

CSCI 127: Joy and Beauty of Data

Lecture 13: OOP

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Snowmester 2020

<https://reese.github.io/classes/127/main.html>

Announcements

When I meet my instructor
on campus and they don't
speak on 2X speed

Lab 8 due **tomorrow** (Tuesday 11:59 PM)

- After today, you will be able to finish it

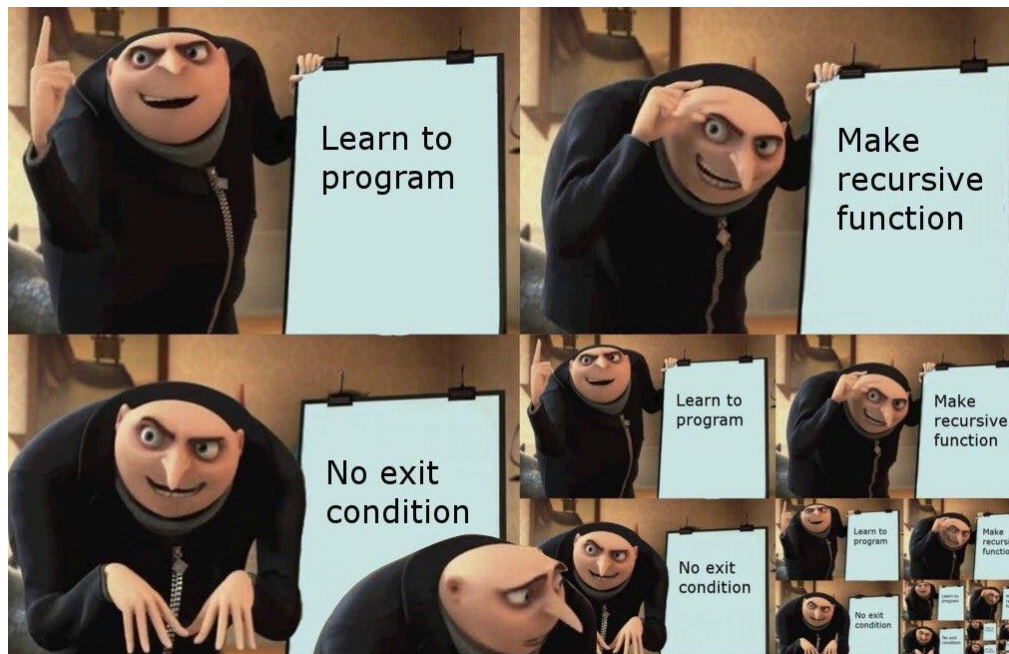
Program 4 due Tuesday Jan 5 @ 11:59 PM

- Hoping to have that posted tonight

No class on Thursday or Friday



Meme Credit: Kai



Object Oriented Programming

So far, we have used **procedural programming** to solve problems. We have written **functions** that do things

Now, we will talk about a different way to solve problems...

Object Oriented Programming (OOP) is a paradigm of solving problems using objects, which represent *something*

The objects we create usually have data (**states/attributes**) and behaviors (**methods**)

Object Oriented Programming Example

There are many different kinds of cars...



Object Oriented Programming Example

There are many different kinds of cars...

However, all cars share similar features



Object Oriented Programming Example

There are many different kinds of cars...

However, all cars share similar features

All cars have:

- A color
- Wheels
- Engine
- Windshield
- Windows
- Seating
- Lights

All cars can:

- Accelerate
- Slow down
- Stop
- Turn



Object Oriented Programming Example

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Attributes

All cars can:

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Functionality/Behavior

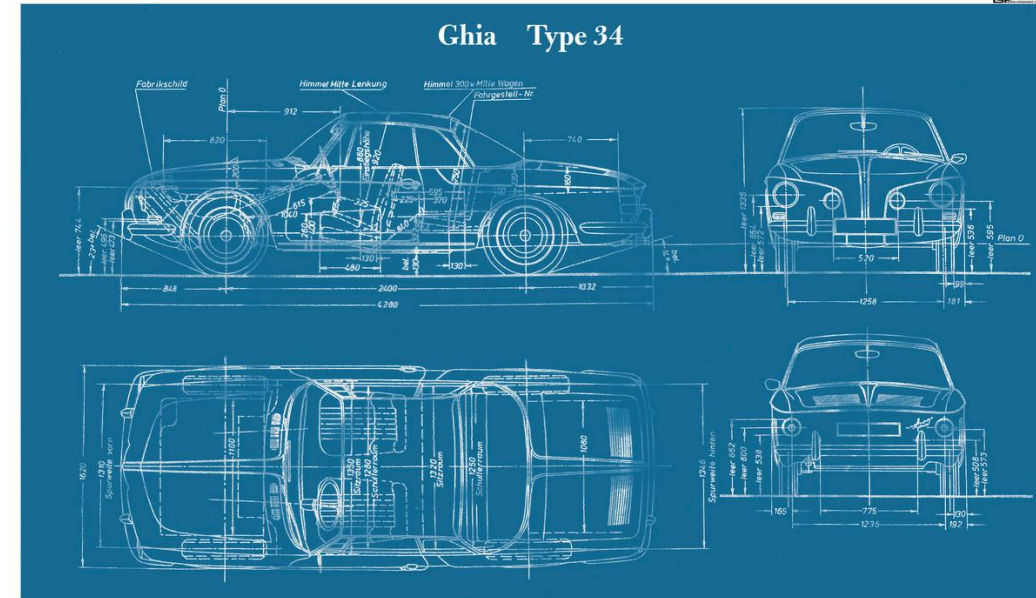


Object Oriented Programming Example

If we can create a **blueprint** for a generic car, then we can use that blueprint to create many different cars

When we create a car using that blue print, we can specify the different **attributes** (color, # of seats, speed, etc)

When we create a car, we give the car access to different kinds of **behavior** (accelerating, stopping, turning, etc)

