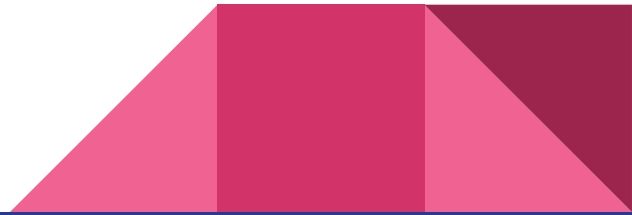
Things you should know!

- Make sure you have joined the #general-questions, #homework, and #exams channels on Slack!
- Get out your resumes! You will be handing them in at the end of class as part of your first assignment.

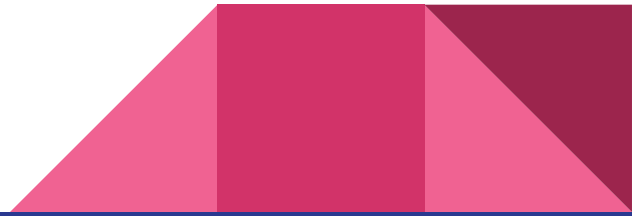


Second Day!

CMSC389O: The Coding Interview

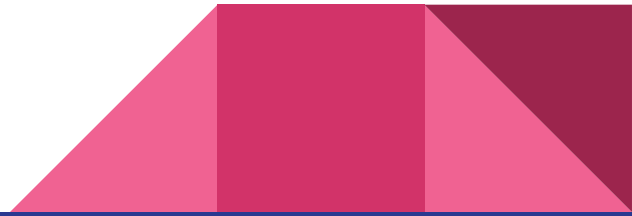
Today

- Big O
- Bit Manipulation
- Behavioral Partner Interviews



Big O

- What is Big O?
- Warmup Examples
- Think about optimal Big O time and space
- Evaluate your algorithms for actual time and space complexity



Order of Big O Complexities

O(1)

O(log n) - problems involving a heap

O(n)

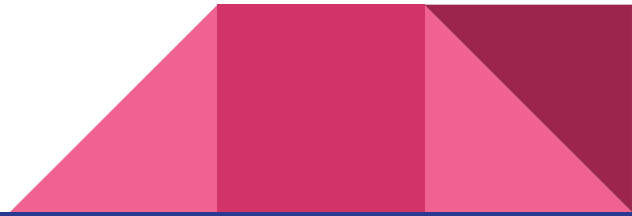
O(n log n)

$O(n^2)$

$O(n^3)$

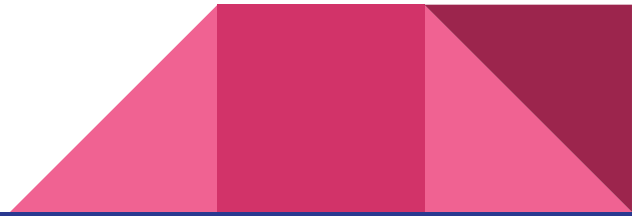
$O(n^k)$

$O(k^n)$ - dynamic programming brute force



What does Big O matter?

- Figuring out a problem’s optimal Big O time and space can give you a goal to work towards
- Interviewers will ask you to state the Big O of your solution

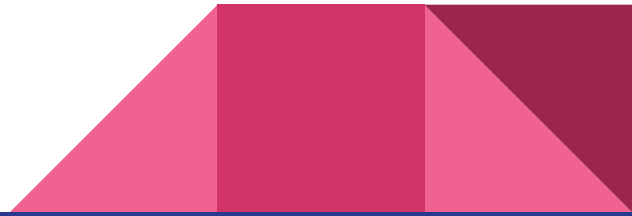


Tips

- Look for loops
- Pay attention to variables!
  - O(ab) vs O(n^2)
  - $O(n^k)$ vs $O(k^n)$
- When figuring out optimal complexity, pretend you are a moderately accomplished magician

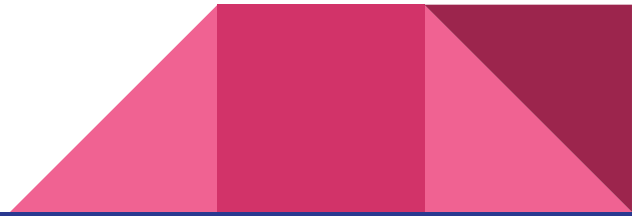
Example 1

```
void foo (int[] array) {
    int sum = 0;
    int product = 1;

    for(int i = 0; i < array.length; i++) {
        sum += array[i];
    }

    for(int i = 0; i < array.length; i++) {
        product *= array[i];
    }

    System.out.println(sum + ", " + product);
}
```



Example 2

```
void foo (int[] array) {
    for(int i = 0; i < array.length; i++) {
        for(int j = 0; j < array.length; j++) {
            System.out.println(array[i] + ", " + array[j]);
        }
    }
}
```



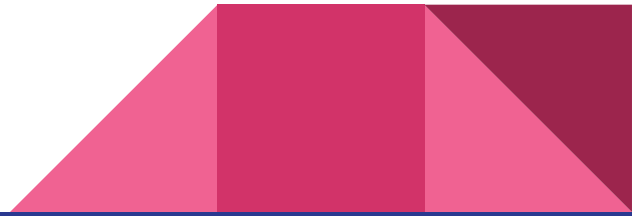
Example 3

```
// assume we have a BALANCED binary search tree

int sum (Node node) {

    if (node == null) return 0;

    return sum(node.left) + node.value + sum(node.right);

}
```

Think about Optimal Time and Space

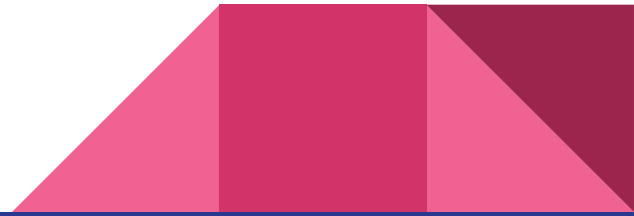
Given an array of integers, return indices of the two numbers such that they add up to a specific target.

