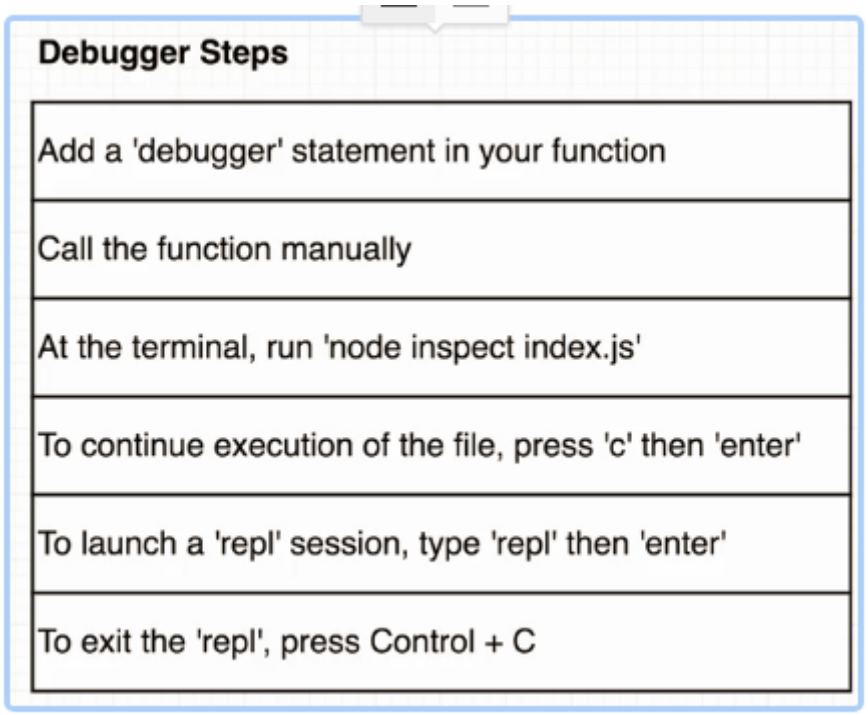
20. N element from last node

Running Tests:

```
jest libraryName/filename --watch
```

0. Debugger (Lecture 12)

```
function reverse(str) {
        debugger;
  return str.split('').reduce((rev, char) => char + rev, '');
}
```



1 String Reverse

//**1. Sollution ***/// Array.prototype.reverse()

```
function reverse(str) {
        return str.split("").reverse().join("");
```

```
}
```

//**2. Sollution ***/// Reversed For loop

```
function reverse(str) {
        let len = str.length;
        let reversed = "";
        for(i=len;i>=0;i--){
                reversed += str.charCodeAt(i);
        }
}
```

//**3. Sollution ***/// For each loop

```
function reverse(str) {
  let reversed = '';
  for (let character of str) {
    reversed = character + reversed;
  }
  return reversed;
}
```

//**4. Sollution ***///Reduce

https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/Array/Reduce

(Basically, reduce is an accumulator, it will add everything together in a reversed order)

```
function reverse(str) {
  return str.split('').reduce((rev, char) => char + rev, '');
//This would return the same string
return str.split('').reduce((rev, char) => rev + char, '');
}
```

2. Palindrome

//***** 1 Solution *** /// reverse()

Will loop through the whole string, will seperated, will reverese each of the charachters in the array, add them together.

3*O(n)

```
function palindrome(str) {
        let string =  str.split("").reverse().join("");


        if(str === string){
                return true;
        }else{
                return false;
        }
}
```

//***** 1 Solution *** /// (For loop)

(More efficient, since it will just loop as long as it is true)

O(n)

```
function palindrome(str) {
        let len = str.length;
        for(i=0;i<len;i++){
                if(str.charCodeAt(i) !== str.charCodeAt(len-1-i)){
                        return false;
                }
        }
        return true;
}
```

3 Integer Reversal

My Sollution

I modified anythin in the string,

```
function reverseInt(n) {
```

```
        if(n ==0) {return n; }                          //Check he input if it
0 return immediately



        let str = n.toString();                         //Convert integer to
string
        let len = str.length;                           //Define it outside the
loop, for faster performance
        let limit = 0;                                          //Will do the
looping i the string until the limit
        let reversed ="";                                       //Basic value
        if(str.charAt(0)=="-"){
                limit = 1;                                              //Will
skip the looping of the "-"
                reversed ="-";                                  //Will add to
the reversed string "-"
         }



        for(i=len;i>=limit;i--){                        //Reversing
            reversed += str.charAt(i);
        }
        while(reversed.charAt(limit) =="0"){    //removing zeros
                reversed = reversed.replace("0","");
        }
        return parseInt(reversed);                              //returnin
converted integer
}
```

Course Solution

It is reverseing the whole number as string,

parseInt() --> will remove the zeros from the begining

Math.sign() --> will return 1 or -1, so we just have to multiply it with the correct sign

```
function reverseInt(n) {
 const reversed = n
   .toString()
```

```
    .split('')
    .reverse()
    .join('');


  return parseInt(reversed) * Math.sign(n);
}
```

4 MaxChar (Perfect for String Queries)

Returnin the most used charachter from the string

```
function maxChar(str) {
let max=0;
//This is to store the max value
 let maxCharacter = "";
//This is to store the max characther string, which will be returned back
 let charsObj = {};
//This is our mapped table
 let len = str.length;
//Declared outside of the for loop, so it is faster
 let char = "";
//Same declared outside

 for(i=0;i<len;i++){
        char = str[i];
        charsObj[char] = charsObj[char] +1 || 1;
//Check if it can find the charachter as a property of the object

        if (charsObj[char] > max)
{
//Instead of looping again over, we keep it O(n) if we keep track of the max value
                max = charsObj[char];
                maxCharacter = char;
        }
 }
 return maxCharacter;

}
```

Note

This line

```
charsObj[char] = charsObj[char] +1 || 1;
//Check if it can find the charachter as a property of the object
```

Is the same as this one.

```
if(!charsObj[char]){
```

```
//If it can't find the property, it will create one and assign a value of 1 to
it
     charsObj[char] = 1;
}else{
     charsObj[char]++;
//Else it will just add one to it.
}
```

5 Fizzbuzz

MySolution

```
function fizzBuzz(n) {
        for(i=1;i<=n;i++){
                if( i%3===0 & i%5===0 ){
                        console.log("fizzbuzz");
                }else if(i%3===0){
                        console.log("fizz");
                }else if(i%5===0){
                        console.log("buzz");
                }else{
                        console.log(i);
                }
        }
}
```

6 Chunk Array (Create small chunks fo array from the array)

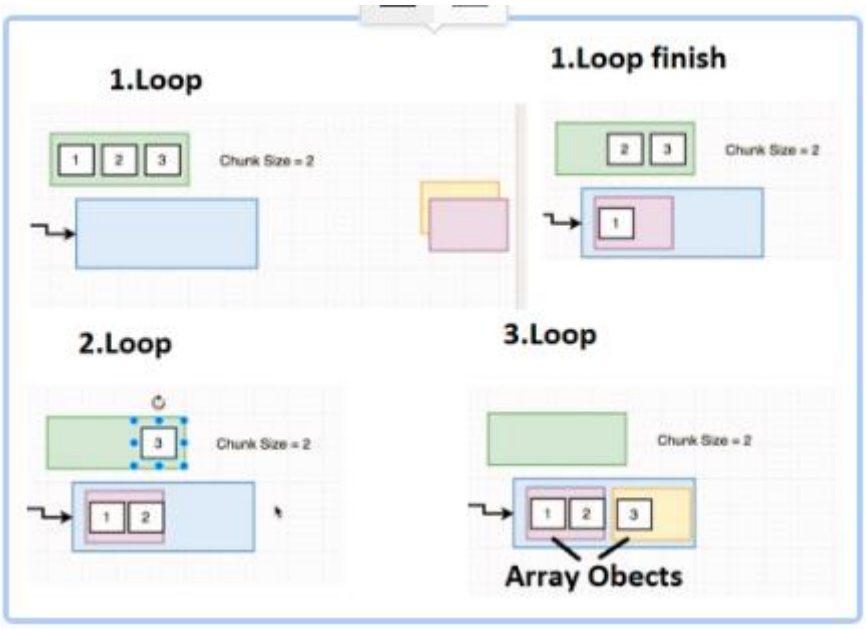
My Solution

Using a temporary array + for loop

```
// chunk([1, 2, 3, 4], 2) --> [[ 1, 2], [3, 4]]
// chunk([1, 2, 3, 4, 5], 10) --> [[ 1, 2, 3, 4, 5]]
```

```
function chunk(array, size) {
        if (size <= 0 || size>= array.length){ return
array};
//Return immedeitaly, if it is 0, or bigger, or the same size
        let finalArr = [];
//Final array, to be returned
        let tempArr = [];
//Temporary array for the chunks
        let limit = size;
//Limit for the temporary array size
        let len = array.length;
//TO make the for loop faster
        for(i=0;i<len;i++){
                if(tempArr.length <limit){
//If the chunk is not full push the element here
        tempArr.push(array[i]);
                } else{
//Else push the chunk to the array, empty it, and push the new element into
the chunk
                        finalArr.push(tempArr);
                        tempArr = [];
                        tempArr.push(array[i]);
                }
        }
        if(tempArr.length >0){  //Push the reamining chunk if it is not empty
                finalArr.push(tempArr);
        }
        return finalArr;

}
```

Course Solution 1



Explanation

0.

