Clearly print (not sign) your name:

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You may use one page of hand written notes (both sides) and a dictionary. No phones, calculators, tablets, laptops or any other type of non-organic computer. Write answers on exam. You may use extra paper which you may turn in or keep, as you see fit. Time Limit: 2 hours.

1) What is the output of the Python 3.x code below?
   
   ```python
   fizz = 2
   fizz = fizz + 1
   pop = 7
   whirl = fizz + 2 + pop
   bang = fizz + 2 * pop + 1
   print(fizz)
   print(whirl)
   print(bang)
   ```

2) Fill in the blanks, so the function returns True if the third argument, x3, is between the first two arguments, and otherwise returns False. Assume that when the function is called, it is given three numeric values for x1, x2 and x3.
   Aside: this type of function is very useful for collision detection.

   ```python
   def between(x1, x2, x3):
       if (x3 ____ x1) ____ (x3 ____ x2): return True
       if (x3 ____ x1) ____ (x3 ____ x2): return True
       return False
   ```
3) The amazing Python function below runs without errors😊 What is the output?

```python
for theon in range(100, 50, -10):
    for grayjoy in range(4, 8, 2):
        print(theon, grayjoy)
```

4) What is the output of the Python 3.x code below?

```python
myList = []
for i in range(3,15,3):
    myList = [i] + myList + [i]
    print(myList)
print(myList[1])
print(myList[5])
```
5) What is the output of the Python 3.x program below?

```python
def foo(a, b, c):
    theon = "A"
    if ((a + b) > c):
        theon += "ll"
        if (a < b): theon += "d"
        elif (a < c): theon += "e"
        theon += "n"
    elif ((b + c) > a):
        theon += "l"
        if (a > b): theon += "f"
        elif (a > c): theon += "g"
        elif (b > c): theon += "h"
        theon += "i"
    if (a != b): theon += "e"
    return theon

print("theon =", foo(7, 6, 15))
print("theon =", foo(7, 7, 12))
```
Below is a variation of Python 3.x program we developed in class. Use this program to answer questions 6, 7 and 8.

```python
1) import pygame, sys
2) pygame.init()
3) 4) surface = pygame.display.set_mode((301, 301))
5) 6) WHITE = (255, 255, 255)
7) BLACK = ( 0, 0, 0)
8) 9) surface.fill(WHITE)
10) 11) x=50
12) y=50
13) 14) while True:  ##main game loop
15) 16)    print(x, y)
17)    if ((y % 100) == 0):
18)        myLength = 75
19)    else:
20)        myLength = 50
21) 22)    pygame.draw.line(surface, BLACK,(x,y),(x+myLength,y),3)
23) 24)    y = y + 50
25)    if (y > 250):
26)        x = x + 150
27)        y = 50
28) 29)    if (x > 200):
30)        x = 50
31)        y = 50
32) 33)    pygame.display.update()
```
6) What prints from line 16 in the above program during the first twelve (12) iterations of the main game loop?

7) Sketch an image of what is drawn by the program above. Your sketch should be accurate enough to show the correct number of lines.
8) In the above Python / pygame program, if line 22 were replaced with the line:

```
pygame.draw.line(surface, BLACK, (x, y), (x+50, y+50), 3)
```

The program would still run without errors, however, the image drawn would be different. Sketch an image of what would be drawn with this replacement for line 22.
9) What is the output of the Python 3.x program below?

```python
a = 'A', 'programming', 'genius', 'called', 'Tutor'
b = 'Built', 'a', 'limerick-writing', 'computer'
c = 'The', 'metre', 'is', 'fine'
d = 'and', 'the', 'rhymes', 'quite', 'divine'
e = 'But', 'for', 'some', 'reason', 'the', 'damn', 'thing', 'always'
f = 'got', 'the', 'last', 'line', 'wrong'
magicList = [a, b, c, d, e, f]

print(magicList[1][3])
print(magicList[0][1])
print(magicList[2][2])
print(magicList[3][4])
```

10) Max wrote a Python 3.x / pygame program that loads an image and draws it on the screen in a location that is a function of where the user clicks the mouse. Below is a snippet of his program. The cat.png file he loads is 100 pixels wide and 50 pixels high. If the user clicks the mouse in the window location (500,500), then what values will print for catx and caty?

```python
img = pygame.image.load('cat.png')
imgSize = myImg.get_rect().size
for event in pygame.event.get():
    if event.type == MOUSEBUTTONDOWN:
        mousex, mousey = event.pos

        catx = mousex - imgSize[0]/2
        caty = mousey - imgSize[1]/2

        print(catx, caty)
```