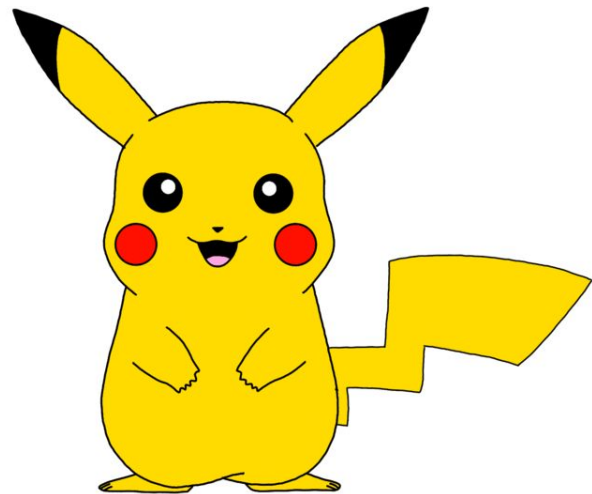


1st Rule of
Programming:
if it works,
don't touch it.

ANIMATION



You will be able to write Bouncing Ball



or Bouncing POKEBALL !!!

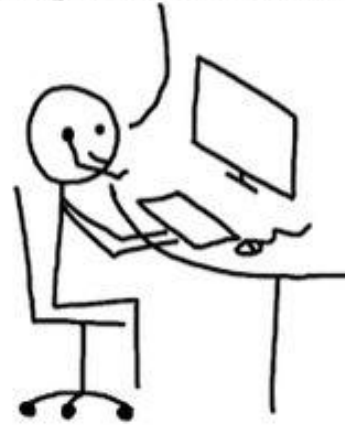


But First...

Let's go on BUG HUNT!



Yeah, I'm just
writing the code now.

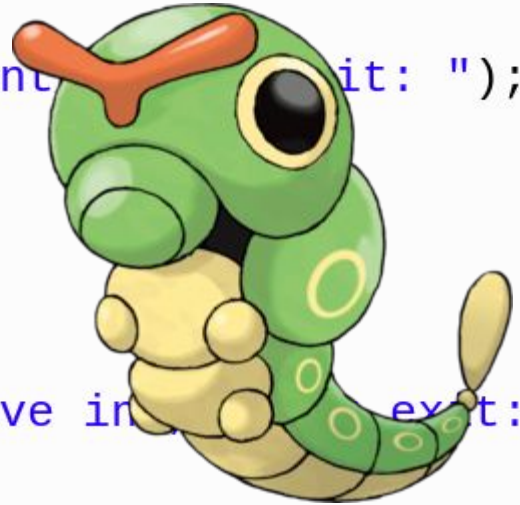


This program is BUGGY!

```
public void run() {  
    int number = readInt("Enter positive int, 0 for exit: ");  
    while (number != 0) {  
        int max = 0;  
        if (number > max) {  
            max = number;  
        }  
        int number = readInt("Enter positive int, 0 for exit: ");  
    }  
    println("The maximum is: " + max);  
}
```

Here's a BUG!

```
public void run() {  
    int number = readInt("Enter positive int to add: ");  
    while (number != 0) {  
        int max = 0;  
        if (number > max) {  
            max = number;  
        }  
        int number = readInt("Enter positive int to add, or 0 to exit: ");  
    }  
    println("The maximum is: " + max);  
}
```



Does it work now?

```
public void run() {  
    int number = readInt("Enter positive int, 0 for exit: ");  
    while (number != 0) {  
        int max = 0;  
        if (number > max) {  
            max = number;  
        }  
        number = readInt("Enter positive int, 0 for exit: ");  
    }  
    println("The maximum is: " + max);  
}
```

Noooo! Another BUG!

```
public void run() {  
    int number = readInt("Enter positive int, 0 for exit: ");  
    while (number != 0) {  
        int max = 0;  
        if (number > max) {  
            max = number;  
        }  
        number = readInt("Enter positive int, 0 for exit: ");  
    }  
    println("The maximum is: " + max);  
}
```

