# Simple Java YEAH Hours

Juliette Woodrow and Brahm Capoor

# What are YEAH hours?

– – –

Held soon after each assignment is released

Help you to get an early start on your assignments

Future dates TBA

Slides will be posted!

# Roadmap

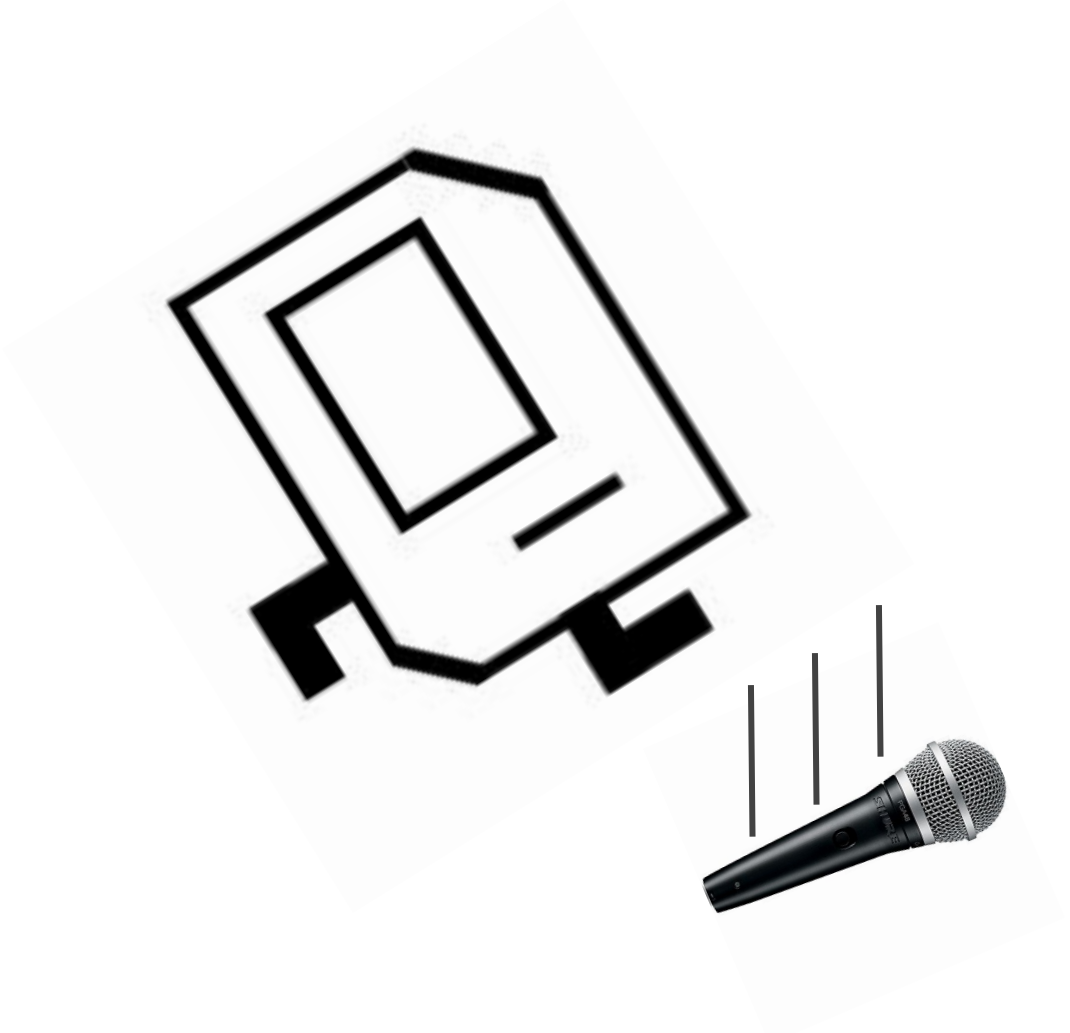
Review

Assignment overview and tips

Questions

