Week 6 Tutorial

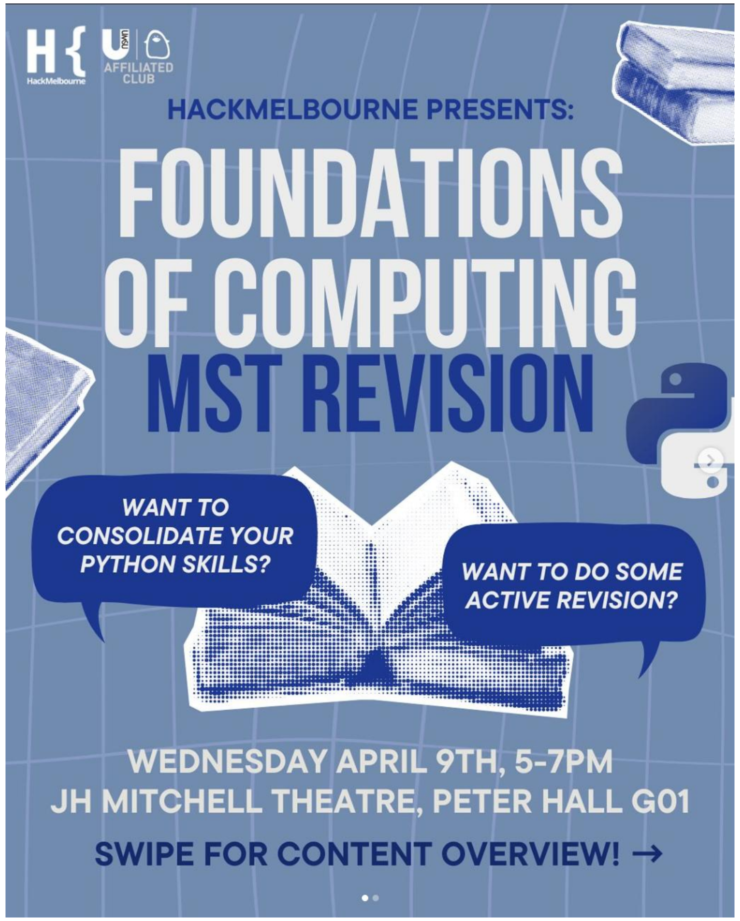
COMP10001 – Foundations of Computing

Semester 1, 2025

Clement Chau

- Dictionaries, Sets, and Containers
- Global and Local Namespaces (Scope)

Before we start,



HACKMELBOURNE PRESENTS:

FOUNDATIONS OF COMPUTING

MST REVISION

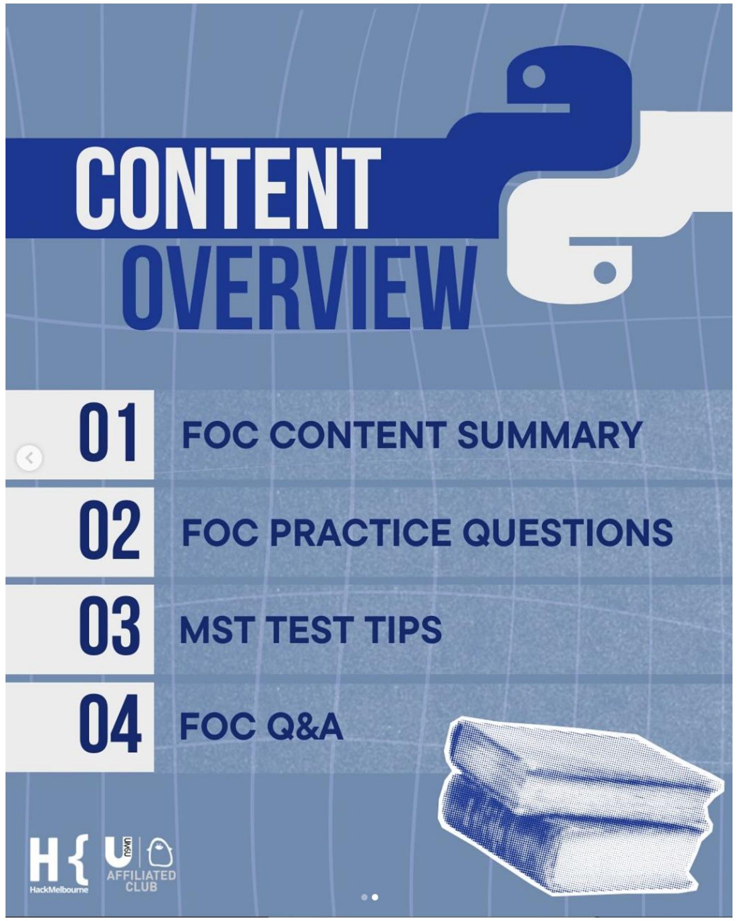
WANT TO CONSOLIDATE YOUR PYTHON SKILLS?