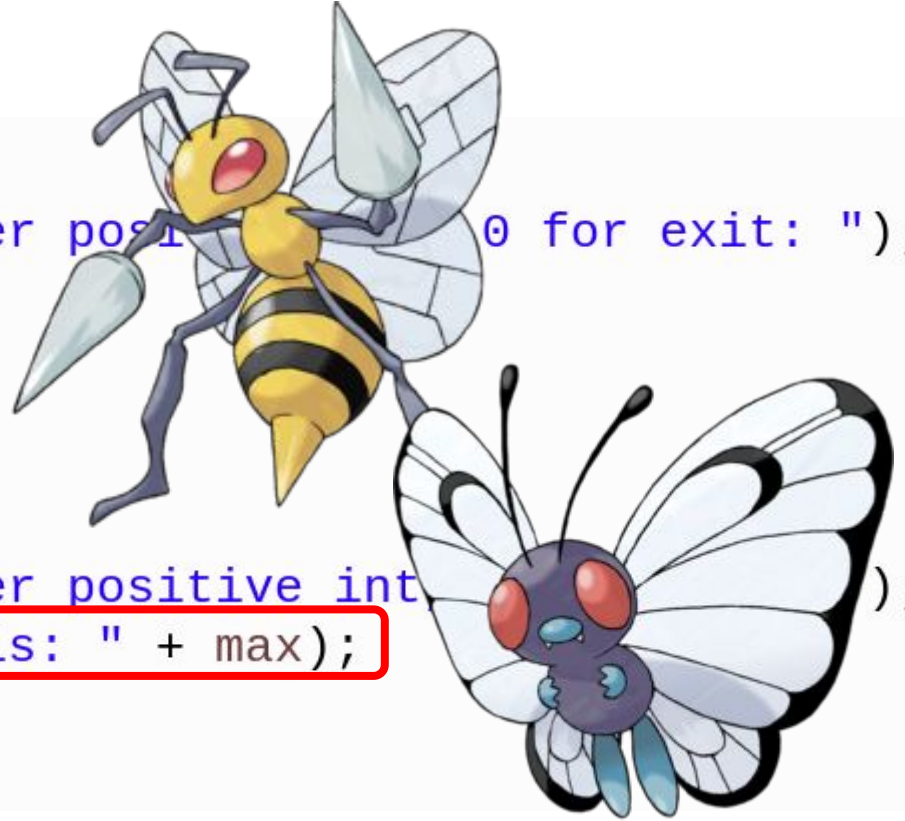


Does it work now?

```
public void run() {  
    int number = readInt("Enter positive int, 0 for exit: ");  
    while (number != 0) {  
        int max = 0;  
        if (number > max) {  
            max = number;  
        }  
        number = readInt("Enter positive int, 0 for exit: ");  
        println("The maximum is: " + max);  
    }  
}
```

Noooo! Two more BUGS?!

```
public void run() {  
    int number = readInt("Enter positive int or 0 for exit: ");  
    while (number != 0) {  
        int max = 0;  
        if (number > max) {  
            max = number;  
        }  
        number = readInt("Enter positive int ");  
        println("The maximum is: " + max);  
    }  
}
```



The correct program!

```
public void run() {  
    int number = readInt("Enter positive int, 0 for exit: ");  
    int max = 0;  
    while (number != 0) {  
        if (number > max) {  
            max = number;  
        }  
        number = readInt("Enter positive int, 0 for exit: ");  
    }  
    println("The maximum is: " + max);  
}
```

This program is BUGGY!

```
int numValue = readInt("Enter a number: ");
println("countdown");
while (numValue != 0) {
    println(numValue);
    numValue = numValue - 1;
}
println("START!");
```

Here's a BUG!

```
int numValue = readInt("Enter a number: ");
println("countdown");
while (numValue != 0) {
    println(numValue);
    numValue = numValue - 1;
}
println("START!");
```



The correct program

```
int numValue = readInt("Enter a number: ");
println("countdown");
while (numValue > 0) {
    println(numValue);
    numValue = numValue - 1;
}
println("START!");
```


Animation

How animation works



Animation loop

```
private void run() {  
    // setup  
  
    while(true) {  
        // update world  
  
        // pause  
        pause(DELAY);  
    }  
}
```

Animation loop

```
private void run() {  
    // setup  
  
    while(true) {  
        // update world  
  
        // pause  
        pause(DELAY);  
    }  
}
```



Make all the variables you need. Add graphics to the screen.

Animation loop

```
private void run() {  
    // setup
```

```
    while(true) {  
        // update world  
  
        // pause  
        pause(DELAY);  
    }  
}
```

← The animation loop is a repetition of heartbeats.

Infinite loop

Infinite loop

```
while (true) {  
    ...  
}
```



Animation loop

```
private void run() {  
    // setup  
  
    while(true) {  
        // update world  
        // pause  
        pause(DELAY) ;  
    }  
}
```

← Each heartbeat, update the world forward one frame.

