Today

- Ask me questions about PA5.
  - Continue how to scale mouseY

- Chapter 5
  - Interactions

How many times will "hi!" be printed?

A. None
B. Five
C. One
D. Six

```
for (int i = 5; i < 6; i += 1) {
    print("hi!");
}
```
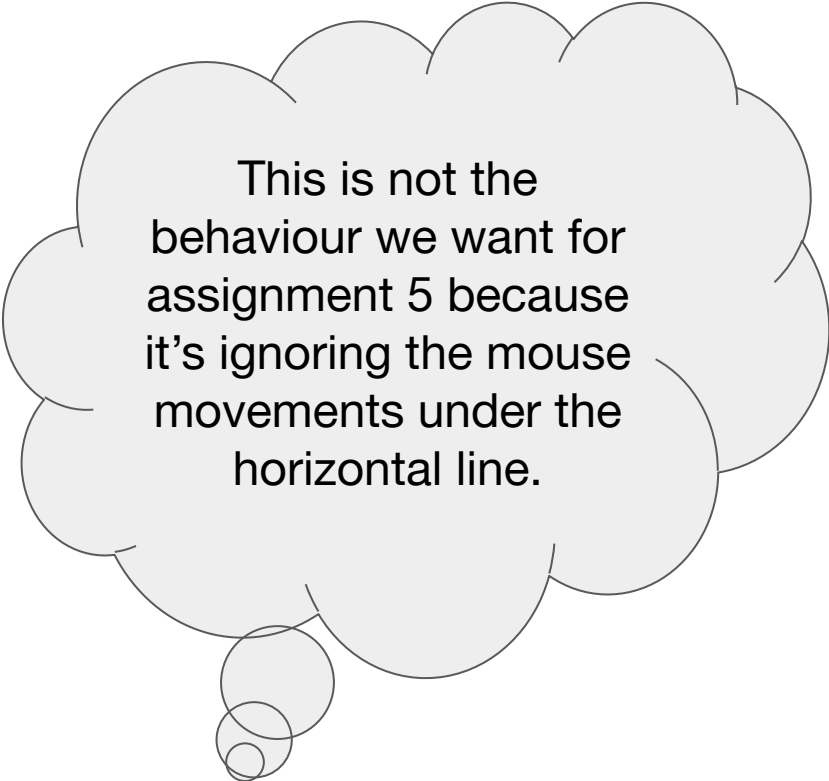
Last lecture …

Modify the code on Slide 7 so the rectangle follows the mouse but stays above the horizontal line.

Using if statements

```
void setup( ) {
 size(500, 400);
}
void draw() {
 background (255, 255, 255);
 line(0,height/2, width, 200);
 if(mouseY<160){
    rect(mouseX, mouseY, 60,40);
 }
 else {
    rect(mouseX, 160, 60,40);
 }
}
```

This is not the behaviour we want for assignment 5 because it's ignoring the mouse movements under the horizontal line.

```
void setup( ) {
```



```

  }

}
```

This is not the behaviour we want for assignment 5 because the mouse movements under the horizontal line won't be captured.

Thinking about the homework

We have seen in the upcoming assignment that certain shapes (the cars) follow the mouse but are bounded by the canvas and the road (yellow lines). Let's think how to achieve that effect.
Let's assume that we want to limit the rectangle to stay above the horizontal line.

How can we use ratios to control the vertical car movement?