# Dropping the mic on Karel

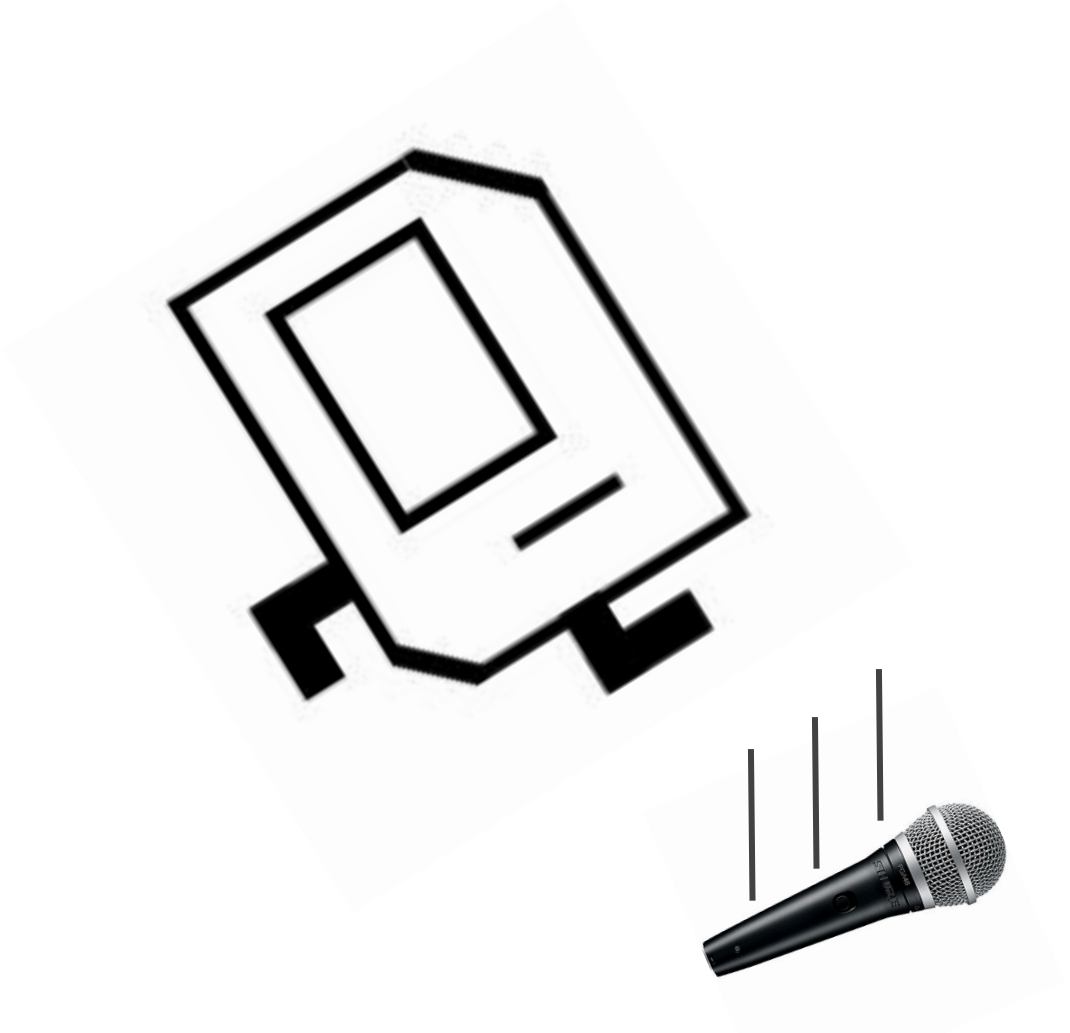
Karel taught us a lot of things!



# Dropping the mic on Karel

Karel taught us a lot of things!

Control Flow



# Dropping the mic on Karel

Karel taught us a lot of things!

Control Flow

Decomposition & Top Down Design

# Dropping the mic on Karel

Karel taught us a lot of things!

