Notecards

Write down any topics you would like to cover next week during review
Admin

+ No more help on final projects (I’ll answer Piazza questions through the end of today)

+ After today, only Piazza questions on class content in preparation for the final exam (asking about past homeworks, labs, etc is fine)

+ **Final project** is due May 3 (Wednesday)

+ TA hours next week: only final review help (Sun-Wed)

+ TA review session: next Wed (May 3)

+ Self-scheduled **final exam** (similar style to the midterm)

+ Last office hours: Monday 3-5pm (final prep only)
Outline: 4/28

- Finish discussion on sort and search
- Tuples
- Final project tips
- Quiz 9
- Shuffle sort and discussion of efficiency
Finish sort and search
Future work: how to actually get the closest element returned?

- Example: when I search for “Bel”, the return value is “Astou”.
- “Astou” < “Bel” < “Belise”, but depending on how we split the list, we will not get “Belise” as the answer
- Any solution ideas?
Future work: how to actually get the closest element returned?

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- “Astou” < “Bel” < “Belise”, but depending on how we split the list, we will not get “Belise” as the answer
- Any solution ideas?
- One idea: have an additional base case for lists of length 2, then compare the query with each of these 2 elements to find the closer one
Future work: how to actually get the closest element returned?

- Example: when I search for “Bel”, the return value is “Astou”.
- “Astou” < “Bel” < “Belise”, but depending on how we split the list, we will not get “Belise” as the answer.
- Any solution ideas?
- One idea: have an additional base case for lists of length 2, then compare the query with each of these 2 elements to find the closer one.
- Another idea: compare the query to both middle elements (right before and right after the split). If the query is between them, use the closer one to determine left/right recursion.
Number of comparisons for search

+ Say our list is of length $n$

+ What is the worst case number of comparisons for linear search?
  (i.e. start at the beginning of the list and go through until we find the closest one)
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  $$\frac{n}{2^x} = 1$$
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What is the worst case number of comparisons for binary search?

$$\frac{n}{2^x} = 1 \Rightarrow x = \log_2(n) \Rightarrow O(\log(n))$$
Linear vs. Binary search

- Linear search: $n$
- Binary search: $\log(n)$
Tuples
Tuples: another type

- **Tuples** are created using (···), kind of like **lists** are created using [···]
- Main difference: tuples are **immutable**
- `circle = Circle((x,y), radius)` will produce an error
- Accidentally using a tuple `(x,y)` instead of a `Point(x,y)`
- Tuples also show up when using simultaneous return
- Common in other situations as well, whenever commas are used without other info
Common tuple error messages

```python
>>> circle = Circle((100,200), 10)
Traceback (most recent call last):
  File "<pyshell#21>", line 1, in <module>
    circle = Circle((100,200), 10)
  File "/Users/ssheehan/Dropbox/Website/smith/spring17/csc111/lecs/lec37/graphics.py", line 646, in __init__
    p1 = Point(center.x-radius, center.y-radius)
AttributeError: 'tuple' object has no attribute 'x'
>>> >>>
>>> type((100,200))
<class 'tuple'>
```
Final Project tips
Other terms for instance variable

+ Instance variable
+ Member variable
+ Attribute (see error below)

Traceback (most recent call last):
    main()
  File "/Users/ssheehan/Dropbox/Website/smith/spring17/csci111/hws/hw9/hw9.py", line 208, in main
    fish.move(width)
  File "/Users/ssheehan/Dropbox/Website/smith/spring17/csci111/hws/hw9/hw9.py", line 61, in move
    if self.x < 0:
AttributeError: 'Fish' object has no attribute 'x'
Final project tips

- Banner class: use `setText(string)`
- Tracking the image: use `getAnchor()`, which returns a `Point`
- Use any methods from the `graphics.py` library
- Now that we’ve learned many methods and functions, you should be able to use new ones using existing documentation

http://mcsp.wartburg.edu/zelle/python_graphics.pdf
Quiz 9
+ `getMouse()` pauses execution: less helpful for animations where you always want some movement

**Question 1**

Which of these statements is accurate when it comes to `getMouse` versus `checkMouse`?

Select one:

- Both `getMouse` and `checkMouse` return the point where the mouse was clicked (if it was clicked) as a `Point()` object. **✓**
- Both `getMouse` and `checkMouse` pause execution, waiting for the user to click the mouse in the window.
- Both `getMouse` and `checkMouse` return `None` under certain circumstances.

Your answer is correct.

The correct answer is: Both `getMouse` and `checkMouse` return the point where the mouse was clicked (if it was clicked) as a `Point()` object.
class MSDie:
    def __init__(self, num_sides):
        self.sides = sides
        self.value = 1
        random = random.randint(1, self.sides)
    
    def roll(self):
        self.value = random

die = MSDie(8)
die.roll()
pri(die.value)

What's wrong with this piece of code?
Select one:

- missing a return statement
- wrong parameters passed in
- `random` cannot be accessed because it's a local variable
- `value` is not an instance variable

Your answer is correct.
The correct answer is: `random` cannot be accessed because it's a local variable.
Question 3

You spontaneously decide that you despise for-loops. You’re now on a mission to refactor any for-loop you encounter to a while loop. Your first enemy is the for-loop below.

```python
b = 6
for i in range(10):
    if i % b == 0:
        print('found one')
    break
```

What would the condition for the while loop be if the structure looks like this?

```python
while <condition>:
    i++
    print('found one')
```

Select one:
- `i % b == 0 and i < 10`
- `i > 10`
- `i++ > 10`
- `i <= 10`
- `i % b != 0 and i < 10`  

You answer is correct.
The correct answer is: `i % b != 0 and i < 10`
Shuffle Sort