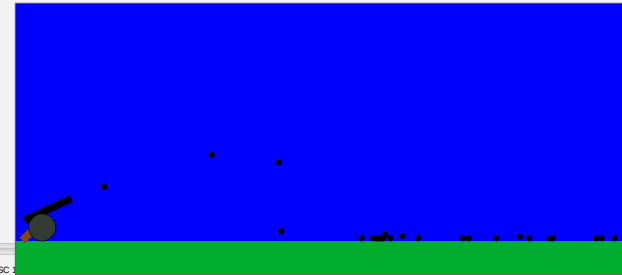


More of the Same (Arrays)

Arrays

When do you need arrays?

- you have multiple things which are drawn and animated in the same way, and
- no predictable relationship between animated values
 - each thing needs its own set of animation variables



Animation, Loops, and Arrays

- use animation when something changes over time (from one frame to the next)
- for repetition within a frame –
 - use loops when –
 - what changes from one repetition to the next is predictable (the update is the same for each repetition), or
 - when the same thing happens in each repetition (the same computation is done)
 - use arrays when animation variables need to be repeated (each thing needs its own copy)

The Idea of Array Variables

a single bouncing ball

```
float y;
float yspeed;
```

y yspeed



two bouncing balls – each need their own y and yspeed

```
float y1, y2;
float yspeed1, yspeed2;
```

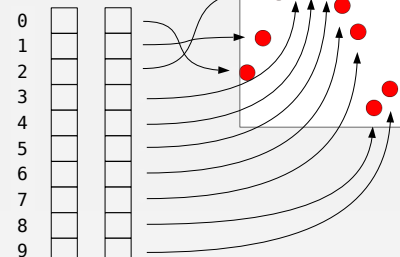
y1 yspeed1 y2 yspeed2



a row of bouncing balls – each need their own y and yspeed

```
float[] y;
float[] yspeed;
```

y yspeed



Working With Array Variables

- declare – specify name, base type, and that this is an array variable

```
float[] y;
```
 - initialize – two steps
 - initialize the array variable
 - create the array – specify the number of compartments

```
y = new float[10];
```
 - initialize each compartment
 - do whatever you'd do for one thing, wrapped in a loop to go through each compartment

```
for ( int i = 0 ; i < y.length ; i = i+1 ) {
  y[i] = ...;
}
```
- common patterns
- initialize all compartments to the same value `y[i] = 0;`
 - initialize all compartments to random values `y[i] = random(low,high);`
 - initialize all compartments to different values but with a predictable pattern
 → additional loop variable(s)

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Working With Array Variables

- use – do whatever you'd do for one thing, wrapped in a loop to go through each compartment

```
for ( int i = 0 ; i < y.length ; i = i+1 ) {
  fill(255,0,0);
  ellipse(width/2,y[i],20,20);
}
```
- update – do whatever you'd do to update one thing, wrapped in a loop to go through each compartment

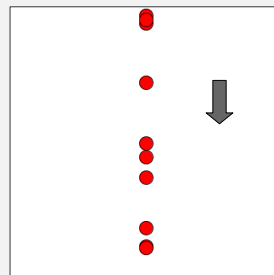
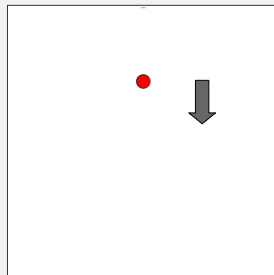
```
for ( int i = 0 ; i < y.length ; i = i+1 ) {
  y[i] = y[i]+1;
}
```

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Array-ifying a Sketch

- start with a single element
 - circle with random y coordinate, moving down
- convert single animation variables to array variables and add loops



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Array-ifying a Sketch

each ellipse may have a different, unrelated y coordinate so this animation variable becomes an array variable

<code>float y;</code>		<code>float[] y;</code>	
<code>void setup () {</code> <code> size(400,400);</code>		<code>void setup () {</code> <code> size(400,400);</code>	
		<code> y = random(0,height);</code>	
			<code> y = new float[10];</code>
			<code> for (int i = 0 ; i < y.length ;</code> <code> i = i+1) {</code> <code> y[i] = random(0,height);</code> <code> }</code>
		<code>void draw () {</code> <code> background(255);</code>	<code>void draw () {</code> <code> background(255);</code>
		<code> fill(255,0,0);</code> <code> ellipse(width/2,y,20,20);</code>	<code> for (int i = 0 ; i < y.length ;</code> <code> i = i+1) {</code> <code> fill(255,0,0);</code> <code> ellipse(width/2,y[i],20,20);</code> <code> }</code>
		<code> y = y+1;</code>	<code> for (int i = 0 ; i < y.length ;</code> <code> i = i+1) {</code> <code> y[i] = y[i]+1;</code> <code> }</code>
		<code>}</code>	<code>}</code>

drawing and animating that were done for the one thing are now repeated for each of the things, using the information from the corresponding compartment of the array

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