WANT TO DO SOME ACTIVE REVISION?

WEDNESDAY APRIL 9TH, 5-7PM

JH MITCHELL THEATRE, PETER HALL G01

SWIPE FOR CONTENT OVERVIEW! →



CONTENT OVERVIEW

01 FOC CONTENT SUMMARY

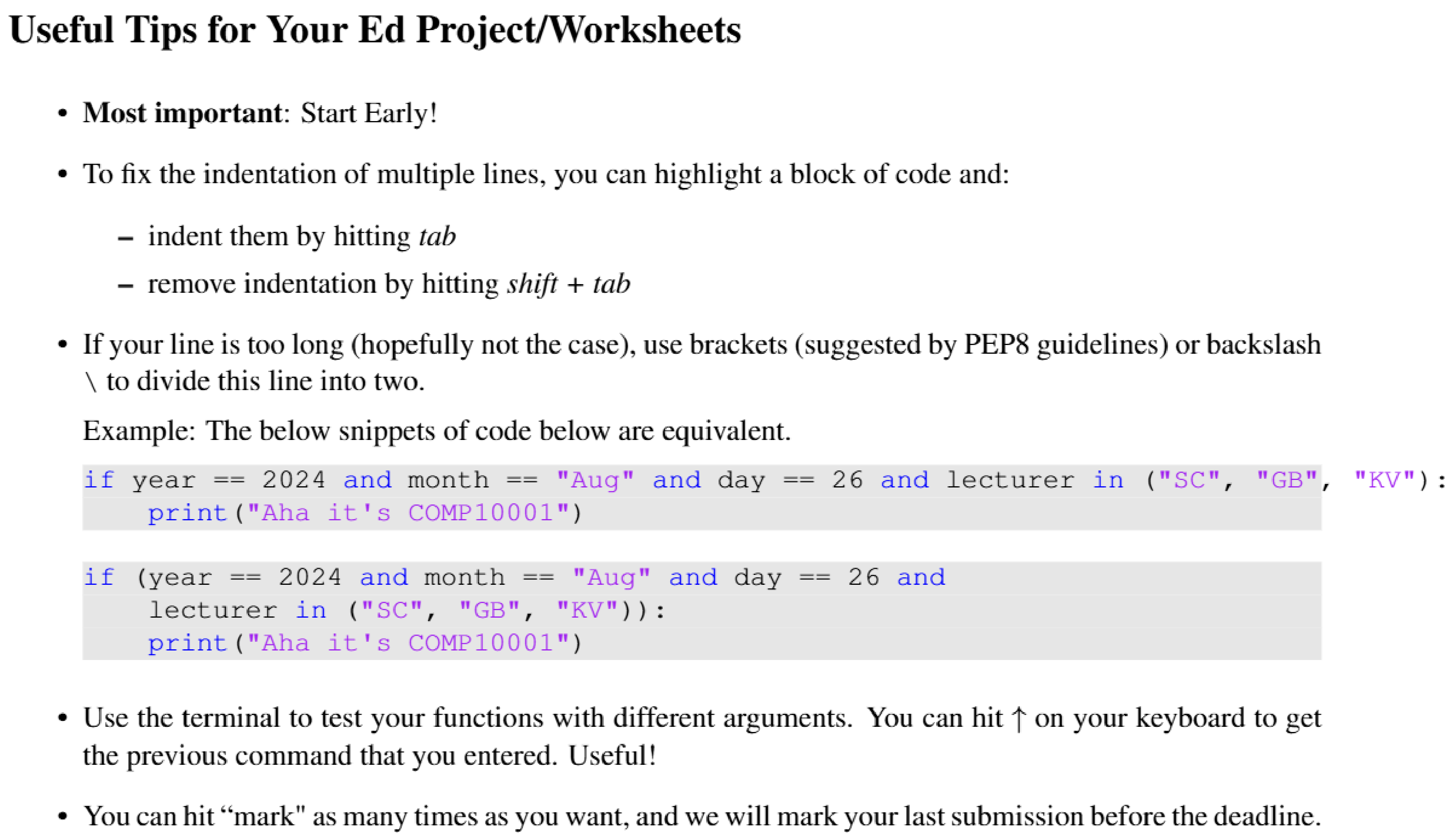
02 FOC PRACTICE QUESTIONS

03 MST TEST TIPS

04 FOC Q&A

Scan Me

Before we start (2),



Useful Tips for Your Ed Project/Worksheets

- **Most important**: Start Early!
- To fix the indentation of multiple lines, you can highlight a block of code and:
  - indent them by hitting *tab*
  - remove indentation by hitting *shift* + *tab*
- If your line is too long (hopefully not the case), use brackets (suggested by PEP8 guidelines) or backslash \ to divide this line into two.

  Example: The below snippets of code below are equivalent.

  ```
  if year == 2024 and month == "Aug" and day == 26 and lecturer in ("SC", "GB", "KV"):