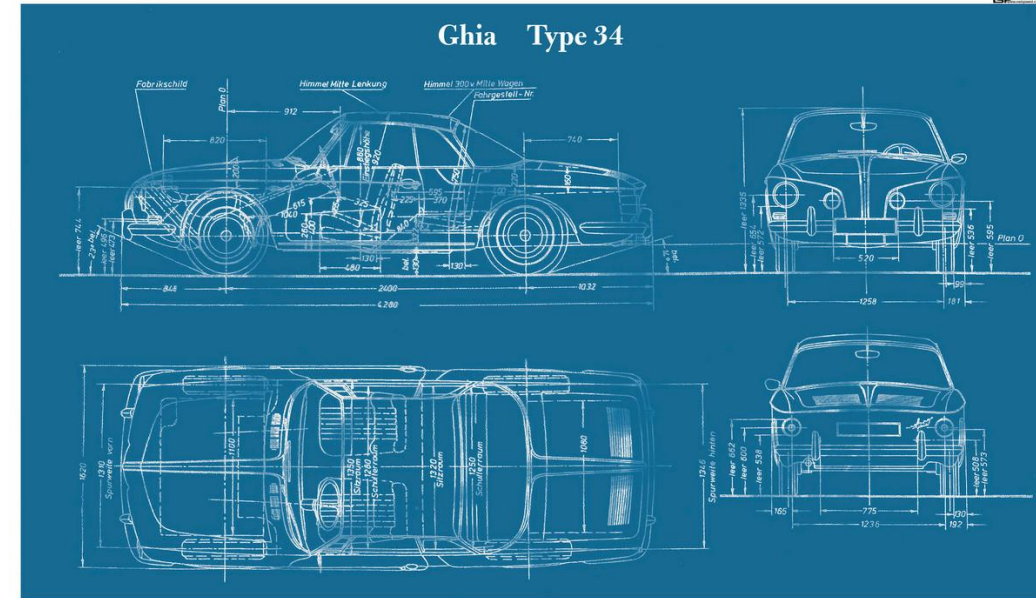


Object Oriented Programming Example

If we can create a **class** ~~blueprint~~ for a generic car, then we can use that ~~blueprint~~ **class** to create many different cars

When we create a car using that blue print, we can specify the different **attributes** (color, # of seats, speed, etc)

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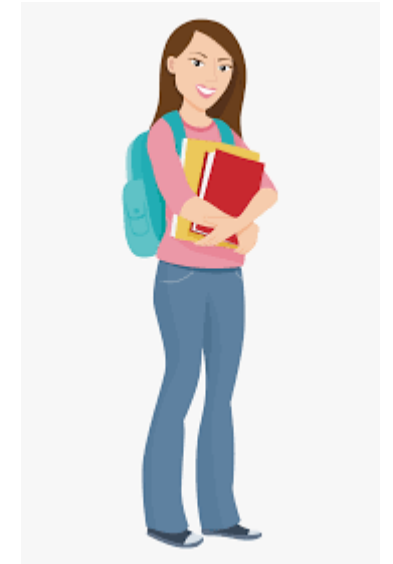
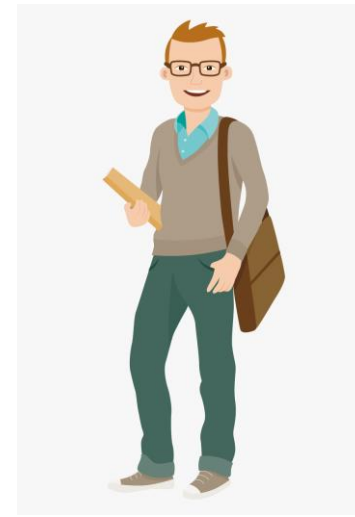
Student Example

Consider a college student at MSU...

What sort of attributes may a college student have?

- Name
- Major
- GPA
- Student ID Number
- Year (freshman, sophomore, junior, senior)

And much more



OOP in Python

Define classes using the **class** keyword

- All class names should be capitalized

All classes need a constructor. A constructor is the method that will create the object

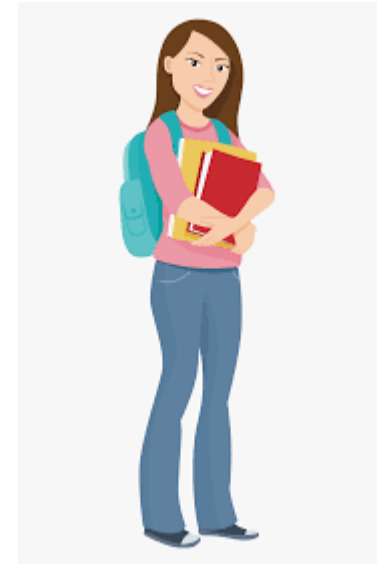
- Constructor will **always** be:

```
def __init__(<insert parameters here>):
```

All methods need to go inside of the class

Reader methods: getName(), getMajor(), etc

Writer methods: setName(), setMajor(), etc



Announcements

Lab 8 due **tonight** (Tuesday 11:59 PM)

Program 4 due Tuesday Jan 5 @ 11:59 PM

No class on Thursday or Friday

Today:
More OOP

When you're the number 1 student in the class but your Python Professor says only the top student in the class gets an A



