

Arrays and Files

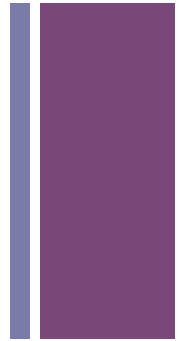


Review

■ 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

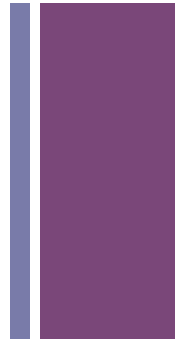
- returns a new array with value or array2 inserted at index

`sort(array)`

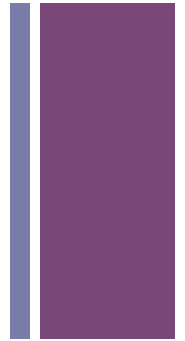
- returns a new array sorted numerically or alphabetically

`reverse(array)`

- returns a new array with all elements reversed in order



+ String[] 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`?

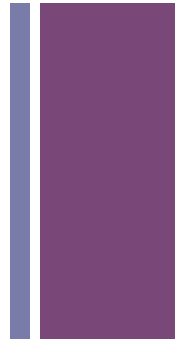
+ Data Type Conversion

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

```
// 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.)

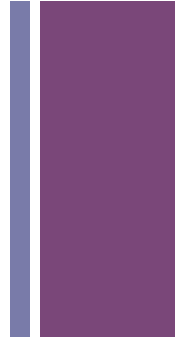
	1	2	3
	4	5	6
	7	8	9

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)

+ Histogram



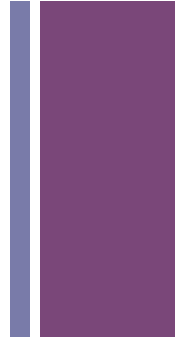
- Below is a list of numbers; create 3 equal range bins from the min and max values of the numbers. Count how many numbers are in each bin and right the value in a 1 x 3 table.
- ,45,84,38,39,66,84,64,75,16,97,33,48,21,67,8
- Next, the same thing with this sorted list of random numbers
- 0,1,15,24,28,44,45,48,52,70,79,83,86,91,94

+ 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

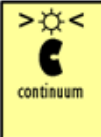







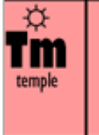



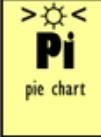


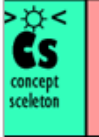
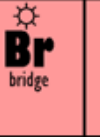
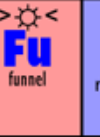

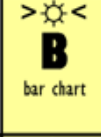



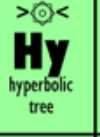
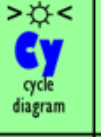











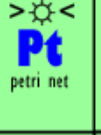
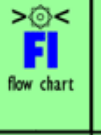





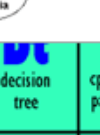
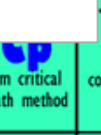




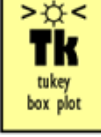


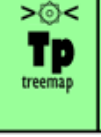
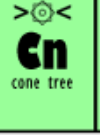
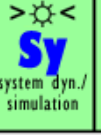
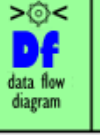

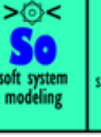
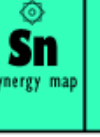
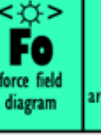
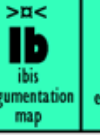






+ Time Series Data



- 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

 C continuum		 Data Visualization <i>Visual representations of quantitative data in schematic form (either with or without axes)</i>							 Strategy Visualization <i>The systematic use of complementary visual representations in the analysis, development, formulation, communication</i>							 G graphic facilitation																			
 Tb table		 Ca cartesian coordinates		 Information Visualization <i>The use of interactive visual representations of data to amplify 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</i>														 Tm temple		 St story template		 Tr tree		 Ct cartoon											
 Pi pie chart		 L line chart		 Concept Visualization <i>Methods to elaborate (mostly) qualitative concepts, ideas, plans, and analyses.</i>							 Cs concept skeleton		 Br bridge		 Fu funnel		 Ri rich picture																		
 B bar chart		 Ac area chart		 R radar chart cobweb		 Pa parallel coordinates		 Hy hyperbolic tree		 Cy cycle diagram		 T timeline		 V venn diagram		 Pm perspectives diagram		 D dilemma diagram		 Pr parameter ruler		 Kn knowledge map													
 Hi histogram		 Sc scatterplot		 Sa sankey diagram		 In information lense		 E entity relationship diagram		 Pt petri net		 Fl flow chart		 Cl clustering		 LC layer chart		 Fy minto pyramid technique		 CE cause-effect chains		 Tl toulmin map		 Dt decision tree		 Cp cpm critical path method		 Cf concept fan		 Co concept map		 Ic iceberg		 Lm learning map	
 Tk tukey box plot		 Sp spectrogram		 Da data map		 Tp treemap		 Cn cone tree		 Sy system dyn./ simulation		 Df data flow diagram		 Se semantic network		 So soft system modeling		 Sn synergy map		 Fo force field diagram		 Ib ibis argumentation map		 Pr process event chains		 Pe pert chart		 Ev evocative knowledge map		 V Vee diagram		 Hh heaven 'n' hell chart		 I informal	

Jer Thorp. Artist/Educator - NYU

225 "random" numbers chosen and tweeted by 225 people

19	42	42	87	81	99	33	98	61	47	24	66
69	23	67	67	57	71	5	79	57	46	93	54
43	32	18	42	77	37	37	6	93	55	55	77
15	88	42	55	77	42	93	3	17	26	64	65
23	21	9	7	23	17	14	42	45	27	97	83
89	4	4	26	6	39	97	72	35	6	66	
19	2	72	81	37	47	66	17	12	52	74	
54	61	43	19	57	17	77	47	26	72	64	
69	99	64	88	67	1	36	2	60	27	73	
4	43	97	67	42	37	27	1	75	15	17	
13	59	32	78	40	15	64	77	11	1	17	
37	13	7	26	57	25	12	69	8	84	23	
66	42	14	33	17	97	25	57	1	81	97	
8	18	78	12	95	37	84	86	41	56	73	
78	60	21	39	28	17	83	69	12	74	37	
67	19	19	88	96	69	29	74	53	33	72	
32	81	72	72	73	39	52	97	77	77	41	
76	17	69	83	67	64	25	35	42	4	76	
13	36	2	37	52	47	43	25	66	7	6	
87	94	16	28	20	79	23	21	55	66	87	

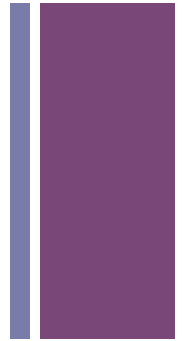
<http://blog.blprnt.com/blog/blprnt/your-random-numbers-getting-started-with-processing-and-data-visualization>



```
// 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-04,500000,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
```