Quiz 01 - Practice

COMP 110: Introduction to Programming
Spring 2025

February 7, 2024

Name: Solutions

9-digit PID: _____

Do not begin until given permission.

Honor Code: I have neither given nor received any unauthorized aid on this quiz.

Signed: _____

Question 1: Multiple Choice Completely fill in the bubble next to your answer using a pencil. Each question should have exactly one filled-in bubble.

1.1. The following string is an example of a formatted string literal (f-string):

```
1 "{1 + 1}"
```

- ○ `True`
- ● `False`

no f at the beginning!

1.2. What is the printed output of the following `print` function call?

```
1 print(f"C{'OM'}P{100 + 10}")
```

- ○ `fCOMP10010`
- ● `COMP110`
- ○ `C'OM'P100 + 10`
- ○ `Error: Invalid Syntax`

1.3. What is the *type* and *evaluation* of this expression in Python?

```
1 "ABCD" == "ABcd"
```

- ○ `bool, True`
- ● `bool, False`

Python is case-sensitive!

1.4. What is the primary difference between keyword arguments and positional arguments in Python?

- ○ Keyword arguments must always be passed, while positional arguments are optional.
- ● Positional arguments are passed based on their position in the function call, while keyword arguments are explicitly named.
- ○ Keyword arguments can only be used in built-in functions, while positional arguments can be used in both built-in and user-defined functions.
- ○ Positional arguments must always come after keyword arguments in a function call.

1.5. Which operator has the highest precedence in an expression?

- ○ or
- ○ >
- ● +
- ○ and
- ○ not

1.6. Which of the following statements correctly describes the behavior of the `and`, `or`, and `not` operators in Python?

- ○ The `and` operator returns True if at least one operand is True.
- ○ The `or` operator returns True only if both operands are True.
- ● The `not` operator inverts the boolean value of an expression.
- ○ The `and`, `or`, and `not` operators can only be used with boolean values.

1.7. What is the evaluation of the following expression:

```
1 1 > 0 or 6 > 8
```

True

- ○ False
- ● True

1.8. What is the evaluation of the following expression:

```
1 "A" == "B" and "B" == "C"
```

- ● False
- ○ True

1.9. What is the evaluation of the following Python expression?

```
1 not True or True
```

- ◯ `False`
- ● `True`
- ◯ `Error`

1.10. Which of the following are required in a recursive function that does not infinitely recur?

- ◯ A base case without a recursive function call
- ◯ Recursive case that progresses toward the base case
- ◯ Arguments changing in the recursive case
- ● All of the above

1.11. Which of the following is a valid function call to the following function signature?

```
1 def ex(x: int, y: int=0) -> int:
2   ...
```

default parameter

- ◯ A. `ex()`
- ◯ B. `ex(1)`
- ◯ C. `ex(1, 2)`
- ● B and C
- ◯ A, B, and C
- ◯ None of the above

1.12. What type of error occurs when a function keeps calling itself, indefinitely?

- ◯ `NameError`
- ◯ `IndexError`
- ● `RecursionError`
- ◯ `SyntaxError`
- ◯ `NeverendingError`

1.13. What will the following Python expression evaluate to?

```
1 1 + True
```

- ◯ `True`
- ● `2`
- ◯ `1`
- ◯ `False`

1.14. Consider the following function declaration:

```
1 def ex(x: int, y: int=0) -> int:
2   ...
```

Which of the following are valid ways of calling the function?

keyword arguments

positional arguments

- ◯ A. `ex(x=1, y=2)`
- ◯ B. `ex(x=1)`
- ◯ C. `ex(1, 2)`
- ◯ A and B
- ● A, B, and C
- ◯ None of the above

1.15. Consider the following code. What is the problem with it?

```
1 def charli(x: int) -> int:
2   if x <= 0:
3     return 1
4   return x + charli(x)
```

- ◯ RecursionError; line 4 should be `return x * charli(x)`
- ● RecursionError; line 4 should be `return x + charli(x - 1)`
- ◯ RecursionError; line 4 should be `return x + charli(x + 1)`
- ◯ Nothing.

the recursive case has to progress toward the base case!