meme made by reese

OOP Review

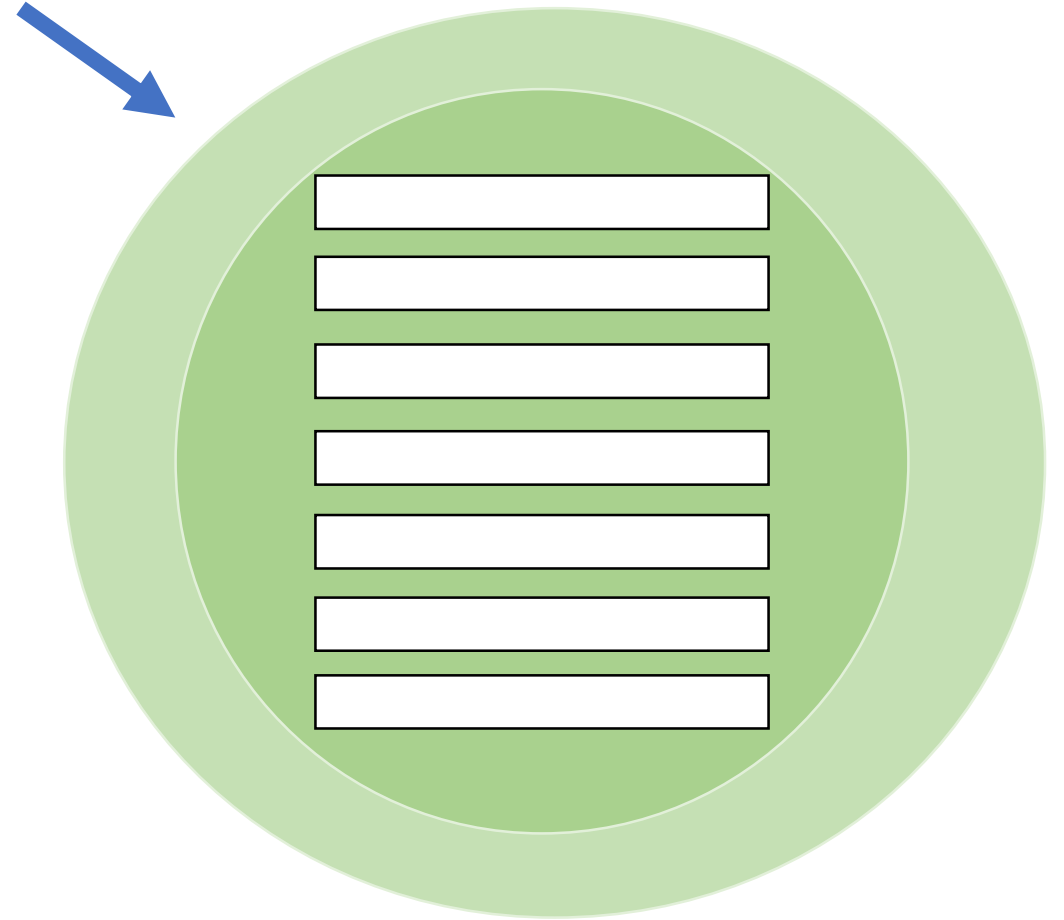
student1

We create and use objects using **classes**

```
student1 = Student("James","Computer Science","04293401",4.0,"Junior")
```

We start off in our **constructor**

```
def __init__(self,name,major,student_id,gpa="Undefined",year="Freshman"):  
    self.name = name  
    self.major = major  
    self.student_id = student_id  
    self.gpa = gpa  
    self.year = year  
    self.champ_change = 0  
    self.minor = "N/A"
```



OOP Review

student1

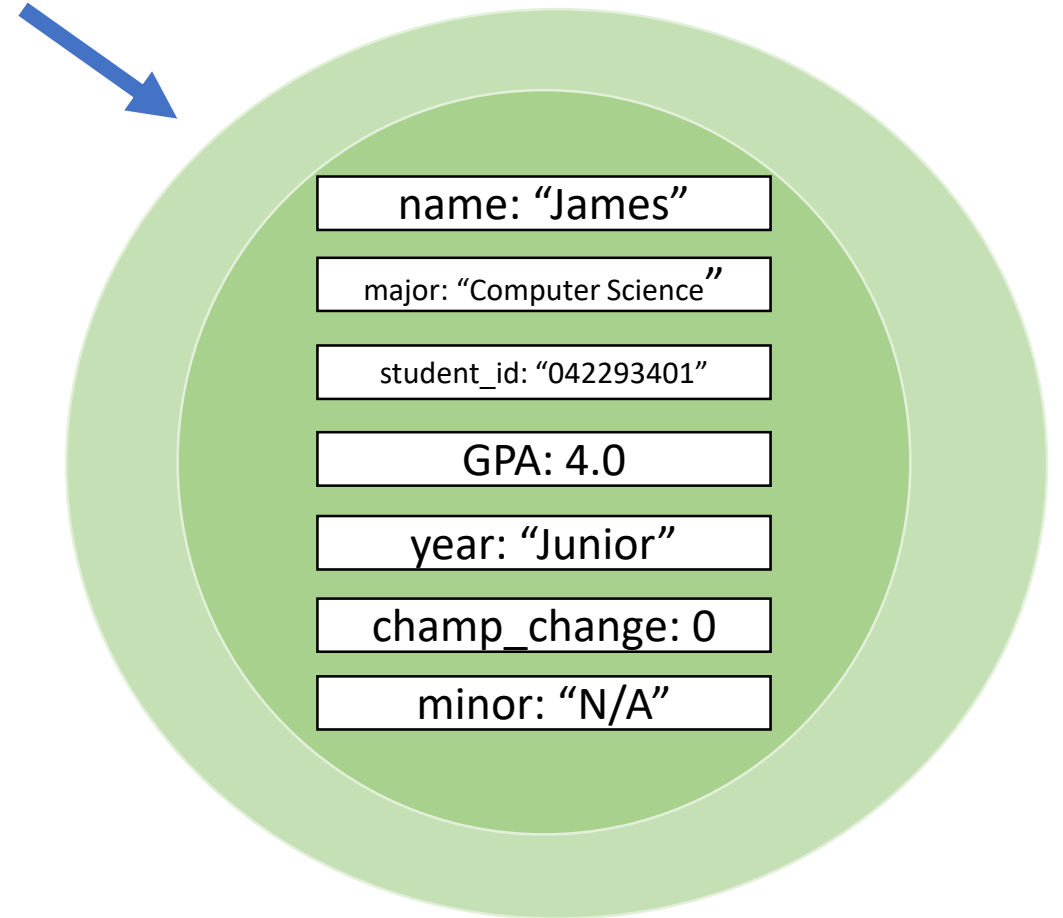
Student object

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OOP Review

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```

```
print(student1)
```



