Classes in Python

You can get a **long way** with Python's **builtin** types.

But when they're **not right** for the job, you can use classes to create **custom** types.

Structure and Behavior

Classes define the **structure** and **behavior** of objects.

An object's **class** controls its **initialization**.

Classes are a Tool

Classes make **complex** problems **tractable**.

Classes can make **simple** solutions overly **complex**.

Python lets you find the right balance

`class`

used to define new classes

By convention, class names use

`CamelCase`

Methods

Method – A function defined within a class

Instance methods – functions which can be called on objects

`self` – the first argument to all instance methods

`__init__()`

instance method for initializing new objects

Initialization

`__init__()` is an **initializer**, not a **constructor**.

`self` is similar to `this` in C++ or Java.

Why `_number`?

1. Avoid name clash with `number()`

2. By convention, implementation details start with underscore

Public!

Private!

Protected!

We’re all consenting adults here.

Class Invariants

Truths about an object that **endure** for its **lifetime**.

seat letters

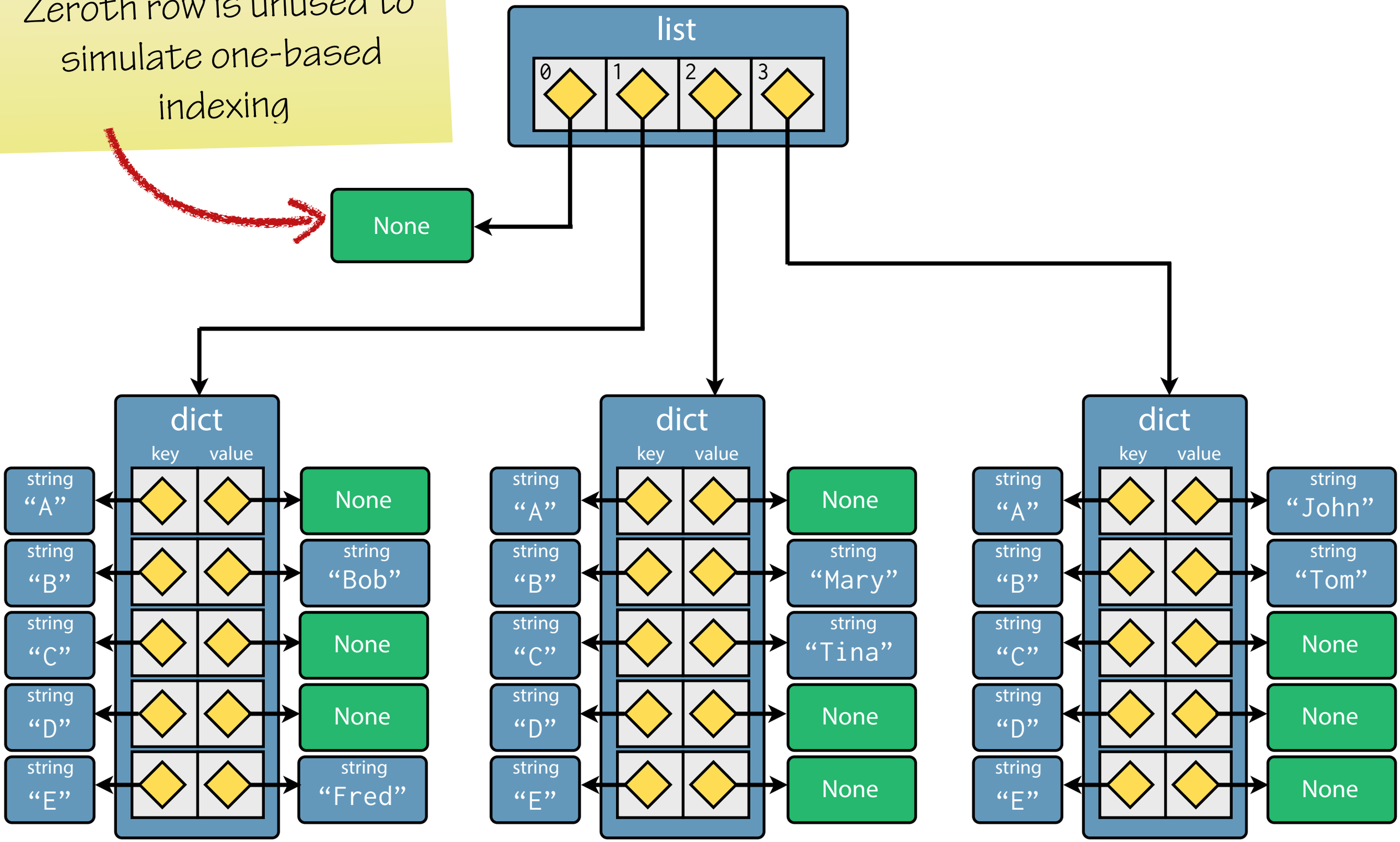
	A	B	C	D	E	F	G	H	J
1									
2									
3									
4									
5									
6									