Question 2: Respond to the following questions. Write a function call, if any, to yield the correct return value.

Consider the following code listing:

```
1 def eight_ball(choice: int) -> str:
2   """Returns an 8-ball response."""
3   if choice <= 0:
4     return "Unlikely."
5   else:
6     if choice > 0:
7       return "It is certain."
8     else:
9       return "Ask again later."
```

2.1. Write a function call expression to the `eight_ball` function that evaluates to `"It is certain."`

Solution: `eight_ball(1)` or `eight_ball(choice=1)` or any argument value greater than 1

2.2. Write a function call expression to the `eight_ball` function that evaluates to `"Unlikely."`

Solution: `eight_ball(0)` or `eight_ball(choice=0)` or any argument value less than 0

2.3. Write a function call expression to the `eight_ball` function that evaluates to `"Ask again later."`

Solution: This code is unreachable and no function call can be made, as written, to result in "Ask again later."

2.4. Rewrite lines 3-9 of the code listing to eliminate any unreachable code and the nested if-else statement.

```
if choice <= 0:
    return "Unlikely."
else:
    return "It is certain."
```

Question 3: Respond to the following questions.

3.1. What value and type does the following expression evaluate to: `3 + 4 == 6`

Solution: False, bool

3.2. What value and type does the following expression evaluate to?

```
1 ((True and False) or (False or True)) != False
```

Solution: True

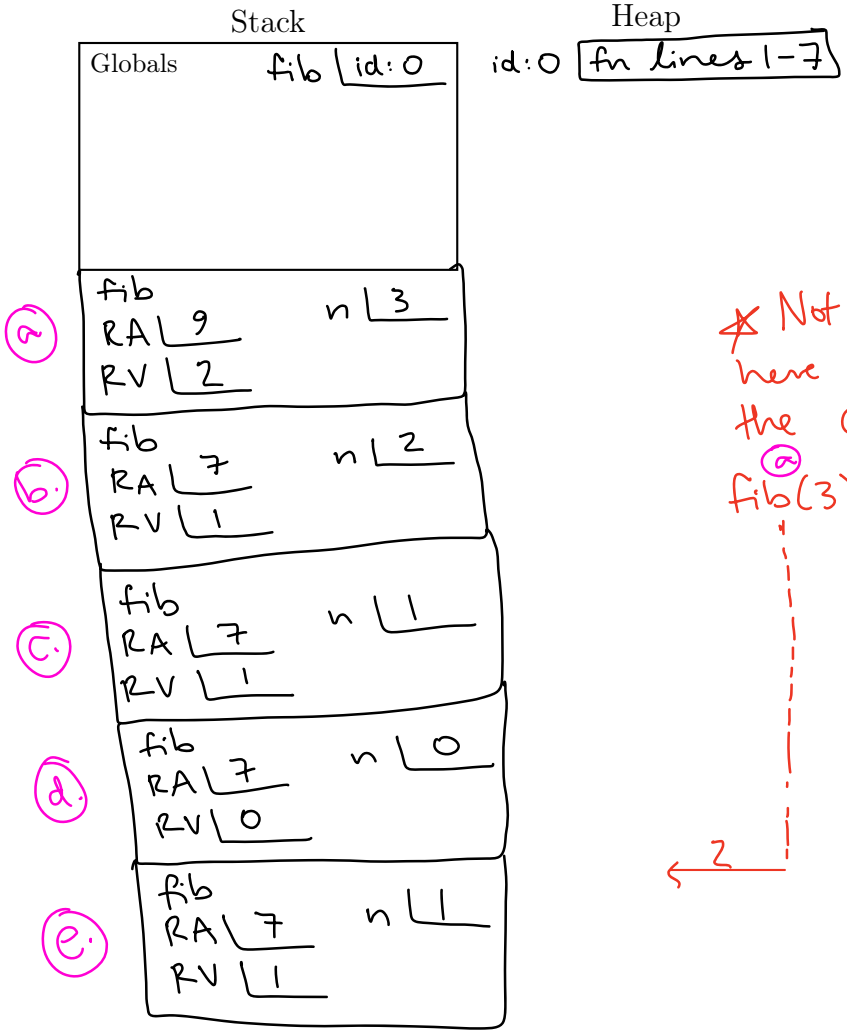
Question 4: Memory Diagram Trace a memory diagram of the following code listing ~~and then answer the sub questions. You do not need to diagram the sub questions.~~