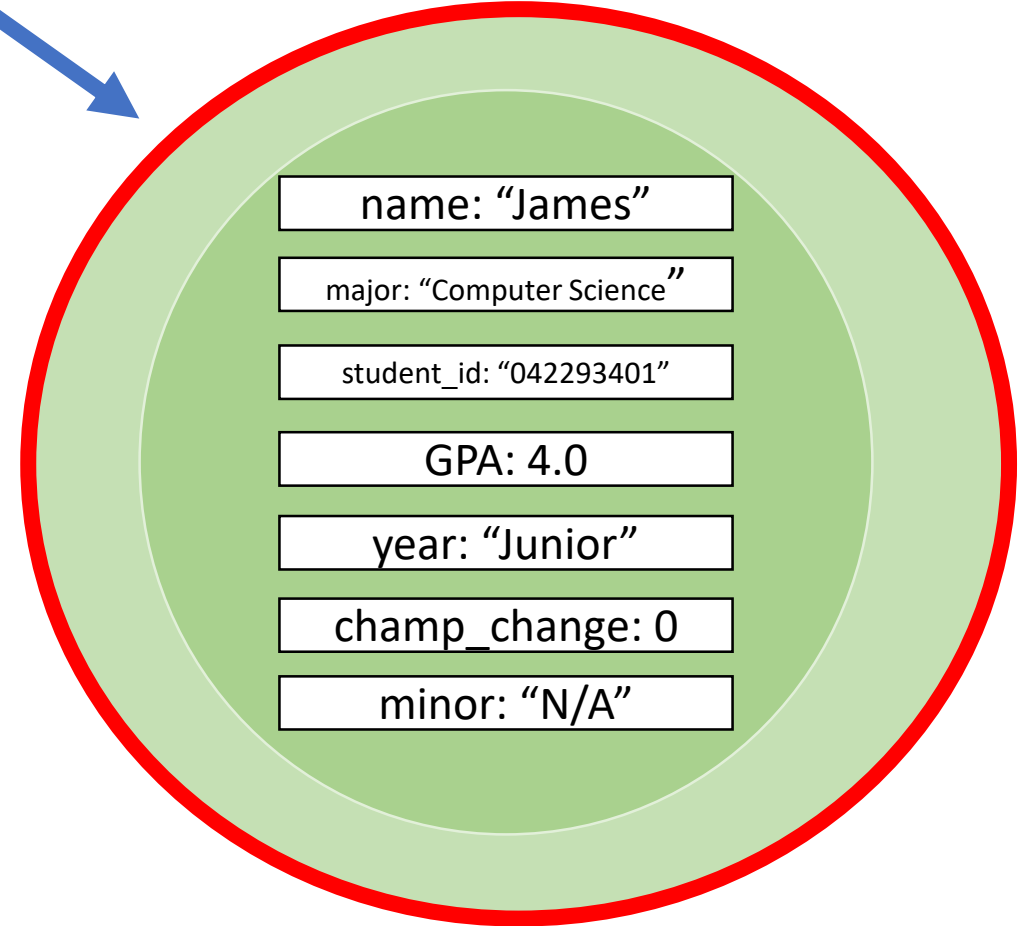
<__main__.Student object at 0x03242D78>

Object's Location in Memory

student1



Student object



OOP Review

We create and use objects using **classes**

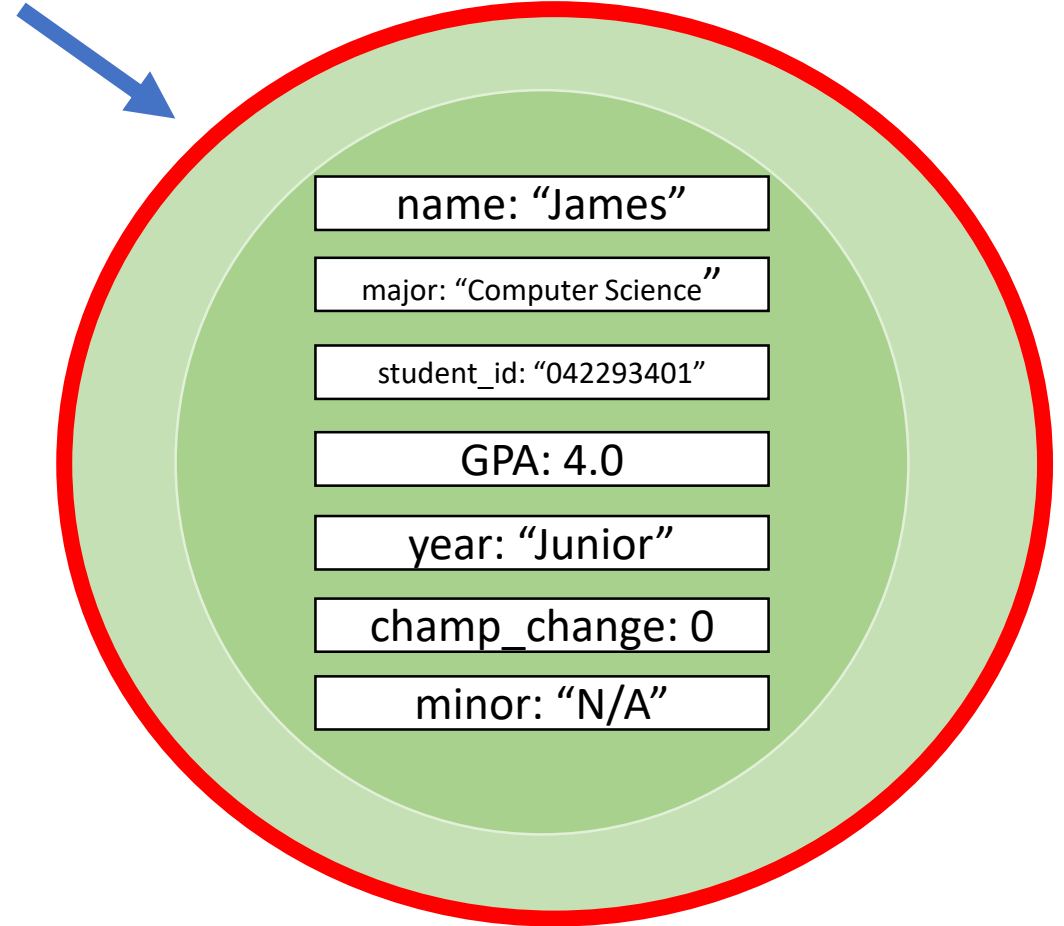
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```

student1

Student object



Solution:

