

# OOP AND INHERITANCE

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COMPUTER SCIENCE MENTORS CS 88

March 29th to April 2nd

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## 1 Object Oriented Programming

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1. What is a class?
2. What is an instance of a class?
3. What is the purpose of the `__init__` method?
4. What is `self`?

5. What would Python display? Write the result of executing the following code and prompts. If nothing would happen, write "Nothing". If an error occurs, write "Error".

```
class Jedi:
    lightsaber = "blue"
    force = 25
    def __init__(self, name):
        self.name = name
    def train(self, other):
        other.force += self.force / 5
    def __repr__(self):
        return "Jedi " + self.name

>>> anakin = Jedi("Anakin")
>>> anakin.lightsaber, anakin.force

>>> anakin.lightsaber = "red"
>>> anakin.lightsaber

>>> Jedi.lightsaber

>>> obiwan = Jedi("Obi-wan")
>>> anakin.master = obiwan
>>> anakin.master

>>> Jedi.master

>>> obiwan.force += anakin.force
>>> obiwan.force, anakin.force

>>> obiwan.train(anakin)
>>> obiwan.force, anakin.force

>>> Jedi.train(obiwan, anakin)
>>> obiwan.force, anakin.force
```

6. We now want to write three different classes, `Postman`, `Client`, and `Email` to simulate email. Fill in the definitions below to finish the implementation!

```
>>> postman = Postman() #Create a new Postman

>>> john = Client(postman, "John") #Create client named John

>>> rohan = Client(postman, "Rohan") #Create client named
    Rohan

>>> john.compose("POG", "Rohan") #John sends an email to Rohan

>>> rohan.compose("CHAMP", "John") #Rohan sends an email to
    John

>>> rohan.inbox[0].msg #Rohan's inbox
"POG"

>>> john.inbox[0].msg #John's inbox
"CHAMP"
```

```
class Email:
    """Every email object has 3 instance attributes: the
        message,
        the sender (their name), and the addressee (the
            destination's
            name) .
    """
    def __init__(self, msg, sender, addressee):

class Postman:
    """Each Postman has an instance attribute clients, which
        is a
        dictionary that associates client names with client
            objects.
    """
    def __init__(self):
        self.clients = {}

    def send(self, email):
        """Take an email and put it in the inbox of the client
            it
            is addressed to."""

    def register_client(self, client, client_name):
        """Takes a client object and client_name and adds it
            to the
            clients instance attribute.
        """
```

```
class Client:
    """Every Client has instance attributes name (which is
        used
        for addressing emails to the client), mailman (which is
        used to send emails out to other clients), and inbox (a
        list of all emails the client has received).
    """
    def __init__(self, mailman, name):
        self.inbox = []

    def compose(self, msg, recipient):
        """Send an email with the given message msg to the
            given
            recipient."""

    def receive(self, email):
        """Take an email and add it to the inbox of this
            client.
        """
```

7. Fill in the classes `Emotion`, `Joy`, and `Sadness` below so that you get the following output from the Python interpreter.

```
>>> Emotion.num
0

>>> joy = Joy()
>>> sadness = Sadness()
>>> emotion = Emotion()
>>> Emotion.num # number of Emotion instances created
3

>>> joy.power
5

>>> joy.catchphrase() # Print Joy's catchphrase
Think positive thoughts

>>> sadness.catchphrase() #Print Sad's catchphrase
I'm positive you will get lost

>>> sadness.power
5

>>> emotion.catchphrase()
I'm just an emotion.

>>> joy.feeling(sadness) # print "Together" if same power
Together

>>> sadness.feeling(joy)
Together

>>> joy.power = 7
>>> joy.feeling(sadness) # Print the catchphrase of the more
    powerful feeling before the less powerful feeling
Think positive thoughts
I'm positive you will get lost

>>> sadness.feeling(joy)
Think positive thoughts
I'm positive you will get lost
```

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```
class Emotion
```

```
    def __init__(self):
```

```
        def feeling(self, other):
```

```
            def catchphrase(self):
```

```
class Joy
```

```
    def catchphrase(self):
```

```
class Sadness
    def catchphrase(self):
```