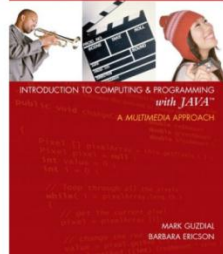


CSE8A Lecture 5

- TODO:
 - PSA2 Interview due by Sunday 1/27 noon
 - FINISH PSA3 WITH YOUR PARTNER by Tu 1/29 11:59pm!
 - PSA3 Interview due by Friday 2/1 noon
- Read next class: Section 5.1-5.2.
- PLAY WITH CODE!
 - Get stuck, then figure out how to get unstuck – it's how you learn!



Your discussion groups

- Did you know...you were assigned not just a seat, but a group!
- Examine this layout to see who is in your group.
 - You **MUST** be discussing with the people shown in your group (same color) on this chart!
 - **NOT** just “anybody nearby to you”!
 - This prevents anybody from being left out (example: stuck between two groups neither of which really claims them) or other problems.









Pepper Canyon 106 Peer Instruction Layout

1	2	3	4	L	5	6	7	8	9	10	11	12	13	L	14	15	16	17	18
1	2	3	4	K	5	6	7	8	9	10	11	12	13	K	14	15	16	17	18
1	2	3	4	J	5	6	7	8	9	10	11	12	13	J	14	15	16	17	18
1	2	3	4	H	5	6	7	8	9	10	11	12	13	H	14	15	16	17	18
1	2	3	4	G	5	6	7	8	9	10	11	12	13	G	14	15	16	17	18
1	2	3	4	F	5	6	7	8	9	10	11	12	13	F	14	15	16	17	18
1	2	3	4	E	5	6	7	8	9	10	11	12	13	E	14	15	16	17	18
1	2	3	4	D	5	6	7	8	9	10	11	12	13	D	15	16	17	18	19
1	2	3	4	C	5	6	7	8	9	10	11	12	13	C	15	16	17	18	19
1	2	3	4	B	5	6	7	8	9	10	11	12		B	14	15	16	17	18
1	2			A	3	4	5				6	7		A			9	10	11

Your discussion groups

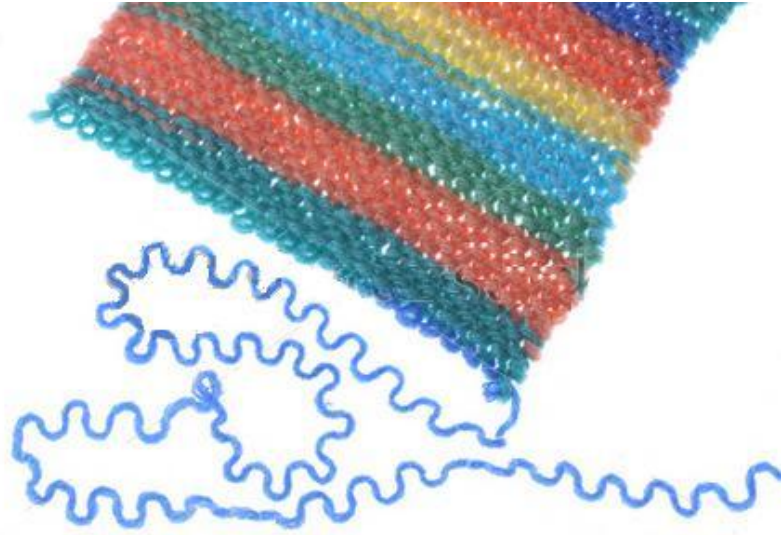
- Please take a moment to:
 - Shake hands with everyone in your group
 - Tell each other your names
 - What was your favorite TV or movie character when you were 8 years old?