- We create a chunked array, which will be the created array of storing the chunk arrays.

1. Loop:

- last: will be undefined since chunked is empty therefore !last ,(!undefined) will be true
- Thus, it will push a new array object, to the chunked array

1. Loop finish:

- So are a result, we are storing a reference to the array object, which is pushed to the chunked array

2. Loop:

- Since ourobject, is not undefined and full, we push the current element to the last object, which is in the chunked array!!

3. Loop:

- Since the last array object is full, we push a new array object, with the current element in it to the chunked array.

**Trick:

- last array object is passed by reference, and pushed inside of an other array,(chunked)
- So if you push anything to the last array, it will be a part of chunked as well.

*/

Course Solution 1

```
function chunk(array, size) {
  const chunked = [];
//Tha main array, which holds the chunked arrays.
//If the input array.lengt is 0, it won't loop.

  for (let element of array) {          //Looping through each element
    const last = chunked[chunked.length - 1];
//Keeping track of the last element, we are referencing array objects, not
storing it by value!
    if (!last || last.length === size) {
//Will push a new array object, into chunked, if, last is not defined, or the
size has been reached
      chunked.push([element]);
    } else {
//Will push the element to the last array ojbect, and since we are storing the
last value by reference, it will push to the array, stored in the chnked
array.
      last.push(element);
    }
  }

  return chunked;
}

console.log(chunk([1,2,3,4,5,6],2));
module.exports = chunk;
```

Course Solution 2

//We are looping through the array, and we slice, chunked arrays from the original array and that's what we push into the cunked array.

```
function chunk(array, size) {
  const chunked = [];
  let index = 0;

  while (index < array.length) {
    chunked.push(array.slice(index, index + size));
    index += size;
  }

  return chunked;
}
```

7 Anagrams (Mapping table / sorting ABC)

// anagrams('rail safety', 'fairy tales') --> True

// anagrams('Hi there', 'Bye there') --> False

Solution 1 (Creating Mapping)

```
function anagrams(stringA, stringB) {
  const aCharMap = buildCharMap(stringA);
  const bCharMap = buildCharMap(stringB);


  if (Object.keys(aCharMap).length !== Object.keys(bCharMap).length) {
//if the charachter lenghts do not match, it is false
    return false;
  }

  for (let char in aCharMap) {
//check the index values.
    if (aCharMap[char] !== bCharMap[char]) {
      return false;
    }
  }


  return true;
}
//so we get a string as an argument, we remove the non latin characthers, we make everythin lowercase and we make return the mapping
function buildCharMap(str) {
  const charMap = {};

  for (let char of str.replace(/[^\w]/g, '').toLowerCase()) {
    charMap[char] = charMap[char] + 1 || 1;
  }


  return charMap;
}
```

Solution 2

```
function anagrams(stringA, stringB) {
  return cleanString(stringA) === cleanString(stringB);            //If they
perfectly match, they are an anagram!!
}


function cleanString(str) {
  return str
    .replace(/[^\w]/g, '')                          //remove the non latin
characthers
=    .toLowerCase()                                  //not case sensitive
    .split('')                                      //Create an array
    .sort()                                         //Sort it according to the
ABC
    .join('');                                      //Create a string from them.
}
```

8 Sentence Capitalization (Uppercase,Slice / string loop)

My solution

```
//Really important, you can't overwrite only just a letter in a string!
// arr[i][0] = "x" is just not working
function capitalize(str) {
 let arr =      str.split(" ");
        for(i=0;i<arr.length;i++){
                arr[i] = arr[i][0].toUpperCase()+ arr[i].slice(1);
        }


 return arr.join(" ");
}
console.log(capitalize('i am a cool guy'));
```

Course solution2

```
//o we are looping over the whole string and recreating it letter by letter,
function capitalize(str) {
  let result = str[0].toUpperCase();


  for (let i = 1; i < str.length; i++) {
    if (str[i - 1] === ' ') {                              // if the previoues
charachter is a space, then ..
      result += str[i].toUpperCase();
    } else {                                              //Else just copy it to
the new string.
      result += str[i];
    }
  }


  return result;
}
```

9 Steps (string concat)

// --- Examples

// steps(2)

// '# '

// '##'

// steps(3)

// '# '

// '## '

// '###'

```
//console.logging all of the levels seperately
function steps(n) {
        let str = '';   //Initial value for our returning text
        let hash = "";  //Initial value of our hash concatenated
        let space = ""; //Initial value of our hash concatenated
        for(i=1;i<=n;i++){
        //looping for as many rows as the recieved integer
                if(n!=1){
                //If we provide 1, we just return a prewritten string
                        space = "";
//In every row, space amount is chaning, has to be set to ""
                        hash +="#";
//In every row, from 1 we increment this string with 1 hash
                        for(j=1;j<=n-i;j++){
                                space += " ";
//We calculate how many spaces do we have in a row, in row 2 we have (total-2)
spaces
                        }
                } else{
                        return console.log('#' + space );
 //If we provide 1, we just return a prewritten string
                }
                console.log( hash + space ) ;
//Will be modified in each loop (console.log each row)
                str += '\''+ hash + space + '\'\n';
//Will be modified in each loop (concatenate the string)
        }
}


steps(2);
```

Course Solution 1

```
//Rewritten with for loop.
function steps(n) {
        let str =
'';                                                     //Initial value
for our returning text
        for(i=0;i<n;i++){
        //looping for as many rows as the recieved integer
                str ="";
                for(j=0;j<n;j++){
                        if(j<=i){
                          str +="#";
                        }else{
                          str +=" ";
                        }
                }
                console.log(str) ;                      //Will be modified in
each loop (console.log each row)
        }
}
steps(3);
```

Solution 1 Rewritten

```
//Rewritten with for loop.
function steps(n) {
        let str = '';//Initial value for our returning text
        for(i=0;i<n;i++){
        //looping for as many rows as the recieved integer
                str ="";
                for(j=0;j<n;j++){
                        if(j<=i){
                          str +="#";
                        }else{
                          str +=" ";
                        }
                }
                console.log(str) ;
//Will be modified in each loop (console.log each row)
        }
}

steps(3);
```

Recursive Solution Mine (Recursing rows)

```
//n is the number, how many times, it should be console.log in total

//hash --> is the current string of "#"

function steps(n, hash="#") {
        let str = hash;
        if(n===1){
//This is our base, if we reach 1, we return the concatenated "#" string.
                return console.log(str);
        }
        for(i=0;i<n-1;i++){
//If not, we add to the current hash the spaces which in total is(n-1)
                str +=" ";
        }
        console.log(str) ;
//Concatenated hashes with spaces
        steps(n-1,hash+"#");
//We decrement the rows to be shown, + add basi hash string.
}
```

Recurson Course solution 2

Recursons are done for every charachter in the row.

```
function steps(n, row = 0, stair = '') {
  if (n === row) {//The and of the cube, last cell in the table.
    return;
  }
  if (n === stair.length) {
//If we run through each column, we console.log the current row + set string
to default
    console.log(stair);
    return steps(n, row + 1);   //and go to the next one
  }
  const add = stair.length <= row ? '#' : ' ';
 // for every row, if there are still column to be looped through
 // We add a # or "space" if the column lenght is smaller, or less then the
current row
  steps(n, row, stair + add);                                          //Since
there are other columns to be looped through, we just call the funciton again
}
```

10 Pyramid Steps

// *****Recursion One ****

```
function pyramid(n, hash="#") {
        if(n===1){
//This is our base, if we reach 1, we return the concatenated "#" string.
                return console.log(hash);
        }
        let space = '';
        for(i=0;i<n-1;i++){
//If not, we add to the current hash the spaces which in total is(n-1)
                space +=" ";
        }
        console.log(space + hash + space) ;
        //Concatenated hashes with spaces
        pyramid(n-1,hash+"##");
//We decrement the rows to be shown, + add basi hash string.
}
```

//******Normal loop with creating the rows****

```
//  function pyramid(n) {
//      let hash ="#";
//
        for(i=0;i<n;i++){
        //looping for as many rows as the recieved integer
//              let str ='';    //Initial value for our returning text
//              for(j=0;j<n-i-1;j++){
//                      str +=" ";
//              }
//              console.log(str + hash + str) ;
//Will be modified in each loop (console.log each row)
//              hash +="##";
//      }
// }
```

11. Count Vowels

solution 1(Object)

```
function vowels(str) {
        let obj = {'a':1,'e':1,'i':1,'o':1,'u':1};
        let counter = 0;
        for(i=0;i<str.length;i++){
                if(obj[str[i].toLowerCase()]){
//trying to reference the object, if it is falsy, it is not a property
                        counter++;
                }
        }
        return counter;
}
```

Solution2 (array.include)

```
function vowels(str) {
  let count = 0;
  const checker = ['a', 'e', 'i', 'o', 'u'];
  for (let char of str.toLowerCase()) {
    if (checker.includes(char)) {
      count++;
    }
  }
  return count;
}
```