rows

Seat letter I omitted to avoid confusion with 1

Seating Data Structure

Zeroth row is unused to simulate one-based indexing



```
rows, seats = self._aircraft.seating_plan()
self._seating = [None] + [ {letter:None for letter in seats} for _ in rows ]
```

Unpack seating plan

```
rows, seats = self._aircraft.seating_plan()
self._seating = [None] + [ {letter:None for letter in seats} for _ in rows ]
```

```
rows, seats = self._aircraft.seating_plan()
self._seating = [None] + [ {letter:None for letter in seats} for _ in rows ]
```


Use first entry to account for offset

```
rows, seats = self._aircraft.seating_plan()
self._seating = [None] + [ {letter:None for letter in seats} for _ in rows ]
```

One entry for each row in the aircraft

```
rows, seats = self._aircraft.seating_plan()
self._seating = [None] + [ {letter:None for letter in seats} for _ in rows ]
```

Discard the row numbers

```
rows, seats = self._aircraft.seating_plan()
self._seating = [None] + [ {letter:None for letter in seats} for _ in rows ]
```

Dictionary comprehensions

```
rows, seats = self._aircraft.seating_plan()
self._seating = [None] + [ {letter:None for letter in seats} for _ in rows ]
```

New requirement:

Boarding card printer

Don't feel compelled to create classes without good reason.

Tell! Don’t ask.

Tell objects what to do.

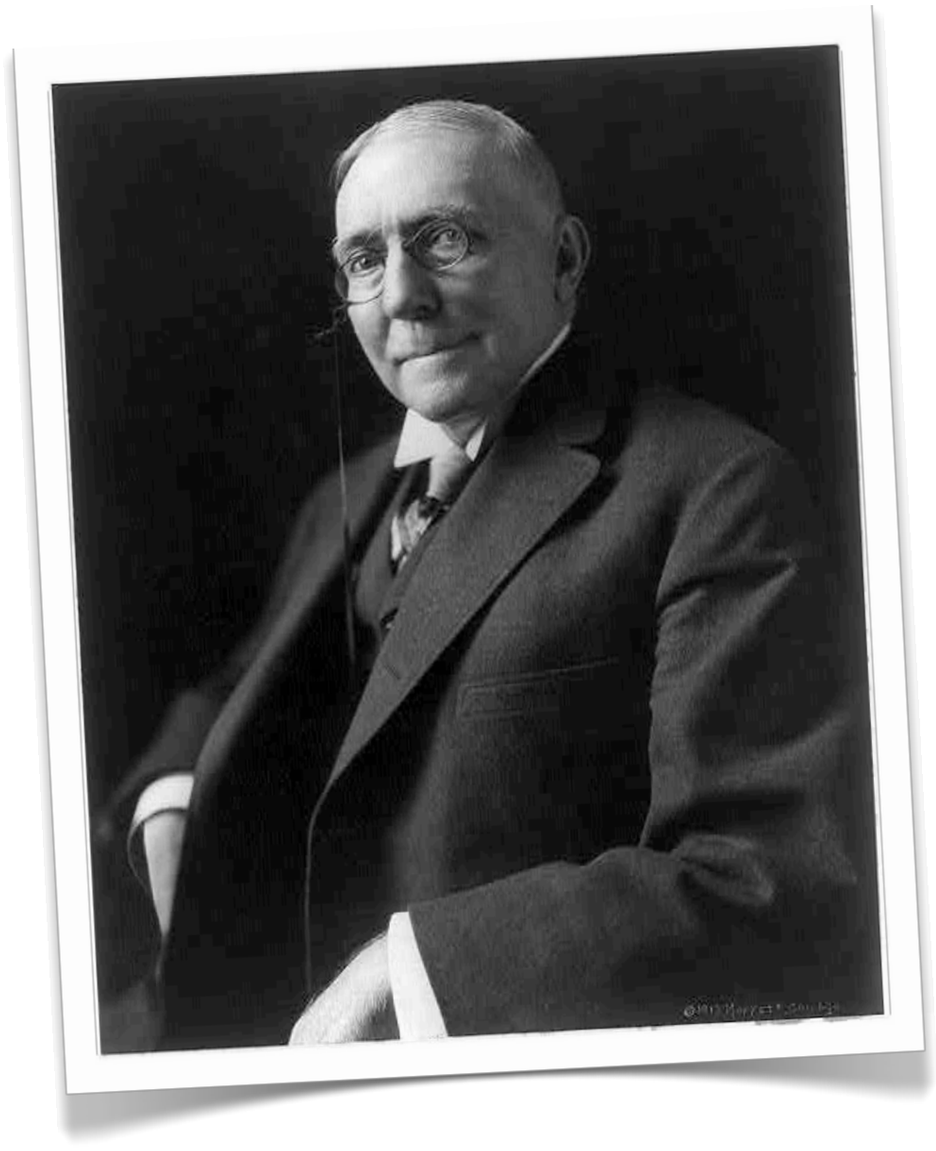
Don't ask for their state.

