Object-Oriented Programming

The Object-Oriented Paradigm

Outline

- Overview of Programming Paradigms
- Basic Concepts of OOP

Looking back...

- Let's look back at what you've (hopefully) learned so far...

CCPROG1
Programming Basics and Logic

- Variables
- Functions
- Conditionals
- Loops

CCPROG2
Structured Data

- Arrays
- Strings
- Structures
- Files

CCPROG3
Object Orientation

- Objects
- Classes
- Relationships

Slides c/o Ms. Candy Espulgar

So… what do we understand when we hear the phrase **programming paradigm**?

Programming Paradigm

- Is a fundamental *style* of programming
- Answers the question…

  "How do I think about and solve a problem?"

- Programming paradigms are different from programming languages

Anyone care to differentiate the two?
Programming Paradigm vs Programming Language

Programming Paradigm

- Influences programming languages
- Serves as the philosophy behind a programming language
- Gives the rationale behind the programming language

Programming Language

- Is influenced by a programming paradigm
- Can be influenced by multiple paradigms
- Need not apply all the “philosophies” of the paradigms that influences it

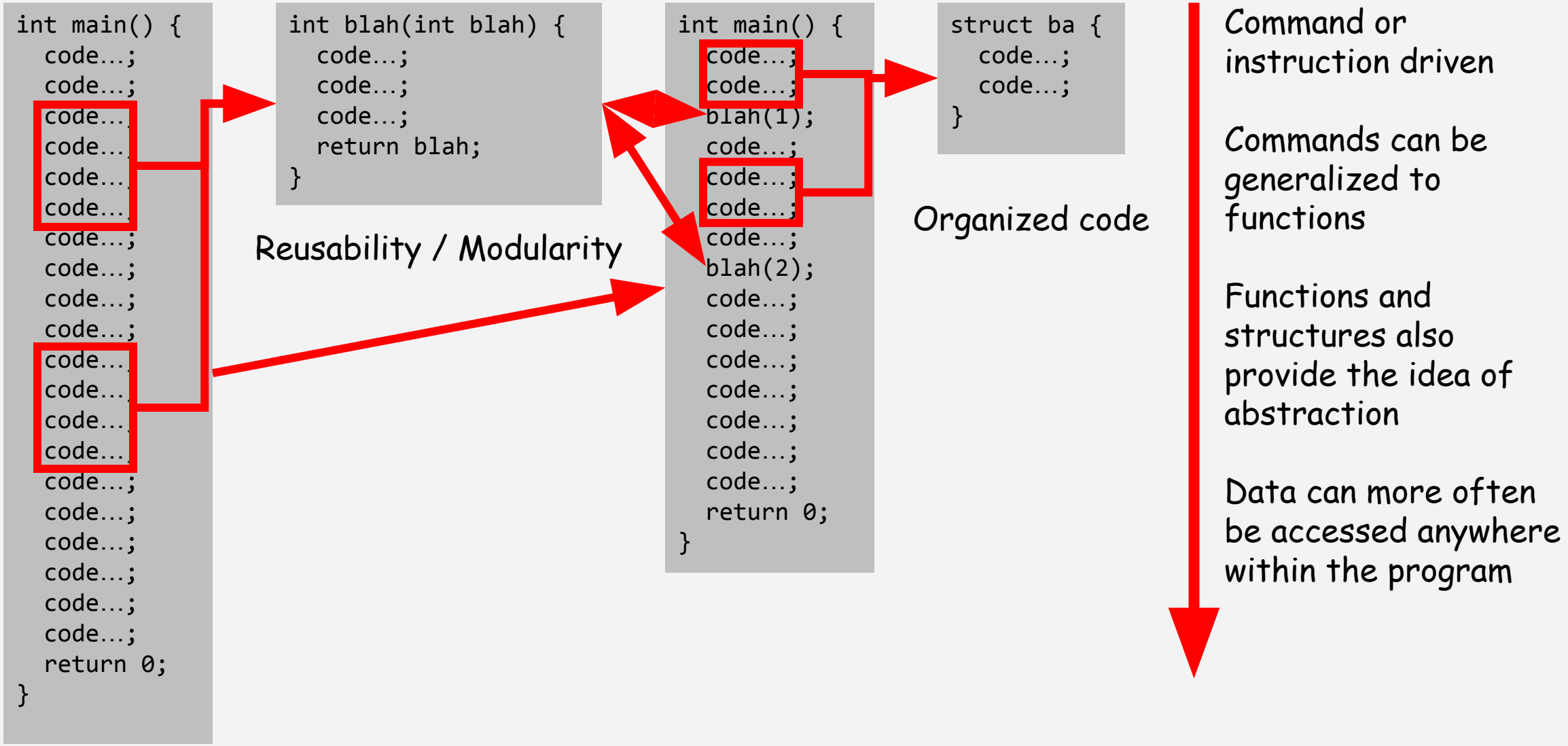
What are some **examples** of programming paradigms?