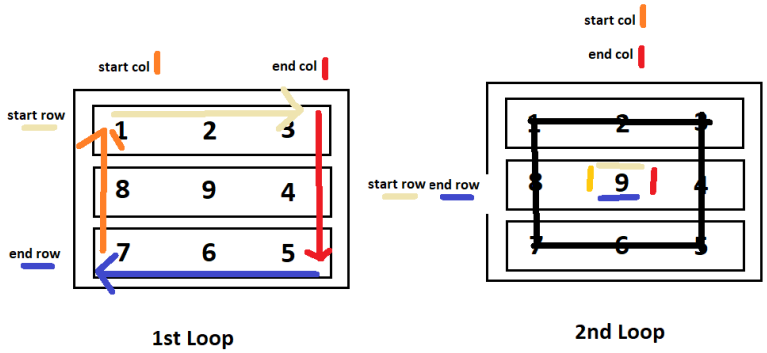
12 Spiral Matrix (Keep looping with descreasing conditionals)

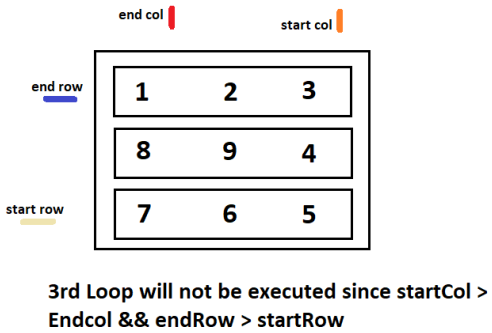
The key to this challange, is to combine 4 loops, keep track of the outer edge of the matrix with varibles.

1. loop:

- We loop through the first row, populate the data (+ incerement the startRow number, since the first row is full)

- We loop through the last column, populate the data (decrease the lastCOl number, since the last colis full)

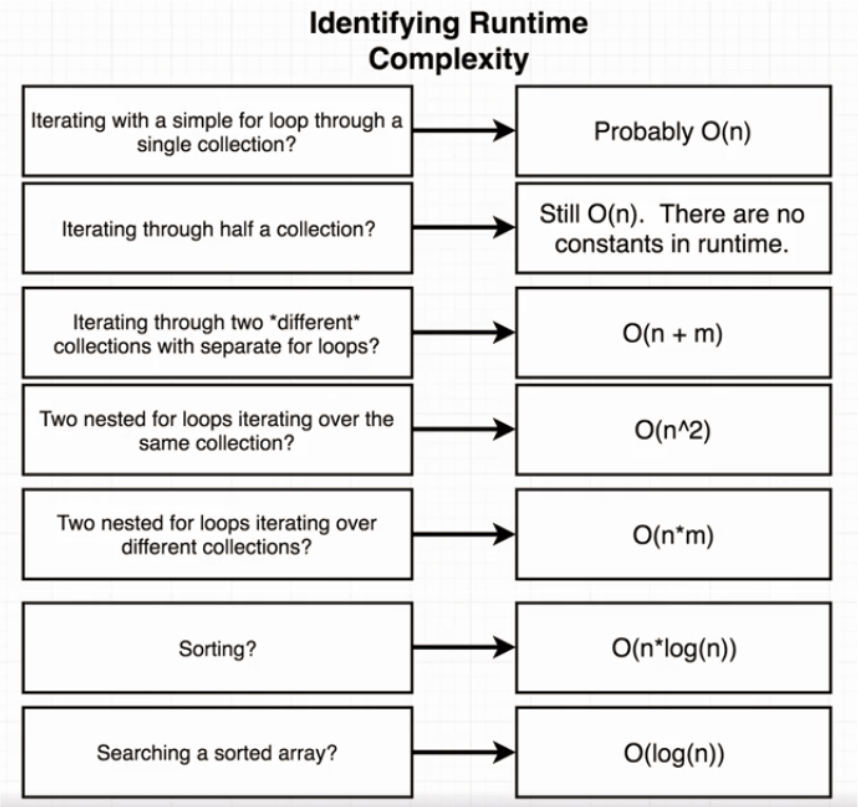




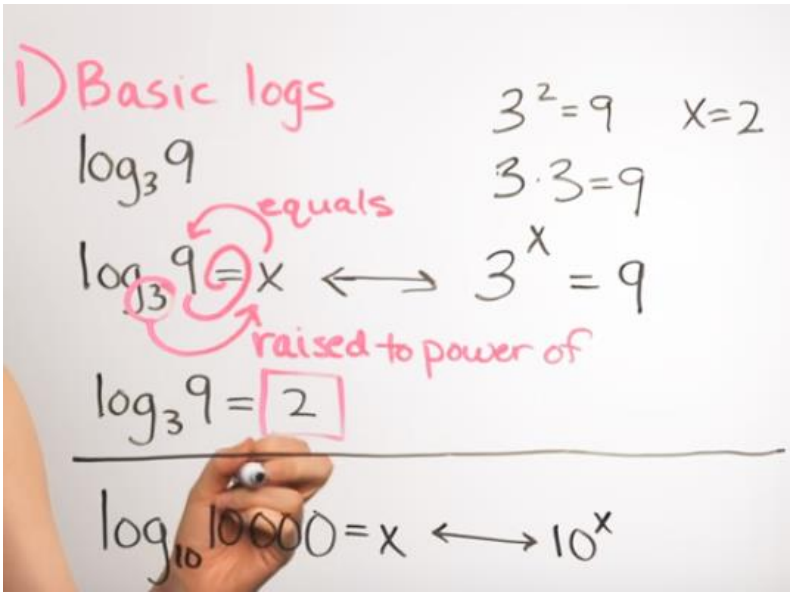

```
// --- Directions // Write a function that accepts an integer N
// and returns a NxN spiral matrix.
//   matrix(2)
//     [[1, 2],
//     [4, 3]]
//   matrix(3)
//     [[1, 2, 3],
//     [8, 9, 4],
//     [7, 6, 5]]
```

```
function matrix(n) {
        let results = [];
        let startRow = 0;
        let endRow = n-1;
        let startCol = 0;
        let endCol = n-1;
        let counter = 1;

        for(i=0;i<n;i++){//To fill with n number of arrays
                results.push([]);
        }
        while(startRow <= endRow || startCol <= endRow){
//Loop to fill the Top Row
                for(i=startCol;i<=endCol;i++){
                        results[startRow][i] = counter;
                        counter++;
//Loop to fill the RightMost Column
                }
                startRow++;
                for(i=startRow;i<=endRow;i++){
                        results[i][endCol] = counter;
                        counter++;
                }
//Loop to fill the Bottom Row
                --endCol;
                for(i=endCol;i>=startCol;i--){
                        results[endRow][i]=counter;
                        counter++;
                }
//Loop to fill the LeftMost Col
                --endRow;
                for(i=endRow;i>=startRow;i--){
                        results[i][startCol]=counter;
                        counter++;
                }
                startCol++;
        }
console.log(results);
return results;
}
matrix(6);
```

