



CS 114

Final review

Nov 28 2025

Final Topics

- ❏ All Midterm Topics
- ❏ Module 8: Masking
- ❏ Module 9: Classes
- ❏ Module 10: Recursion
- ❏ Module 11: Efficiency
- ❏ Style (docstrings, annotations, asserts)

Final date: Thursday Dec. 11, 7:30pm-10:00pm

Module 10: Recursion

- A recursive function is a function that calls itself.
- It needs a base case to stop, or it will run forever.
- Each call usually works on a smaller part of the problem that approaches the base case.
- The results from smaller calls are combined to get the final answer.

Write a recursive function `count_odd(lst)` that counts the number of **odd** integers in the list `lst`. You can only use recursion, no loops.

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Masking

```
import numpy as np  
  
a = np.array([4,9,2,7,6])  
mask = a > 3 & a < 9  
print(a[mask])
```

What does this code print?

A. [4,9,2,7,6]

B. [4,5,7,6]

C. [4,7,6]

D. error



Left Hand Masking

```
import numpy as np  
  
a = np.array([4,9,2,7,6])  
a[(a>3) & (a<9)] = 0  
print(a)
```

What does this code print?

A. [4,7,6]

B. [4,0,0,7,6]

C. [0,9,2,0,0]

D. error



Classes

```
class Cat:  
    def __init__(self, color):  
        self.color = color
```

Which of the following is to create a object of class Cat?

A.c = Cat.color("Black")

B.c = Cat("Black")

C.c = Cat.self("Black")

D.c = Cat.new("Black")



Special Method Classes

```
class Num:
    def __init__(self, v):
        self.v = v

    def __eq__(self, other):
        return self.v % 2 == other.v % 2

a = Num(3)
b = Num(7)
print(a == b)
```

What does this print?

A. False B. True C. Error: cannot compare objects



Does this code run in an infinite loop?

- A. Yes

- B. No

- ### C. Sometimes



Recursion

```
def recurse(x: int) -> int:  
    if x <= 0:  
        return 0  
    return x + recurse(x-2)  
  
print(recurse(5))
```

What does this code print?

- A. 15 B. 9 C. 8 D. 4

```
!wget https://student.cs.uwaterloo.ca/~cs114/src/plot_me.csv
```

CSV Files, Plotting, & Masking

Download the CSV file above and write a code that will take open a csv with columns called "X" and "Y". You will then plot this data however it must be masked so that the X values only range from 0.0-10.0.

Recursion & Classes:

Create a class called Counter that stores the attributes value, step, and message. The first two are ints, message is a string. Write a method called countdown() that will recursively reduce the value by the step until it reaches a value less than 0 and print each value as it goes.

```
Counter(5, 1, "Launch").countdown()
```

```
Launch: 5
```

```
Launch: 4
```

```
Launch: 3
```

```
Launch: 2
```

```
Launch: 1
```

```
Launch: 0
```