LEC 11

CSE 122

Encapsulation, Constructors, More Instance Methods

Questions during Class?

Raise hand or send here

sli.do #cse122

BEFORE WE START

Talk to your neighbors: Which is the best fruit?

Instructors Tristan Huber & Hunter Schafer

TAs

Ambika
Andrew
Audrey
Autumn
Ayush
Ben
Colton
Di
Eesha
Elizabeth

Evelyn
Jacob
Jaylyn
Jin
Joe
Kevin
Leon
Megana
Melissa
Mia

Poojitha
Rishi
Rucha
Shivani
Shreya
Steven
Suhani
Yijia
Ziao

Lecture Outline

- **Announcements** ◀
- Warm Up
- More Instance Methods
- Encapsulation
- Constructors

Announcements

- Reminder: Quiz 0 Retake and Quiz 1 grades coming soon

Lecture Outline

- Announcements
- **Warm Up** ◀
- More Instance Methods
- Encapsulation
- Constructors

Practice : Think

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What do p and p2 hold after the following code is executed?

```
Point p = new Point();
p.y = 10;
Point p2 = p;
p.x = 3;
p2.y = 100;
p = new Point();
p.y = -99;
```

A. p: (3, 10) p2: (3, 10)

B. p: (3, -99) p2: (3, 100)

C. p: (0, -99) p2: (3, 100)

D. p: (3, -99) p2: (0, 100)

E. p: (0, -99) p2: (3, 10)

Practice : Pair

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(Review) Client v. Implementor

We have been the *clients* of many objects this quarter!

Now we will become the *implementors* of our own objects!

Practice : Think

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What is the correct implementation of the `distanceFrom` instance method?

$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

(A)

```
public double distanceFrom() {
    double xTerm = Math.pow(x - x, 2);
    double yTerm = Math.pow(y - y, 2);
    return Math.sqrt(xTerm + yTerm);
}
```

(B)

```
public static double distanceFrom(Point otherPoint) {
    double xTerm = Math.pow(otherPoint.x - x, 2);
    double yTerm = Math.pow(otherPoint.y - y, 2);
    return Math.sqrt(xTerm + yTerm);
}
```

(C)

```
public double distanceFrom(Point otherPoint) {
    double xTerm = Math.pow(otherPoint.x - x, 2);
    double yTerm = Math.pow(otherPoint.y - y, 2);
    return Math.sqrt(xTerm + yTerm);
}
```

(D)

```
public double distanceFrom(int otherX, int otherY)
{
    double xTerm = Math.pow(otherX - x, 2);
    double yTerm = Math.pow(otherY - y, 2);
    return Math.sqrt(xTerm + yTerm);
}
```

Practice : Pair

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    return Math.sqrt(xTerm + yTerm);
}
```

(D)

```
public double distanceFrom(int otherX, int otherY)
{
    double xTerm = Math.pow(otherX - x, 2);
    double yTerm = Math.pow(otherY - y, 2);
    return Math.sqrt(xTerm + yTerm);
}
```

(PCM) toString

```
public String toString() {
    return "String representation of object";
}
```

The `toString()` method is automatically called whenever an object is treated like a `String`!

Why not write a `print()` method that prints out the String representation to the console?

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- **Encapsulation** ◀
- Constructors

(PCM) Encapsulation

Objects *encapsulate* state and expose behavior.

Encapsulation is hiding implementation details of an object from its clients.

Encapsulation provides *abstraction*.

(PCM) private

The `private` keyword is an *access modifier* (like `public`)

Fields declared `private` cannot be accessed by any code outside of the object.

We **always** want to encapsulate our objects’ fields by declaring them `private`.

Accessors and Mutators

Declaring fields as private removes all access from the user.

If we want to give some back, we can define instance methods.

Accessors ("getters")	Mutators ("setters")
`getX()`	`setX(int newX)`
`getY()`	`setY(int newY)`
	`setLocation(int newX, int newY)`

(PCM) Encapsulation

Objects *encapsulate* state and expose behavior.

Encapsulation is hiding implementation details of an object from its clients.

Encapsulation provides *abstraction*.

Encapsulation also gives the implementor flexibility!

Encapsulation

While users can still access and modify our Point's fields with the instance methods we defined, *we have control of how they do so*.

Can only accept positive coordinate values

Can swap out our underlying implementation to use polar coordinates instead!

Lecture Outline

- Announcements
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- More Instance Methods
- Encapsulation
- **Constructors** ◀

Constructors

Constructors are called when we first create a new instance of a class.

```
Point p = new Point();
```

If we don’t write any constructors, Java provides one that takes no parameters and just sets each field to its default value.

Constructor Syntax

```
public Point(int initialX, int initialY) {
    x = initialX;
    y = initialY;
}
```

If we write *any* constructors, Java no longer provides one for us.

this keyword

The `this` keyword refers to the current object in a method or constructor.

You can use it to refer to an object's fields

`this.x`, `this.y`

You can use it to refer to an object's instance methods

```
this.instanceMethod(param1, param2, ...);
```

You can use it to call one constructor from another

```
this(0, 0)
```