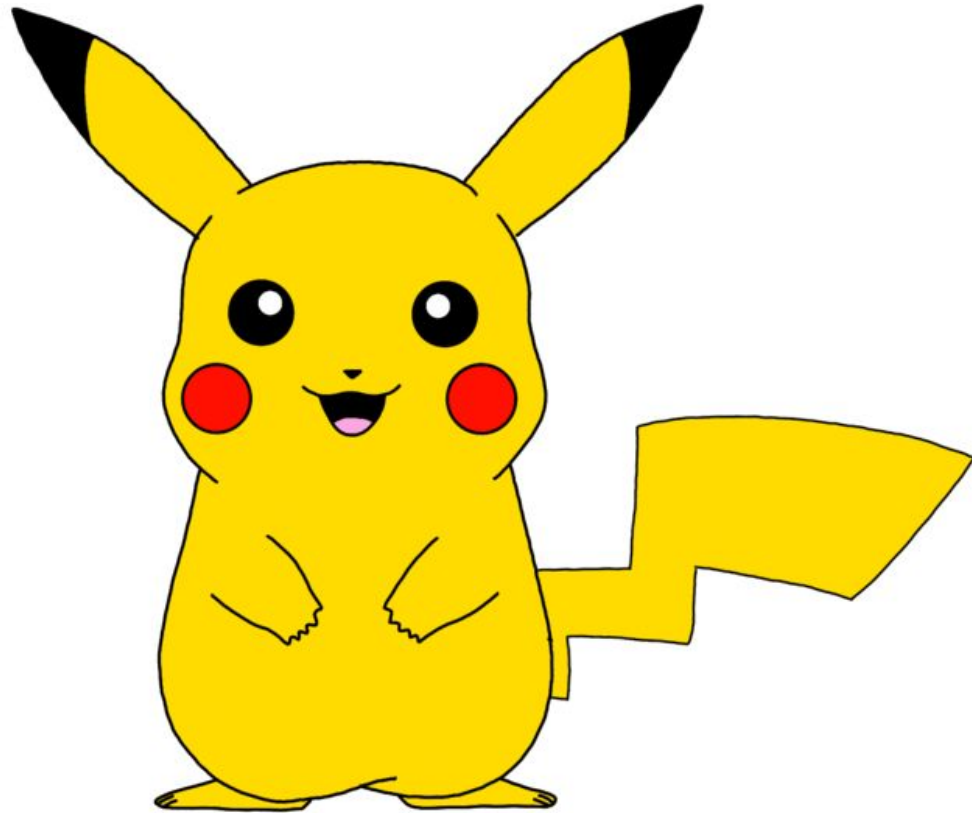
Animation loop

```
private void run() {  
    // setup  
  
    while(true) {  
        // update world  
  
        // pause  
        pause(DELAY);  
    }  
}
```

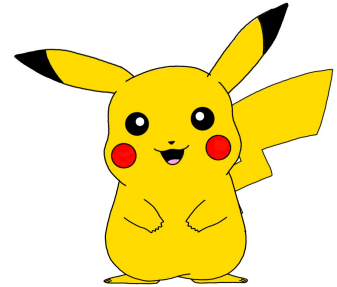
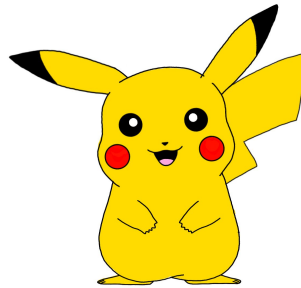
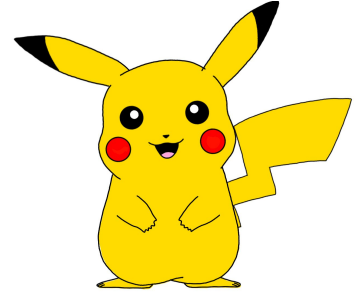
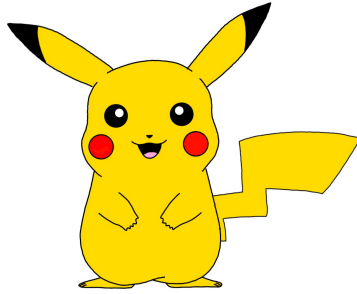
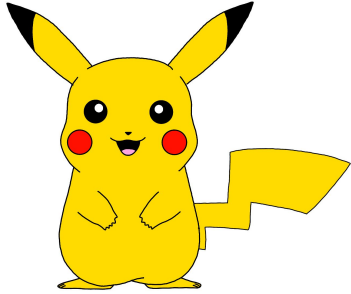


If you do not pause,
humans won't be able
to see it.

Programming time!



How animation works



and so on ...

Programming time!

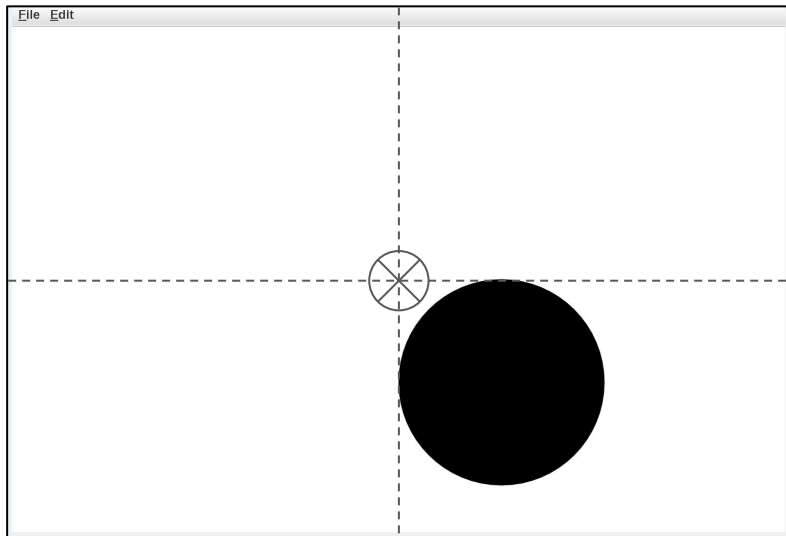


Centering in the Scene

```
GOval ball = new GOval(DIAMETER, DIAMETER);  
ball.setFilled(true);  
  
add(ball, getWidth() / 2, getHeight() / 2);
```