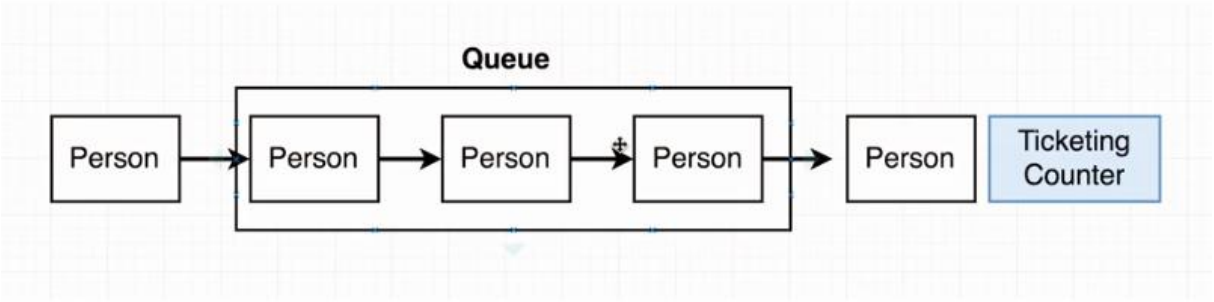
13 RunTime Complexity

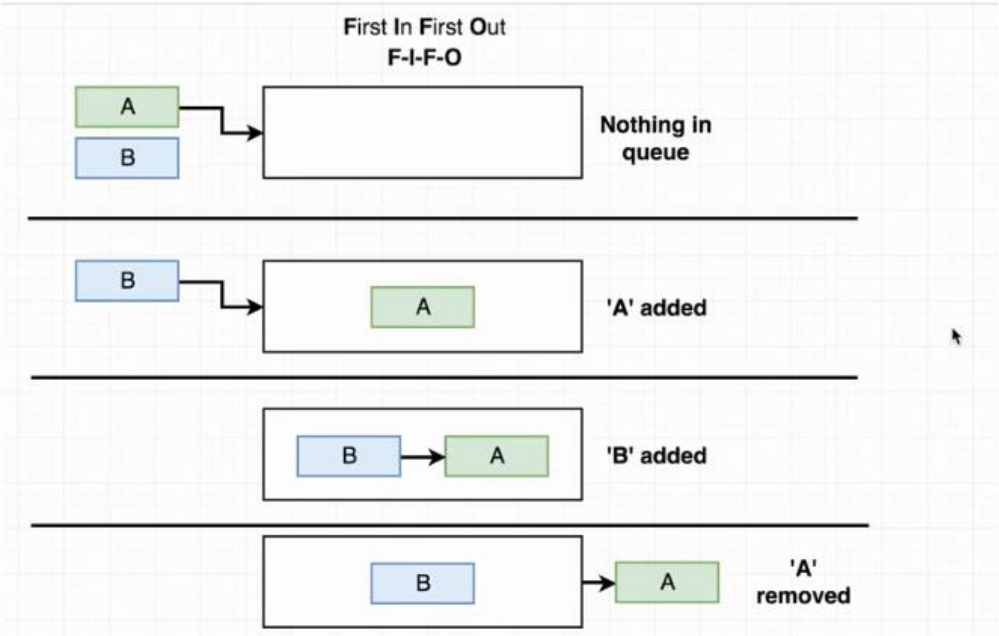


Log Explained



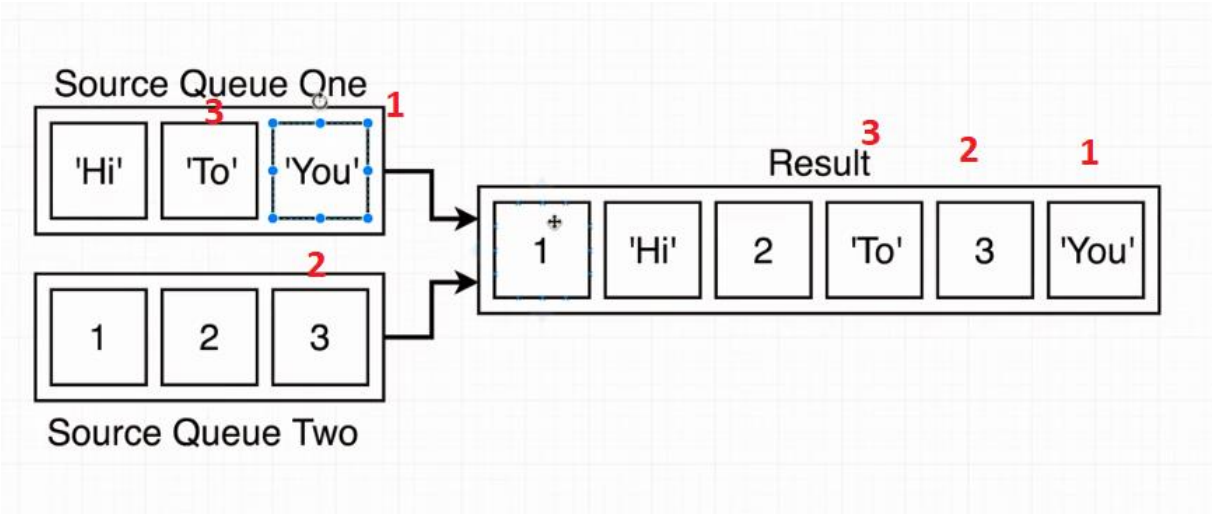
14 Queue






```
class Queue {
  constructor() {
    this.data = [];
  }
  add(record) {
    this.data.unshift(record);
  }
  remove() {
    return this.data.pop();
  }
}


module.exports = Queue;
```

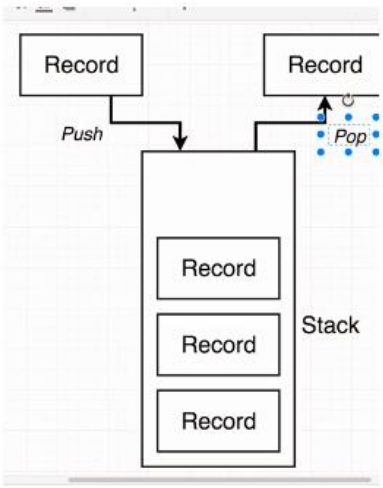
15 Weave (Combine two queue)



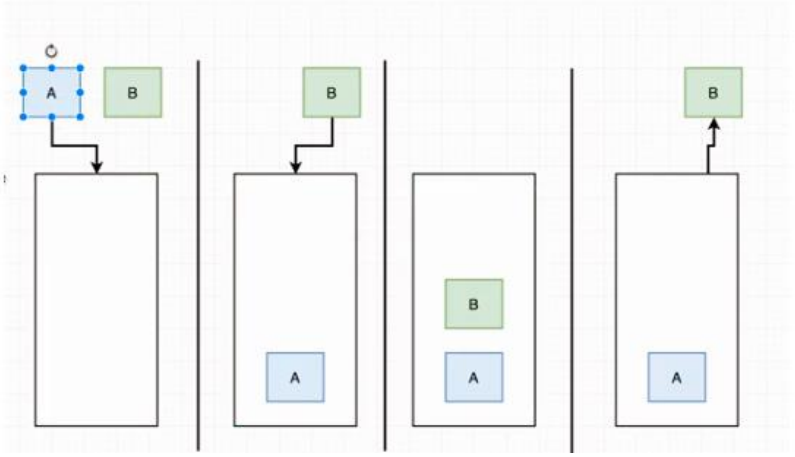

```
const Queue = require('./queue');


   const queueOne = new Queue();
   queueOne.add(1);
   queueOne.add(2);
   const queueTwo = new Queue();
   queueTwo.add('Hi');
   queueTwo.add('There');


function weave(sourceOne, sourceTwo) {
        let q = new Queue();
 for(i=0;i<sourceOne.data.length;i++){
        q.add(sourceOne.data[i]);
        q.add(sourceTwo.data[i]);
 }
return q;
}
```

15 Stacks

```
class Stack {
  constructor() {
    this.data = [];
  }
  push(record) {
    this.data.unshift(record);
  }
  pop() {
    return this.data.shift();
  }
  peek() {
    return this.data[0];
  }
}
```

