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Lecture 21: Programming with Subclasses

CS 1110

Introduction to Computing Using Python

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Announcements

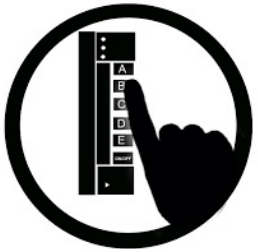
Put Me in the Zoo

- Develop classes: `Animal`, `Bird`, `Fish`, `Penguin`, `Parrot`
- Instances can **swim**, **fly**, and **speak** based on class membership
- Track:
  - # of animals created (Q1)
  - **name**, **tag #**, **weight** for each animal (w/default weights)
- Methods:
  - print words if animal speaks
  - animal eats: print eating sounds and gain 1 pound
- Read the skeleton `zoology.py`

Questions to ask

- What does the class hierarchy look like?
- What are class attributes? What are instance attributes? What are constants?
- What does the `__init__` function look like?
- How do we support default weights?
- How do we implement the methods?
- What does a "*stringified*" Animal look like? `str(a)`

Q1: What is the best way to keep track of the number of Animals that have been created?



A: a global variable that you increment each time you call the `Animal` constructor

B: a class attribute inside the `Animal` class that is incremented by the `Animal`'s `__init__` method

C: an instance attribute inside each `Animal` that is incremented by the `Animal`'s `__init__` method

D: A & B both work, but B is better

E: A & B & C all work, but C is best

Questions to ask

- What does the class hierarchy look like?
- What are class attributes? What are instance attributes? What are constants?
- What does the `__init__` function look like?
- How do we support default weights?
- How do we implement the methods?
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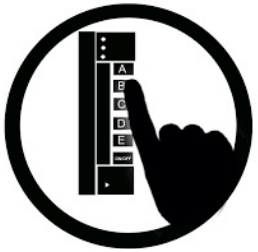
speak(words)



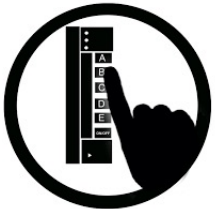
If `speak` is defined by the `Animal` class like this:

```
def speak(self, words):
    if self.CAN_SPEAK:
        print(words)
```

Q2: Which subclasses need to provide their own version of this method?

A: `Bird`, `Fish`, `Penguin`, and `Parrot`
B: `Bird` and `Parrot`
C: just `Parrot`
D: none
E: I don't know

If `eat` is defined by the `Animal` class like this:



```
def eat(self):
    print("NOM NOM NOM")
    self.weight += 1
```

Q3: We want `Fish` to say nothing and `Bird`s to make a pecking sound. Which subclasses need to provide their own version of this method?

A: `Bird`, `Fish`, `Penguin`, and `Parrot`
B: `Bird` and `Fish`
C: just `Bird`
D: just `Fish`
E: I don't know

Questions to ask

- What does the class hierarchy look like?
- What are class attributes? What are instance attributes? What are constants?
- What does the `__init__` function look like?
- How do we support default weights?
- How do we implement the methods?
- What does a "*stringified*" Animal look like? `str(a)`

After lecture

- Implement class `Penguin`
  - Penguins cannot fly but can swim
  - Let's say the default weight is 25 units
  - You decide what it sound it makes when it eats
- Experiment! It's the best way to learn
- *In lieu of pre-lecture reading for Thurs*, read, run, and experiment with module `zoo`, which sets up a `Zoo` and lets you interact with the animals. Check out how the module uses `Animal` and its subclasses