Overwrite what gets printed out using the `__str__` method

```
print(student1)
```



```
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```

Object's Location in Memory

OOP Review

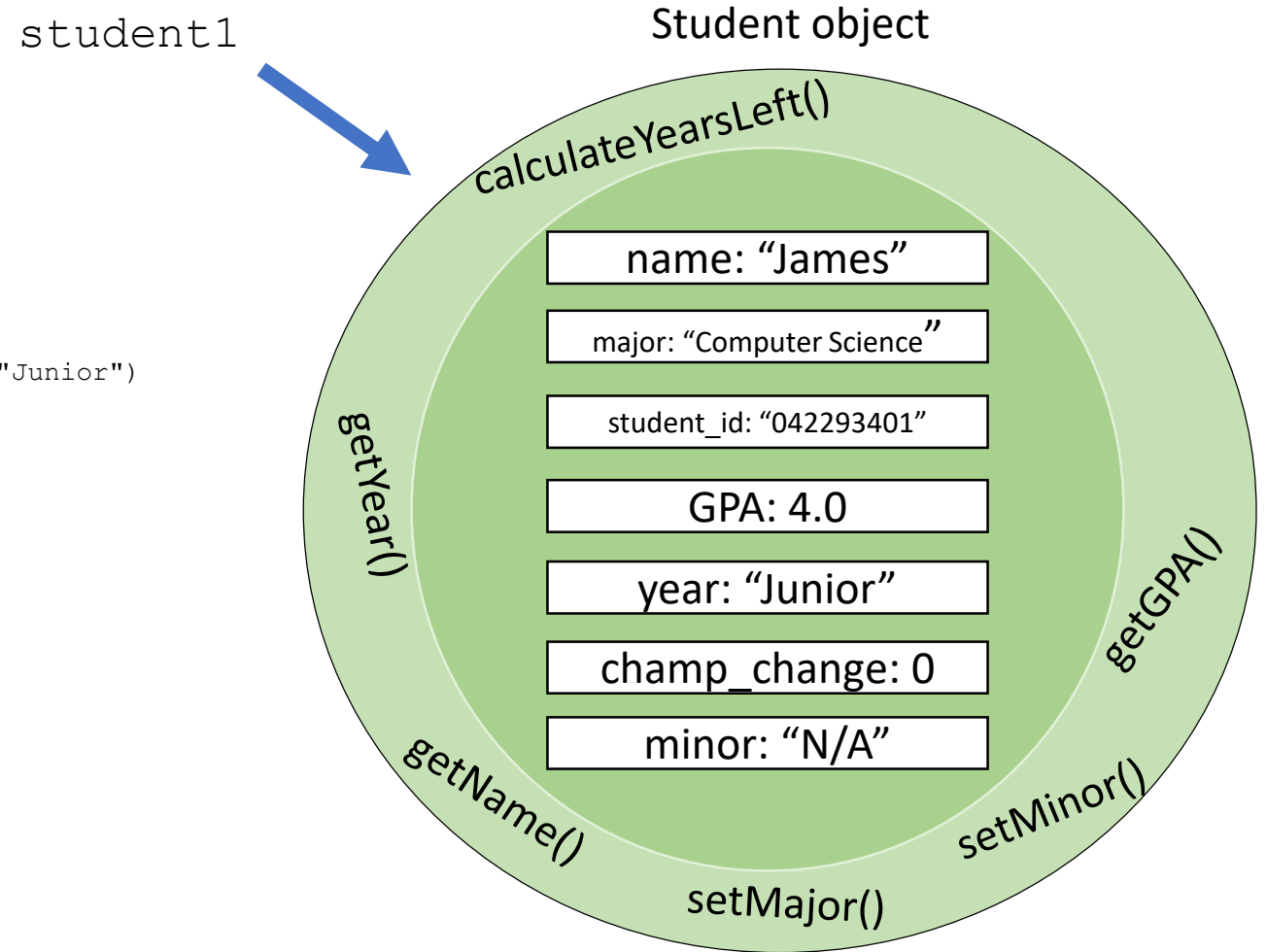
We create and use objects using **classes**

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student1 = Student("James", "Computer Science", "04293401", 4.0, "Junior")
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We start off in our **constructor**

Our objects also have functionality (**methods**)

