

**1. (8.0 points) What Would Python Display? 1**

Assume the following code has been executed already.2

`one = 1`3

```
def choose(one):  
    if big(one):  
        print('A')  
        if huge(one):  
            print('B')  
    elif big(one) or huge(one):  
        print('C')  
    if big(one) or print('D'):  
        print('E')  
    else:  
        print('F')
```

4

```
big = lambda x: x >= one  
huge = lambda x: x > one
```

5

```
def which():  
    one = 3  
    def this():  
        return one  
        return one + 1  
    return this  
one = 4
```

6

(a) (6.0 pt) Which lines are displayed by the interactive Python interpreter after evaluating `choose(one)`? Select all that apply. +7

- ☐ A
  - ☐ B
  - ☐ C
  - ☐ D
  - ☐ E
  - ☐ None
  - ☐ None of the above
- 8

(b) (2.0 pt) What is displayed by the interactive Python interpreter after evaluating `which()()`? 9

- ☐ 2
  - ☐ 3
  - ☐ 4
  - ☐ 5
  - ☐ A function
  - ☐ An error occurs before anything is displayed
- 10

**3. (8.0 points) Nearly Square** <sup>1</sup>

Implement `near_square`, which takes positive integer `n` and non-negative integer `k`. It returns the largest integer <sup>2</sup> less than or equal to `n` which is the product of two positive integers that differ by `k` or less. You may use `solve`, which is provided.

```
def near_square(n, k):
    """Return the largest integer that is less than or equal to n and
    equals a * b for some positive integers a and b where abs(a - b) <= k.

    >>> near_square(125, 0) # 11 * 11 = 121 and abs(11 - 11) = 0
    121
    >>> near_square(120, 3) # 10 * 12 = 120 and abs(10 - 12) = 2
    120
    >>> near_square(120, 1) # 10 * 11 = 110 and abs(10 - 11) = 1
    110
    """
```

while True: <sup>4</sup>

```
    gap = k 5

    while ____:
        (a)
        x = ____
        (b)
        if ____: # Check if x is a whole number
            (c)

        return ____
            (d)

    ____
    (e)

    ____
    (f)
```

def solve(b, c): <sup>6</sup>

```
    """Returns the largest x for which x * (x + b) = c 7

    >>> solve(2, 120) # x=10 solves x * (x + 2) = 120
    10.0
    >>> solve(2, 121) # x=10.045... solves x * (x + 2) = 121
    10.045361017187261
    """
    return (b*b/4 + c) ** 0.5 - b/2
```

(a) (2.0 pt) Fill in blank (a). Select **all** that apply. <sup>8</sup>

- ☐ gap <sup>9</sup>
- ☐ gap != 0
- ☐ gap > 0
- ☐ gap >= 0