Centering in the Scene

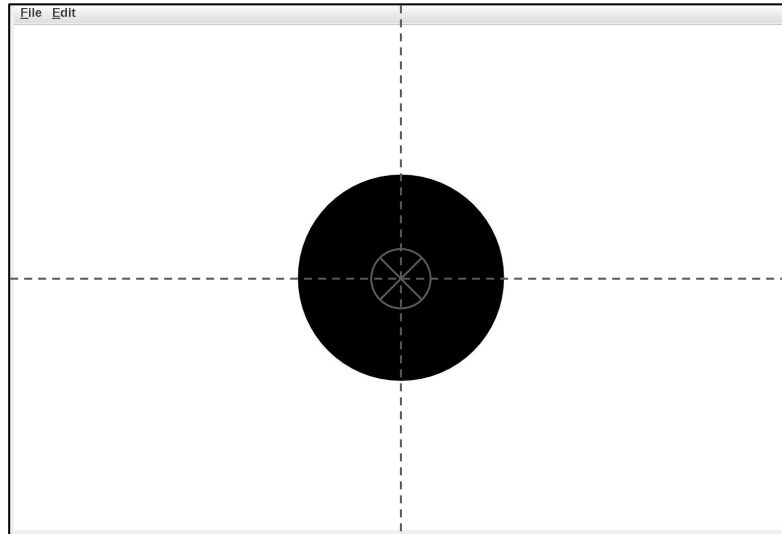
```
GOval ball = new GOval(DIAMETER, DIAMETER);  
ball.setFilled(true);  
  
add(ball, getWidth() / 2, getHeight() / 2);
```



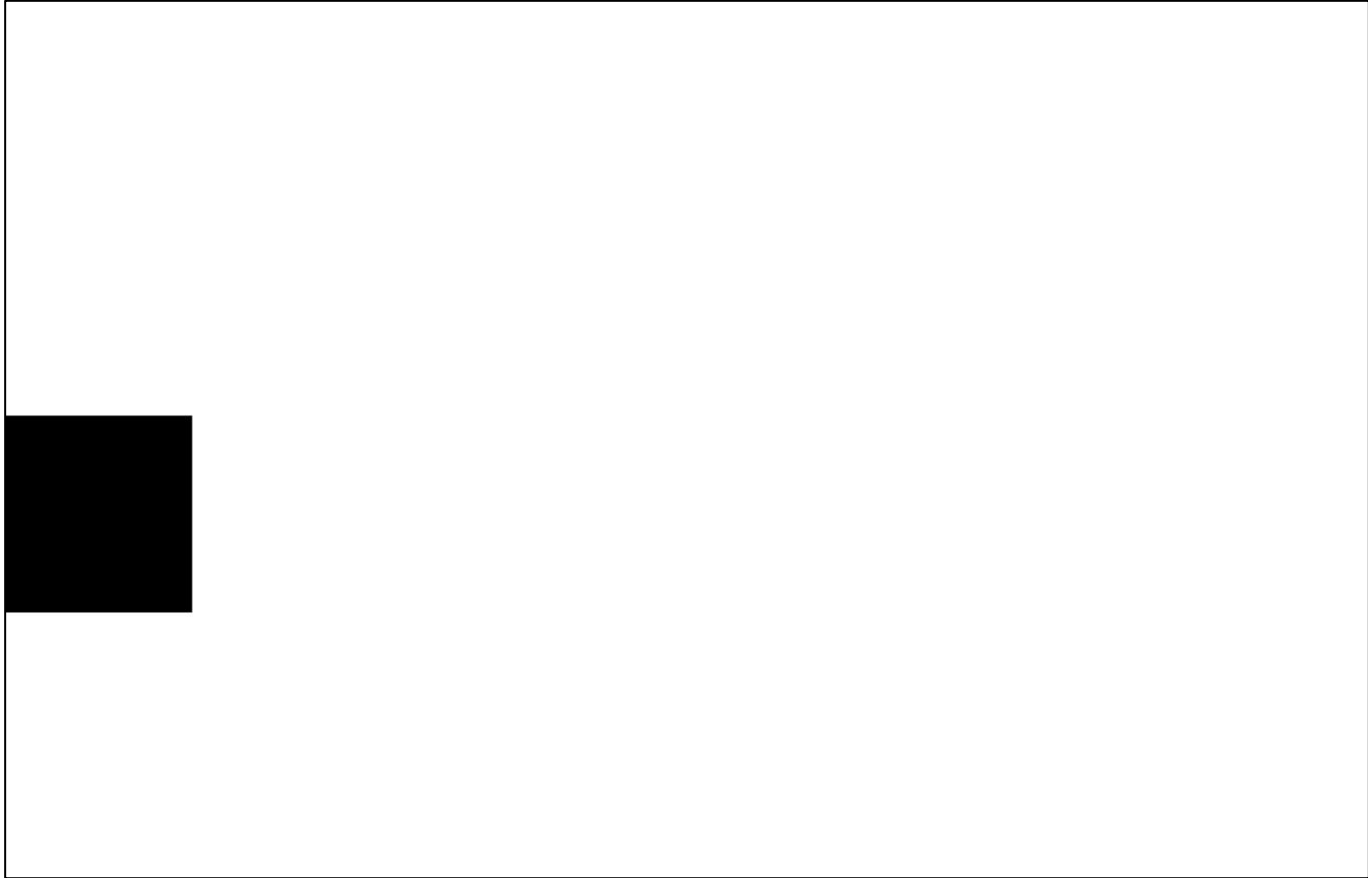
Centering in the Scene

```
GOval ball = new GOval(DIAMETER, DIAMETER);  
ball.setFilled(true);
```