```
print(student1.getName())
```



OOP Review

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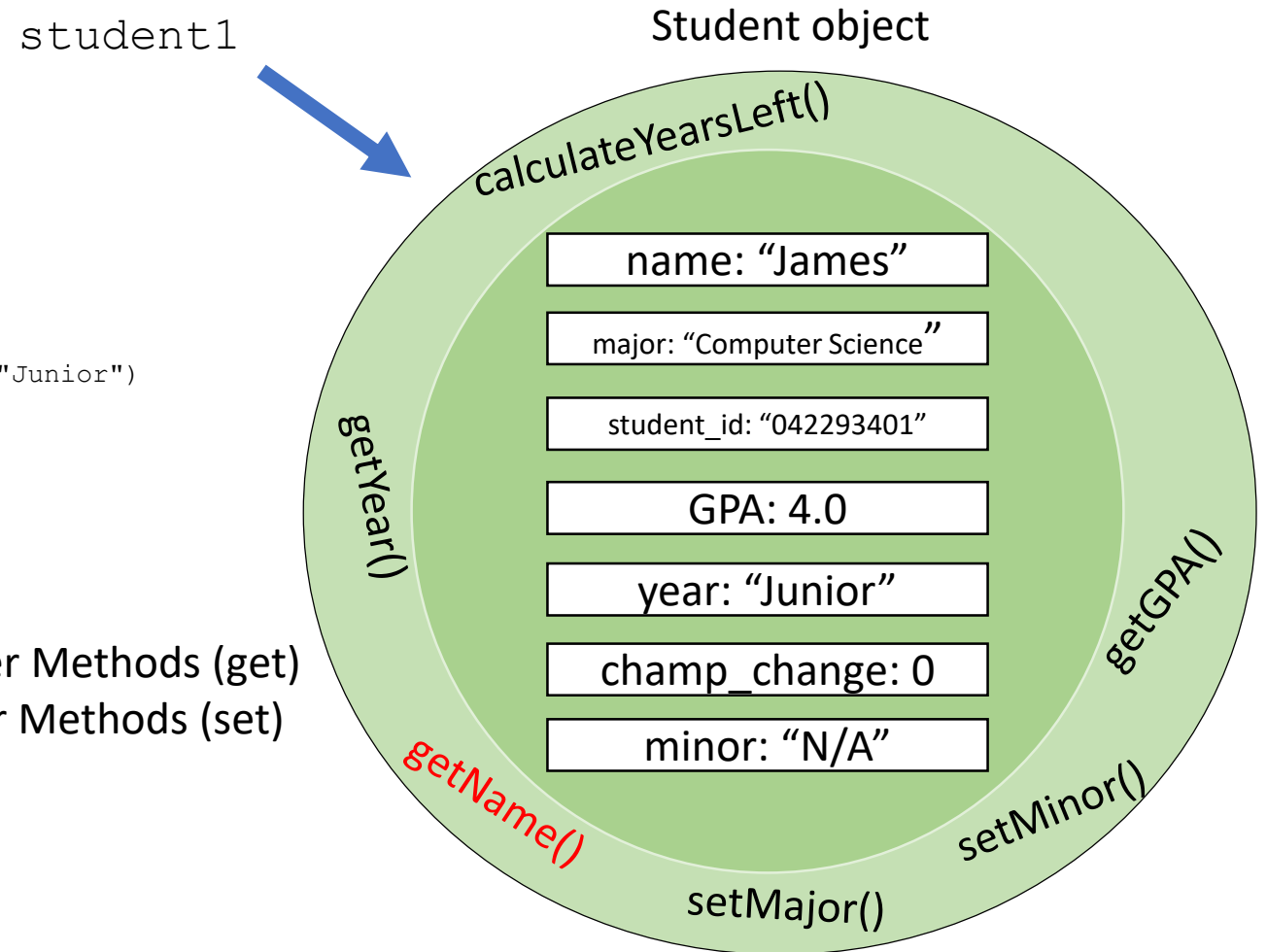
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OOP Review

We create and use objects using **classes**

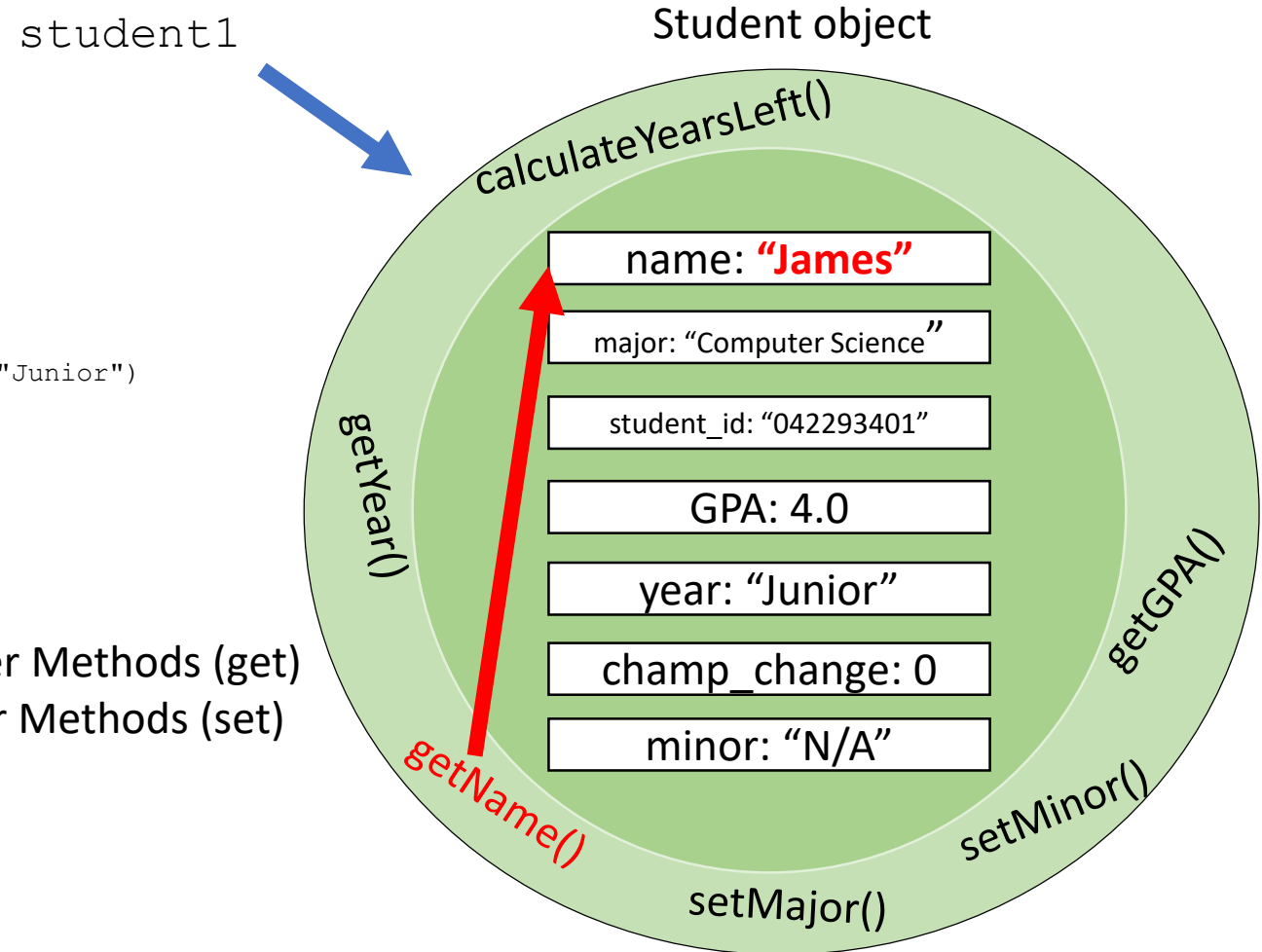
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OOP Review

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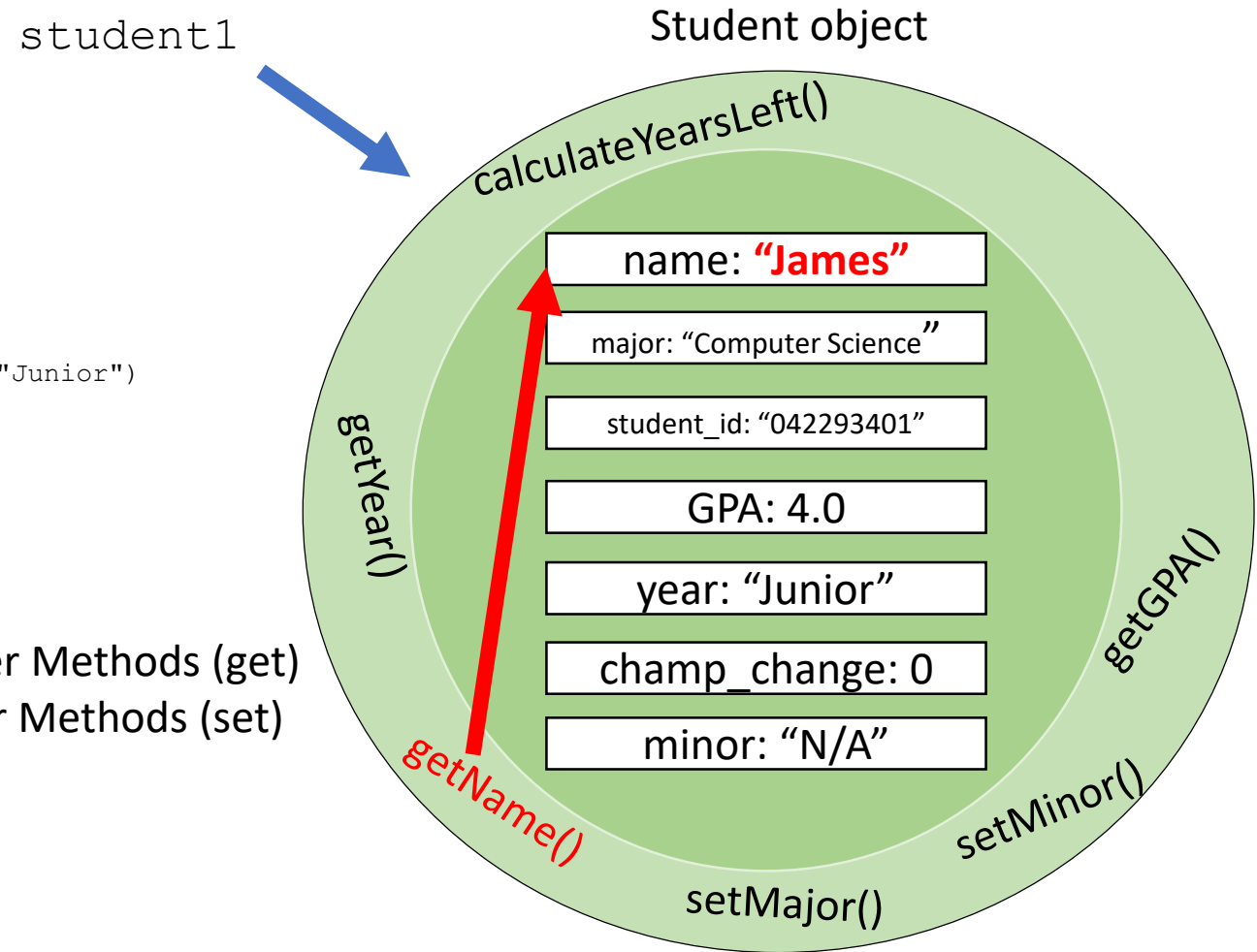
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print(student1.getName()) → James
```



