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### 15-112 Spring 2026 Quiz 5

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

#### 1. (8 points) Code Tracing

```
import copy

def ct(a):
    b = a[:]
    print(a is b, a[0] is b[0])
    c = copy.deepcopy(a)
    print(c == a)
    a.append([1,6])
    print(a)
    b[1].extend([9, 3])
    c[0][1] += 10
    a[0] = [10, 11]
    print(a[0] is b[0])
    c.pop()
    print(a)
    print(b)
    print(c)

a = [[2,4], [5]]
ct(a)
print(a)
```

## 2. (12 points) **Animation: Falling Star!**

Write an app with the following functionality:

### ● **Game Setup (Figure 1a):**

- A gray rectangular **bucket** ( $100 \times 20$ ) appears at the bottom of the screen, centered horizontally.
- A single yellow **star** (radius 12) appears fully visible at the top of the canvas, with a random x-position.
- The current **score** is displayed in the top-left corner of the screen, centered at the following coordinates (60, 20).
- A **timer** is displayed in the top-right corner of the screen, centered at the following coordinates (app.width-60, 20). It starts at 20 seconds and displays only whole seconds.

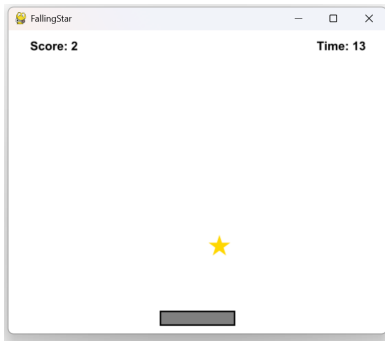
### ● **Gameplay Rules (Figure 1a):**

- The bucket is controlled using the left and right arrow keys.:
  - Pressing the **left** arrow key moves the bucket 20 pixels to the left.
  - Pressing the **right** arrow key moves the bucket 20 pixels to the right.
  - The bucket must remain fully on the screen.
- The star falls downward continuously at a constant speed (6 pixels per onStep call).
- If the star touches the bucket (*NOTE: you may assume a function `starCaught(app)` is provided that returns `True` in this case*):
  - The score increases by 1.
  - A new star immediately appears at a new random x-position at the top.
- If the entire star moves below the bottom edge of the canvas:
  - The score decreases by 1 (but may not go below 0).
  - A new star immediately appears at the top.

### ● **Game Over:**

- The timer counts down from 20 seconds to 0.
- When the timer reaches 0, the game ends:
  - A centered message is displayed:
    - \* If the score is at least 5, display **“You Win!”**; Figure 1b.
    - \* Otherwise display **“Game Over”**; Figure 1c.

● **Bonus [3 points]:** Implement the function `starCaught(app)`. It should return `True` if the circular star intersects the rectangular bucket, and `False` otherwise. *Hint: Treat the star as a circle and the bucket as a rectangle.*



(a) Playing Screen



(b) User Wins



(c) Game Over

Figure 1: Falling Star Game Screenshots

Space for Problem 2.

Extra space for Problem 2.

Extra space for Problem 2.