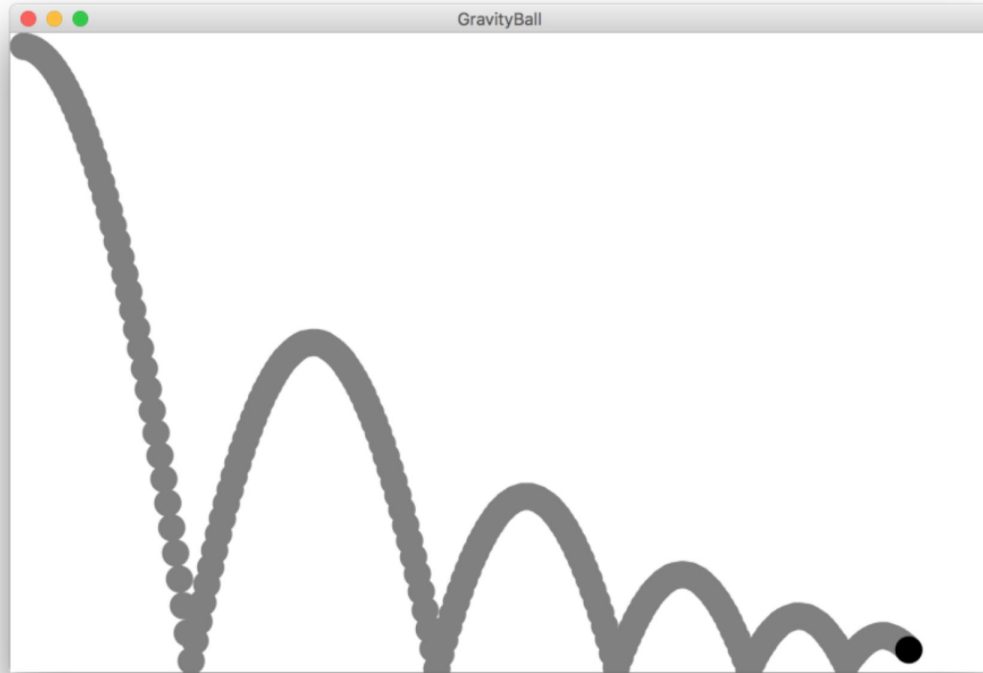
```
add(ball, (getWidth() - DIAMETER) / 2, (getHeight() - DIAMETER) / 2);
```



Programming time!

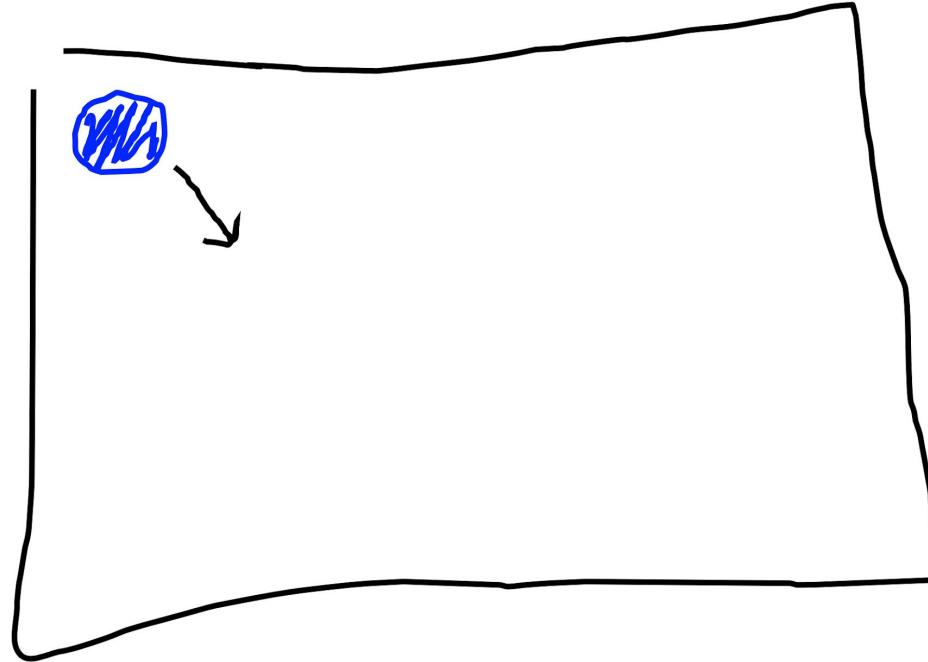


Programming time!