OOP Review

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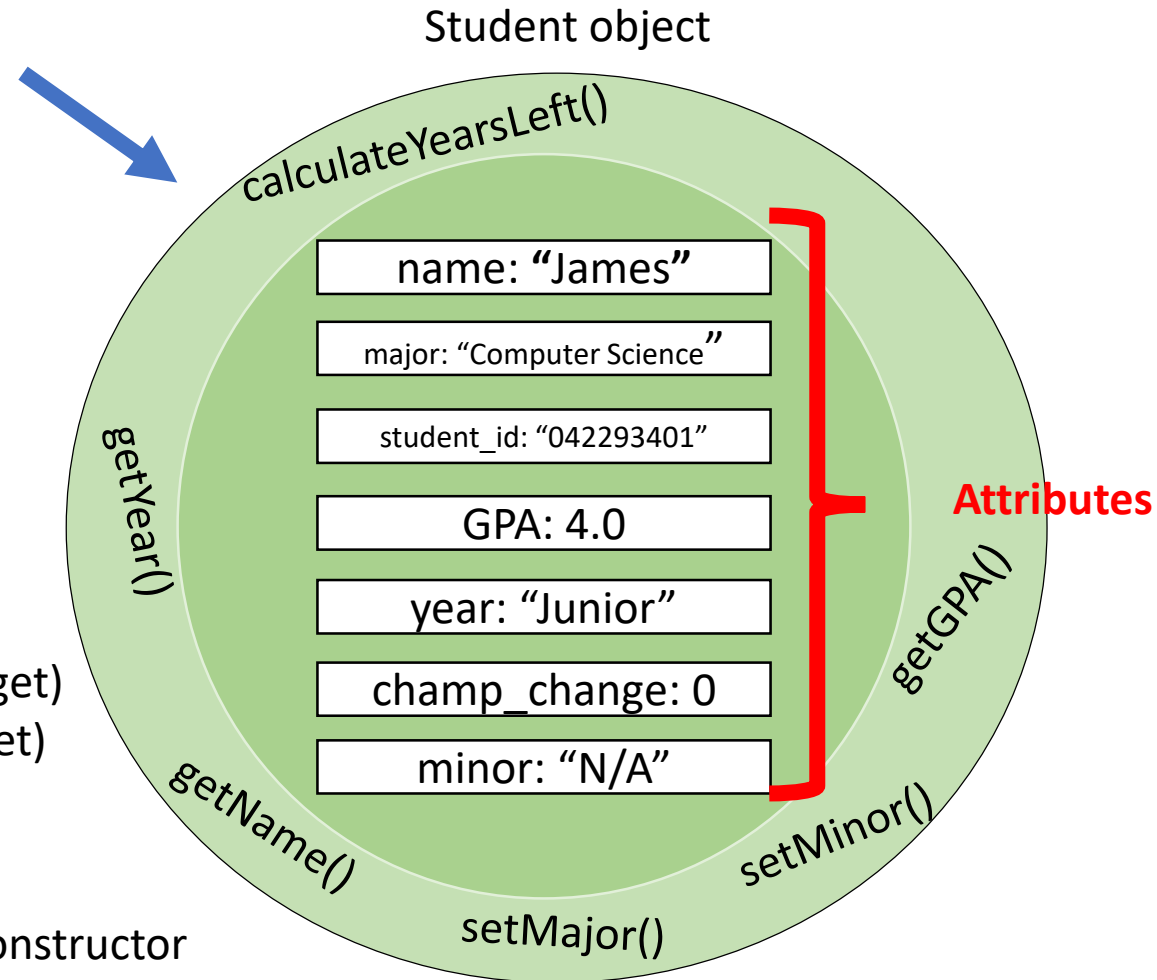
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We can find the attributes/states of the object by looking at the constructor