      print("Aha it's COMP10001")
  ```

  ```
  if (year == 2024 and month == "Aug" and day == 26 and
      lecturer in ("SC", "GB", "KV")):
      print("Aha it's COMP10001")
  ```

- Use the terminal to test your functions with different arguments. You can hit ↑ on your keyboard to get the previous command that you entered. Useful!
- You can hit “mark" as many times as you want, and we will mark your last submission before the deadline.

Question 1, assume that seq is a list. Write one line of code to:

1. Sort seq in-place (i.e. mutate the list)

→ `seq.sort()`

2. Assign the sorted version of seq to a new variable new_seq. Do not change the original list.

→ `new_seq = sorted(seq)`

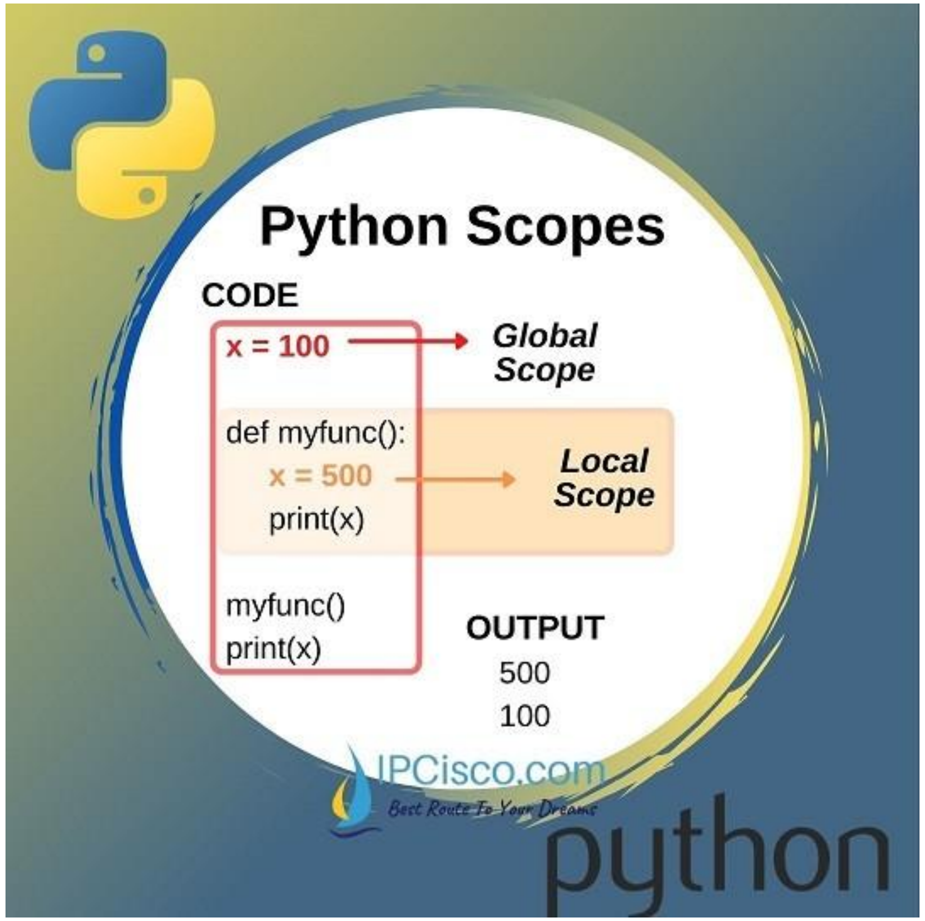
3. Add the string "hi" to the end of seq.