Polymorphism

Using objects of different types through a common interface.

Duck Typing

"When I see a bird that walks like a duck and swims like a duck and quacks like a duck, I call that bird a duck."



- James Whitcomb Riley

An objects fitness for purpose is determined at the time of use .

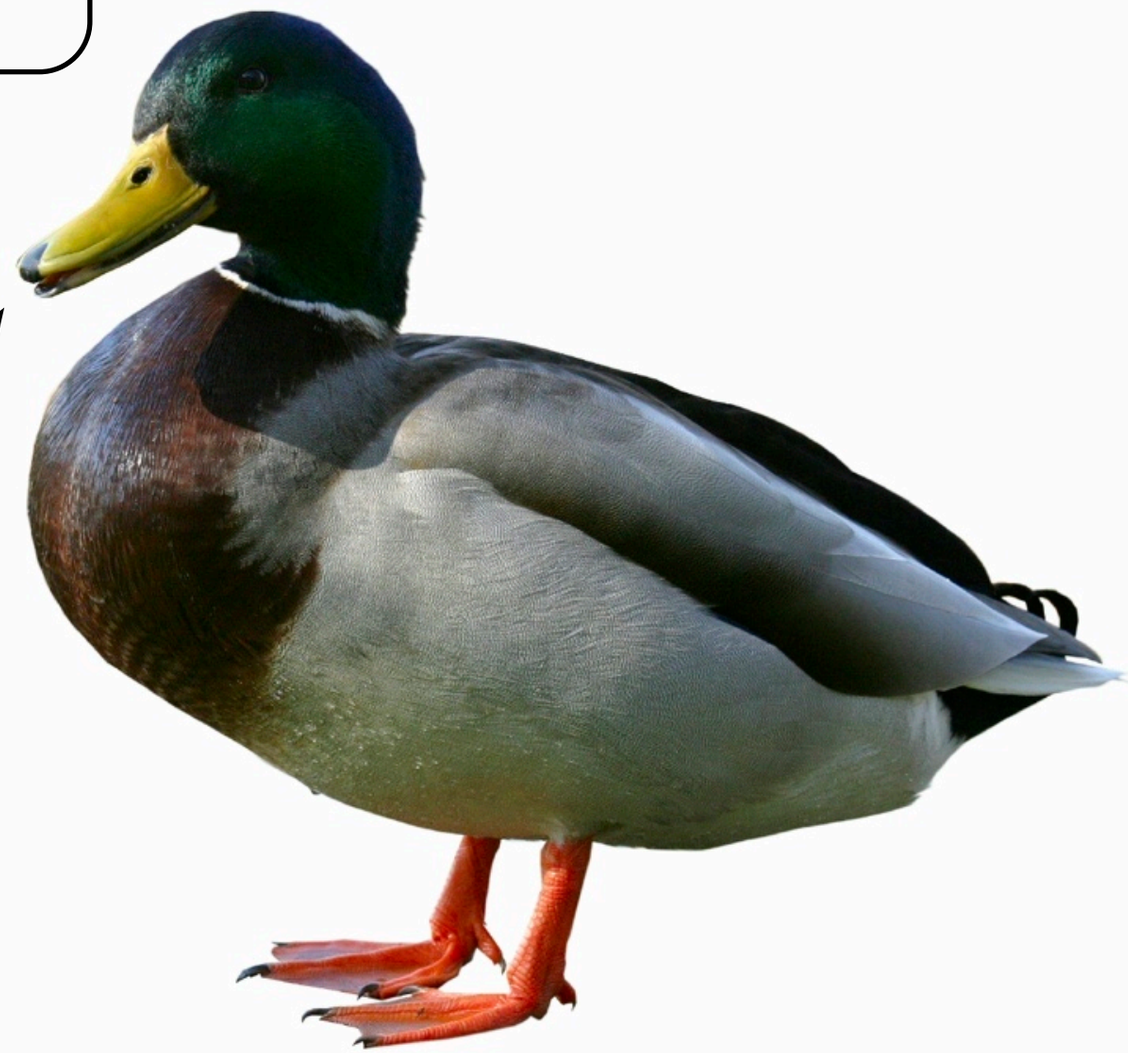
Inheritance

A sub-class can **derive** from a base-class, **inheriting** its behavior and making behavior **specific** to the sub-class.

In Python inheritance is most useful for sharing implementation.

Loose coupling is great!

wink-wink, nudge-nudge



Classes Summary

- **All types in Python have a 'class'**
- **Classes define the structure and behavior of an object**
- **Class is determined when object is created**
  - normally fixed for the lifetime
- **Classes are the key support for Object-Oriented Programming in Python**
- **Classes defined using the `class` keyword followed by CamelCase name**
- **Class instances created by calling the class as if it were a function**
- **Instance methods are functions defined inside the class**
  - Should accept an object instance called `self` as the first parameter
- **Methods are called using `instance.method()`**
  - Syntactic sugar for passing `self` instance to method
- **The optional `__init__()` method initialized new instances**
  - If present, the constructor calls `__init__()`
  - `__init__()` is not the constructor
- **Arguments passed to the constructor are forwarded to the initializer**

Classes Summary

- **Instance attributes are created simply by assigning to them**
- **Implementation details are denoted by a leading underscore**
  - There are no public, protected or private access modifiers in Python
- **Accessing implementation details can be very useful**
  - Especially during development and debugging
- **Class invariants should be established in the initializer**
  - If the invariants can't be established raise exceptions to signal failure
- **Methods can have docstrings, just like regular functions**
- **Classes can have docstrings**
- **Even within an object method calls must be preceded with `self`**
- **You can have as many classes and functions in a module as you wish**
  - Related classes and global functions are usually grouped together this way
- **Polymorphism in Python is achieved through duck typing**
- **Polymorphism in Python does not use shared base classes or interfaces**
- **Class inheritance is primarily useful for sharing implementation**
- **All methods are inherited, including special methods like the initializer**

Exception Handling – Summary

- Strings support slicing, because they implement the *sequence* protocol
- Following the Law of Demeter can reduce coupling
- We can nest comprehensions
- It can sometimes be useful to discard the current item in a comprehension
- When dealing with one-based collections it's often easier just to waste one list entry.
- Don't feel compelled to use classes when a simple function will suffice
- Comprehensions or generator expression can be split over multiple lines
- Statements can be split over multiple lines using backslash
  - Use this feature sparingly and only when it improves readability
- Use “Tell! Don’t ask.” to avoid tight coupling between objects