Programming paradigms

- Some examples of programming paradigms include:
  - Procedural Programming
  - Functional Programming
  - Object-Oriented Programming
  - Logical Programming

What’s your understanding of **procedural programming**?

Procedural Programming



What about **object-oriented programming**?

Object-Oriented Programming

I'm a square!
☺️

What characteristics would a typical square have?

-sideLength
-area

What might you want a square to do?

+getSideLength()
+setSideLength()
+getArea()

Main Code

```
Square square = new Square(5);
square.setSideLength(4)
square.getArea() // returns 16
```

What's happening?

```
public class Square {
  private int sideLength;
  private int area;

  public Square(int sideLength) {
    this.sideLength = sideLength;
    this.area = sideLength * sideLength;
  }

  public int getSideLength() {
    return this.SideLength;
  }

  // and so on...
}
```

Object-Oriented Programming

- Real-world objects are treated as entities that…
  - can be composed of variables (attributes), and
  - can perform some action (methods)
- Allows for objects to interact with each other within an environment
- Highly encourages generalization and abstraction

Object-Oriented Programming

- Provides for more complex programming features
  - Granting you greater control over…
    - how data is stored or grouped,
    - how processes are executed, and
    - where each process originates from
- With more complexity comes more responsibilities
  - Greater effort is expected from the programmer

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Object-Oriented Programming

- Keep in mind, OOP isn't entirely new – there are just new ways to view creating solutions
- More complex programming concepts are built on top of simpler programming concepts

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Object-Oriented Programming

- However, don’t be afraid!
- The added complexity allows for the simulation of more complex systems
- Also allows for the solving of large scale problems through representations, behaviors, and relationships

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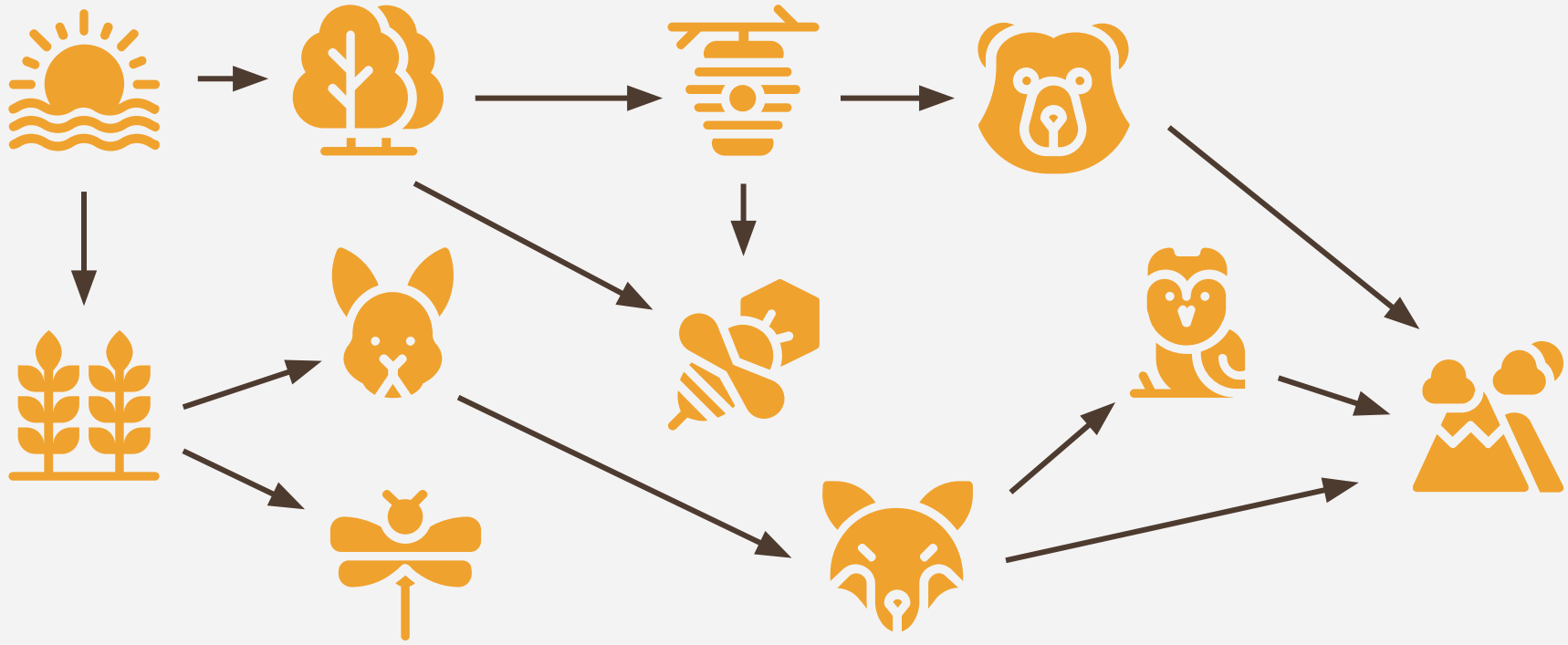
Object-Oriented Programming

