CSE 11
Accelerated Intro to Programming
Lecture 8

Greg Miranda, Spring 2021

This lecture is being recorded

Announcements

- Quiz 8 due Friday @ 8am
- PA2 due tonight @ 11:59pm
- Survey 3 due Friday @ 11:59pm

Math

- Let’s look at a few ways to manipulate numbers using more built-in methods in Java
  - Like built-in String methods we looked at before
- Square root of a number - common operation to do
  - double sqrt2 = Math.sqrt(2);
    - Takes an int or a double
      - double sqrt2FromDouble = Math.sqrt(2.0);
    - Answer is always a double
      - An approximation of the square root – not a full answer to the square root
- Raise a number to a power
  - double cubeOf12 = Math.pow(12, 3);
- Both methods are defined in Java’s Math library

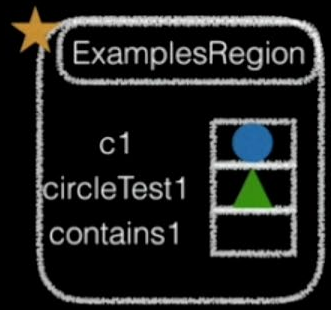
- More math methods
  - Max
    - double maxOf45 = Math.max(4, 5);
  - Min
  - And several other math methods as well
- Two ways to think of this based on what we've seen before
  - Definition 1
    - Math is a built-in object
  - Definition 2
    - Math is a built-in class
      - sqrt, pow, max, min are a special kind of a method
        - Calling them with the class name before the dot
        - Instead of writing an object before the dot
    - Defn2 is the correct way to think about it
      - Another feature called **static methods** that's coming up in future weeks

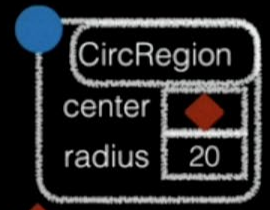
Memory Models

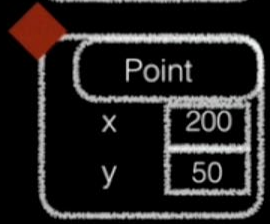
- More practice with drawing diagrams for laying out objects
  - Build up a little more of a visual language for
    - Drawing objects
    - Drawing what's happening inside Java
- Code from the reading

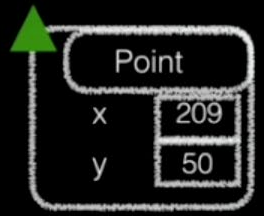
```
class Point {
  int x;
  int y;
  Point(int x, int y) {
    this.x = x;
    this.y = y;
  }
  double distance(Point other) {
    return Math.sqrt(Math.pow(this.x - other.x, 2)
      + Math.pow(this.y - other.y, 2));
  }
}
class CircRegion {
  Point center;
  int radius;
  CircRegion(Point center, int radius) {
    this.center = center;
    this.radius = radius;
  }
  boolean contains(Point p) {
    return this.center.distance(p) < this.radius;
  }
}
class ExamplesRegion {
  CircRegion c1 = new CircRegion(new Point(200, 50), 10);
  Point circleTest1 = new Point(209, 50);
  boolean contains1 = this.c1.contains(this.circleTest1);
}
```

```
class Point {


  double distance(Point other) {
    return Math.sqrt(Math.pow(this.x - other.x, 2)
      + Math.pow(this.y - other.y, 2));
  }
}
class CircRegion {


  boolean contains(Point p) {
    return this.center.distance(p) < this.radius;
  }
}


                    this.c1.contains(this.circleTest1);
```