You may assume that each input would have exactly one solution, and you may not use the same element twice.



Think about Optimal Time and Space

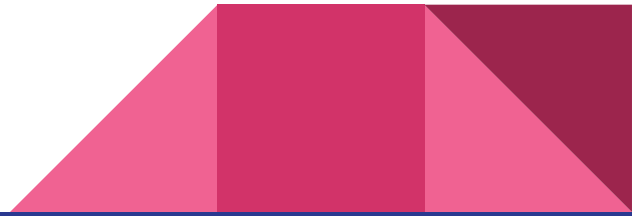
Given a linked list, remove the nth node from the end of list and return its head.



Think about Optimal Time and Space

Given n non-negative integers a1, a2, ..., an, where each represents a point at coordinate (i, ai). n vertical lines are drawn such that the two endpoints of line i is at (i, ai) and (i, 0). Find two lines, which together with x-axis forms a container, such that the container contains the most water.

Note: You may not slant the container and n is at least 2.



Bit Manipulation

Review:

How do you convert a number from base 10 to a number in base 2?

How do you convert a number from base 2 to a number in base 10?

Bitwise Operators

X	Y	X&Y	X|Y	X^Y	~(X)
0	0	0	0	0	1
0	1	0	1	1	1
1	0	0	1	1	0
1	1	1	1	0	0

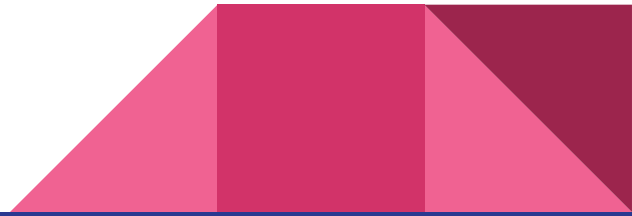
XOR

Practice:

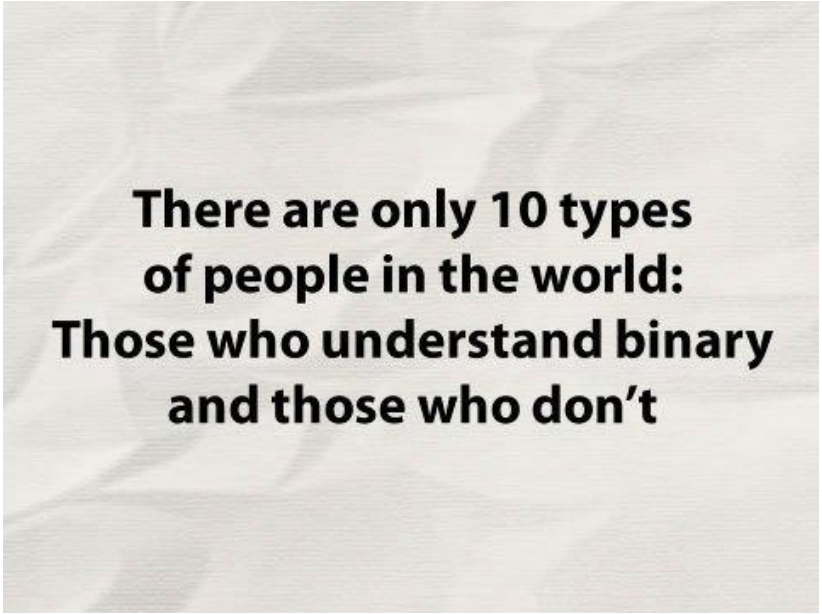
1. 17 & 8
2. 25 | 13
3. 37 <<
4. 37 >>

Practice:

1. 17 & 8
   17 & 8 → 10001 & 1000 → 00000 → 0
2. 25 | 13
   25 | 13 → 11001 | 1101 → 11101 → 29
3. 37 <<
   37 << → 100101 → 010100 → 20
4. 37 >>
   37 << → 100101 → 001001 → 9

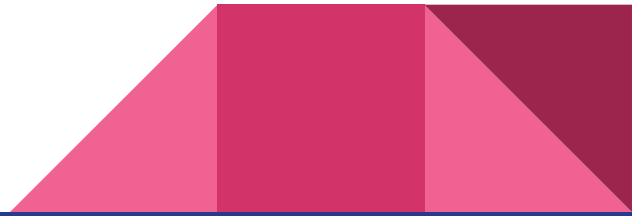


Why does it matter?



Behavioral Interview Practice

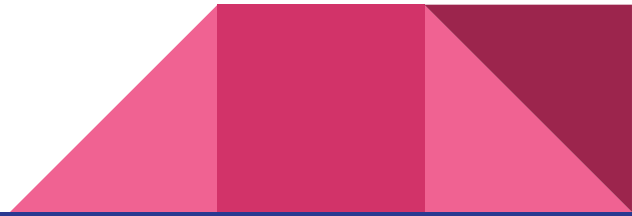
- Have a solid 3-minute pitch
- Have one project / internship / etc that you can talk in-depth about



How to do homework!

https://www.hackerrank.com/challenges/solve-me-first/problem

https://screencast-o-matic.com/



Homework Due for Next Week

https://www.hackerrank.com/challenges/ctci-lonely-integer/problem

https://www.hackerrank.com/challenges/js10-bitwise/problem