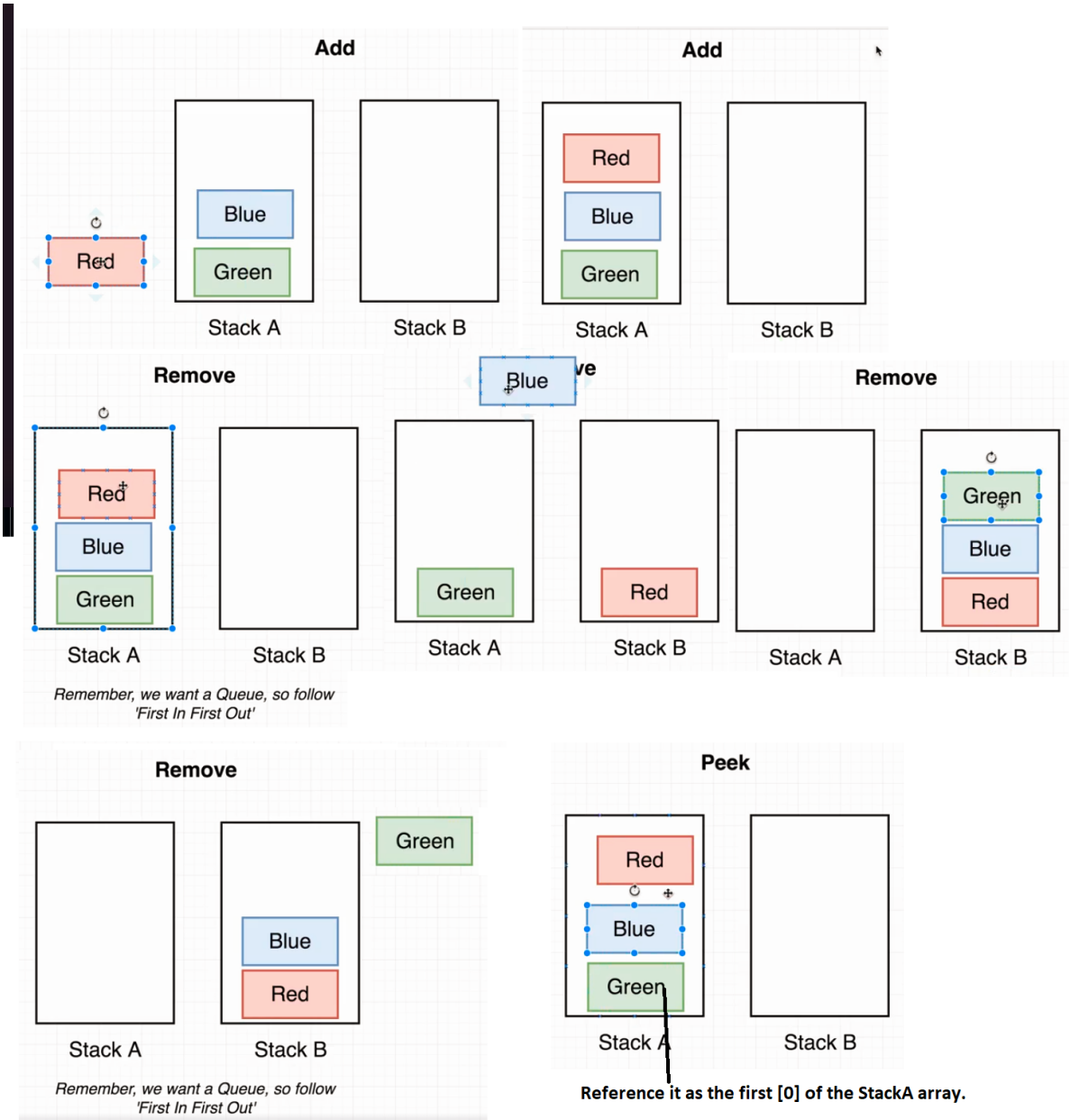


First In Last Out



16 Queue from stacks

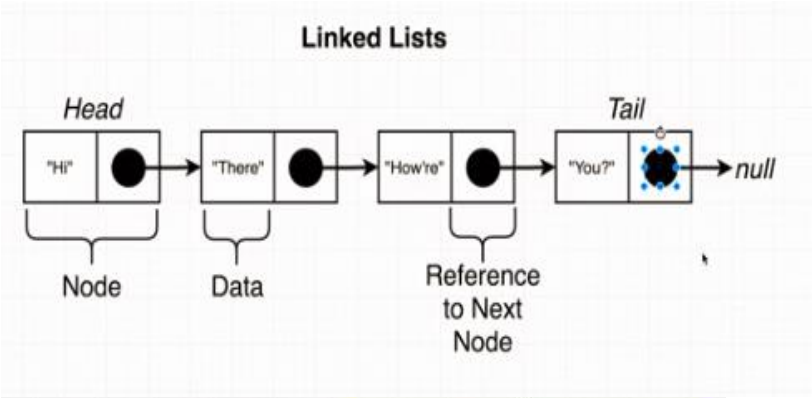
We have two stacks, which will be flipped, so we can check what was the first element.



```
const Stack = require('./stack');
class Queue {
  constructor() {
    this.stackA = new Stack();
    this.stackB = new Stack();
  }



  add(record) {
    this.stackA.push(record) ;
  }

  remove() {
//Move all of the items from stackA to stackB, so the last item from stackA
will be the first item for stackB,
        let len = this.stackA.data.length;
        while(len>0){
                this.stackB.push(this.stackA.data[len-1]);
                this.stackA.pop();
                len = this.stackA.data.length;
        }
//Remove the first item from stackB
        return this.stackB.pop();
//Switch the two stacks, to always have the data in the stackA
        let temp = this.stackA;
        this.stackA = this.stackB;
        this.stackB = temp;
  }
  peek(){
        return this.stackA.peek();
  }
}
```

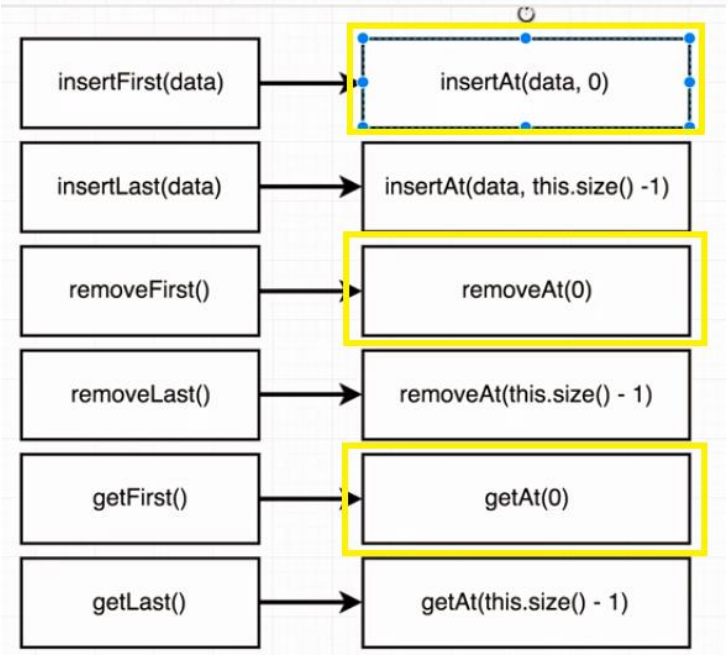
17 Linked List

(with generator for..of loop)



The follo wing functions are crutial in the linkedList : **insertAt**(), **removeAt**(), **getAt()**

The created whole linked list, can be found in the mentione repository



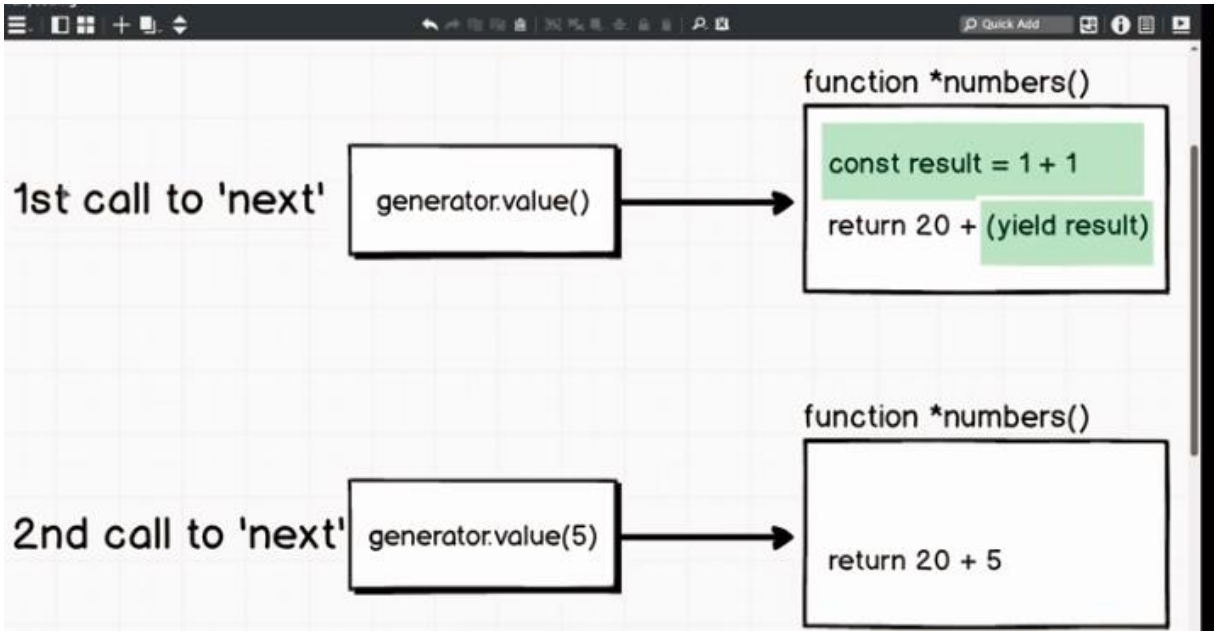

```
//Creating instantly the iterator, when the class is created
*[Symbol.iterator]() {
    let node = this.head;
    while (node) {
      yield node;
      node = node.next;
    }
  }
//Now this object, can be iterated through with the created iteration
protocoll
    const l = new List();
    for (let node of l) {
      node.data += 10;
    }
```

17.1 Generators

1. **Create a generator** with

```
function * fname(){
}
```

1.1 The generator will pause, it will provide back the value of the returned generator object.




```
function * numbers(){
        let result = 1 + 1;
        return 20 + (yield result);
}
const generator = numbers();
//The execution at the *yield* keyword is paused, and the yielded value has
been returned


generator.next();               //value --> 2 -- {'value':2, "done":false}
generator.next();               // value --> 32 -- {'value':32, "done":true}
```

```
//if we pass a value to the .next() we will overwrite the yielded value


generator.next(10);
```

2. Looping over the *yielded values

```
function * list(){
        yield 1;
        yield 2;
        yield 3;
        yield 4;
}
const generator = list();

//The execution at the *yield* keyword is paused, and the yielded value has
been returned
generator.next();               //value --> 1 -- {'value':1, "done":false}
generator.next();               // value -->2 -- {'value':2, "done":true}

//or we can loop over the yield steps
let numbers = [];
for (let value of generator){
        numbers.push(value);
}
console.log(numbers);;
```

3. Nest generator loopings

```
 function * list(){
        yield 1;
        yield 2;
        yield* moreNumbers() ;
        yield 5;
}
//The generator will call the inserted other generator function and will yield
through of its content
function * moreNumbers(){
        yield 3;
        yield 4;
}
```

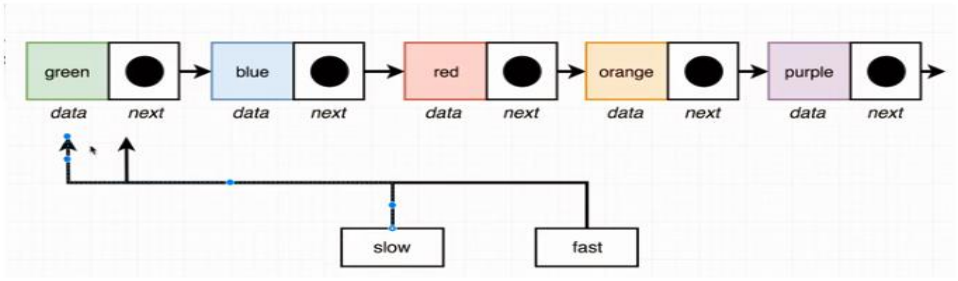
```
const generator = list();

let numbers = [];
for (let value of generator){
        numbers.push(value);
}
console.log(numbers);     // [1,2,3,4,5]
```