Center 119 Peer Instruction Layout:

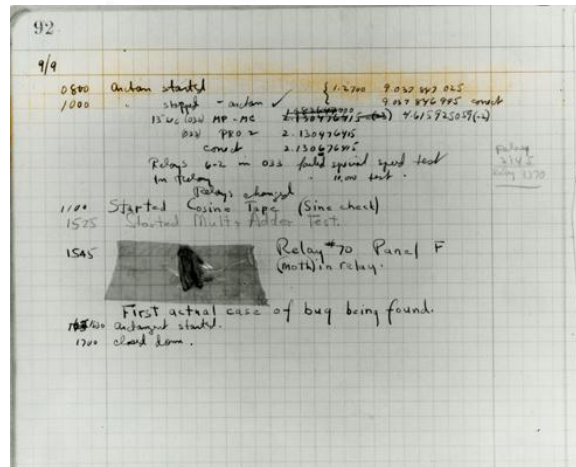
					L												L						
1	2	3	4	5	K								12	13					K				
1	2	3	4	5	J	6	7	8	9	10	11	12	13			15	16	J	17	18	19	20	
1	2	3	4	5	H	6	7	8	9	10	11	12	13	14	15	16	H	17	18	19	20		
1	2	3	4	5	G	6	7	8	9	10	11	12	13	14	15	16	G	17	18	19	20		
	1	2	3	4	F	5	6	7	8	9	10	11	12	13	14	15	F	16	17	18	19		
	1	2	3	4	E	5	6	7	8	9	10	11	12	13	14	15	E	16	17	18	19		
	1	2	3	4	D	5	6	7	8	9	10	11	12	13	14	15	D	16	17	18	19		
	1	2	3	4	C	5	6	7	8	9	10	11	12	13	14	15	C	16	17	18	19		
	1	2	3	4	B			6	7	8	9	10	11	12	13	14	15	B	16	17	18	19	
		1	2	3	A			4	5	6	7	8	9	10	11		A	12	13	14	15		

CSE8A Today

- Arrays: from 2D to 1D, unraveling your arrays



- Debugging tips and tricks



What pixels does this code modify?

```
Pixel[] pixelArray = this.getPixels();  
int value = 0;  
int index = 0;  
while (index < pixelArray.length/4)  
{  
    value = pixelArray[index].getRed();  
    value = (int) (value * 0.5);  
    pixelArray[index].setRed(value);  
    index = index + 1;  
}
```