Gravity Ball

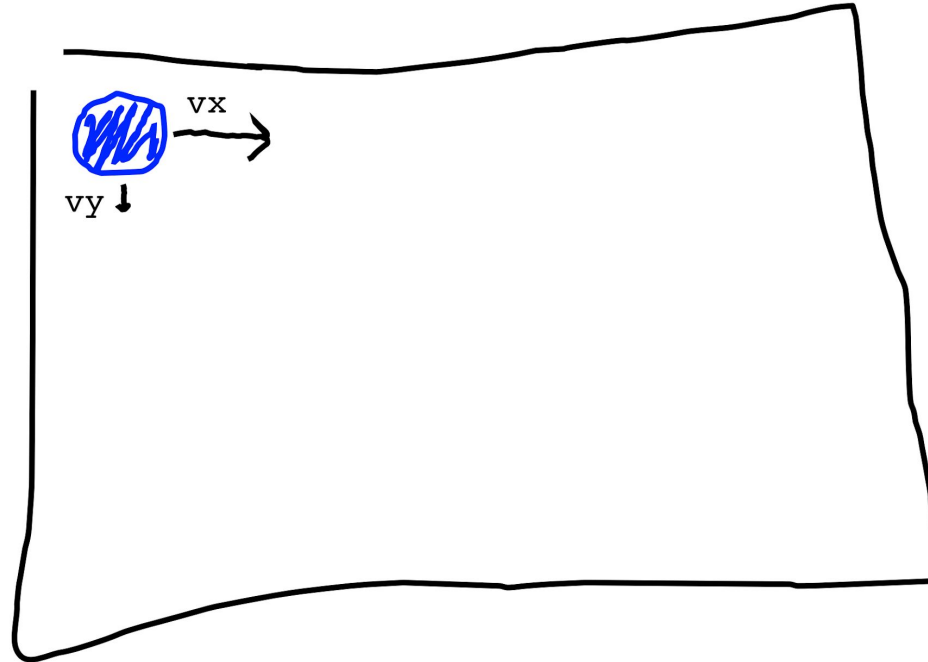
First heartbeat



Velocity: how much the ball position changes each heartbeat

Gravity Ball

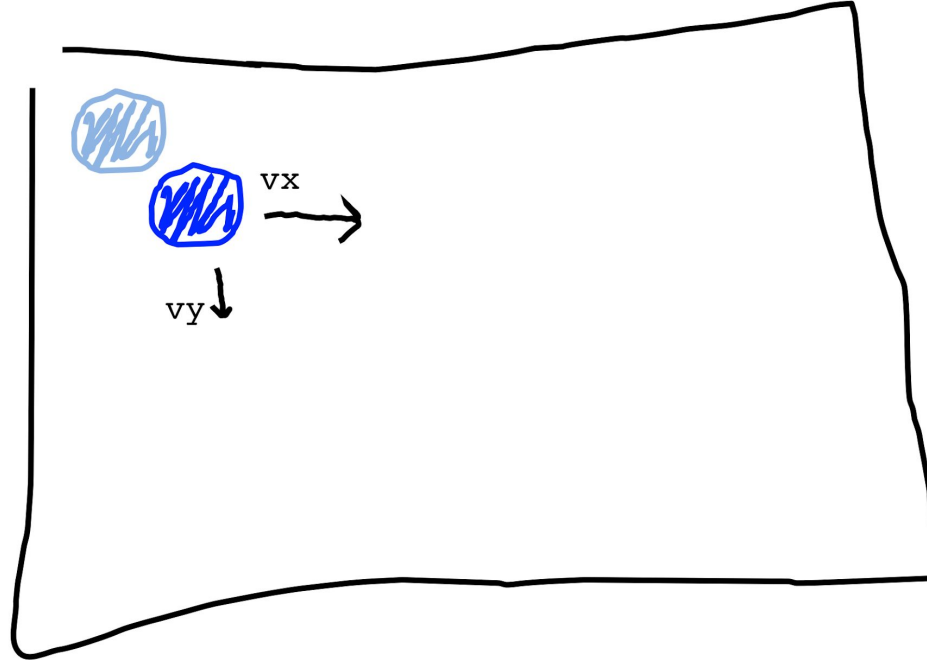
First heartbeat