4. Nesting generators, inside class + looping

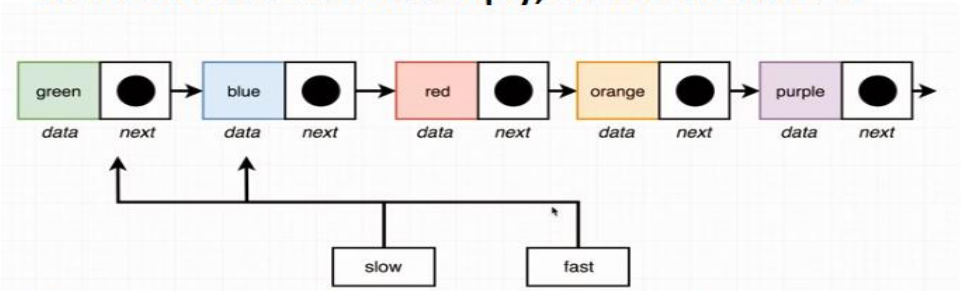
```
//Creating a tree object, wich has a value and children array
class Tree {
        constructor(value = null, children = []){
                this.value = value;
                this.children = children;
        }
        // THis is a property of the Tree class, which is a generator
        //Returning the current object value first
        //Then it will yield(return) and call the child's generator property
        *printValues(){
                yield this.value;
                for(let child of this.children){
                        yield* child.printValues();
                }
        }
}
//Creating a tree
//              1
//        2             3
// 4
let tree = new Tree(1,[
        new Tree(2,[new Tree(4)]),
        new Tree(3),
        ]);
let arrValues = [];


for(let child of tree.printValues()){
        arrValues.push(child);
}


console.log(arrValues);                 // [1,2,4,3]
```

18. Midpoint of LinkedList

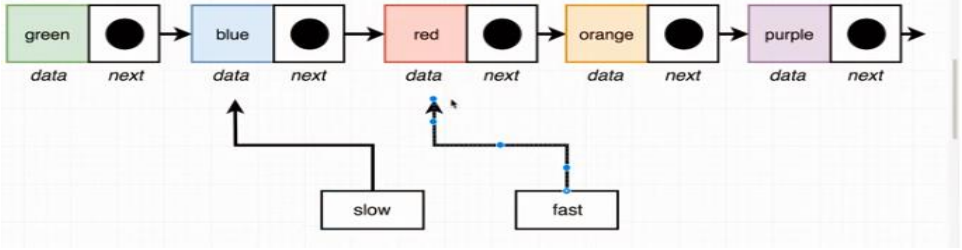
Slow: Moving with 1 node
Fast: Moving with 1 node



if current node + 2 is not empty, then it will slow + 1



if current node + 2 is not empty, then it will fast + 2




```
function midpoint(list) {
//Return null if the list is empty.
        if(!list.head){return};
        let slow = list.head;   //It is for the midpoint
        let fast = list.head;   //For advance looping
        while(fast.next && fast.next.next){     //Loop until there is item
                slow = slow.next;       //Storing the object references
                fast = fast.next.next;
        }
        return slow;                    //returning the midNode
}
return slow;                            //returning the midNode

}
```

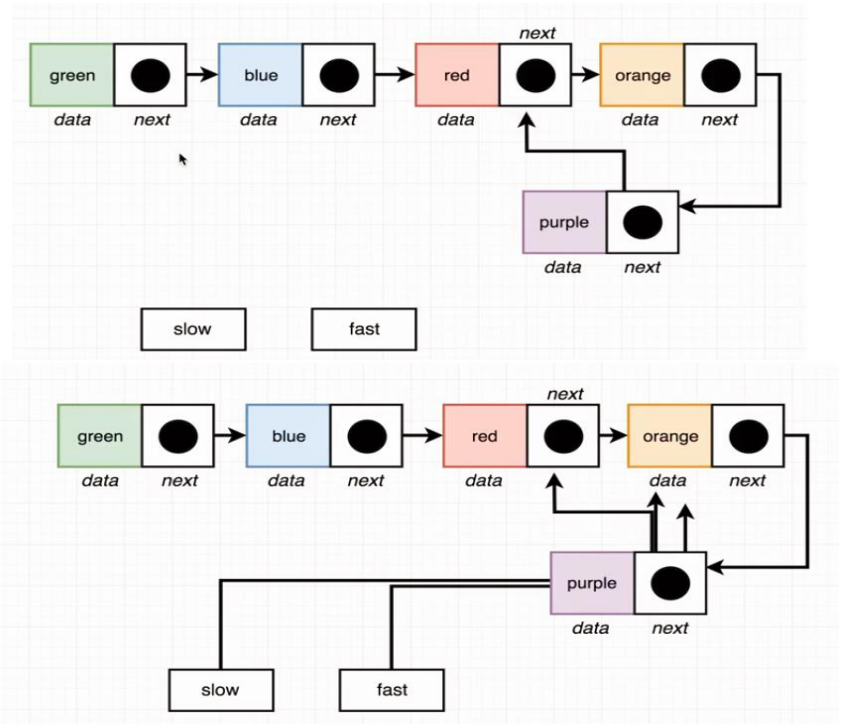
19.Circular Linked List

There could be some cases, when you accidentaly have a circular reference, thus it will kill all of our for loops.

Solution:

- Since, fast node is moving 1 node ahead all the time compared to the slow one.

- If it is circular, then they will meet at one node.



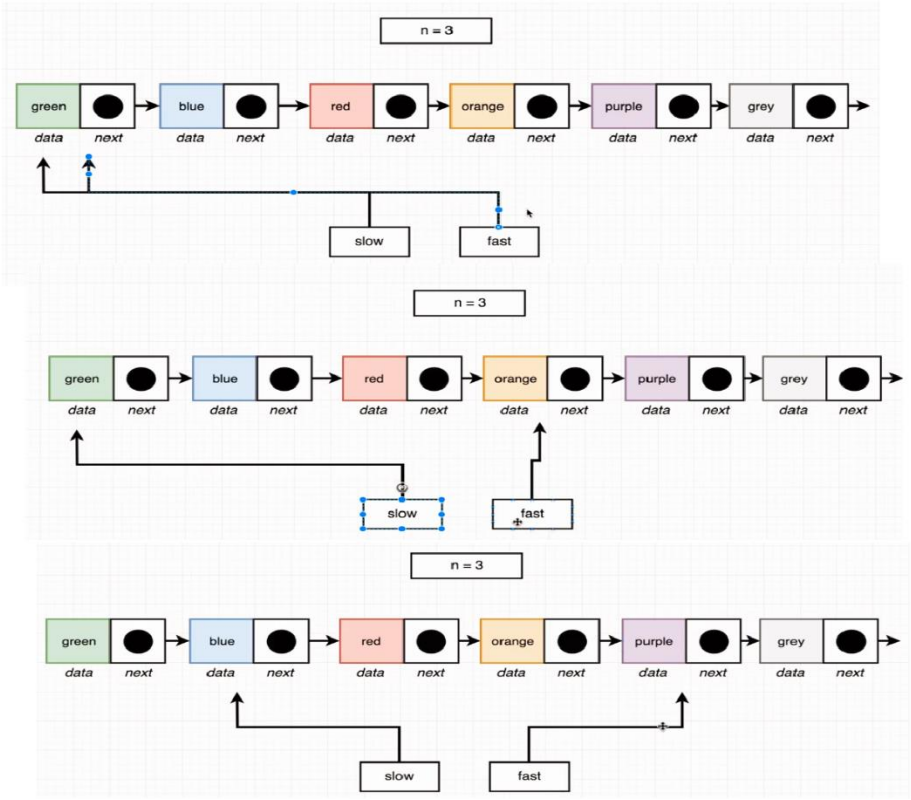

```
function circular(list) {
        if(!list.head){return false};          //Return false if empty
        let slow = list.getFirst();
        let fast = list.getFirst();
        while(fast.next && fast.next.next){
//loop until it finds a last el
                slow = slow.next;
                fast = fast.next.next;
                if(slow === fast){
//or until they equal.
                        return true;
                }
        }
return false;
}
```

