

Name: _____
Surname: _____
Date: _____

Instructions

Circle the correct answer for each question, as each question has **only one** correct answer. Provide reasoning for your answer in the space next to each question. A correct answer always awards a point (even with no explanation). An incorrect answer with faulty or no reasoning subtracts one point. No answer gives zero points (neither adds nor subtracts points). Assume each code cell is **run in isolation**, meaning no other code has been run before it.

Questions

1. What is a difference between a Python list and a NumPy array?
 - (a) Lists can contain strings, arrays cannot.
 - (b) Lists are mutable, arrays are not.
 - (c) NumPy arrays allow broadcasting, lists do not have that feature.
 - (d) All of the above.

2. After running this code, what will be **length of “z”**?

```
1 import numpy as np
2 x = np.array()
3 y = np.zeros(3)
4 z = np.concatenate([x, y])
```

- (a) 0
 - (b) 3
 - (c) 4
 - (d) The code will raise an error.
3. We have a 1D-array “x” of length 8. Which of the following lines of code will reshape it to a 3D-array of shape (2, 2, 2)?
 - (a) `x = x[2:2:2]`
 - (b) `x = x.reshape((2, 2))`
 - (c) `x = x.reshape((2, 2, -1))`
 - (d) None of the above.

4. Why will the following code cell fail?

```
1 import numpy as np
2 arr = np.arange(10)
3 arr_bool = arr > 5 and arr < 8.0
4 selected = arr[arr_bool]
```

- (a) (Line 2) The function `np.arange()` does not generate an array.
- (b) (Line 3) NumPy cannot compare integers (5) and floats (8.0) together.
- (c) (Line 3) The `and` command cannot be used to merge boolean arrays.
- (d) (Line 4) We cannot index an array (`arr`) with a boolean array (`arr_bool`).

5. You run the following cell once. It prints “265”. What will it print when you run it again?

```
1 import numpy as np
2 x = 10
3 np.random.seed(x)
4 x = np.random.randint(low=0, high=1000)
5 print(x)
```

- (a) 10
- (b) 265
- (c) We cannot predict the outcome of another run.
- (d) The code will raise an error when we run it a second time.

6. How would you replace the for loop in the code below, for any 1D NumPy array?

```
1 result = 1
2 for value in arr: # Assumes arr is a 1D-array
3     result = result - value
```

- (a) `result = 1 - np.sum(arr)`
- (b) `result = 1 - np.cumsum(arr)`
- (c) `result = 1 - np.loop(arr)`
- (d) `result = np.diff(arr)`

7. What is going to be the final value of “x”?

```
1 import numpy as np
2 x = np.array(
3     [[1, 2],
4      [3, 4]]
5 )
6 x[:, 0] = 0
```

(a)

$$\begin{bmatrix} 0 & 2 \\ 3 & 4 \end{bmatrix}$$

(b)

$$\begin{bmatrix} 1 & 2 \\ 0 & 4 \end{bmatrix}$$

(c)

$$\begin{bmatrix} 0 & 0 \\ 3 & 4 \end{bmatrix}$$

(d)

$$\begin{bmatrix} 0 & 2 \\ 0 & 4 \end{bmatrix}$$

8. I want my code below to print the message “Ohana” with a 25% chance (one out of four times). Which condition should I use?

```
1 import numpy as np
2 p = np.random.uniform(0, 100)
3 condition = # Change this line
4 if condition:
5     print("Ohana")
```

(a) condition = p >= 25

(b) condition = p < 25

(c) condition = p >= np.random.uniform(25)

(d) condition = p < np.random.uniform(25)

9. We run this code. What will the value of “c” be?

```
1 import numpy as np
2 a = np.array([1, 2, 3])
3 b = np.array([4, 5, 6, 7])
4 c = b > a
```

- (a) True
- (b) [True, True, True]
- (c) [True, True, True, True]
- (d) The code will raise an error.

10. Which line of code below correctly filters out all even numbers from any integer array “arr”? The output must be an array with only odd numbers.

- (a) `arr[1::2]`
- (b) `arr[arr != 0]`
- (c) `arr[arr % 2 != 0]`
- (d) `arr[(arr.astype(int) / 2) != (arr / 2)]`