Thinking about the homework

Mouse movement
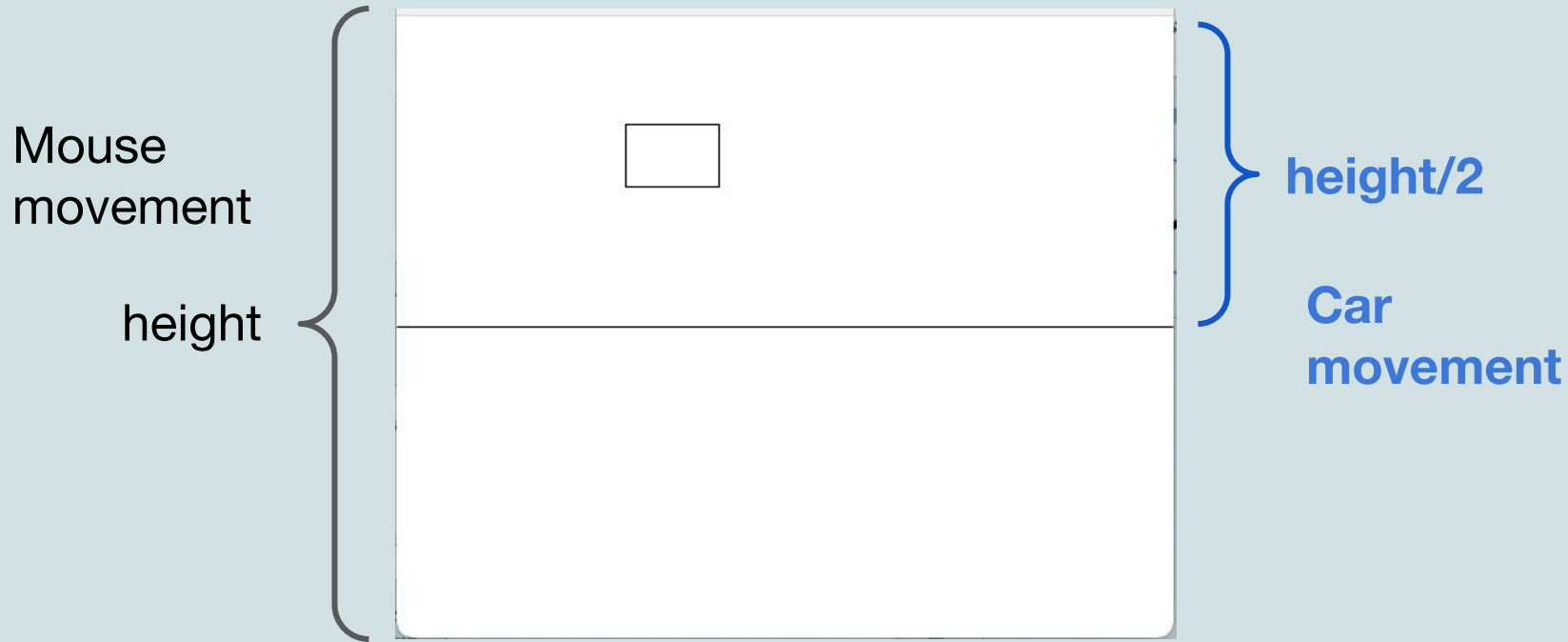
height

height/2
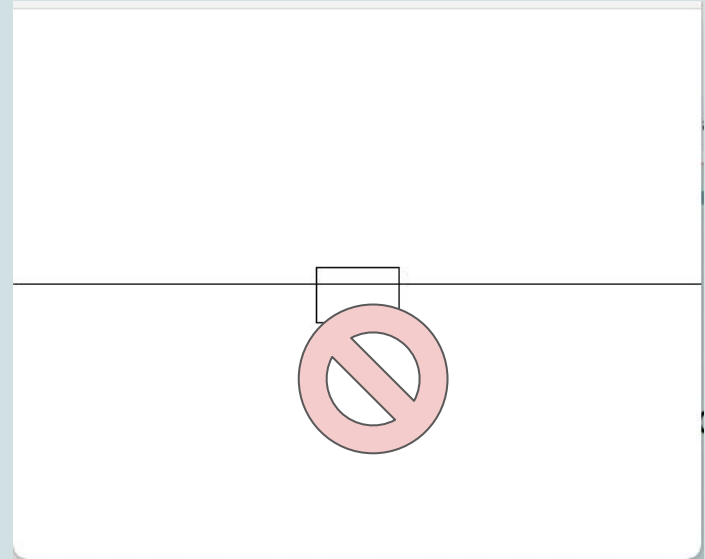
Car movement

```
void setup( ) {
  size(500, 400);
}

void draw() {
  background (255, 255, 255);
  rect(mouseX, mouseY/2, 60,40);
  line(0,height/2, width, 200);
}
```

For each pixel the mouse moves, the rectangle moves half a pixel

Question 1

Modify the following code so the rectangle follows the vertical coordinate of the mouse but never goes under the horizontal line.

```
void setup( ) {
  size(500, 400);
}

void draw() {
  background (255, 255, 255);
  rect(220, mouseY/2, 60,40);
  line(0,height/2, width, 200);
}
```

```
void setup( ) {
  size(500, 400);
}


void draw() {
  background (255, 255, 255);
  rect(220, mouseY/2.5, 60,40);
  line(0,height/2, width, 200);
}
```

CS 101
Response and Events in Processing

Chapter 5 - continuation

Interacting with a user

- It's very common for a program to "interact" with a human being
- How do humans interact with programs?
- Input devices!
  - What are some of the input devices we've talked about?
- In this lecture we learn how to make our programs more interactive

