Name: _____

Use this quiz to help make sure you understand the videos/reading. ***Answer all questions.*** Make additional notes as desired. ***Not sure of an answer?*** Ask your instructor to explain in class and revise as needed then. ***Turn this in via the Session 12 Dropbox on our Moodle site.***

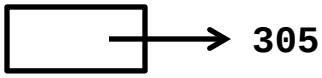
Throughout, where you are asked to "circle your choice", you can circle or underline it (whichever you prefer).

Online reading: ***Box-and-Pointer Diagrams and Mutable Objects***

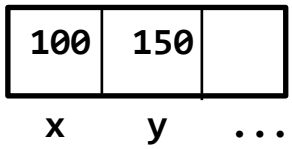
1. True or false: ***Variables are REFERENCES to objects.*** **True** **False** (circle your choice)
2. True or false: ***Assignment*** (e.g. `x = 100`) causes a variable to refer to an object. **True** **False** (circle your choice)
3. True or false: ***Function calls*** (e.g. `foo(54, x)`) also cause variables to refer to objects. **True** **False** (circle your choice)
4. Give one example of an object that is a ***container*** object:

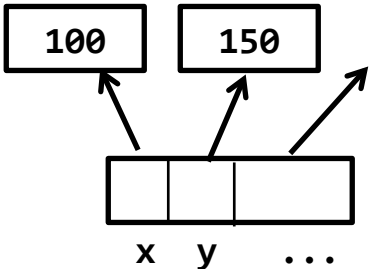
5. Give one example of an object that is ***NOT*** a ***container*** object:

6. Which of the following demonstrates the correct way to depict a ***NON-container*** object in a box-and-pointer diagram? (Circle your choice.)

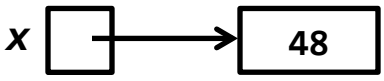


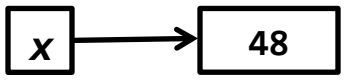
7. Which of the diagrams shown to the right demonstrates the correct way to depict a ***container*** object (here, a ***`zg.Point`***) in a box-and-pointer diagram? (Circle your choice.)





8. Which of the following demonstrates the correct way to depict an ***assignment*** statement in a box-and-pointer diagram? (Circle your choice.)

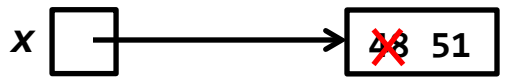




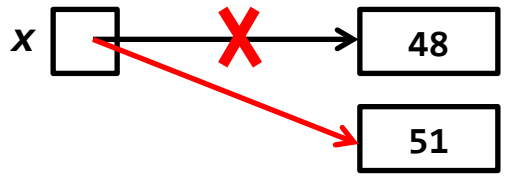
9. Which of the box-and-pointer diagrams shown to the right more accurately reflects the execution of the statements shown in the box below. (Circle your choice.)

```
x = 48
x = x + 3
```

Box and Pointer diagram 1:



Box and Pointer diagram 2:



10. True or false: When an object is mutated, it no longer refers to the same object to which it referred prior to the mutating. **True** **False**
    (circle your choice)

11. Consider the following statements:

```
c1 = zg.Circle(zg.Point(200, 200), 25)
c2 = c1
```

    At this point, how many ***zg.Circle*** objects have been constructed? **1** **2**
    (circle your choice)

12. Continuing the previous problem, consider an additional statement that follows the preceding two statements:

```
c1.radius = 77
```

    After the above statement executes, the variable ***c1*** refers to the same object to which it referred prior to this statement. **True** **False**
    (circle your choice)

13. Continuing the previous problems:
    - What is the value of ***c1***'s radius after the statement in the previous problem executes? **25** **77** (circle your choice)
    - What is the value of ***c2***'s radius after the statement in the previous problem executes? **25** **77** (circle your choice)

14. Which of the following two statements mutates an object? (Circle your choice.)

```
numbers1 = numbers2

numbers1[0] = numbers2[0]
```

15. Mutable objects are good because:

16. Explain briefly why mutable objects are dangerous.

17. Circle each of the following which is a ***mutable*** object:

- A ***zg.Rectangle*** object
- A ***Create*** object (as we use in our robotics exercises).
- **[3, 6, 22]**
- **(3, 6, 22)**
- **zg.Point(100, 30)**
- **(100, 30)**
- **100**
- **'Jello'**
- **'ice cream'**
- **"ice cream"**
- **True**
- **88.6**
- **zg.Point(88.6, 88.6)**
- A ***zg.Entry*** object
- **math.pi**
- **turtle.Turtle()**

Textbook RE-reading: ***Section 6.1.4 —List References*** (bottom of page 281)

You read this subsection for a previous session, but it is worth reading again in order to answer the following questions:

18. When the code snippet below is executed, what gets printed?

```
seq1 = ['John', 'Paul', 'George', 'Pete']
seq1[1] = 'Sir Paul'

seq2 = seq1
seq2[3] = 'Ringo'

print(seq1[1], seq2[1])

print(seq1[3], seq2[3])
```

Output (*fill in the blanks*):

_____

_____

19. In the above code snippet, there are 3 assignment statements:

```
seq1[1] = 'Sir Paul'

seq2 = seq1

seq2[3] = 'Ringo'
```

Which of the above assignment statements ***mutates*** a list? (Circle your choice(s).)

20. Continuing to refer to the code snippet in the box above, suppose that we wanted the code snippet to end in the following state:

- ***seq2*** is a ***COPY*** of ***seq1*** that contains the same information as ***seq1*** but with the index ***3*** item of ***seq2*** being ***'Ringo'*** instead of ***'Pete'*** (while the index ***3*** item of ***seq1*** remains ***'Pete'***).

How could we change the 3rd line above (that is, the statement: **`seq2 = seq1`**) to accomplish this effect?

Hint: Nothing in your reading tells you the answer to this question. Try typing the following in Eclipse (and pause after the dot) to see all the list methods:

```
[].
```

Continue by typing **`[].c`** (and pausing) to see if one of the suggestions looks like a good way to make a COPY of a list. (That's a hint!)