- Control Flow
- Decomposition & Top Down Design
- Algorithmic Strategy

# Control Flow in Karel

```
for (int i = 0; i < 5; i++) {      // do whatever is in the loop 5 times
     if (beepersPresent()) {       // what to do if a particular condition is true
          move();
     } else {                      // what to do if that condition is false
          putBeeper();
     }
}

while (frontIsClear()) {          // do this until a particular condition is false
     move();
     putBeeper();
}
```

# Control Flow outside Karel

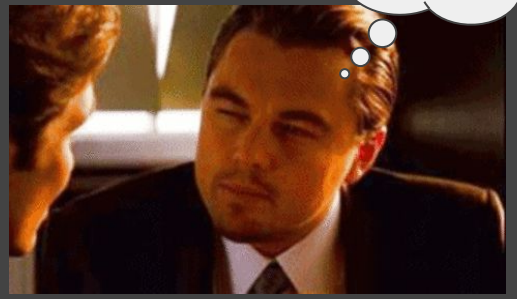
```
for (int i = 0; i < 100; i++) {    // do whatever is in the loop 100 times
     if (i % 2 == 0) {             // what to do if a particular condition is true
          println("Even: " + i);
     } else {                      // what to do if that condition is false
          println("Odd: " + i);
     }
}

while (true) {                     // loop indefinitely
     if (agentOfChaos()) {
          break;                   // ~~savagely~~ immediately end while loop
     }
     print("Good prevails!");
}
```

# Control Flow-ception

```
for (int i = 0; i < 10; i++) {
     for (int j = 0; j < 10; j++) {
          if (i == j) {
               println(“i and j are equal!”);
          } else {
               int difference = i - j;
               if (difference > 0) {
                    println(“i is bigger than j by ” + difference + “!”);
               } else {
                    println(“j is bigger than i by ” + difference + “!”);
               }
          }
     }
}
```

# Control Flow-ception




```
for (int i = 0; i < 10; i++) {
     for (int j = 0; j < 10; j++) {
          if (i == j) {
               println(“i and j are equal!”);
          } else {
               int difference = i - j;
               if (difference > 0) {
                    println(“i is bigger than j by ” + difference + “!”);
               } else {
                    println(“j is bigger than i by ” + difference + “!”);
               }
          }
     }
}
```

# Control Flow-ception

```
for (int i = 0; i < 10; i++) {
     for (int j = 0; j < 10; j++) {
          if (i == j) {
               println(“i and j are equal!”);
          } else {
               int difference = i - j;
               if (difference > 0) {
                    println(“i is bigger than j by ” + difference + “!”);
               } else {
                    println(“j is bigger than i by ” + difference + “!”);
               }
          }
     }
}
```

# Graphics

```
GRect rect = new GRect(50, 50, 200, 200);
rect.setFilled(true);
rect.setColor(Color.BLUE);

GOval oval = new GOval(0, 0, getWidth(), getHeight());
oval.setFilled(false);
oval.setColor(Color.GREEN);

GLabel text = new GLabel("banter", 200, 10);

add(text);
add(rect);
add(oval);
```

# Graphics

```
GRect rect = new GRect(50, 50, 200, 200);
rect.setFilled(true);
rect.setColor(Color.BLUE);

GOval oval = new GOval(0, 0, getWidth(), getHeight());
oval.setFilled(false);
oval.setColor(Color.GREEN);

GLabel text = new GLabel("banter", 200, 10);

add(text);
add(rect);
add(oval);
```

Things to remember

- Coordinates are `doubles`
- Coordinates are measured from the top left of the screen
- Coordinates of a shape are coordinates of its top left corner
- Coordinates of a label are coordinates of its bottom left corner
- Remember to `add` objects to the screen!
- Use the online documentation!