student1



OOP Review

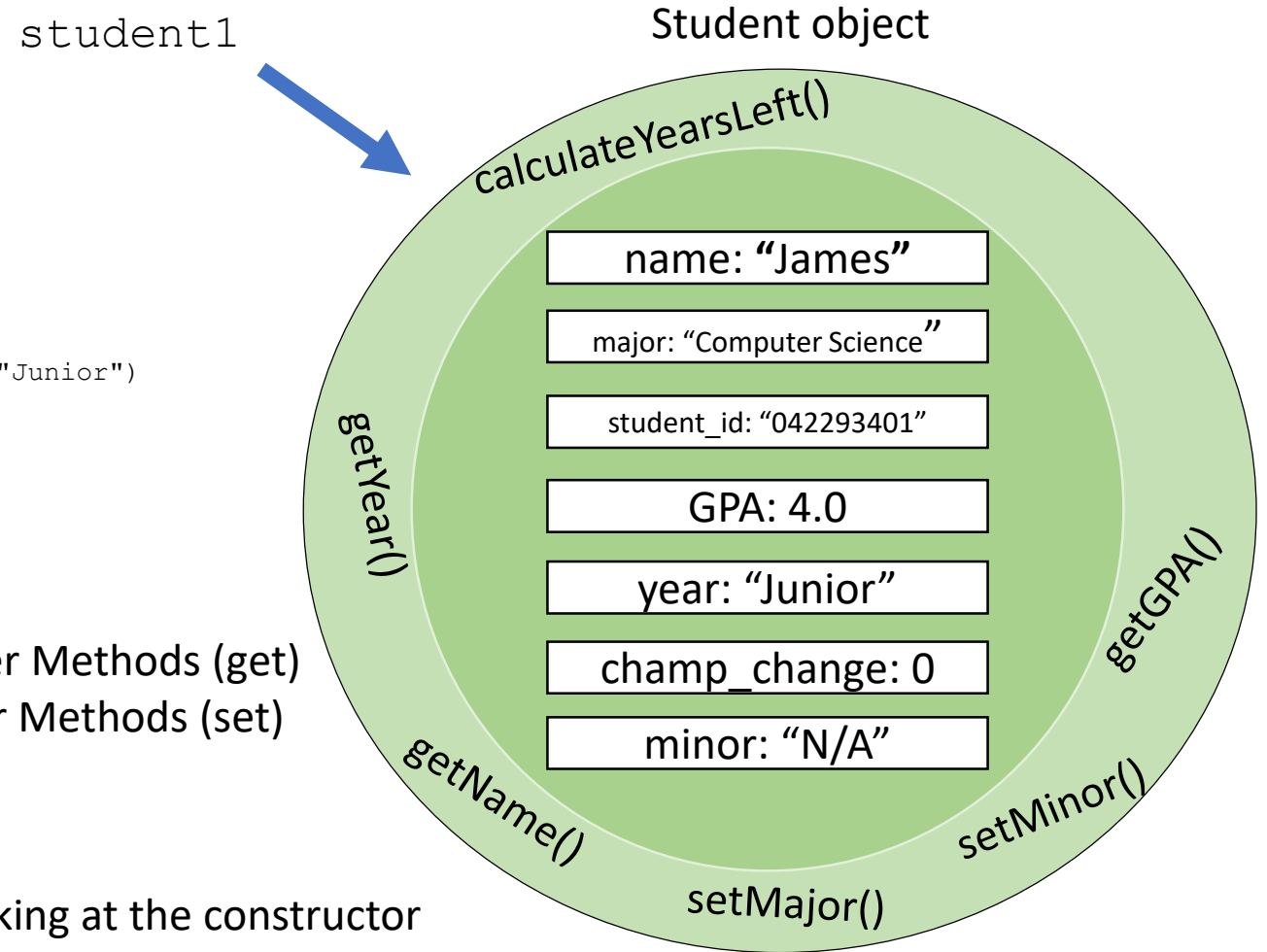
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OOP Example

Lets create a Python class that is going to represent a Pokemon

Each Pokemon has:

A number (ex. 1)

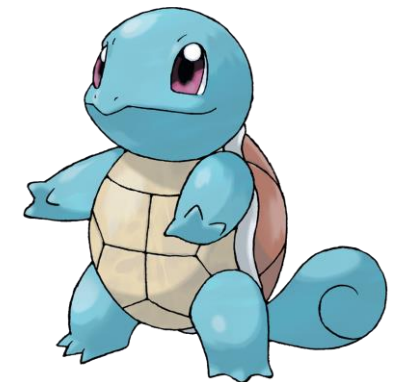
A Name (ex. Pikachu)

A type (ex. Electric)

Combat Points (ex. 443)

Write a function `battle_pokemon` that will take in two different pokemon. The function should determine who is the winner (whoever has the most CP)

Then, implement a Pokedex Class that will contain a list of all Pokemon created. Write a `searchPokemon` method that will search through the Pokedex for a specific Pokemon



OOP Example

Lets create a Python class using billionaires.csv that is going to represent information about Billionaires

Each Billionaire has a

Name

Company Name

Age

Gender

Worth in Billions

Location (Continent)

Lets write some functions that can

- Search for billionaires that make more money than a certain threshold
- Print out proportion of male vs female billionaires
- Print out number of Billionaires based on Continent