Modelling complex relationships become possible



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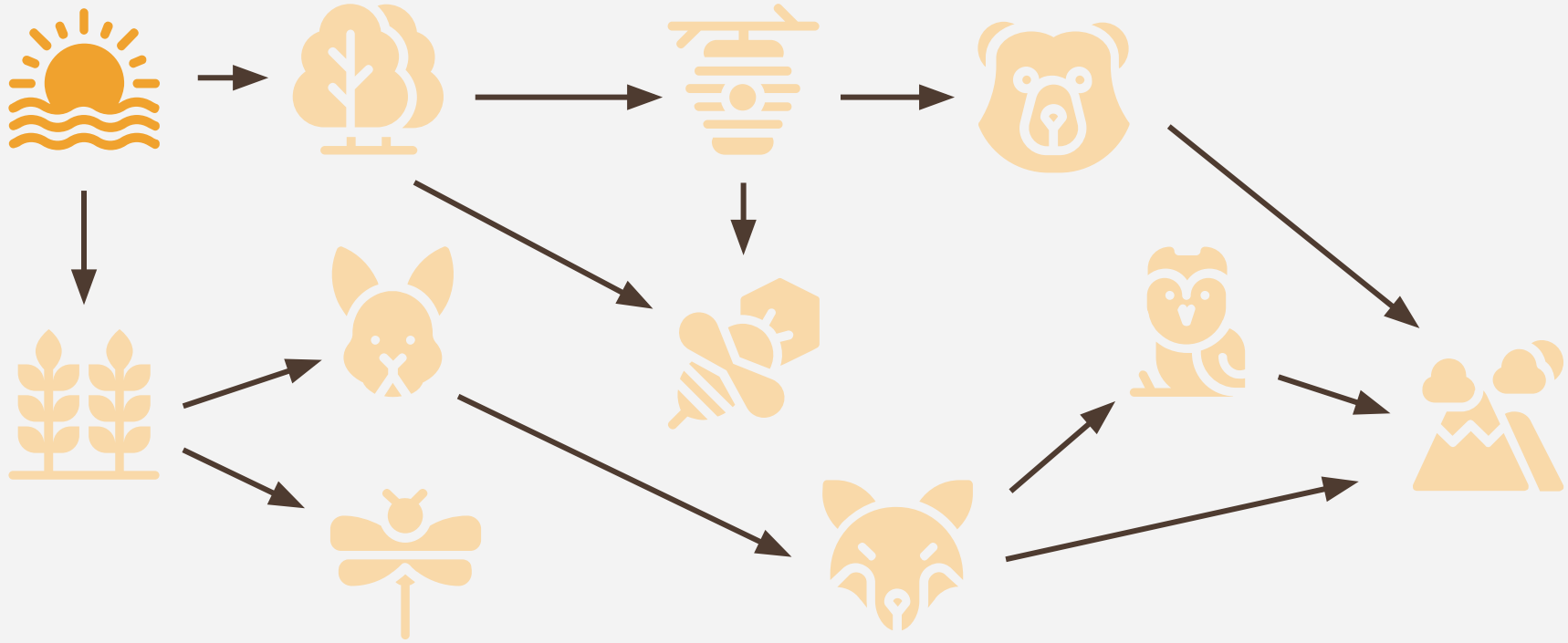
Object-Oriented Programming

