Today’s topics

- Subroutines
- Iteration
- Arrays

- Upcoming
  - More Java programming
Repeating code

- Repeating code is bad
- Writing repetitive code is tedious
- Debugging repetitive code is hard
- Avoid repeating code through:
  - Subroutines/methods
  - Loops
Loops

- If statements need to repeat, then you probably need a loop
- Describe portion of program as:
  - Repeat
  - Continue until
  - For each value from 1 to n
  - For every object of a set, do something

- We have already used iteration by using the buttons
  - How?
Problems

- **We want to:**
  - Print out all numbers from 0 up to 100 incrementing by 0.5 each time
  - Sum up the numbers from 1 to 100
  - ...

- **New Java syntax**
  - New object type `TextArea` which is basically a big scrolling textbox
  - `tArea` is 80 character wide and 20 rows high text box with 20 rows
    ```java
    TextArea tArea = new TextArea(20,80);
    ```
  - Add characters to the end of the `TextArea` using `append`
    ```java
    tArea.append("Hello\n");
    ```
  - `\n` is called a newline character which moves the next character to the next line
Anatomy of a while loop

- While loops are one way to get rid of repetitive code
- Print out numbers up to 100 by increments of 0.5

```
x = 0.0;
while (x < 100)
{
    x = x + 0.5;
    tArea.append("x = " + x);
    tArea.append("\n");
}
```
Another loop

- **Summing the numbers 1 ... 100**
  ```
  int sum = 0;
  int k = 0;
  while (k < 100)
  {
    k = k + 1;
    sum = sum + 1;
  }
  ```

- **Other Loop designs**
  - Count down
  - Stopping and starting at computed values
  - Data dependent loop
Arrays

- Aggregate data type
- Deal with items of same type
  - Lists
  - numbers
  - words ...
- Analogies
  - Mailboxes in post office
  - CD racks with slots
- Simplifies naming
- Allows use of loops
- Required for many mathematical and statistical problems
- Multiple elements or cells
Using arrays

- *subscript or index to access element*
  
  ```java
  x[5] = 20;
  foo.setText("Result is "+x[5]);
  ```

- *Often used in loops*
  
  ```java
  int k = 0; sum = 0;
  while ( k < 10 )
  {
    k = k + 1;
    sum = sum + name[k];
  }
  ```
Creating Arrays

- **Declaration**
  
  ```java
  double weights[];
  ```

- **Definition**
  
  ```java
  weights = new double[50];
  ```

- **Combine**
  
  ```java
  double weights[] = new double[50];
  ```

```java
int num[] = new int[6];


```
Arrays & Loops

```c
int k = 2;
while(k<6)
{
    num[k] = k*k;
    k = k+1;
}
```

<table>
<thead>
<tr>
<th></th>
<th>21</th>
<th>4</th>
<th>9</th>
<th>16</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>k</td>
<td>?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>