PFTD and PFTW

- Discuss and review: classes and arrays
  - In Java we have ArrayList as well as array

- What is a class: conceptually, syntactically
  - Blueprint or factory for creating objects
  - Encapsulation mechanism: combines state and behavior
  - Mechanism for organizing code for inheritance/interfaces
    - More on this later, for completeness now

- How do we write code for a group of things
  - In an array, an ArrayList, or a set

Class

- Object-oriented way to combine state and behavior
  - State is: instance variables, behavior is methods
  - Examples: Point, String, Rectangle, ArrayList

- Objects are instances of a class. Class is blueprint
  - Create objects by calling new – invokes constructor
  - A constructor is like a method, but initializes object
  - You can put code in the constructor

- Objects communicate via methods (parameters)
  - Object can pass itself: this is a keyword for that

More elaborate example

- If HangmanGame could be played many times
  - What would state be, what would be kept by the class
  - Is HangmanGame the right name? Something else?
  - HangmanGame could be one game, etc.

- State is typically private, only accessed within class
  - Client code calls methods to use values stored in class
  - Who stores the secret word in HangmanGame?
  - We'll use private and public fields/state and methods
    - Private methods are typically helper methods

Arrays and ArrayLists

- String[], int[], double[], how to read?
  - Type to the left of [], so what is String[][]?

- An array is an object, so created by calling new
  - String[] s = new String[100];
  - How to access # elements? .length, but not a method!
  - Cannot grow, but minimal memory overhead and stores anything (contrast ArrayList)
  - No useful methods per se, see Arrays.java in java.util
    - How to read an API, what is Arrays.sort(..) Java 6
Using an array

- Using an array in Hangman for secret word
  - ["_ _ _ _"] OR ["_ _ _ _"] or "_ _ _ _"
  - Pros and cons of each approach?

```java
for (int k = 0; k < guess.length(); k += 1) {
    char ch = guess.charAt(k);
    if (ch == secret.charAt(k)) {
        myDisplay[k] = 'e';
    }
}
```

- What type is guess, secret, myDisplay? Clues?

An array has a fixed size, alternatives?

- Store already-guessed hangman letters in array
  - We have to make the array so big, how big? Can’t grow
  - How do we know how many things in the array?
  - How do we search for element in the array?

- Why is a set a better choice?
  - Add elements to set with .add, check with .contains
  - Set, like ArrayList, cannot store int, char, boolean, double
  - Cannot store primitives
  - Can store Integer, Characters, Boolean, Double, String
  - Which is confusing? Why?

ArrayList in java.util with Set

- Collection of objects, cannot store primitives
  - Primitives are autoboxed and unboxed, so can .add
  - Access with .get, change with .set(,)
  - Query with .contains, ..

```java
ArrayList<Integer> il = new ArrayList<Integer>();
il.add(7);
il.add(8);
int sz = il.size();
int value = il.get(0);
il.set(1, 10);
value = il.get(3);  // exception thrown!
```

Sergey Brin

- Simple ideas sometimes can change the world [wikipedia]
  - Works because of scale
  - Co-created pagerank (Larry Page), which evaluates links to a page and the importance of those links, based on the importance of the page from which the links come which ...

http://upload.wikimedia.org/wikipedia/commons/0/00/Sergey_Brin_2008.jpg

http://www.bloomberg.com/video/66114966/