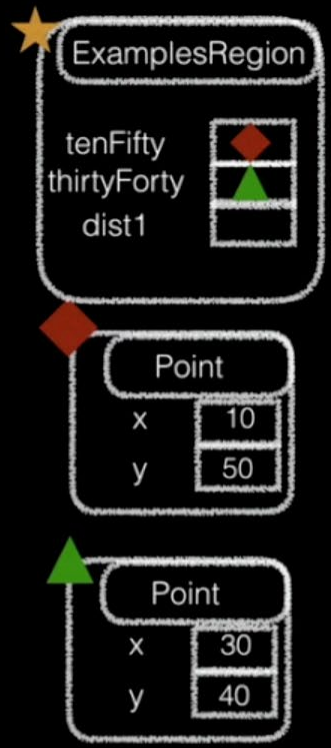




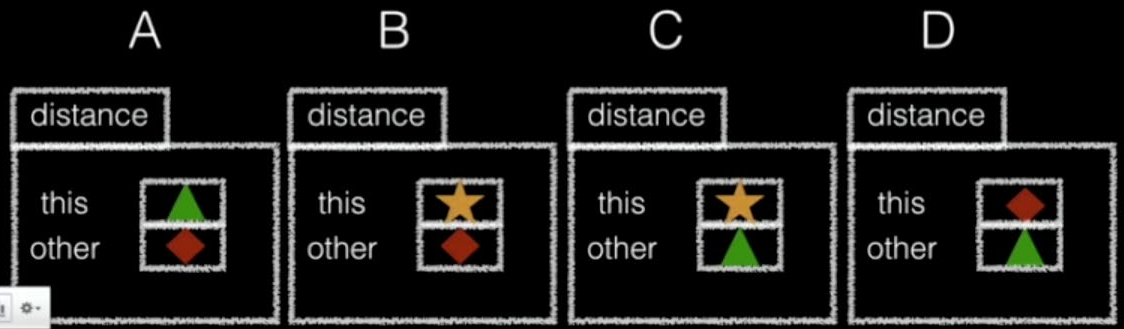




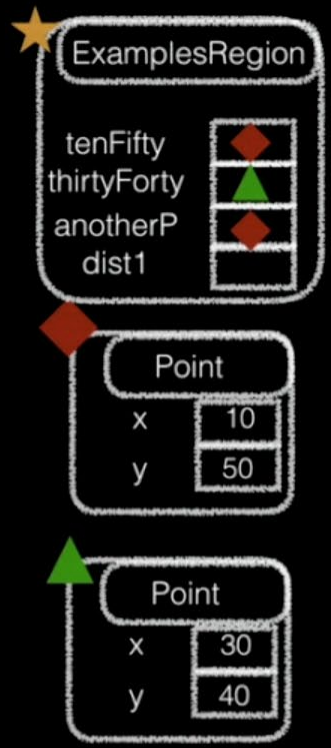
```
class Point {
  int x;
  int y;
  Point(int x, int y) {
    this.x = x;
    this.y = y;
  }
  double distance(Point other) {
    return Math.sqrt(Math.pow(this.x - other.x, 2)
      + Math.pow(this.y - other.y, 2));
  }
}
class ExamplesRegion {
  Point tenFifty = new Point(10, 50);
  Point thirtyForty = new Point(30, 40);

  double dist1 = this.tenFifty.distance(this.thirtyForty);
}
```



Which of these is the stack frame that's created for the call to distance?

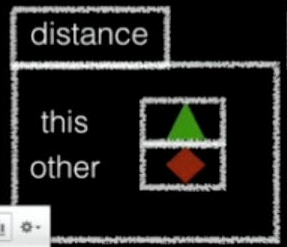


```
class Point {
  int x;
  int y;
  Point(int x, int y) {
    this.x = x;
    this.y = y;
  }
  double distance(Point other) {
    return Math.sqrt(Math.pow(this.x - other.x, 2)
      + Math.pow(this.y - other.y, 2));
  }
}
class ExamplesRegion {
  Point tenFifty = new Point(10, 50);
  Point thirtyForty = new Point(30, 40);
  Point anotherP = tenFifty;

  double dist1 = this.tenFifty.distance(this.anotherP);
}
```



Which of these is the stack frame that's created for the call to distance?

A



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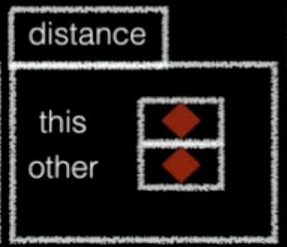

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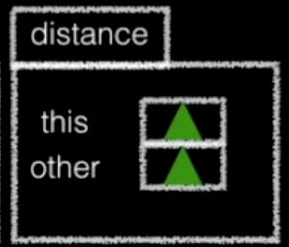

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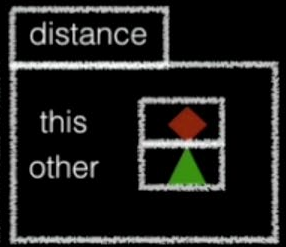


Constructors

- Now that we understand the Stack, we have what we need to understand constructors

```
class Point {
  int x;
  int y;
  Point(int x, int y) {
    this.x = x;
    this.y = y;
  }



}
class ExamplesRegion {
  Point tenFifty = new Point(10, 50);

}
```

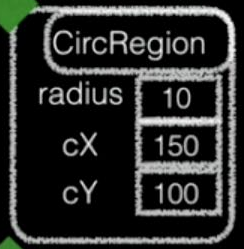
Constructor Summary

- Constructors:
  - Are special methods, called when **new** is used
  - Are passed the newly-constructor object as **this**, and any arguments
  - Typically assign values into fields using **this.field = value**
- When new is used:
  - A fresh object, with a new reference is created with uninitialized fields
  - The constructor with parameters that match the arguments is called
  - The whole new expression evaluates to the new reference

```
class CircRegion2 {
  int radius;
  int cX;
  int cY;
  CircRegion2(int radius, int cX, int cY) {
    this.radius = radius;
    this.cX = cX + 100;
    this.cY = cY;
  }
}
class ExamplesRegion {
  CircRegion2 cr2 = new CircRegion(10, 50, 100);

}
```

A



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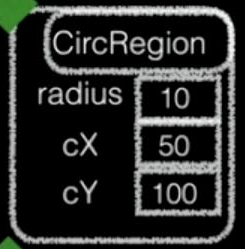

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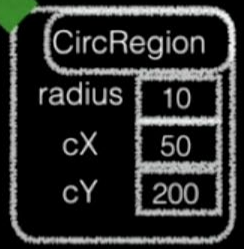

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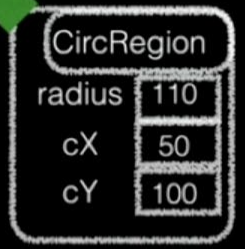
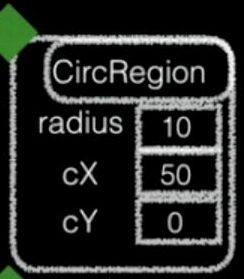


```
class CircRegion2 {
  int radius;
  int cX;
  int cY;
  CircRegion2(int radius) {
    this.radius = radius;
    this.cX = 0;
    this.cY = 0;
  }
}
class ExamplesRegion {
  CircRegion2 cr2 = new CircRegion(10);

}
```

A



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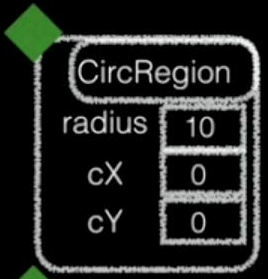

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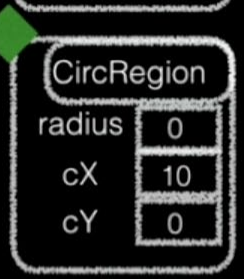

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