Types of Interaction

- Mouse movement (you have learned this already)
- Mouse click
- Key press

Built-in variables

- We've seen variables that keep track of the location of the mouse
  - mouseX, mouseY

- Processing also keeps track of whether the mouse button is pressed or not:
  - **mousePressed**

Built-in variables

- We've seen variables that keep track of the location of the mouse
  - mouseX, mouseY
  - The values of the variables are integers
- Processing also keeps track of whether the mouse button is pressed or not:
  - mousePressed
  - Would that make sense for mousePressed?
- No

Boolean variables

- **mousePressed** is a variable that determines whether or not the mouse is currently pressed-down
  - Automatically declared and updated, like mouseX, mouseY, etc…
- However, this variable is not an **int** or **float**!
- New type: **boolean**
  - Can only have two values: **true** or **false**

Remember the *test condition* in the for-loop?

Test condition

```
for (int i = 0 ; i < 10 ; i += 1) {
  // lines to repeat
}
```

That is a **Boolean** Value (it's True or False)

Remember the *test condition* in the if statemennt?

test condition

```
if ( i == 10 ) {

   // lines run one time (if the condition is true)

   // or zero times (if the condition is false)

}
```

That is a **Boolean** Value
(it's True or False)

```
if (mousePressed == true) {
  // lines of code that will
  // execute only if the
  // mouse is clicked
}
```

Question 2

Modify this code so the line is only drawn when we click the mouse

```
void setup() {
  size(500, 500);
  strokeWeight(30);
  background(100);
  stroke(250, 200, 100, 150);
}
void draw() {
    line(0, 0, mouseX, mouseY);
}
```

```
void setup() {
  size(500, 500);
  strokeWeight(30);
  background(100);
  stroke(250, 200, 100, 150);
}
void draw() {
  if (mousePressed == true) {
    line(0, 0, mouseX, mouseY);
  }
}
```
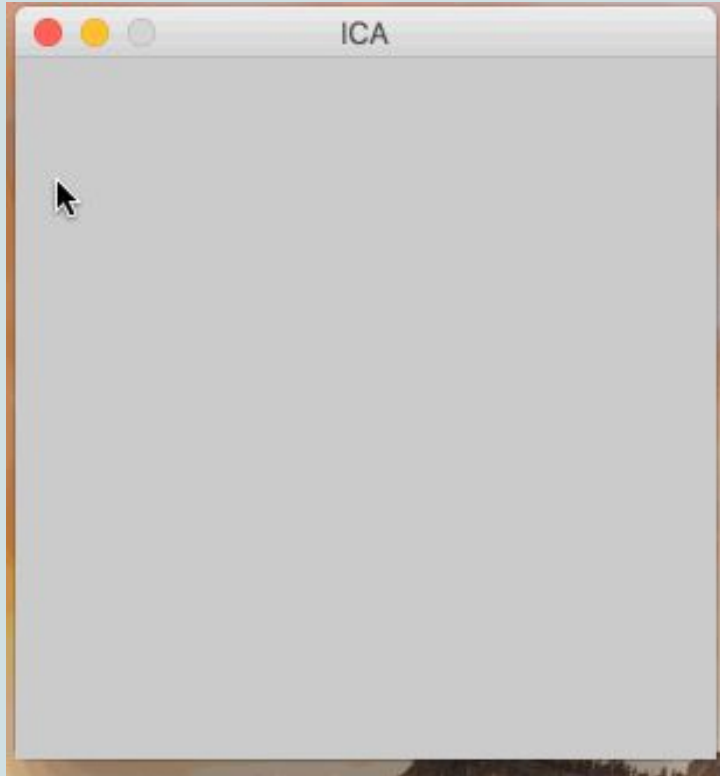
Mouse Clicks

What does this code do?

Discuss in your groups!

