Name: ______________________ Recitation: ____ Andrew Id: ______________

15-112 Summer 2019 Quiz 2

Up to 50 minutes. No calculators, no notes, no books, no computers, no extra paper. Show your work!
Do not use sets, dictionaries, or recursion on this quiz.

1. (40 points) **Free Response: Snappy Square Animation** Your task in this problem is to write a basic animation. You must follow MVC conventions in your solution. You will need to write init(d), mousePressed(e, d), keyPressed(e, d), and redrawAll(c, d); you may assume the run() function is already implemented. We recommend abbreviating data as d, event as e, and canvas as c (as shown above) to save time. The animation should have the following properties:

   - When the animation is first run, there is a green 50 x 100 pixel rectangle drawn in the center of the screen. There is also a score, which starts at 0, that is displayed at the center of the rectangle at all times.
   - When the left arrow key is pressed, the rectangle should move 20 pixels to the left. When the right arrow key is pressed, the rectangle should move 20 pixels to the right.
   - The rectangle should not be able to move off the screen - any time a keypress would cause the rectangle to move partially off screen, it should be moved **just** to the edge of the screen, but not past it. For example, if a right keypress would cause the rectangle to move off screen, it should be moved such that the right side of the rectangle is at the rightmost point of the canvas.
   - If the user clicks inside the rectangle, the rectangle should return to the center of the canvas, and the score should be increased by 1.

Additional Space for Question 1

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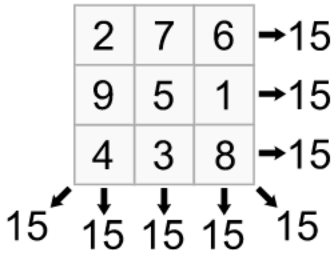
2. (25 points) **Free Response: isMagicSquare**. A magic square is defined as an NxN (square) 2D list, containing all of numbers from $1, 2, .., N^2$, with each number occurring exactly once, and where the sum of the integers in each row, column, and diagonal is the same number. Write the function **isMagicSquare(L)**, which takes in a 2D list L, and returns whether or not the list L is a magic square or not. Here is an example of a magic square:



2	7	6	→15
9	5	1	→15
4	3	8	→15

Notice how this list contains all of the numbers from 1 to 9, and all of the rows, cols, and diagonals sum up to 15. Here are some examples of 2D lists that are **not** magic squares:

```
[[3,  8, 7],
 [10, 6, 2],
 [5,  4, 9]]
```

```
[[1, 2, 6],
 [5, 4, 3]]
```

```
[[2, 7, 6],
 [9, 5],
 [4, 3, 8]]
```

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3. (20 points) **Code Tracing:** Indicate what the following program prints. Place your answer (and nothing else) in the box below the code.

```
import copy
def ct1(a):
    b = a
    c = copy.copy(a)
    d = copy.deepcopy(a)

    a = d[1:3] + [c.append(42)]
    b[0] += b[2][:2]
    c[1] = c[1] + ["fresh"]
    b[0][1] = "razzy"
    d[0] = d[1]
    d[1][0] += b[2].pop()

    print("a", a)
    print("b", b)
    print("c", c)
    print("d", d)

a = [[1], [2], [3, 4, 5]]
ct1(a)
print(a)
```

4. (15 points) **Reasoning Over Code**: Find an input value for s that makes roc(a) return True. Place your answer (and nothing else) in the box to the right of the code.

```
def roc(a):
    assert(type(a) == list)

    for i in range(len(a)):
        if  (i % 2 == 1):
            a[i] -= i
        else:
            a[i] //= 2

    return a == list(range(2, 7))
```