→ `seq.append("hi")`

OR

`seq = seq + ["hi"]`

Revision, Python Scopes!



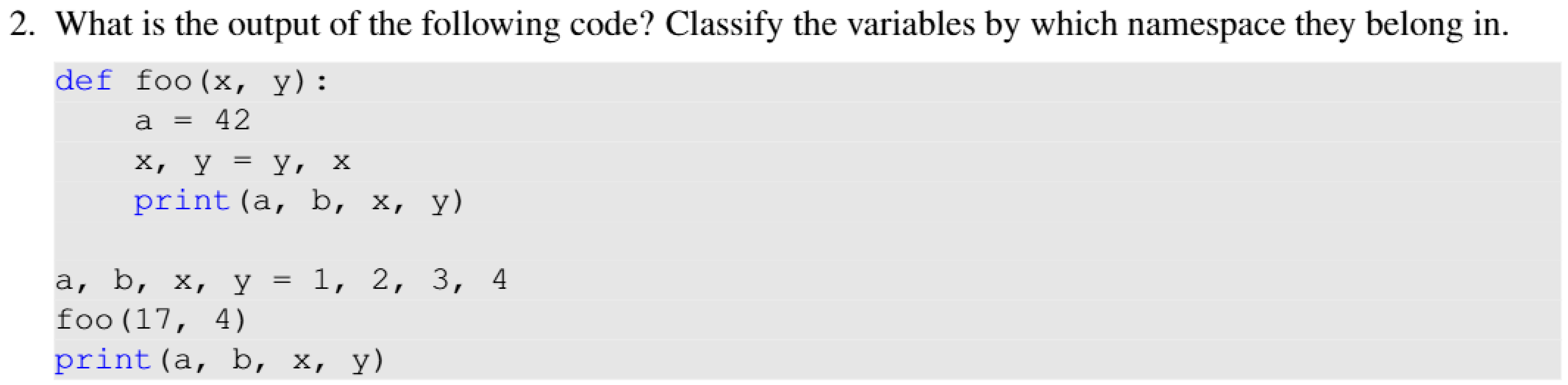
```
x = 100

def myfunc():
    x = 500
    print(x)

myfunc()
print(x)
```

```
500
100
```

Question 2, what is the output of this code?

