This is Method Man. He is part of the Wu Tang Clan. 😊
You will be able to write Bouncing Ball
Learning Goals

1. Feel more confident writing methods
2. Write animated programs
Review
boolean karelIsAwesome = true;

boolean myBool = 1 < 2;
public void run() {
    for(int i = 1; i <= 100; i++) {
        if( /*check if i is a square number*/ ) {
            println(i);
        }
    }
}
public void run() {
    for(int i = 1; i <= 100; i++) {
        if(isSquare(i)) {
            println(i);
        }
    }
}
public void run() {
    for(int i = 1; i <= 100; i++) {
        if(isSquare(i)) {
            println(i);
        }
    }
}

private boolean isSquare(int x) {
    double root = Math.sqrt(x);
    if(root == Math.floor(root)) {
        return true;
    } else {
        return false;
    }
}
public void run() {
    for(int i = 1; i <= 100; i++) {
        if(isSquare(i)) {
            println(i);
        }
    }
}

private boolean isSquare(int x) {
    double root = Math.sqrt(x);
    return root == Math.floor(root);
}
public void run() {
    for(int i = 1; i <= 100; i++) {
        if(isSquare(i)) {
            println(i);
        }
    }
}

private boolean isSquare(int x) {
    double root = Math.sqrt(x);
    return root == (int)root;
}
Great foundation
End Review
Move to Center
private void run() {
    // setup

    while(true) {
        // update world

        // pause
        pause(DELAY);
    }
}
private void run() {
    // setup

    while(true) {
        // update world

        // pause
        pause(DELAY);
    }
}
Animation Loop

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

The animation loop is a repetition of heartbeats.
private void run() {
    // setup

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

    while (true) {
        // update world

        // pause
        pause(Delay);
    }
}
private void run() {
    // setup
    GRect r = makeRect();
    while (!isPastCenter(r))
        // update world
        r.move(1, 0);
        // pause
        pause(DELAY);
}
Bouncing Ball
Milestone #1
Bouncing Ball

First heartbeat

Velocity: how much the ball position changes each heartbeat
The GOval `move` method takes in a change in x and a change in y
Bouncing Ball

Second heartbeat

vx

vy
Bouncing Ball

Third heartbeat

vx

vy
Bouncing Ball

What happens when we hit a wall?
Bouncing Ball

We have this velocity

Piech, CS106A, Stanford University
Bouncing Ball

Our new velocity

\[ v_y \]

\[ v_x \]
Bouncing Ball

Seventh heartbeat

Piech, CS106A, Stanford University
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Eighth heartbeat

Piech, CS106A, Stanford University
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Ninth heartbeat

Piech, CS106A, Stanford University
Bouncing Ball

We want this!
Bouncing Ball

This was our old velocity

Piech, CS106A, Stanford University
When reflecting horizontally: $v_x = -v_x$
When reflecting horizontally: $v_x = -v_x$
Bouncing Ball
A Sticky Situation

The ball is above the bottom
so we reverse its $vy$

The ball is bellow the bottom
so we reverse its $vy$
Learning Goals

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Novelty
// this variable can make random numbers
RandomGenerator rg = new RandomGenerator();

// make a random number between 0 and 5
int randNum = rg.nextInt(6);
Random Numbers Theory

\[ X_{n+1} = (aX_n + c) \mod m \]

// actual code from the java library
int nextseed = (oldseed * multiplier + addend) % max;

Fun fact: the first random number comes from the CPU clock

* Just for fun. Not on exams or psets…
Random Numbers

// this variable can make random numbers
RandomGenerator rg = new RandomGenerator();

// now each run will be the same...
rg.setSeed(0);

// make a random number between 0 and 5
int randNum = rg.nextInt(6);