Use whiteboards!

```
void setup() {
  size(300, 300);
  frameRate(60);
}
void draw() {
  if (mousePressed == true) {
    if (mouseX < 100) {
      fill(50, 200, 255);
    } else if (mouseX < 200) {
      fill(100, 255, 100);
    } else {
      fill(150, 0, 200);
    }
    ellipse(mouseX, mouseY, 50, 50);
  }
}
```
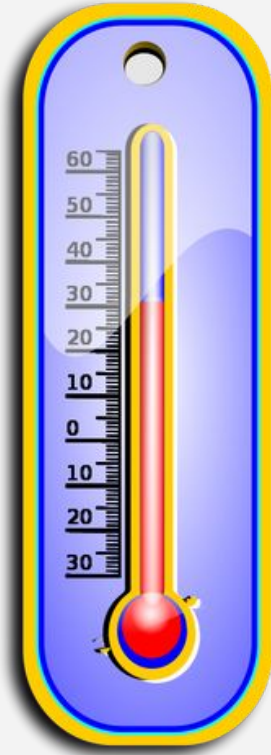
Mouse Clicks


```
void setup() {
  size(300, 300);
  frameRate(60);
}
void draw() {
  if (mousePressed == true) {
    if (mouseX < 100) {
      fill(50, 200, 255);
    } else if (mouseX < 200) {
      fill(100, 255, 100);
    } else {
      fill(150, 0, 200);
    }
    ellipse(mouseX, mouseY, 50, 50);
  }
}
```

Please ask me questions

How are you feeling?

A. Very confused
B. Need a lot more practice
C. Need a little more practice
D. Just have a couple of questions
E. Feeling good

Keypress

Key Press

- Similar to **mousePressed** the **keyPressed** variable is **true** if a keyboard key is "currently" being pressed
- **false** if not

```
if (keyPressed == true) {
  // lines of code that will
  // execute only if a
  // key is pressed
}
```

Question 3

Modify this code so the ellipse is only drawn when we press any key

```
void setup() {
  size(400, 400);
}
void draw() {
  background(100, 100, 100);
  fill(255, 0, 0);
  ellipse(200, 200, 300, 300);
}
```


TO START
PRESS ANY KEY

RUNNING OR INTERRUPTED??
"To start, press any key."
Where's the "any" key?

```
void setup() {
  size(400, 400);
}
void draw() {
  background(100, 100, 100);
  if(keyPressed){
    fill(255, 0, 0);
    ellipse(200, 200, 300, 300);
  }
}
```

Key

- Another built-in variable: **key**
- If a key is being pressed, **key** will be the letter that corresponds to that key
- Use this to differentiate between key-presses
- When a key is pressed on the keyboard, it has the corresponding letter stored inside of it
- The **key** variable is not an **int** , **float**, or **boolean**
- New type: **char**
  - Short for "character"

Key Press and Character

- A **char** variable can "store" a single character (like those on your keyboard)
- **key** – gets assigned a single character
- char values are surrounded by single-quotes
- For example, to declare a new char variable:

```
char letter = 'A';
char period = '.';
char first_letter = 'x';
char number = '4';
```

- chars are case-sensitive

Key Press and Character

- To compare a char variable:

```
if (key == 'w') { …
if (letter == 'i') { …
if (key == letter) { …
```

- These types of comparisons are needed to check which key on the keyboard is being pressed

Key Press

- Here's an example of using the **key** variable to differentiate between keys

```
void draw() {
  background(100, 100, 100);
  if (keyPressed) {
    if (key == 'r') {
      fill(255, 0, 0);
    }
    else if (key == 'g') {
      fill(0, 255, 0);
    }
    else if (key == 'b') {
      fill(0, 0, 255);
    }
  }
  rect(50, 50, 200, 200);
}
```

Question 4

Modify this code so the ellipse is only drawn when we press the 'y' key

```
void setup() {
  size(400, 400);
}
void draw() {
  background(100, 100, 100);
  fill(255, 0, 0);
  ellipse(200, 200, 300, 300);
}
```


MAKE GIFS AT GIFSOUP.COM

```
void setup() {
  size(400, 400);
}
void draw() {
  if(keyPressed == true){
    if(key == 'y'){
      background(100, 100, 100);
      fill(255, 0, 0);
      ellipse(200, 200, 300, 300);
    }
  }
}
```
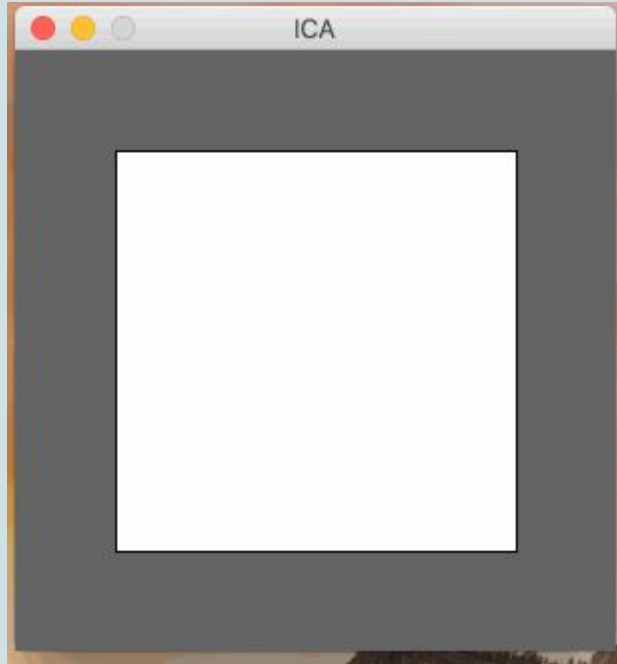
Key Press

What does this code do?