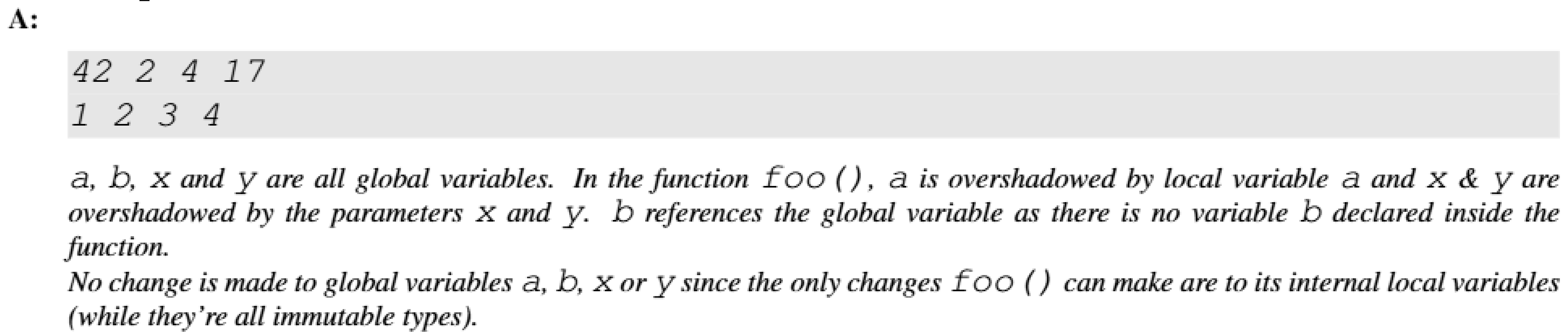


2. What is the output of the following code? Classify the variables by which namespace they belong in.

```python
def foo(x, y):
    a = 42
    x, y = y, x
    print(a, b, x, y)

a, b, x, y = 1, 2, 3, 4
foo(17, 4)
print(a, b, x, y)
```

Answer + Explanation:

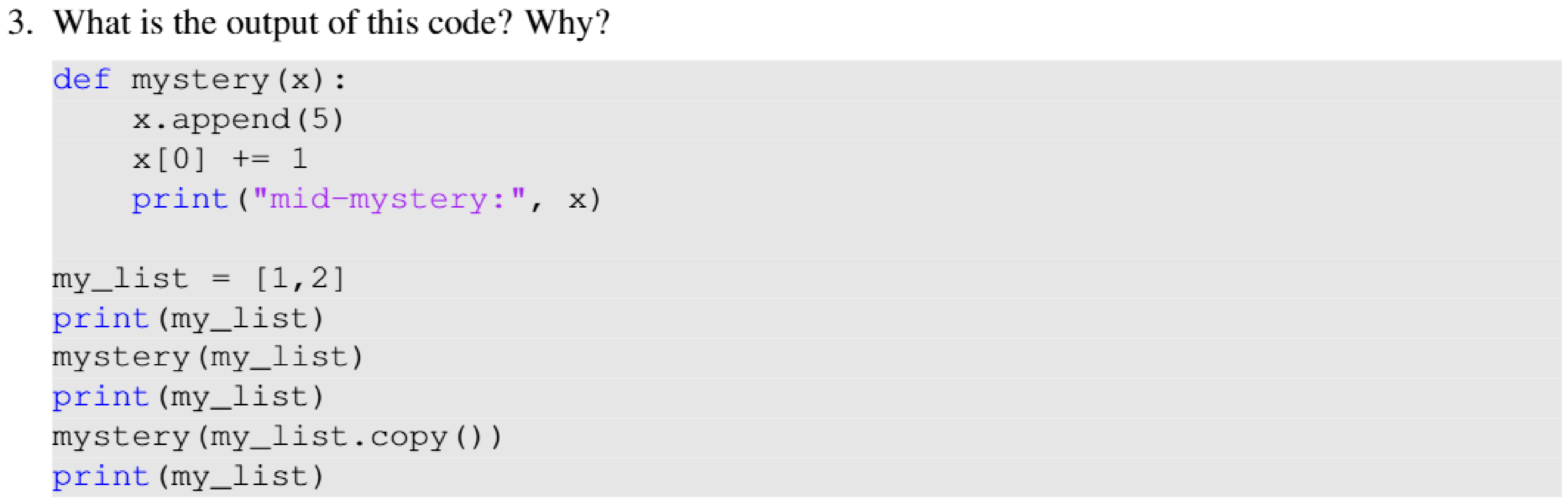


A:

```
42 2 4 17
1 2 3 4
```

a, b, x and y are all global variables. In the function foo(), a is overshadowed by local variable a and x & y are overshadowed by the parameters x and y. b references the global variable as there is no variable b declared inside the function.
No change is made to global variables a, b, x or y since the only changes foo() can make are to its internal local variables (while they're all immutable types).

