

The background of the slide is a grayscale image of a circuit board. It features a complex network of black lines representing traces and several solid black circles representing vias or components. The circuitry is arranged in a somewhat symmetrical, horizontal pattern. A solid black horizontal band runs across the middle of the image, partially obscuring the circuit board design. Below this band, the text 'CMSC 131' is displayed in a large, white, sans-serif font. Underneath the course number, the text 'Fall 2018' is written in a smaller, green, monospace-style font.

CMSC 131

Fall 2018

Announcements

- Project #7 has been posted
- Monday lecture will be review
- No Lab on Monday
- Final Exam Thursday 12/13 from 4:00 to 6:00.

Example: IsPresent

Let's code this up recursively:

```
boolean isPresent(String s, char c) {...}
```

What is the running time (be careful!)

We need to avoid making all of these copies!

New approach:

```
// checks if character is present, starting at a  
// specific position in the String  
private boolean isPresentHelper(String s, char c, int position)
```

Now what is the running time?

Example: Sum

Let's code this up recursively:

```
int sum(int[] a) {...}
```

We're going to need a helper again...

Example: Binary Search

Let's solve this recursively:

```
// returns the index of the value, if found  
int binarySearch(Comparable[] a, Comparable value) {...}
```

Review algorithm

We should use a helper!

Example: [BinarySearch.java](#)