Arrays and Files
Review

Array

- int[] diameters = new int[10];
- diameters[0], diameters[2], diameters[9]
- diameters.length

- Indexing starts at 0
- A way to have a collection of variables instead of individual ones
**Built-in Array Functions**

append( array, item )
- returns a new array expanded by one and add item to end

expand( array, newSize )
- returns a new array with size increased to newSize

shorten( array )
- returns a new array shortened by one

concat( array1, array2 )
- returns a new array that is the concatenation of array1 and array2

subset( array, offset [, length] )
- returns a subset of array starting at offset and proceeding for length (or end)

splice( array, value|array2, index ) or
- returns a new array with value or array2 inserted at index

sort( array )
- returns a new array sorted numerically or alphabetically

reverse( array )
- returns a new array with all elements reversed in order
String[] loadStrings(String url)

- loadStrings() is a built-in function to Processing
- It takes a String as a parameter, interprets it as a URL, and loads the text contents of the URL as an array of strings.
- `String[] somePoems = loadStrings("http://www.scottaaronson.com/" + "spamhaiku.txt");`
String[] split(String splitMe, char delim);

- int row=0;
  char delim = ',';
  String[] cells = split(someData[row], delim);

- String sampleRow = "10/10/2015, sunny, 75 degrees, windy";
  String delim2 = "/,;"; // slash or comma delimits
  String[] cells2 = splitTokens(sampleRow, delim2);
  String[] cells3 = split(sampleRow, delim);

- What is cells2.length? What is cells3.length?
Data Type Conversion

- Variables of some types can be converted to other types.
- Type conversion function names are the types to which data will be converted

```java
// binary(...), boolean(...), byte(...),
// char(...), float(...), str(...)

float f = float("1.23");
float f2 = float(cells[0]);

int i = int("200");
int i2 = int(cells[1]);
```
Two-dimensional Arrays

• Visualized as a grid
• `int[][] grays = {{0, 20, 40},
                   {60, 80, 100},
                   {120, 140, 160},
                   {180, 200, 220}};`
• `int[][] grays = new int[4][3];`
Processing 2D Arrays

- Need two indices, one for the rows and one for the columns.
- `int[][]` `grays = {{0, 20, 40},
               {60, 80, 100},
               {120, 140, 160},
               {180, 200, 220}};`
- `grays[2][1] = 255;`
- `grays[2][3] = 0;`
Lengths of 2D Arrays

- `int[][] grays = new int[80][100];`
- `println(grays.length);`
- `println(grays[0].length);`
Example data

Given this example data:

Draw the following arrays:
A 2-D Array of the values.
An array for each row.
An array for each column.
An array for row names
An array for column names (Choose names that make sense to you.)

Consider int i that represents the row index and int j that equals the column index.

In numerical order do the following
Write a line with the value, index i, and index j. (You should have 9 lines each with 3 numbers.)
Below is a list of numbers; create 3 equal range bins from the min and max values of the numbers. Count how many numbers are in each bin and right the value in a 1 x 3 table.

45, 84, 38, 39, 66, 84, 64, 75, 16, 97, 33, 48, 21, 67, 8

Next, the same thing with this sorted list of random numbers

0, 1, 15, 24, 28, 44, 45, 48, 52, 70, 79, 83, 86, 91, 94
Exercises

- Make a function that takes an array and returns:
  - min value
  - index to min value
  - max value
  - index to max value
  - mean value
  - std. dev.
  - the number that repeats the most
Time Series Data

- Typically sequential data
- Typically has many points
- Can be about one variable
  - Stock price
  - Heart rate
  - Temperature
  - Hair length
- Sequences can be summarized by basic statistics
  - Interval based low, high, mean, std. dev., median
  - Counting particular events (Histogram)
Ideas for Visualization

A PERIODIC TABLE OF VISUALIZATION METHODS

Concept Visualization
Methods to elaborate (mass) qualitative concepts, ideas, plans, and analyses.

Information Visualization
The use of interactive visual representations of data to simplify cognition. This means that the data is transformed into an image, it is mapped to screen space. The image can be changed by users as they proceed working with it.

Data Visualization
Visual representations of quantitative data in schematic form (either with or without axes).

Strategy Visualization
The systematic use of complementary visual representations in the analysis, development, formulation, communication, and evaluation of ideas or plans.

Process Visualization
Visual representations of data flow with the aim of illustrating an idea or plan.
225 "random" numbers chosen and tweeted by 225 people

// ParseFile
String[] data;
int count;
final int CLEARANCE = 40; // 40 pixels of clearance

void setup() {
    size(displayWidth, displayHeight);
    // initialize count
    count = 0;
    // set filename
    String filename = "MyCoolTextFile.txt";
    // Load data from a file as array of strings
    data = loadStrings(filename);
}

void draw() {
    // Continue printing data until run out
    if (count < data.length) {
        String row = data[count];
        text(row, random(width - textWidth(row)),
             random(CLEARANCE, height - CLEARANCE));
    }
    count++;
}
MyCoolTextFile.txt

Copy and paste this into a file called MyCoolTextFile.txt and put it in your Data directory of your ParseFile sketch from the previous page.

permalink,company,numEmps,category,city,state,fundedDate,raisedAmt,raisedCurrency,round
lifelock,LifeLock,,web,Tempe,AZ,1-May-07,6850000,USD,b
lifelock,LifeLock,,web,Tempe,AZ,1-Oct-06,6000000,USD,a
lifelock,LifeLock,,web,Tempe,AZ,1-Jan-08,25000000,USD,c
mycityfaces,MyCityFaces,7,web,Scottsdale,AZ,1-Jan-08,50000,USD,seed
flypaper,Flypaper,,web,Phoenix,AZ,1-Feb-08,3000000,USD,a
infusionsoft,Infusionsoft,105,software,Gilbert,AZ,1-Oct-07,9000000,USD,a
gauto,gAuto,4,web,Scottsdale,AZ,1-Jan-08,250000,USD,seed
chosenlist-com,ChosenList.com,5,web,Scottsdale,AZ,1-Oct-06,140000,USD,seed
chosenlist-com,ChosenList.com,5,web,Scottsdale,AZ,25-Jan-08,233750,USD,angel
digg,Digg,60,web,San Francisco,CA,1-Dec-06,8500000,USD,b
digg,Digg,60,web,San Francisco,CA,1-Oct-05,2800000,USD,a
facebook,Facebook,450,web,Palo Alto,CA,1-Sep-04,5000000,USD,angel
facebook,Facebook,450,web,Palo Alto,CA,1-May-05,12700000,USD,a
facebook,Facebook,450,web,Palo Alto,CA,1-Apr-06,27500000,USD,b