20. N element from last node

1. Phase we equal the slow, fast

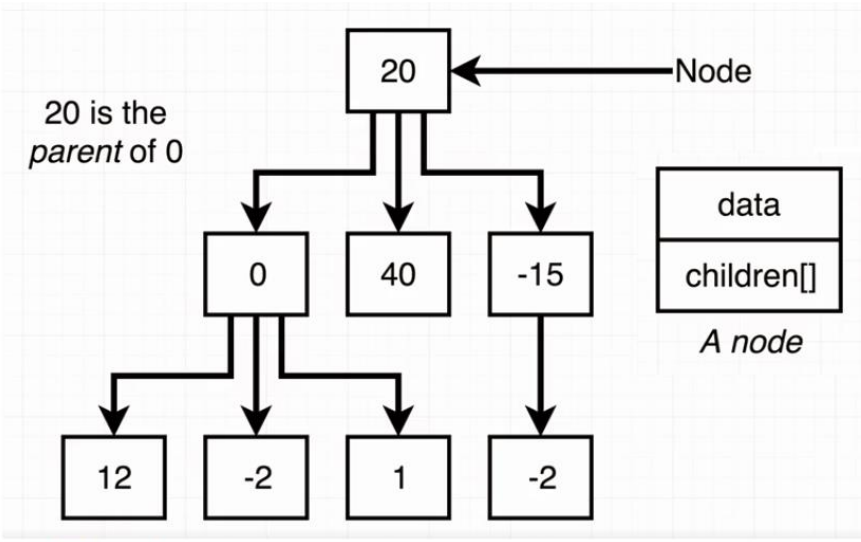
2. Phase we move the fast n distance away

3. We are looping until the last element




```
function fromLast(list, n) {
        if(!list.head){return}
        let slow = list.head;
        let fast = list.head;
        for(let i = 0; i<n;i++){        //moving away n step
                fast = fast.next;
        }

        while(fast.next){       //Since we are moving 1 step
                slow = slow.next;
                fast = fast.next;
        }
        return slow;
}
```

21 Building Tree



Siblings: Share a parent

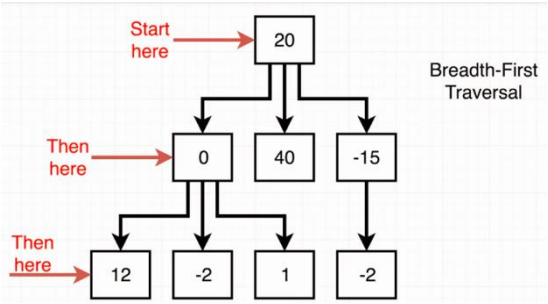
21.1 Tree Nodes

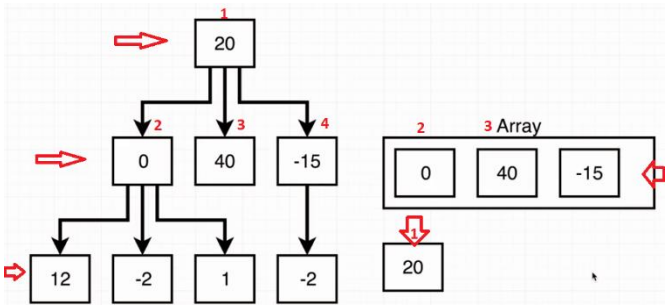
Basically, they are objects, which has data, and instead of next property they have an array of childrens.

```
class Node {
        constructor(data,children=[]){
                this.data = data;
                this.children = children;
        }
        add(value){
                this.children.push(new Node(value));
        }
        remove(data) {
            this.children = this.children.filter(node =>
{                       //Filter will return filtered data as an array
              return node.data !== data;
            });
        }
}
```

21.2 Breadth First Traversal

We are using a queue based execution, we put every node in an array with **FIFO** storing and by removing always the first one, we run the looping until no item is left in the array.

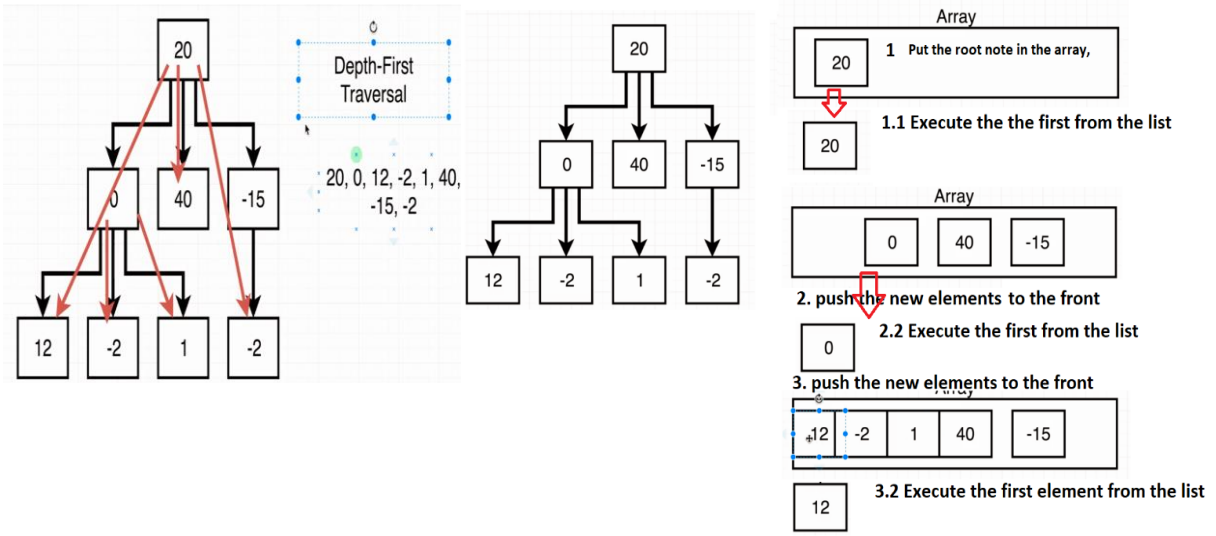





```
traverseBF(fn){
 if(!this.root){return null;}   //If empty tree
 let nodeArr = [this.root];
 while(nodeArr[0]){
     fn(nodeArr[0]);
     for(let i = 0; i<nodeArr[0].children.length;i++){
        nodeArr.push(nodeArr[0].children[i]);  //push to be last
     }
     nodeArr.shift(); //remove first
 }
}
```

```
//instead of for loop, ... separator has been used
traverseBF(fn) {
  const arr = [this.root];
  while (arr.length) {
    const node = arr.shift();
    arr.push(...node.children);
    fn(node);
  }
}
```

21.2 Depth First Traversal




```
traverseDF(fn) {
  const arr = [this.root];
  while (arr.length) {
    const node = arr.shift();
    arr.unshift(...node.children);
    fn(node);
  }
}
```

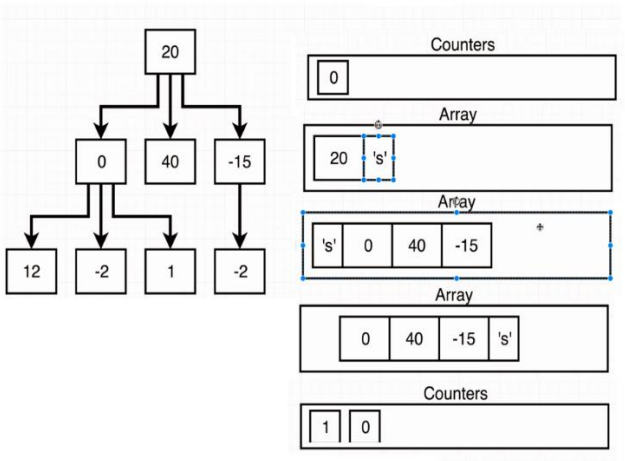
Recursion

```
//We are executing the passed function on the root, or on the passed node
first
//Then base = if it has children, do the looping, else, return
//If a lower call stack is returned, it will continue to the next loop
       traverseDF(fn,node = this.root){
              if(!this.root){return null;}
              fn(node);
              if(!node.children[0]){
                     return;
              }

              for(let i = 0; i<node.children.length;i++){
                     this.traverseDF(fn,node.children[i]);
              }
       }
```

21.3 Levelwidth

So, this is almost the same as breadth First Traversal, but the way we keep track of the levels, is a pointer variable in the array, which is not a node, just a specific indicator.

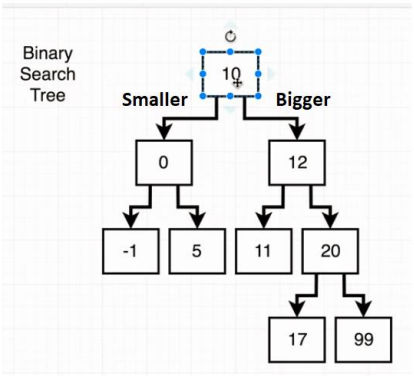
Then if the array is not empty, we put it to the end of the array and continue looping.

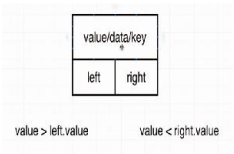



```
//      0
//    / |  \
// 1    2    3
// |         |
// 4         5
// Answer: [1, 3, 2]
```

```
function levelWidth(root) {
  const arr = [root, 's'];
  const counters = [0];
//Run until every item is remove expect 's'
  while (arr.length > 1) {
    const node = arr.shift();
//if indicator reached, check for other element and create a new array with 0
    if (node === 's') {
      counters.push(0);
      arr.push('s');
//if not indicator, spread the elements in the array and increment the counter
    } else {
      arr.push(...node.children);
      counters[counters.length - 1]++;
    }
  }
  return counters;
}
```

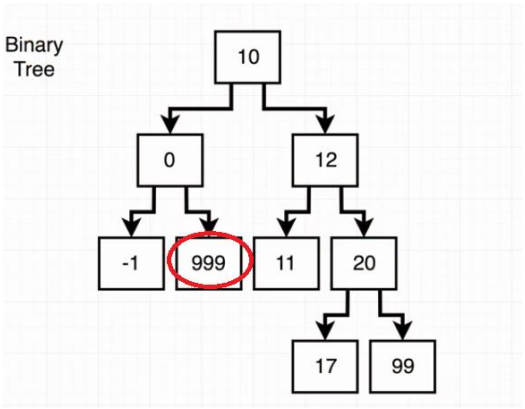
22. Binary Search Tree (bst)





At Binary Search Trees, you can make sure that the left arguments are smaller than the rights, so binary search method can be used.