Discuss!

```
void draw() {
  background(100, 100, 100);
  if (keyPressed) {
    if (key == 'r') {
      fill(255, 0, 0);
    }
    else if (key == 'g') {
      fill(0, 255, 0);
    }
    else if (key == 'b') {
      fill(0, 0, 255);
    }
  }
  rect(50, 50, 200, 200);
}
```

Key Press


```
void draw() {
  background(100, 100, 100);
  if (keyPressed) {
    if (key == 'r') {
      fill(255, 0, 0);
    }
    else if (key == 'g') {
      fill(0, 255, 0);
    }
    else if (key == 'b') {
      fill(0, 0, 255);
    }
  }
  rect(50, 50, 200, 200);
}
```

Please ask me questions

How are you feeling?

A. Very confused
B. Need a lot more practice
C. Need a little more practice
D. Just have a couple of questions
E. Feeling good
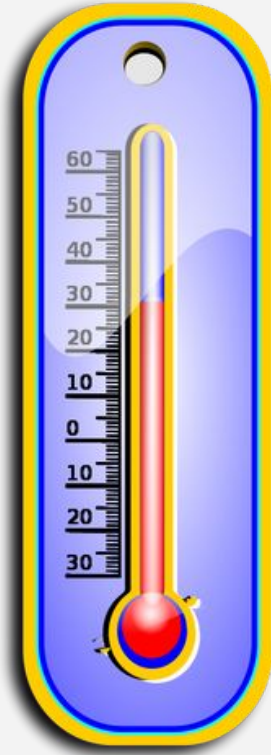
Question 5

Draw a circle on a 700 x 700 canvas. The user should be able to move the circle left and right using the 'j' and 'l' keys.
The y position of the circle will remain 150, but the x position will change based on whether keyPressed is true and whether the 'j' or 'l' key is pressed.

1. Define a global variable named XCoord for the x-coordinate and use it to draw the circle.

```
int xCoord = 350; //global variable

void setup() {
  size(700,700);
}


void draw() {
  background(255,255,255);
  ellipse(xCoord,150,200,200);
}
```

Question 5

2. Fill out the code below and place it into the draw function to complete the functionality described in the previous slide

```
if (keyPressed == true) {
    if (key == _____) { // go left
        xCoord = xCoord - _____;

    } else if (key == _____) { // go right
        xCoord = xCoord + _____;
    }
 }
 // draw the circle below using the answer from the previous question
```

Time allowing
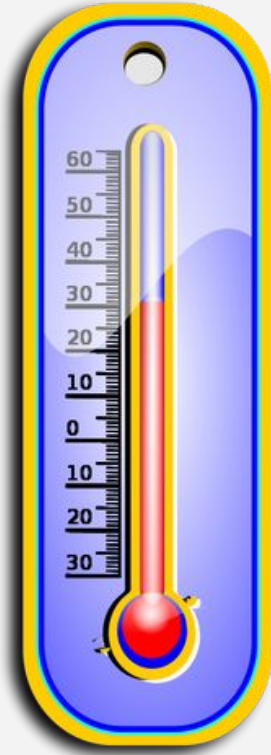
Question 6. Practice Basic Animations

Write a program that shows a red circle moving from the top left corner to the bottom right corner of the canvas.

