CSCI 136:
Data Structures
and
Advanced Programming

Lecture 3

Classes, Objects, and Nim

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Williams

Announcements

Code review time change:
Tuesdays now 10:30-11:30am

No class on Friday (Winter Carnival)

Prof. Jannen lectures on Monday

Outline

1. Happy/Sad cards
2. Quiz
3. Scanner
4. Classes and Objects
5. Nim

Quiz

Input

1. ~~Static input (constants)~~
2. Dynamic input
   1. ~~`args`~~
   2. **`scanner`**
3. ~~Type conversion~~
4. Handling unexpected inputs

Scanner

Program state

State is the complete set of program variables and their values at a given time.

```
int add() {
 int x = 10;
 int y = 20;
 return x + y;
}
```

The state of this program is stored in the variables `x` and `y`.

Classes and objects

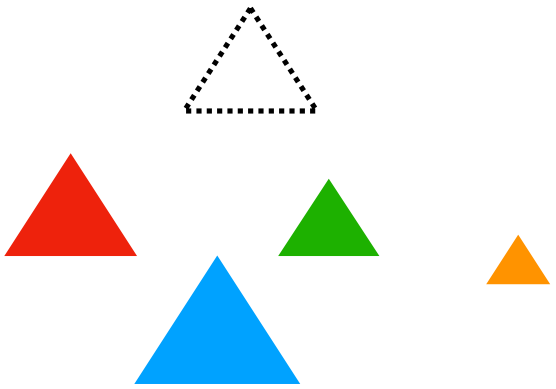
Classes

A **class** is a form of **data abstraction**. The purpose of a class is to separate the details that are important to the programmer (the **interface**) from the details that are important to the computer (the **implementation**). *Classes are a key building block in designing data structures.*

Another way to think about a **class** is that it is a convenient receptacle for **state**.

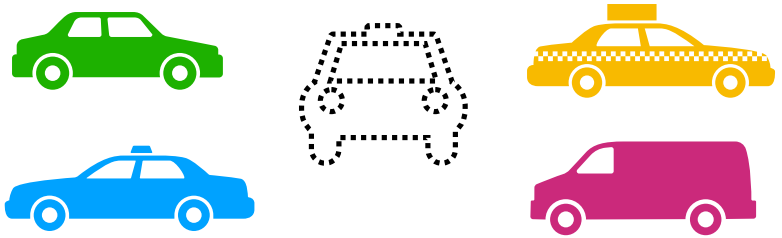
Classes are prototypes.

Objects are copies ("instances").



"Car" is a prototype.

There are many instances of cars.

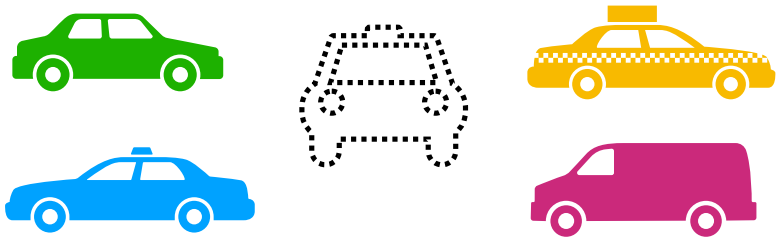


All cars have the same interface.

(wheels, doors, steering wheel, etc.)

"Car" is a prototype.

There are many instances of cars.



But most cars vary in the details

(wheels, doors, steering wheel, etc.)

```
public static void main(String[] args) {
    System.out.println("Pay attention!");
}
```

Methods are functions that are tied to either:

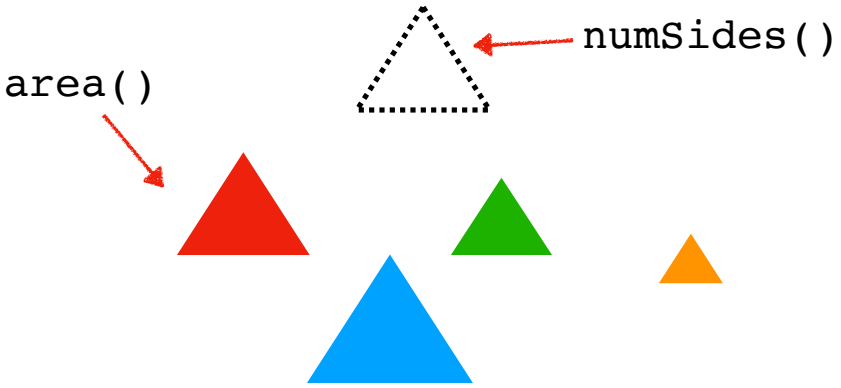
1. a class, or
2. an instance of a class (an object).

static method

instance method

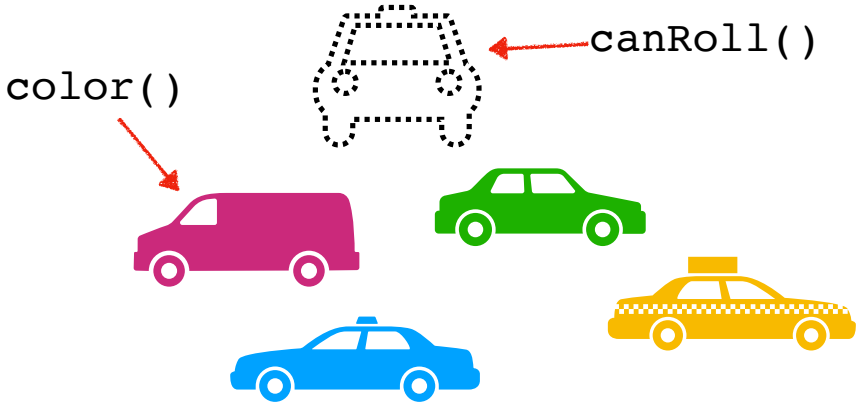
`static` methods are "attached" to class.

instance methods are "attached" to object.



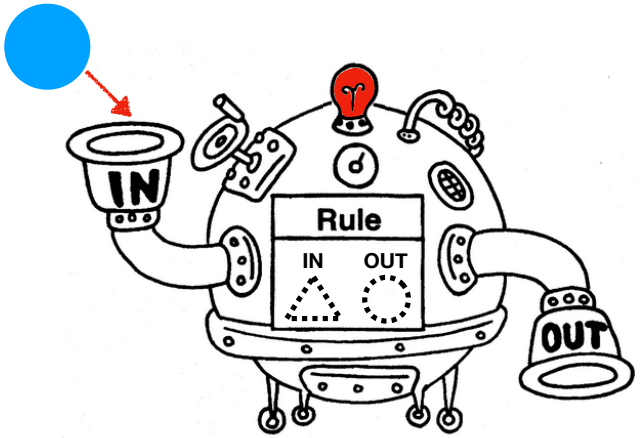
`static` methods are "attached" to class.

instance methods are "attached" to object.



A class also defines a type.

Using object incorrectly yields a type error.



Nim

- Game starts with **random** piles.
- Each player removes **one or more** objects from **ONE** pile.
- The last player to remove the **last object wins**.

Recap & Next Week

Today we learned:

- Input/output
  - Scanner
- Scanner
- More Program Design
- Classes

Next class:

- More Program Design