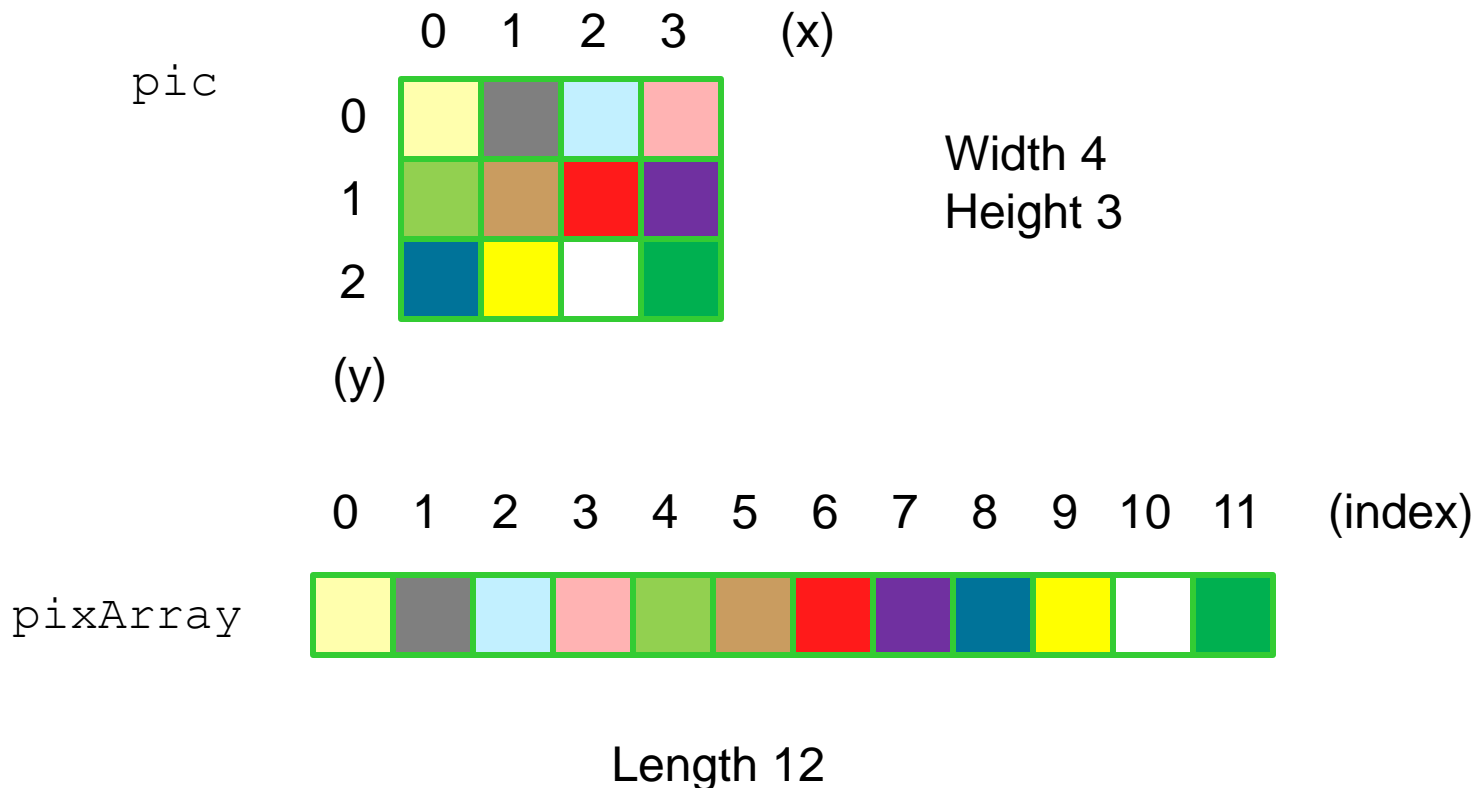
Pixel arrays and pixels in Pictures

- A Picture is a 2-dimensional array of pixels
 - Each pixel in the Picture has (x,y) coordinates, with $x==0, y==0$ at the upper-left-hand corner of the picture
- A Pixel[] pixel array is a 1-dimensional array of pixels
 - Each Pixel in the array has an integer index I, with $I==0$ indexing the first Pixel in the array
- How do the two relate to each other...?

Pixel arrays and pixels in Pictures

- How do the two relate to each other...?

```
Picture pic = new Picture("mypic.jpg");  
Pixel[] pixArray = pic.getPixels();
```



Pixel arrays and pixels in Pictures

- How do the two relate to each other...?

```
Picture pic = new Picture("mypic.jpg");  
Pixel[] pixArray = pic.getPixels();
```

- The top row of pixels comes first in `pixArray`, then the second row of pixels, etc.
- `pixArray[i]` corresponds to what `(x,y)` in `pic`?

$$i = y * \text{pic.getWidth()} + x$$

- Try it!

CS Concept: Bugs!

This code is supposed to increase red by 1.5, but...

```
Pixel[] pixelArray = this.getPixels();  
int value = 0;  
int index = 0;  
  
while (index < pixelArray.length)  
{  
  
    value = pixelArray[index].getRed();  
    value = (int)1.5 * value;  
  
    pixelArray[index].setRed(value);  
    index = index + 1;  
  
}
```

Think Step 1 (1 min)
Discuss Step 1
(2 mins)

Debugging Loops: Tracing variables

Step 1: Have a mental model of what the variables are supposed to do

Step 2: Add print statements to make sure variables are doing what you think are.

```
Pixel[] pixelArray = this.getPixels();  
int value = 0;  
int index = 0;  
  
while (index < pixelArray.length)  
{  
  
    value = pixelArray[index].getRed();  
    value = (int)1.5 * value;  
  
    pixelArray[index].setRed(value);  
    index = index + 1;  
  
}
```

Solo (2 mins)
Discuss (3 mins)
Group vote (30 sec)

Debugging Loops: Tracing variables

Where should you insert the following print statements in the code below?

```
System.out.println( "Old value of red is " + value );  
System.out.println( "New value of red is " + value );
```

```
Pixel[] pixelArray = this.getPixels();  
int value = 0;  
int index = 0;
```

1

```
while (index < pixelArray.length)  
{
```

2

```
    value = pixelArray[index].getRed();
```

3

```
    value = (int)1.5 * value;
```

```
    pixelArray[index].setRed(value);  
    index = index + 1;
```

4

- A. 1 & 2
- B. 1 & 3
- C. 2 & 3
- D. 3 & 4
- E. 2 & 4

```
}
```

Solo (2 mins)
Discuss (2 mins)
Group vote (30 sec)

DEBUGGING: This code should
swap the **red** and **blue** components
at each Pixel; what does it ACTUALLY do?

```
Pixel[] pixelArray = this.getPixels();  
int value = 0;  
int index = 0;  
while (index < pixelArray.length)  
{  
    Pixel pix = pixelArray[index];  
    value = pix.getRed();  
    value = pix.getBlue();  
    pix.setRed(value);  
    pixelArray[index].setBlue(value);  
    index++;  
}
```

- A. It sets the **red** value to be the same as **blue**
- B. It has a compiler error
- C. It sets the **blue** value to be the same as red
- D. It really does swap them

How could we fix it?