Please ask me questions

Temperature check
How are you feeling?
A. Very confused
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C. Need a little more practice
D. Just have a couple of questions
E. Feeling good

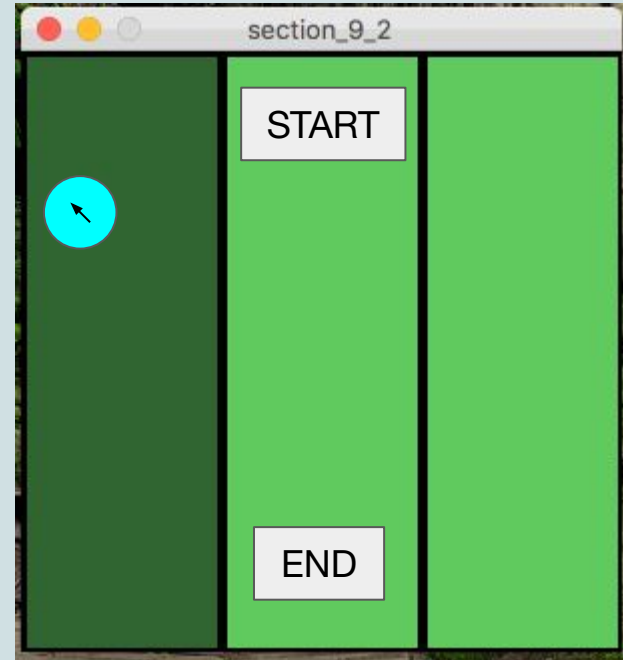# Text

- We want to draw characters on the canvas

- **text() - a new function**

- The function text(s,x,y) will draw the character specified in s at the coordinate given by the x and y arguments.

```
void setup() {
  size(300, 300);
  textSize(200);          // new!
}
void draw() {
  background(100, 100, 100);
  fill(255, 0, 0);
  text("Hi!", 100, 180);  //draw some words
}
```
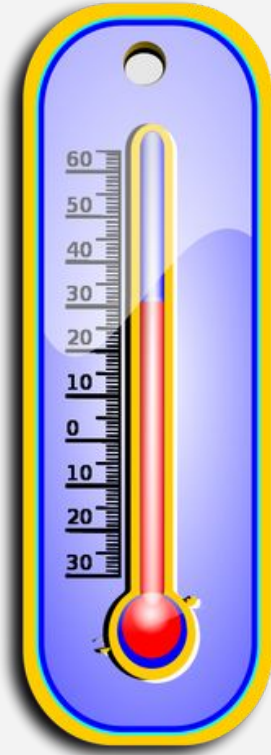
Question 7

Add two text boxes and rectangles to the three_rectagles.pde program so your canvas looks like the on the right
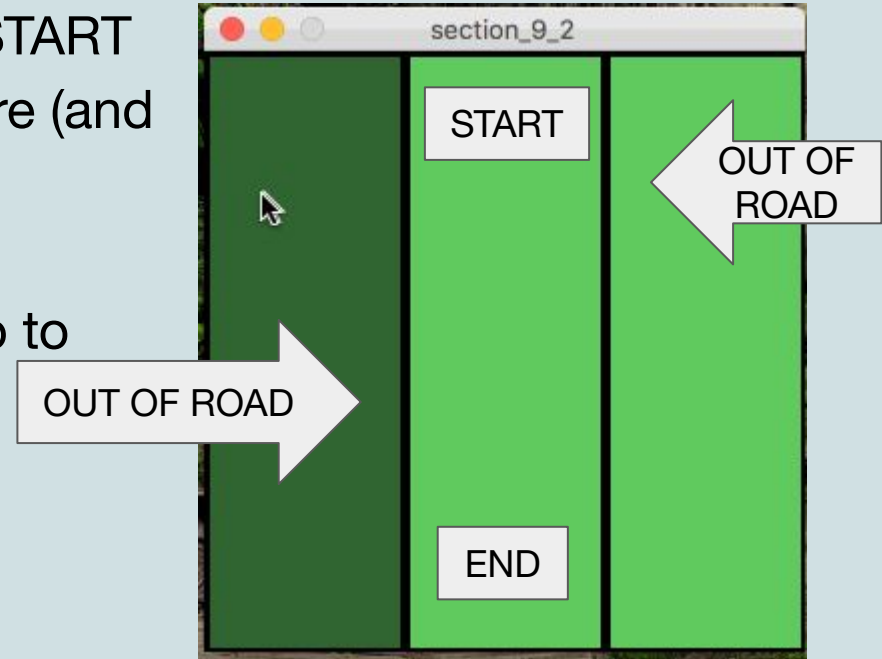
Please ask me questions

How are you feeling?

A. Very confused

B. Need a lot more practice

C. Need a little more practice

D. Just have a couple of questions

E. Feeling good

ICA

Question 8

We want to program a game that asks the user to move the mouse from the START square (and click) to the END square (and click) to win the game.

What are some steps you would do to complete this program?

Please ask me questions

Temperature check
   How are you feeling?
   A. Very confused
   B. Need a lot more practice
   C. Need a little more practice
   D. Just have a couple of questions
   E. Feeling good