Question 3, what is the output of this code?

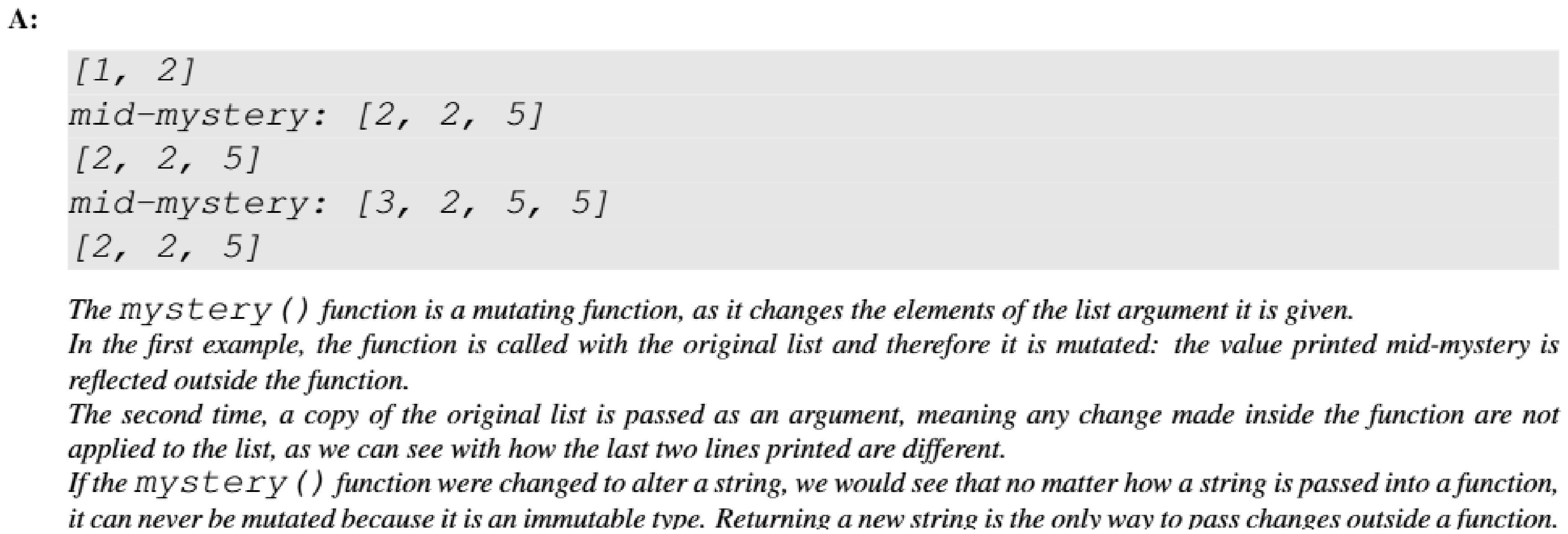


3. What is the output of this code? Why?

```
def mystery(x):
    x.append(5)
    x[0] += 1
    print("mid-mystery:", x)

my_list = [1,2]
print(my_list)
mystery(my_list)
print(my_list)
mystery(my_list.copy())
print(my_list)
```

Answer + Explanation:

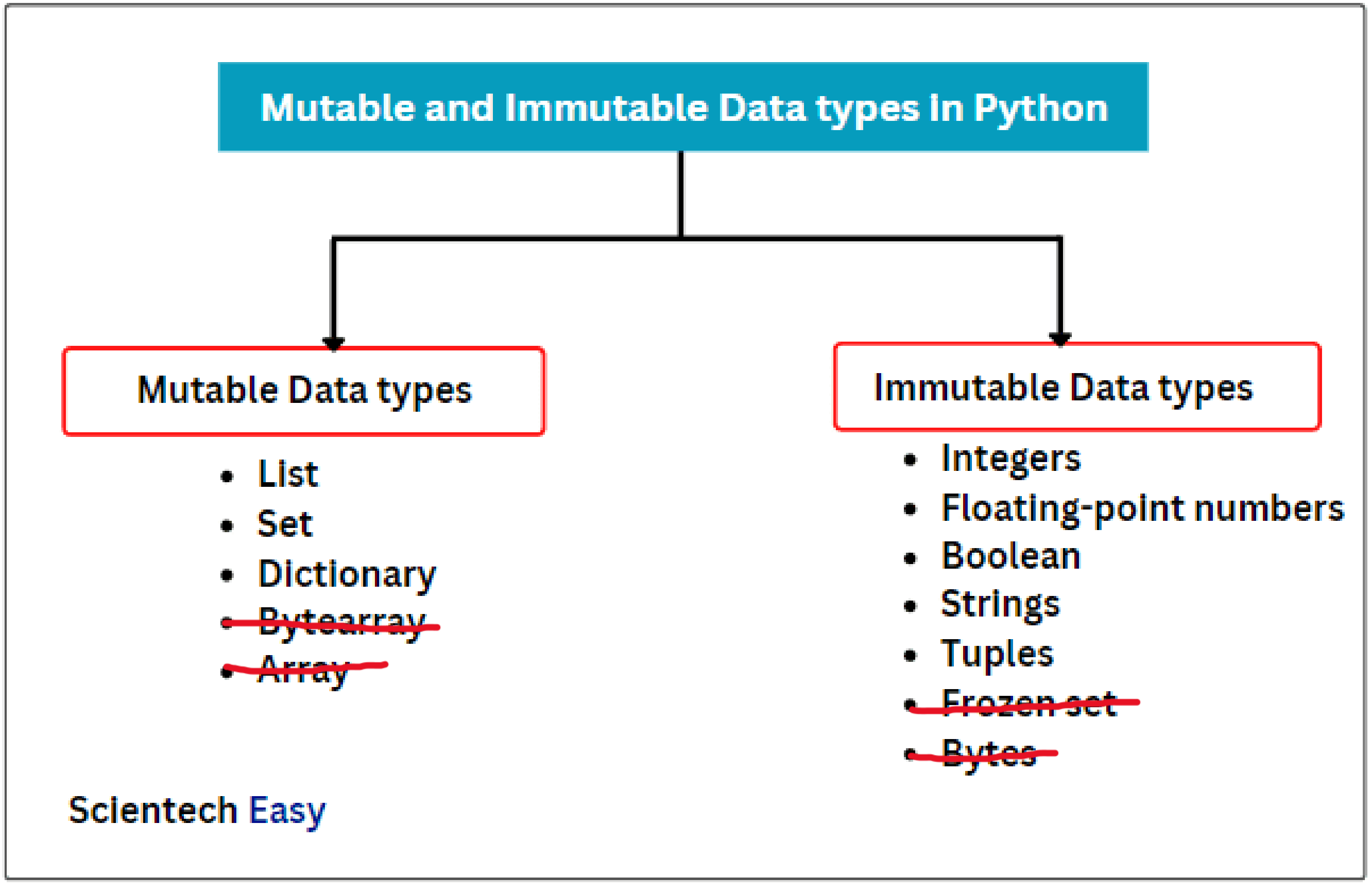


A:

```
[1, 2]
mid-mystery: [2, 2, 5]
[2, 2, 5]
mid-mystery: [3, 2, 5, 5]
[2, 2, 5]
```

The `mystery()` function is a mutating function, as it changes the elements of the list argument it is given.
In the first example, the function is called with the original list and therefore it is mutated: the value printed mid-mystery is reflected outside the function.
The second time, a copy of the original list is passed as an argument, meaning any change made inside the function are not applied to the list, as we can see with how the last two lines printed are different.
If the `mystery()` function were changed to alter a string, we would see that no matter how a string is passed into a function, it can never be mutated because it is an immutable type. Returning a new string is the only way to pass changes outside a function.