Solo (2 mins)
Discuss (2 mins)
Group vote (30 sec)

Swapping: A better way

```
Pixel[] pixelArray = this.getPixels();  
int value = 0;  
int index = 0;  
while (index < pixelArray.length)  
{  
    Pixel pix = pixelArray[index];  
    <<CODE GOES HERE>>  
    index++;  
}
```

```
value = pix.getRed();  
pix.setBlue(pix.getRed());  
pix.setRed(value);
```

```
value = pix.getRed();  
pix.setBlue(value);  
pix.setRed(pix.getBlue());
```

```
value = pix.getRed();  
pix.setRed(pix.getBlue());  
pix.setBlue(value);
```

```
value = pix.getRed();  
pix.setRed(value);  
pix.setBlue(pix.getRed());
```

What picture most accurately describes what this code does ?

```
Pixel[] pixelArray = this.getPixels();
int value = 0;
Pixel p = null;
for(int index = 0; index < pixelArray.length-1; index++)
{
    p = pixelArray[index];
    q = pixelArray[index+1];
    p.setRed(q.getRed());
    p.setBlue(q.getRed());
    p.setGreen(q.getGreen());
}
```

What picture most accurately describes what this code does ?

```
Pixel[] pixelArray = this.getPixels();  
int value = 0;  
Pixel p = null;  
for(int index = 0; index < pixelArray.length-1; index++)  
{  
    p = pixelArray[index+1];  
    q = pixelArray[index];  
    p.setRed(q.getRed());  
    p.setBlue(q.getRed());  
    p.setGreen(q.getGreen());  
}
```

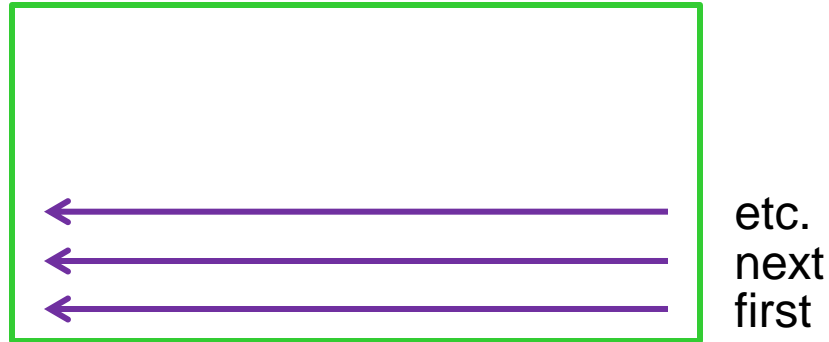
Why does this code have an error?

```
Pixel[] pixelArray = this.getPixels();  
int value = 0;  
Pixel p = null;  
for(int index = 0; index < pixelArray.length; index++)  
{  
    p = pixelArray[index];  
    q = pixelArray[index+1];  
    p.setRed(q.getRed());  
    p.setBlue(q.getRed());  
    p.setGreen(q.getGreen());  
}
```

- A. It tries to access pixelArray[-1]
- B. It tries to access pixelArray[0]
- C. It tries to access pixelArray[pixelArray.length]
- D. It tries to access pixelArray[pixelArray.length+1]
- E. None of the above

Fill in the for(.....) to loop over pixels bottom right to top left

- Like this:



```
Pixel[] pixArr = this.getPixels();
```

```
for (                                     )  
{  
    //Some code doing set on pixArr[i]  
}
```

TODO

- FINISH PSA3, do interview
- Go to discussion section for help getting started
- Read next class: Section 5.2
- **PLAY WITH CODE!**
 - Get stuck, then figure out how to get unstuck – it's how you learn!

