CS21: INTRODUCTION TO COMPUTER SCIENCE

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Fall 2018
Swarthmore College
Outline Nov 30:

- Quiz 5: first 30 min
- Examples of abstraction/encapsulation
- baseball.py example
- ord/chr practice (cipher.py)

Notes

- Lab 10 due MONDAY (no office hours Monday)
- Office hours today! 3-5pm
- Ninja session tonight!
Abstraction/Encapsulation
Student example

- Encapsulated (student is represented as one thing, a list), but not abstract

```python
kendre = ["Kendre", 2020, ["cs35","act1","relg43","span1"]]
name = kendre[0]
year = kendre[1]
```
Student example

- Encapsulated (student is represented as one thing, a list), but not abstract

```python
kendre = ['Kendre', 2020, ['cs35', 'act1', 'relg43', 'span1']]
name = kendre[0]
year = kendre[1]
```

- Neither encapsulated (data for one student is spread over multiple objects), nor abstract

```python
name_lst = ['Kendre', 'Rohan', 'Ayaka', 'Maleyah']
year_lst = [2020, 2021, 2020, 2021]
name = name_lst[0]
year = year_lst[0]
```
Student example

- Encapsulated (student is represented as one thing, a list), but not abstract

```python
kendre = ['Kendre', 2020, ['cs35', 'act1', 'relg43', 'span1']]
name = kendre[0]
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```

- Neither encapsulated (data for one student is spread over multiple objects), nor abstract

```python
name_lst = ['Kendre', 'Rohan', 'Ayaka', 'Maleyah']
year_lst = [2020, 2021, 2020, 2021]
name = name_lst[0]
year = year_lst[0]
```

- Both abstract and encapsulated

```python
kendre = Student('Kendre', 2020)
name = kendre.getName()
year = kendre.getYear()
```
Advantages of encapsulation/abstraction

• Interface (how you interact with something) is consistent even if the internal details change.

  • 1) If you change the engine in your car, you still drive it the same way – don’t need to know how the engine works.
Advantages of encapsulation/abstraction

- Interface (how you interact with something) is consistent even if the internal details change.

  1) If you change the engine in your car, you still drive it the same way – don’t need to know how the engine works.

  2) In online shopping you have a “Cart”, which is an abstract concept and is roughly the same across sites. Probably represented as a list underneath but user doesn’t need to know.
Ord(..) and Chr(..)
Using `ord(..)` and `chr(..)`

- We can use `ord(ch)` to obtain a numerical representation of a character.
- When we compare characters (when searching or sorting, for example), we are really comparing their numerical representations.
- We can use `chr(int)` to convert an integer back into a character.

```python
>>> ord('a')
97
>>> ord('b')
98
>>> 'a' < 'b'
True
>>> ord('A')
65
>>> ord('Z')
90
>>> ord(',')
44
>>> chr(90)
'Z'
>>> chr(101)
'e'
```
Example of using `ord/chr` to create a cipher

Create a cipher that can encode a string as a list of numbers, and then decode the list of numbers to form the original string. (Practice `ord/chr`)

```
def main():

    # two hidden messages, use `chr(..)` to decode them
    hidden1 = [72, 97, 112, 112, 121, 32, 70, 114, 105, 100, 97, 121, 33]
                32, 105, 115, 32, 111, 118, 101, 114, 33]

    decoded1 = decode(hidden1)
    print(decoded1)

    decoded2 = decode(hidden2)
    print(decoded2)
```
Back to baseball example