The GOval **move** method takes in
a change in x and a change in y

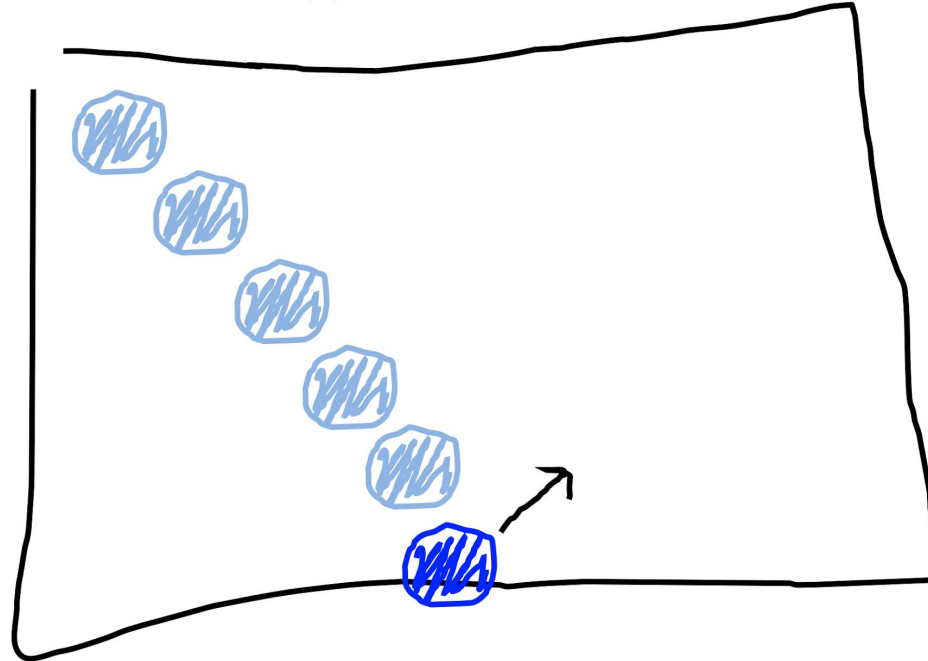
Gravity Ball

Second heartbeat



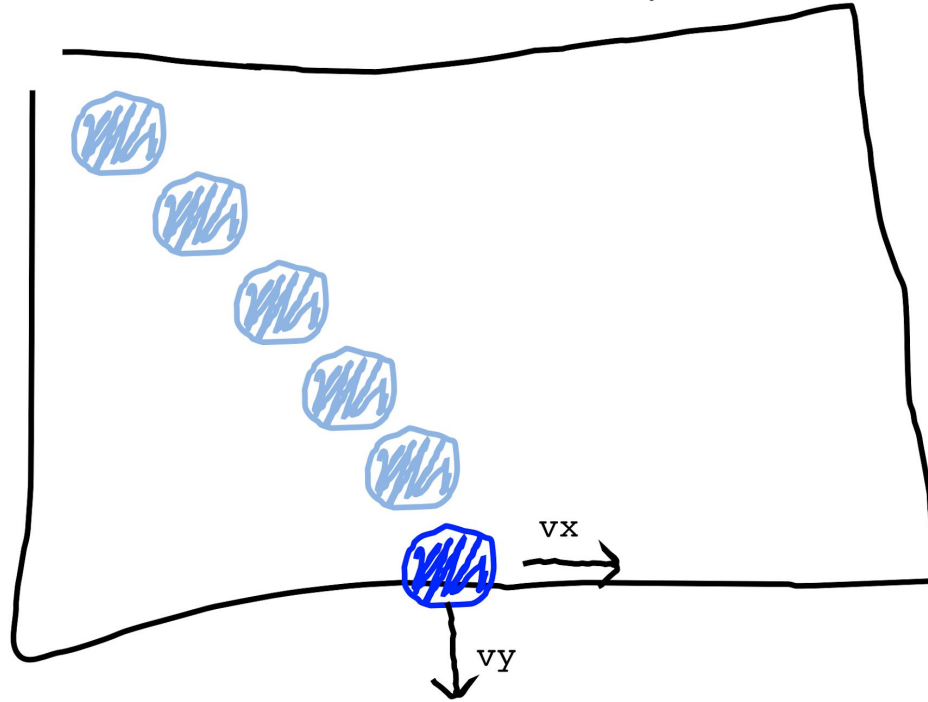
Gravity Ball

What happens when we hit a wall?