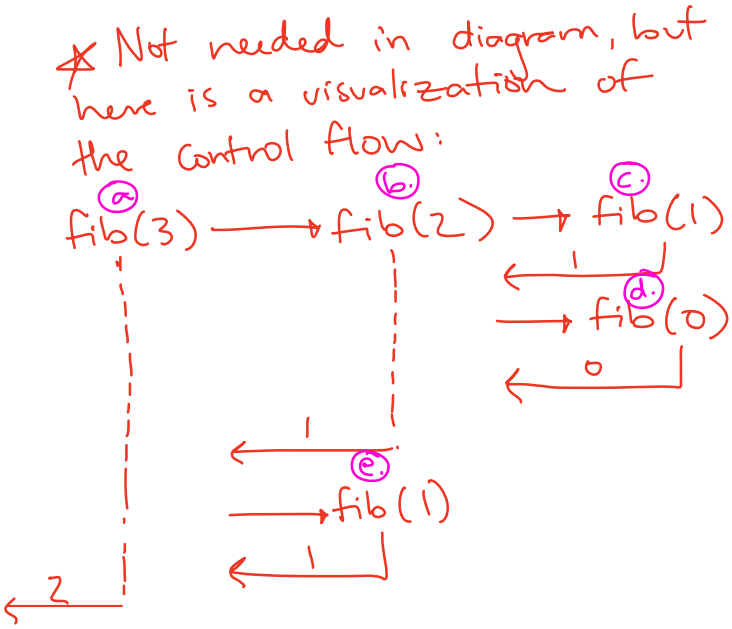
ignore that

```
1 def fib(n: int) -> int:
2   """Compute the fibonacci of n"""
3   print(f"fib({n})")
4   if n == 0 or n == 1:
5     return n
6   else:
7     return fib(n - 1) + fib(n - 2)
8
9 print(fib(3))
```

Output

Solution: fib(3) // fib(2) // fib(1) // fib(0) // fib(1) // 2





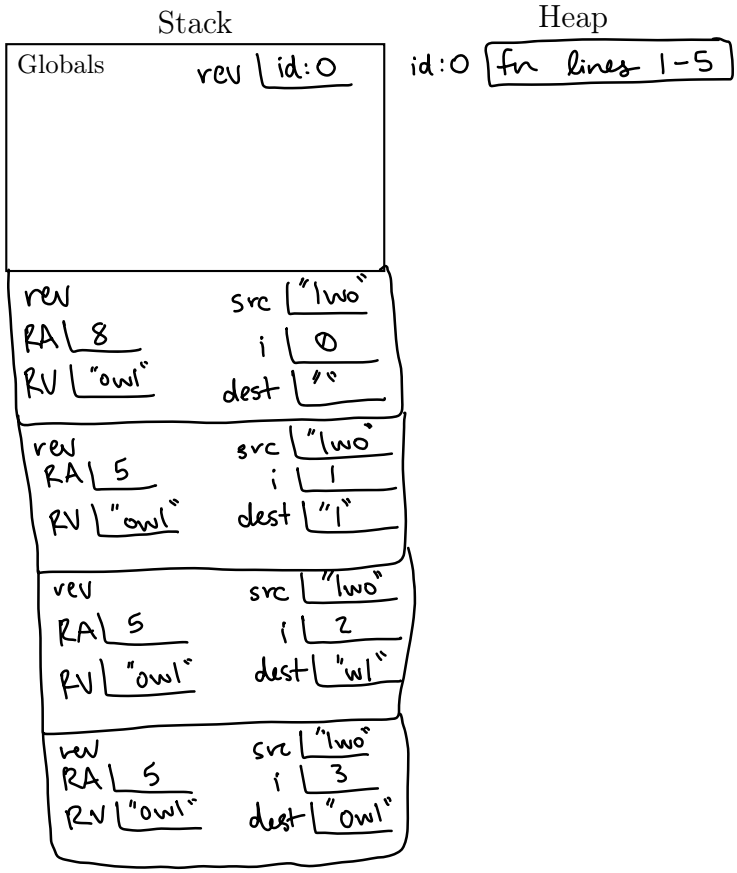
Question 5: Memory Diagram Trace a memory diagram of the following code listing ~~and then answer the sub-questions. You do not need to diagram the sub-questions~~.

