Name: _____ Andrew Id: _____

1. **Code Tracing**: Indicate what the following programs draw. Place your answer on the grid to the right of the code. You may assume that each square in the grid is 50 units wide and 50 units high. You may also assume that the turtle starts on the black dot, facing to the right. (Note that the grid lines are provided for your reference. You may assume that they do not appear in the actual, final picture.)

   (a) (2 points) CT1

```
def CT1():
    forward(50)
    circle(75)
    forward(200)
    left(90)
    forward(150)
    left(90)
    forward(275)

CT1()
```
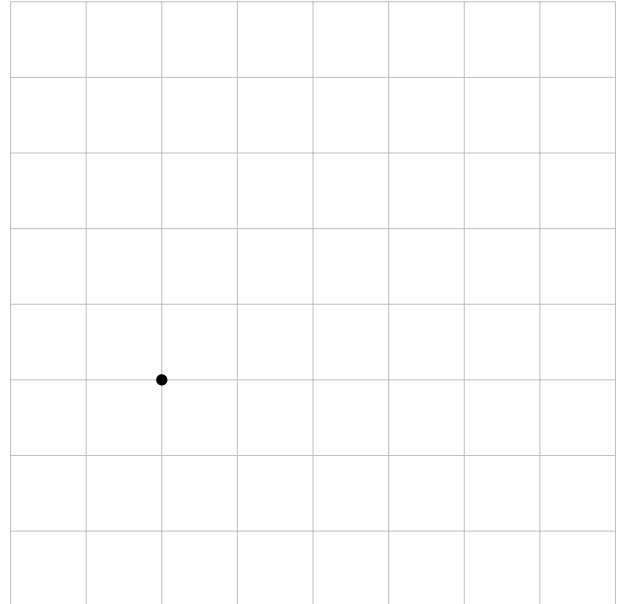
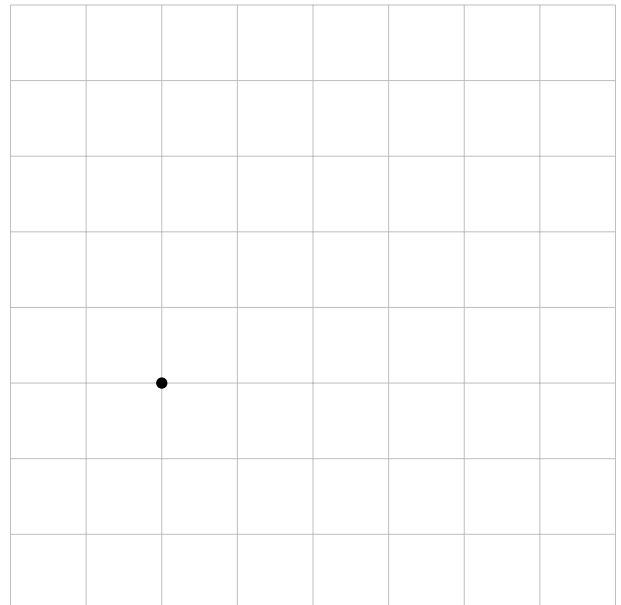   (b) (2 points) CT2

```
def helperFunction():
    left(90)
    forward(50)
    for n in range(4):
        forward(50)
        right(90)
    left(180)
    forward(50)
    left(90)

def CT2():
    penup()
    forward(100)
    left(90)
    forward(50)
    right(90)
    pendown()
    for n in range(4):
        helperFunction()
        right(90)

CT2()
```

2. (3 points) **Free Response**: Write python code using the turtle library to produce the image given below. Your solution should be as succinct as possible in terms of lines of code. Any correct solution with more than eight lines of code will get only 50% of the points for this question. The longest line in the image is 100 units, the next line is 90 units, and each subsequent line decreases in size by 10.
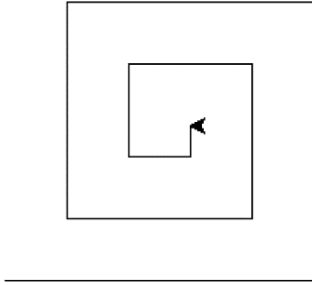

```python
def drawSpiral():
    # You can assume that turtle library is already imported
    # Your code goes here.
```

3. **Reasoning Over Code**: Consider the following function:

```python
def roc1(n):
    return (n+12)%5
```

(a) (1 point) What is a value of **n** which, if passed to this function, will cause the function to return 0?

(b) (1 point) What is the value of **n** which, if passed to this function, will cause the function to return the largest possible value?

(c) (1 point) In general, for the formula `c = a % b`, what is the largest possible value of c (as a function of a and/or b)? Explain your answer.