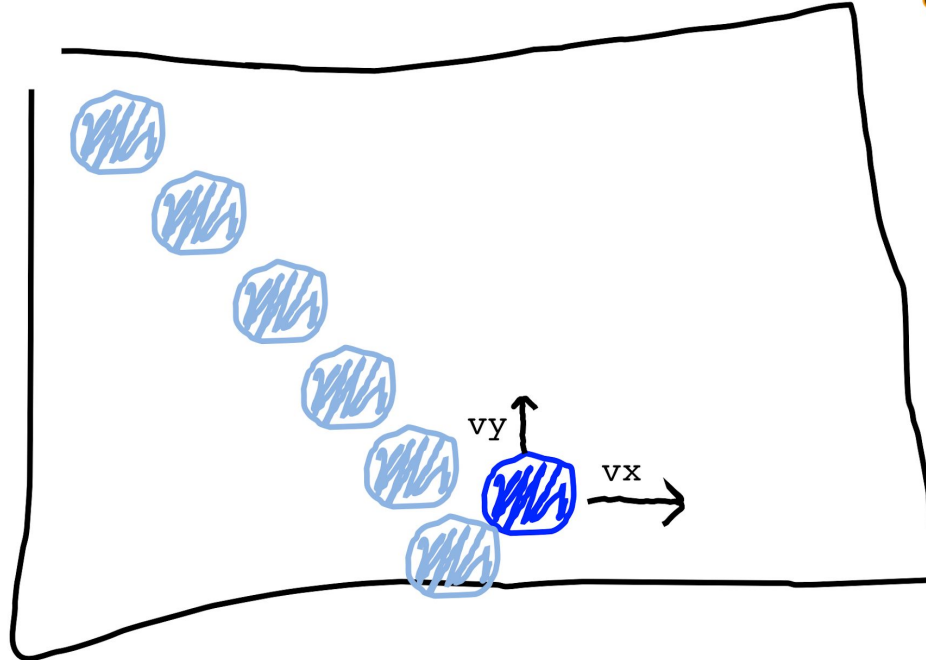
Gravity Ball

We have this velocity

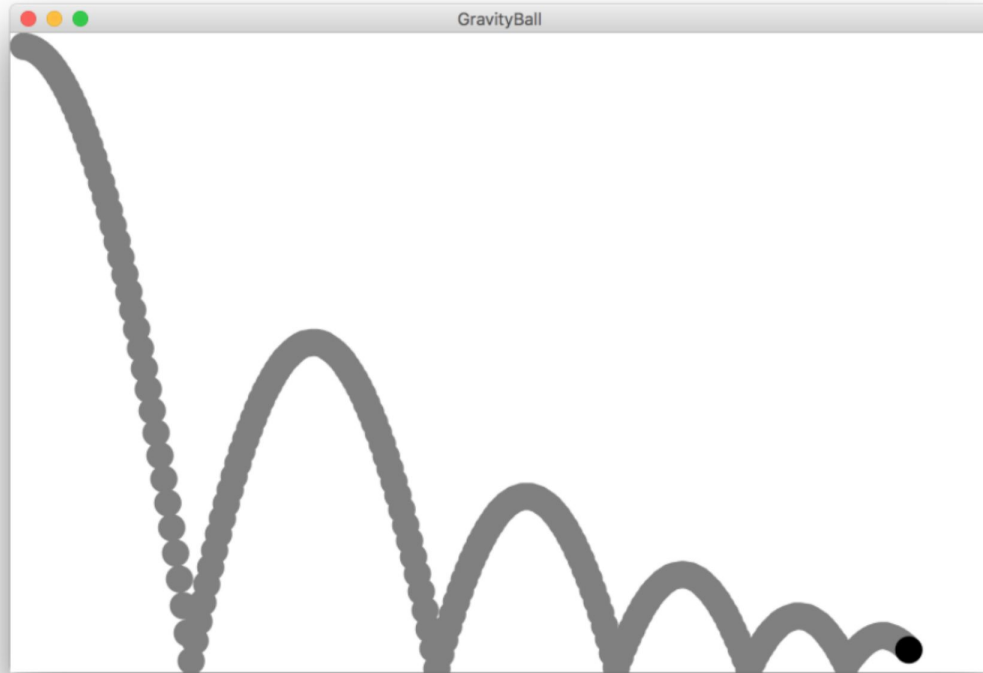


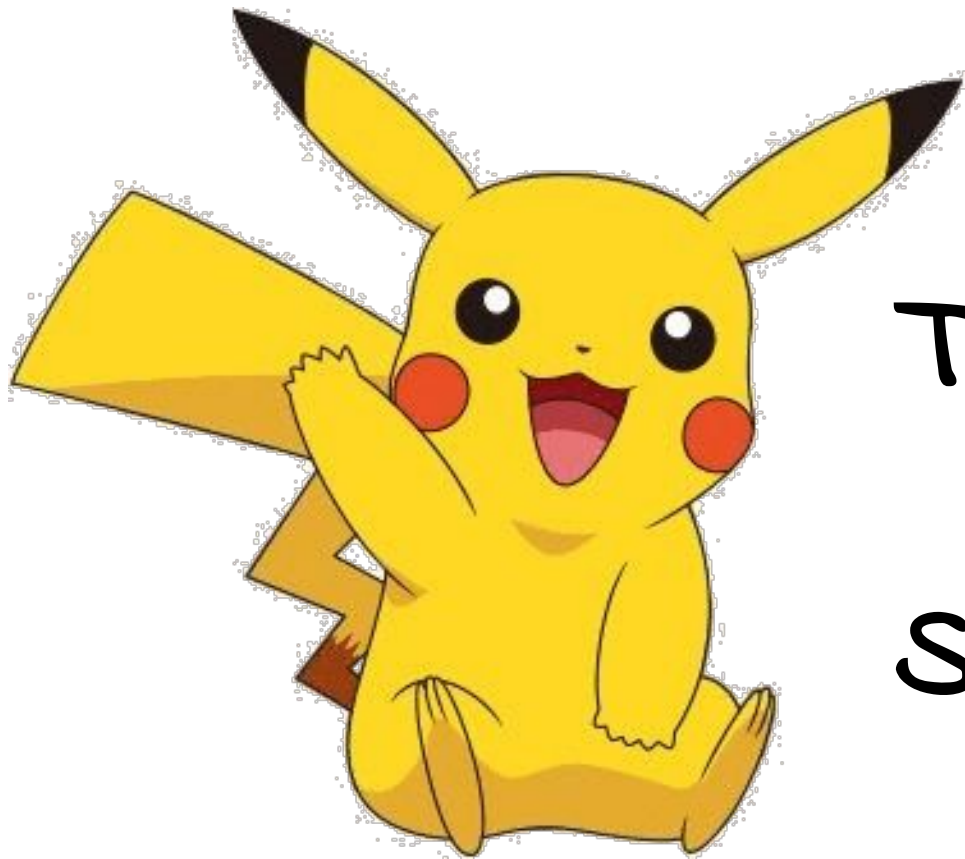
Gravity Ball

Seventh Heartbeat



Programming time!





THAT'S IT.

SEE YOU LATER.