↖ ignore that

```
1 def rev(src: str, i: int, dest: str) -> str:
2   if i >= len(src):
3     return dest
4   else:
5     return rev(src=src, i=i + 1, dest=src[i] + dest)
6
7
8 print(rev(src="lwo", i=0, dest=""))
```

Output

owl



Question 6: Function Definition Writing Write a function definition that returns a different string, depending on the value of a given `int`. Your function definition should meet the following expectations:

- The function should be named `fizzbuzz`, have one `int` parameter named `n`, and return a `str`.
- If `n` is divisible by 3 and not 5, the function should return `"fizz"`.
- If `n` is divisible by 5 and not 3, the function should return `"buzz"`.
- If `n` is divisible by 3 AND 5, the function should return `"fizzbuzz"`.
- If `n` is not divisible by 3 OR 5, the function should return `n` as a string.
- Explicitly type your parameter and return type.

The following REPL examples demonstrate the expected functionality of your `summit` function:

```
>>> print(fizzbuzz(-2))
-2
>>> print(fizzbuzz(1))
1
>>> print(fizzbuzz(2))
2
>>> print(fizzbuzz(3))
fizz
```

```
>>> print(fizzbuzz(5))
buzz
>>> print(fizzbuzz(12))
fizz
>>> print(fizzbuzz(15))
fizzbuzz
>>> print(fizzbuzz(20))
buzz
```

6.1. Write your function definition here:

```
def fizzbuzz(n: int) -> str:
    if n % 3:
        if n % 5:
            return "fizzbuzz"
        else:
            return "fizz"
    elif n % 5:
        return "buzz"
    else:
        return str(n)
```

* Note that there are many correct ways to write this function - this is just one example!

Question 7: CHALLENGE: Recursive Function Definition Writing Write a recursive function definition that returns the sum of all positive, even integers less than or equal to a given `int`. Your function definition should meet the following expectations:

- The function should be named `summit`, have one `int` parameter named `n`, and return an `int`.
- If `n` is negative, the function should return `-1`.
- If `n` is positive, the function should return the sum of all positive, even integers less than or equal to `n`.
- Explicitly type your parameters and return types.
- Label your base case(s) and recursive case(s).

The following REPL examples demonstrate the expected functionality of your `summit` function:

```
>>> summit(-2)
-1
>>> summit(1)
0
>>> summit(2)
2
>>> summit(3)
2
```

```
>>> summit(4)
6
>>> summit(5)
6
>>> summit(6)
12
>>> summit(12)
42
```

7.1. Write your function definition here:

```
def summit(n: int) -> int:
    if n < 0: # Edge case → we'll learn about this concept later! (no expectation to know it now)
        return -1
    elif n <= 1: # Base case
        return 0
    elif n % 2 == 1: # Recursive case
        return summit(n=n-1)
    else: # Recursive case
        return n + summit(n=n-2)
```

if n is odd, call summit again with an argument of n-1

if n is even and > 1, return the sum of n and the return value of calling summit with an argument of n-2 (the next lowest even int)

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