

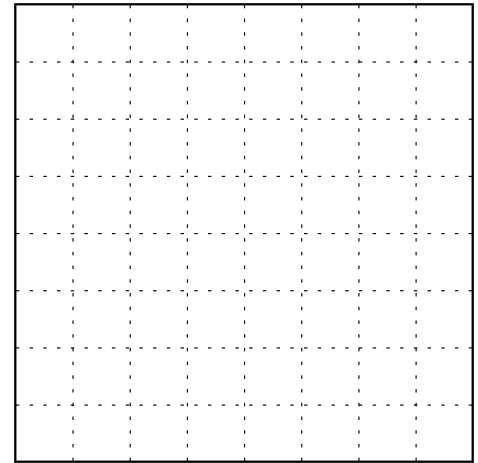
**15-112 Fall 2021 Quiz 9**

Up to 25 minutes. No calculators, no notes, no books, no computers. Show your work!  
Do not use try/except on this quiz.

1. (6 points) **Code Tracing:** Given that the box to the right is your canvas, with a width and height of 400 each, draw what the following code would display. You can assume that this is called within the appropriate graphics helper code. **Hint:** Each of the small boxes on the canvas is 50x50 pixels.

```
def ct1(canvas, width, height):
    (x0, y0, x1, y1) = (0, 0, 100, 200)
    canvas.create_rectangle(x0, y0, x1, y1, fill="gray")
    canvas.create_oval(x0, y0, x1, y1, fill="white")
    textY = height//2
    textX = width//2
    canvas.create_line(textX, 0, textX, height)
    canvas.create_text(width/2, textY, text="CT1", \
                       font="Arial 16", anchor='s', \
                       angle=-90)
    canvas.create_text(width/2, textY, \
                       text="(What will this draw?)", \
                       font="Arial 16", anchor='n', \
                       angle=-90)

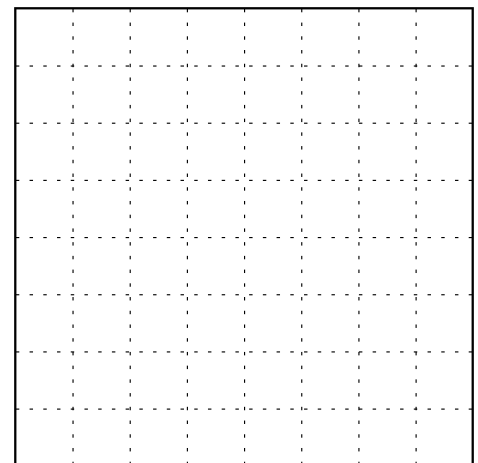
def draw(canvas, width, height):
    ct1(canvas, width, height)
```



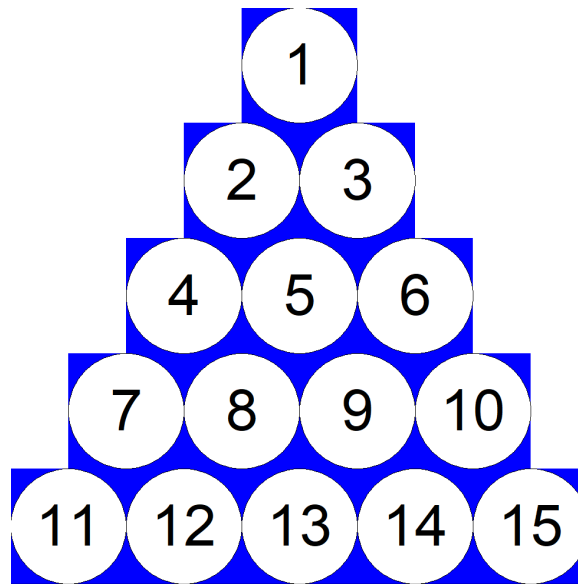
2. (6 points) **Code Tracing:** Given that the box to the right is your canvas, with a width and height of 400 each, draw what the following code would display. You can assume that this is called within the appropriate graphics helper code. **Hint:** Each of the small boxes on the canvas is 50x50 pixels.

```
def ct2Rec(canvas, x, y, r, d):
    if d == 0:
        return
    canvas.create_oval(x-r,y-r,x+r,y+r)
    if d % 2 != 0:
        ct2Rec(canvas,x-r//2,y,r//2,d-1)
        ct2Rec(canvas,x+r//2,y,r//2,d-1)
    else:
        ct2Rec(canvas,x,y-r//2,r//2,d-1)
        ct2Rec(canvas,x,y+r//2,r//2,d-1)

def draw(canvas, width, height):
    ct2Rec(canvas, width//2, height//2, 100, 3)
```



3. (8 points) **Free Response** Write the function `drawNumberPyramid(canvas, width, height, rows)`, which draws a pyramid, filled with white circles and numbers, as shown below.



In this example, the number of rows is 5. You can assume that the canvas has equal width and height. The font should be bold, and its size should be equal to half of the circle radius. Your code should be able to handle window resizes. As usual, this question will have partial credit. So, start by drawing the pyramid.

```
def drawNumberPyramid(canvas, width, height, rows):
```

Answer space for Question 3