Modelling complex relationships become possible

SUN

If a Plant feeds on my Sunlight, it will `grow()`



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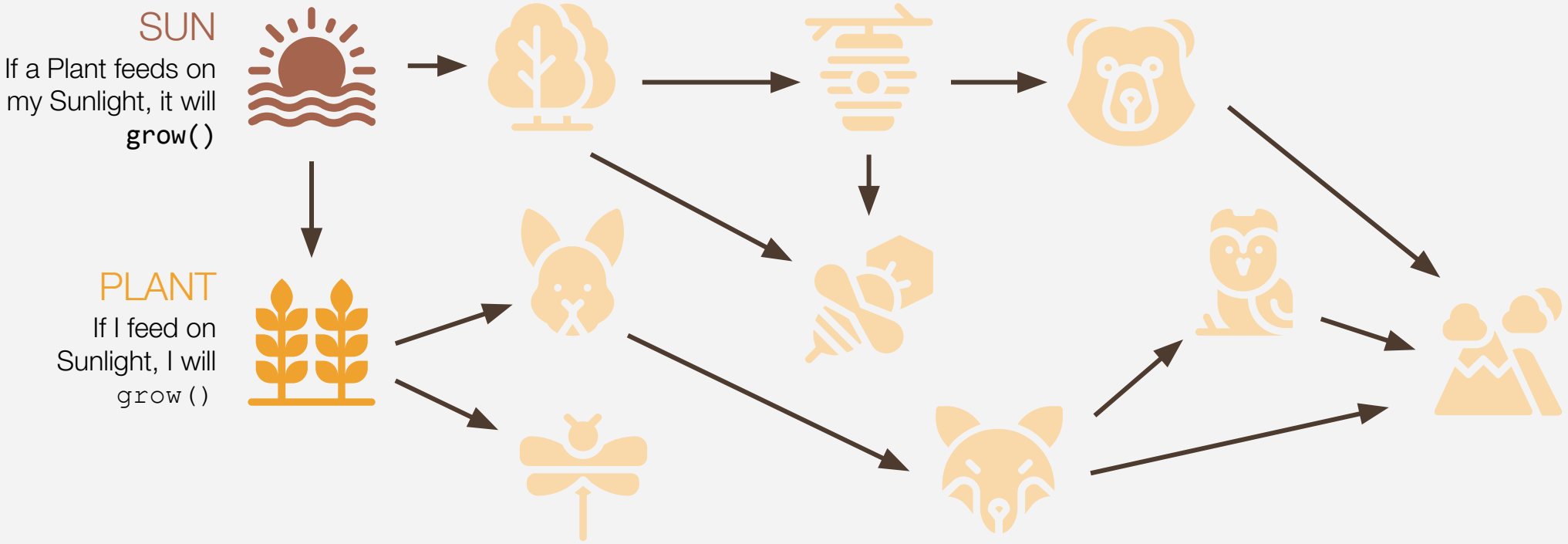
Object-Oriented Programming

Modelling complex relationships become possible



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If we imagine a Plant
can feed on Sunlight
and grow

Then we could design an OO solution such that…

```
Plant plant = new Plant();
Sunlight sunlight = new Sunlight();
plant.feed(sunlight);
```

Where the method feed affects the Plant object in some manner

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Object-Oriented Programming

- Classes
  - Is a template or blueprint from which instances of objects may be created (via a process called instantiation)
- Objects
  - Each object is an instance of a class (i.e. distinct)
  - Has its own copy of attributes (i.e. the actual values)
  - Can act in the way the class was designed

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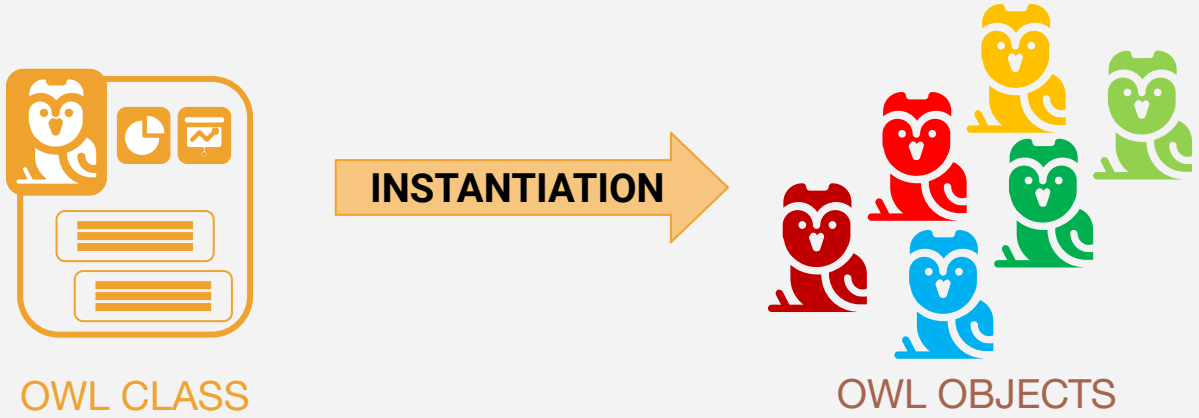
Object-Oriented Programming



We'll discuss more on these concepts when we officially tackle Classes and Objects

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Any questions so far?

In your own words, how would you **differentiate** procedural from OO programming?

Summary

- A programming paradigm is a style or philosophy of programming
- The Object-Oriented Paradigm…
  - Encourages for the modeling of real-world objects
  - Provides more complex programming features, which entails that OO solutions can…
    - Better model complex systems
    - Be more complex to build

Summary

- Objects…
  - have characteristics (attributes) and can perform actions (methods)
  - Are distinct from other objects and are based on classes, which act like templates

Next meeting

- Overview of Java
  - Expect coding exercises

Keep learning…