Binary Tree



While binary trees are same in the format, but you are not sure if the left side if the tree contains lesser values than the right side of the tree.

22.1 Inserting(bst)

```
//Recursion looping, check the right side and return null if the node is there
// or find the last node and insert to one of it's properties
        insert(data){
                if(data === this.data){return};
                if(data> this.data){
                        if(!this.right){
                          this.right = new Node(data);
                        }else{
                                this.right.insert(data);
                        }
                }else{
                        if(!this.left){
                           this.left = new Node(data);
                        }else{
                                this.left.insert(data);
                        }
                }
        }
```

Course solution (Combined elseif)

```
//1.So it is doing the comparison + check the existence of this.left property
//1.if yes, it will call itself
//2.if data is simply bigger and there are no left properties, it will create
one
//3. check the same for the right one
  insert(data) {
    if (data < this.data && this.left) {            //1
      this.left.insert(data);
    } else if (data < this.data) {                  //2
      this.left = new Node(data);
    } else if (data > this.data && this.right) {    //3
      this.right.insert(data);
    } else if (data > this.data) {
      this.right = new Node(data);
    }
  }
```

22.2 Contains (Recursion return)(bst)

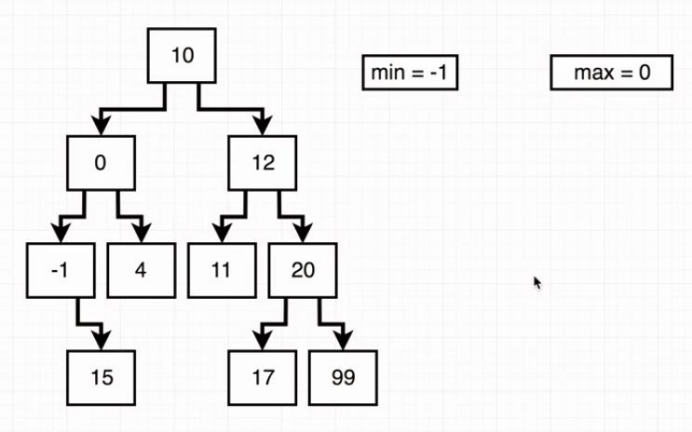
Main difference is that I am storing the returned value in recursion in an variable

```
//Recursion loopin, where the returned answer has to be stored
//to obtain the node
        contains(data){
                let answer = null;
                if(data === this.data) {
                                return this;
                }else if(data > this.data && this.right){
                                answer = this.right.contains(data);
                }else if(data> this.data){
                                return null;
                }else if(data< this.data && this.left){
                                answer = this.left.contains(data);
                }else if(data< this.data){
                                return null;
                }
                return answer;
        }
```

While here, instead of storing it, it is just returned.

```
  contains(data) {
    if (this.data === data) {
      return this;
    }


    if (this.data < data && this.right) {
      return this.right.contains(data);
    } else if (this.data > data && this.left) {
      return this.left.contains(data);
    }


    return null;
  }
```

22.3 Validating Binary tree(validate)



The key here, is to keep track of the possible minimum or maximum value during the recursion.

```
function validate(node, min = null, max = null) {
        if(!node){return false};
//Will start looping on the left
//Check if the below node data is smaller, than the current node
// and checks if it is bigger then min, or min is null --> recursion with
update min,max
//else false
        if(node.left){
                max = node.data;
                if(node.left.data<max && min == null || node.left.data>min ){
                        return validate(node.left,min,max);
                }else{
                        return false;
                }
        }
//Doing the same thing on the right
        if(node.right){
                min = node.data;
                if(node.right.data>min && node.right.data<max || max == null){
                        return validate(node.right,min,max);
                }else{
                        return false;
                }
        }
//Return true nor the left or right side is false or they are empty
        return true;
}
```

Notes:

- Try to avoid nested, if statements. Instead of nesting, try to focus on the negative criteria, if the statement can survive all of the statements then it will return true.
- It is like a funnel, keep the possibilities less and less as we process the code.

```
//1.Test the first cases, if it is bigger or smaller then the criterias
//2.If there is a node function + it is returning false   !false = true
function validate(node, min = null, max = null) {
/**1**/
  if (max !== null && node.data > max) {
    return false;
  }
  if (min !== null && node.data < min) {
    return false;
  }
// !validate(node.left, min, node.data)-> will return true or false
// !false = true
// So if there is a node left, and the recursed function results in false
// there is a mistake in the binary tree
/**2**/
  if (node.left && !validate(node.left, min, node.data)) {
    return false;
  }

  if (node.right && !validate(node.right, node.data, max)) {
    return false;
  }
//if no error has been found, than it will return true
  return true;
}
```

23. Events

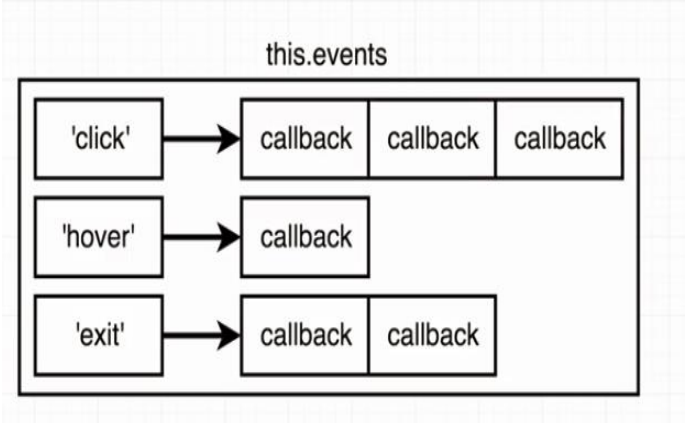
On: Register a custom event, in the events object

(Note that multiple call back functions can be registered under the same name)

Trigger:

Will directly call the registered event name

Off: Will clear the registered event name from the Events Object




```
class Events {
        constructor(){
                this.events = {};
        }
  // Register an event handler
  on(eventName, callback) {
        if(!this.events[eventName]){
                this.events[eventName] = [callback];
        }else{
                this.events[eventName].push(callback);
        }
  }
  // Trigger all callbacks associated
  // with a given eventName
  trigger(eventName) {
        let event = this.events[eventName];
        if (event == null){return};
        for(let i=0;i<event.length;i++){
                event[i]();
        }
  }
  // Remove all event handlers associated
  // with the given eventName
  off(eventName) {
  //Delete is 100 times slover, the assigning null.
        // delete this.events[eventName];
        this.events[eventName] = null;
  }
}
```

24. Sorting

http://dissertation.dayanpetrow.eu/

Name	Worst Case Runtime	Difficulty
BubbleSort	n^2	easiest
SelectionSort	n^2	easier
MergeSort	n*log(n)	medium

24.1 BubbleSort

Comparing each value to each other into a nested loop

```
function bubbleSort(arr) {
        let temp = null;
        for(let i = 0; i<arr.length;i++){
                for(let y = 0; y<=arr.length-i;y++){
                        if(arr[y]>arr[y+1]){
                                temp = arr[y+1];
                                arr[y+1] = arr[y];
                                arr[y] = temp;
                        }
                }
        }
        return arr;
}
```

24.2 Selection Sort

Selecting the first element in the array, setting it as a minimum.

During the loop we are trying to find a smaller one and in the end we switch to the lowest one to the first position.

```
function selectionSort(arr) {
  for (let i = 0; i < arr.length; i++) {
    let indexOfMin = i;


    for (let j = i+1; j <arr.length; j++) {
      if (arr[j] < arr[indexOfMin]) {
        indexOfMin = j;
      }
    }


    if (indexOfMin !== i) {
      let lesser = arr[indexOfMin];
      arr[indexOfMin] = arr[i];
      arr[i] = lesser;
    }
  }


  return arr;
}
```

24.3 MergeSort

https://www.youtube.com/watch?v=JSceec-wEyw

From the video, you can visually see recursive sorting algorithm.

```
//Slicing up the recieved aarray in half and return if there
//is only 1 element in the arr
function mergeSort(arr) {
  if (arr.length === 1) {
    return arr;
  }


  const center = Math.floor(arr.length / 2);
  const left = arr.slice(0, center);
  const right = arr.slice(center);


  return merge(mergeSort(left), mergeSort(right));
}


//From two array, create a sorted one
function merge(left, right) {
  const results = [];


  while (left.length && right.length) {
    if (left[0] < right[0]) {
      results.push(left.shift());
    } else {
      results.push(right.shift());
    }
  }


  return [...results, ...left, ...right];
}
```