# Primitive variables

```
int x = 7;   // declare and initialize a variable
x = 9;       // change the value of x
x = x + 1;   // increment (add 1 to) x.  A.K.A. x++
x = x + 2;   // add 2 to x.             A.K.A. x += 2
x /= 2       // divide x by 2, and truncate result

double d = 3.5;

boolean isThisTrue = true;
isThisTrue = !isThisTrue;  // flip isThisTrue
```

# Primitive variables

```
int x = 7;    // declare and initialize a variable
x = 9;        // change the value of x
x = x + 1;    // increment (add 1 to) x.  A.K.A. x++
x = x + 2;    // add 2 to x.              A.K.A. x += 2
x /= 2        // divide x by 2, and truncate result

double d = 3.5;

boolean isThisTrue = true;
isThisTrue = !isThisTrue;  // flip isThisTrue
```

## Things to remember

- The expressive hierarchy:
  `boolean < char < int < double`
- Compare variables using ==
  `if (x == 7) {...}`
- Conditional operators: && and ||
  `if (x == 7 && y == 6.3)`
  `if (x == 7 || x == 6)`
  Avoid this:
  `if (x == 7 || 6)`
- Use constants!

```
private static final int MY_NUM = 10;
```

# Methods

```
private returnType methodName(type param1, type param2, ...) {
    // sick code here
}
```

- A method header provides some guarantees about the method (what it returns, how many parameters it takes)
- Parameters and return values generalize the methods we saw in Karel to allow the use of variables
- If a method returns something, that something needs to be stored in a variable

```
returnType storedValue = methodName(/* params */);
```

- Primitive variables passed into a method are passed by value

# Methods, parameters and variables


```
private returnType methodName(type parameter1, type parameter2,...)

private int returnsInt() {...}
private void drawsRect(int width, int length) {...} //void is no type
public boolean frontIsClear() {...} //look familiar?
```

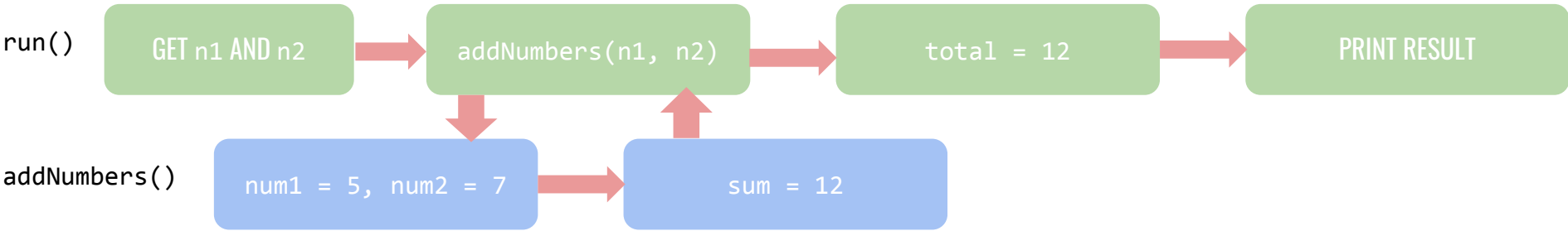
Parameters and a return value are both optional!

# Example: Methods and Parameters

```
public void run() {
     println("Choose 2 numbers!");
     int n1 = readInt("Enter n1"); //5
     int n2 = readInt("Enter n2"); //7

     int total = addNumbers(n1, n2);
     println ("The total is " + total);
}
```

```
                                        5          7
private int addNumbers(int num1, int num2) {
     int sum = num1 + num2;    //12
     return sum;
}
```



# Variable scope

Variables live inside the block in which they're declared

Scope for i

Scope for y

```
for (int i = 0; i < 5; i++) {
    int y = i * 4;
}
i = 3; // Error!
y = 2; // Error!

... // in some code far, far away
int y = 0;
for (int i = 0; i < 5; i++) {
    y = i * 4;
}
y = 2;
```

Scope for y

# Returning in different places

```
private int multipleReturns(int x) {

      if (x == 5) {
            return 0;
      }

      return 1; // this only happens if x != 5
      return 5; // never gets to this line
}


// note: every path through the method ends
with a single return statement

// note: a function ends immediately after it
returns
```

