Quick Reminders

1. Vote tomorrow - Wisconsin Supreme Court primary
2. Program 1 due this Friday at 10pm
3. Start thinking about Wisconsin Idea projects - check website for more info

We've been learning loops lately - `for`, `while` and `do`

Together, let's translate a `while` loop to a `for` loop:

```
int letter = 0;
String str = ``espresso'';
while (letter < str.length()) {
    System.out.println(str.charAt(letter));
    letter++;
}
```

Writing nested loops

Now, on your own, write a quick code fragment to print out a square of ‘`x`’ characters with sides of length `int side`.

Hint: to print something out without a newline, use `System.out.print()`.

Introducing arrays

Sometimes we need to look at a bunch of variables of the same type. Could do:

```
int x1 = 0;
int x2 = 1; // etc
```

but it's easier and a lot simpler to put these in an *array*.

Array vocabulary

- A set of related variables of the same type is called an *array*.
- Each variable in this array is called an *element*, which occupies a *slot*
- To access each element, we use its *index*

Making arrays

Arrays are themselves variable types, and so have to be declared and initialized just like every other variable:

```
char[] grades = new char[24];
grades[0] = 'A';
```

I have to give it an explicit length (though this can be an `int` variable). I can't change the length once I initialize the array - it's a fixed-size location in memory.

Getting information from arrays

To figure out how long a `String` is, I use `str.length()`. Similarly, but *not identically*, I use `arr.length` to figure out how many slots are in my array.

Why the difference? $\rightarrow$ Methods vs. *properties*

To get a `char` at a certain index from a `String`, I use `str.charAt(index)`. For arrays, I use `arr[index]`.

Note: `index` just has to be an `int` - it can come from a literal, a variable, a constant, some calculation, a method call...

ArrayIndexOutOfBounds

What happens if I try to get `str.charAt(str.length())`?

Exception in thread "main"
java.lang.StringIndexOutOfBoundsException: String index out of range: <str.length()>

And if I try `arr[arr.length]`?

Exception in thread "main"
java.lang.ArrayIndexOutOfBoundsException: <arr.length>

These can be really quick indicators that you've got an off-by-one error.