Revision: Mutable and Immutable Data Types



Mutable Data types

- List
- Set
- Dictionary
- ~~Bytearray~~
- ~~Array~~

Immutable Data types

- Integers
- Floating-point numbers
- Boolean
- Strings
- Tuples
- ~~Frozen set~~
- ~~Bytes~~

Question 4, compare and contrast the 2 functions

4. Compare the two functions below. Are they equivalent? Why would we prefer one over the other?

```python
def noletter_1(words, letter='z'):
    for word in words:
        if letter in word:
            return False
    return True

def noletter_2(words, letter='z'):
    no_z = True
    for word in words:
        if letter in word:
            no_z = False
    return no_z

wordlist = ['zizzer'] + ['aardvark'] * 10_000_000
print(noletter_1(wordlist))
print(noletter_2(wordlist))
```

Explanation:

A: *The two functions are functionally equivalent, but the first one uses a timely return while the second one doesn't. In the example of* `'zizzer'` *followed by 10 million instances of* `'aardvark'`*, the first function will perform much faster as it's able to return* `False` *as soon as it tests* `'zizzer'`*. The second will continue to iterate through every instance of* `'aardvark'` *before returning* `False`*, taking much more time unnecessarily.*

Programming on Paper

Past MST Question 2023 Semester 1

1. Write a Python function `find_ints(text)` that takes a (possibly empty) Python string `text` and returns a (possibly empty) list of the word locations at which integers occur. A “word" is defined as a consecutive sequence of non-whitespace characters, and an “integer" is defined as a word that is either completely made up of digits, or is a single + or − sign, and then nothing but digits. Word positions within text are counted from one.

   For example:

   - `find_ints("Ints -34 there and here +551 but not here88")` should return `[2, 6]`
   - `find_ints("No integers here99 88-77 or there")` should return `[]`
   - `find_ints("+18 and -777 and 666 are all 3 integers")` should return `[1, 3, 5, 8]`

   Hint: if you get stuck, try seperating the first character from the rest for each word.

A:

Answer:

```python
def find_ints(text):
    int_pos = []
    words = text.split()
    for i in range(len(words)):
        word = words[i]
        if word.isdigit() or word[0] in "+-" and word[1:].isdigit():
            int_pos.append(i+1)
    return int_pos
```

Exercise 1 / 3

1. Write a function which takes two lists as input and returns a list containing the numbers which they both have in common. `in_common([1, 2, 4], [3, 4, 5])` should return `[4]`.

Answer:

A:

```python
def in_common(list_1, list_2):
    set_1 = set(list_1)
    set_2 = set(list_2)
    common = set_1 & set_2
    return list(common)
```

Exercise 2 / 3

2. Write a function which takes a dictionary and returns a sorted list containing the unique values in that dictionary. `unique_values({'a': 1, 'b': 0, 'c': 0})` should return `[0, 1]`.

Answer:

A: *Note that this solution only works if the values of the input dictionaries are immutable, since the values in a set must be immutable.*

```python
def unique_values(d):
    values = d.values()
    set_values = set(values)
    sorted_values = sorted(set_values)
    return sorted_values
```

Exercise 3 / 3

3. Write a function which takes a list of words and checks whether any of those words are palindromes (spelled the same way backwards as forwards, like “kayak”). It should return True if there are any palindromes and False if there are none. Use a timely return to save some time!
`any_palindrome(['kayak', 'motorbike', 'scooter'])` should return `True`.

Answer:

A:

```
def any_palindrome(words):
    for word in words:
        if word == word[::-1]:
            return True
    return False
```

Independent Work

- **MST page on canvas has been released!**
  - **It contains where and when exactly is your test.**
  - **It also contains 9 past papers, 3 of which has sample solutions.**
  - **Practice, practice, practice!!!**
- **NO Ed Worksheets due next week.**
  - Please focus on your **Project 1**. This is **due Friday, May 2nd, 6pm**.
- **Raise your hand** if you have any questions!

Scan here for annotated slides