# Assignment 2!

# High level overview

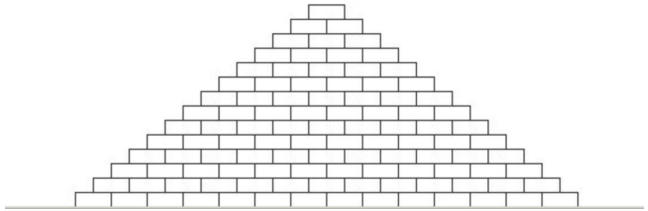
- Due Monday 10/15/2018
- 6 Problems
- 3 Graphics Programs
- 3 Console Programs

# Problem 1 Draw a pyramid!

— — —

## Questions to ask yourself:

1. What sort of control flow structure best suits this problem?
2. How do I decompose this problem?
3. What information do I need to draw a row and the bricks inside a row?



### Useful ideas from lecture

- You can use the variables inside `for` loops!
- You can nest `for` loops!
- This checkerboard example from lecture

### Useful methods

- `getWidth()` tells you the width of the canvas
- `getHeight()` tells you the height of the canvas
- `rect.getWidth()` tells you the width of `rect`
- `rect.getHeight()` tells you the height of `rect`
- See lecture and `GRect` documentation for more!

** remember that coordinates should be `double`s

# Problem 2 Bullseye!

– – –

Questions to ask yourself:

1. Can this problem be decomposed?
2. What information is needed to draw each circle?

Useful ideas from lecture

- How methods can be used to encapsulate repeated functionality

Useful methods

- See lecture and `GOval` documentation for more!

# Problem 3 CS 106A Tiles

Questions to ask yourself:

1. Can this problem be decomposed?
2. What information is needed to draw each rectangle?


Useful ideas from lecture

- How methods can be used to encapsulate repeated functionality
- Remember that a label's coordinate is its bottom left corner

Useful methods

- `label.getAscent()` tells you the distance between the baseline of the label and the top of the label. This is useful for centering!
- See lecture and `GRect` documentation and `GLabel` documentation for more!

# Problem 4 Pythagorean Theorem

Questions to ask yourself:

1. What data type should I store numbers as?
2. How many variables do I need?

```
Enter values to compute the Pythagorean theorem.
a: 3.5
b: 4.2
c = 5.4671747731346585
```

Useful ideas from lecture

- Primitive data types
- The expressive hierarchy

Useful methods

- `math.sqrt(n)` tells you the square root of `n`
- Look at the lecture for more!

# Problem 5 Keeping track of the largest and smallest

Questions to ask yourself:

1. What sorts of things do you need to store?
2. How do you initialize variables?

```
This program finds the largest and smallest numbers.
? 11
? 17
? 42
? 9
? -3
? 35
? 0
smallest: -3
largest: 42
```

Useful ideas from lecture

- Loop structures
- Variable scope
- Edge cases
- Sentinel values

# Problem 6 Hailstone sequence

---

## Questions to ask yourself:

1. What sorts of things do you need to store?
2. How do you initialize variables?

```
Enter a number: 17
17 is odd, so I make 3n + 1: 52
52 is even so I take half: 26
26 is even so I take half: 13
13 is odd, so I make 3n + 1: 40
40 is even so I take half: 20
20 is even so I take half: 10
10 is even so I take half: 5
5 is odd, so I make 3n + 1: 16
16 is even so I take half: 8
8 is even so I take half: 4
4 is even so I take half: 2
2 is even so I take half: 1
The process took 12 to reach 1
```

## Useful ideas from lecture

- Loop structures
- Variable scope
- Edge cases
- Sentinel values

# A last few tips and tricks

– – –

- “Write a `GraphicsProgram` SubClass”: Don’t worry about what this means! (You’ll learn a lot about this in a few weeks)
- Draw things on paper for Graphics Programs
- Use Top Down Decomposition wherever you can
- Go to the LaIR (6:50-10:50 PM, First floor of Tresidder)!
- Incorporate your IG feedback!
- Use the debugger!
- Work on extensions

# Questions?