MR2020: Extra Practice Problems

1. Given an array called values:

```
values = np.array([5.7, 1.2, 9.3, 4.8, 7.6, 2.1, 0.9, 3.4, 6.5, 8.9])
```

   Write a for-loop or list comprehension to create a variable 'count' that stores the number of elements in 'values' that are greater than 5.

2. What is the value of B after the following code is executed?

3. Create a list called 'num_list' that contains the numbers 1, 4, and 7.

4. Create a tuple called num_tuple that contains the numbers 10, 20, and 30.

5. Create a dictionary called location_data containing the following information:

Key	Value
State	California
Elevation	300
Population	500000

6. Write Python statements equivalent to the following English statements:

a. X is equal to Y.

b. Z is less than or equal to the median of a numpy array arr.

c. Y is greater than the minimum value in arr.

d. X is greater than Y and Y is greater than Z.

e. Either both X is equal to Y and X is less than Z or X is greater than Z.

7. Translate the following Python statements into written English:

   a. `(A + B) >= 5 and C < 2`

   b. `X != Y – 2`

   c. `if Z > 10: Z –= 3`

   d. `A > B or A == 5`

   e. `np.median(X[:, 1]) <= Y`

8. Write a code snippet that attempts to create an array `B` filled with ones using `np.ones_like(A)` where `A` is another numpy array. Print "Assignment failed" if the operation fails.

9. Write a while loop that generates a random integer from 1 to 20 using `random.randint(1, 20)` and continues until the generated number is 15.

10. Suppose you have arrays of data for pressure (P) and wind speed (WS):

Write a function check_conditions that returns 1 if the pressure is below 1000 hPa and wind speed exceeds 20 m/s. Otherwise, return 0.

11. Define a class called Rectangle that is initialized with the attributes length (float), width (float), and color (string). Add a method to the class that calculates the area of the rectangle. Then, create an object my_rectangle with length 15, width 10, and color "blue" in one line.

12. For each problem below, determine the output of the Python code snippet:

a.

```
B = np.array([(1,4),(2,8)])
B[1, 0]
```

b.

```
C = np.array([5,9,2,6,1,8,3,4,7])
C[5:]
```

c.

```
[k for k in range(6)]
```

d.

```
weather_info = {'temp': [20, 25, 30], 'wind': ['Yes', 'No', 'Yes']}
weather_info['wind'][2]
```

13. Create a list called heights that contains the numbers 150, 165.2, 170, and 180.5 in that order.

14. Create a tuple called weights that contains the numbers 60, 75.5, 82, and 70.3 in that order.

15. Create a dictionary called book_info containing the following information:

Key	Value
Title	List containing elements '1984' and 'Brave New World'
Author	List containing elements 'Orwell' and 'Huxley'

16. Given the following Python set and the print statement:

```
fruits = {'apple', 'banana', 'apple', 'orange', 'banana'}
print(fruits)
```

What would you expect to see as the result of print(fruits)?

17. What would the following code return for the variable B?

```
B = 1
for i in range(3):
    B += 2
    B *= 2
```

18. Write a Python comparison statement for each of the following English statements. Assume that numpy was imported as np.

a. The absolute difference between X and Y is less than or equal to 5. Hint: Use np.abs()

b. M is greater than or equal to the square root of N. Use np.sqrt(N).

c. Z is positive, or both P and Q are greater than or equal to 20.

19. Translate the following Python statements to written English:

```
a. A % B == 0 and B > A // 2
```

```
b. C.min() < D[:,0].min()
```

```
c. if not A: C -= 3
```

20. Write a Python code that tries to subtract C from D (i.e., D - C). If the subtraction fails, print "Subtraction failed. Check the dimensions of C and D." If the subtraction succeeds, print "Subtraction successful!"

21. Assume you have the following code:

```
from random import randint
```

Use the following line of code inside a while loop

```
num = randint(1, 4)
```

If num is not 4, print the number. If num is 4, set a variable called found to True and exit the while loop.

22. Suppose you already have the following code:

```
import numpy as np

X = np.array([1.2, 3.5, 6.7, 2.1, 8.4])
Y = np.array([4.3, 1.5, 2.9, 5.6, 3.8])
```

Write a code that prints how many times the sum of corresponding elements in X and Y is less than or equal to 10.

23. Define a class called WeatherStation that is initialized with the following attributes: temperature (float), pressure (float), humidity (float), and wind_speed (float). Add a method that calculates the wind chill using the formula:

$$WC = 13.12 + 0.6215 \times T - 11.37 \times V^{0.16} + 0.3965 \times T \times V^{0.16}$$

where T is temperature and V is wind speed. Create an object station with temperature of 5, pressure of 1013, humidity of 85, and wind_speed of 10, then calculate the wind chill using this object. What answer do you get for the wind chill?

Write a function called calculate_heat_index that takes two input variables: T (temperature in degrees Fahrenheit) and RH (relative humidity as a percentage). The function should return the Heat Index (HI) using the following made-up formula:

$$HI = -42.379 + 2.049 \times T + 10.143 \times RH - 0.225 \times T \times RH$$

The function should warn by printing a message if any special cases where the input values lead to extreme or unrealistic Heat Index values (for example greater than 135 degrees F).

25. For each separate, unrelated problem, determine what the following Python code snippets would return:

a.

```
B = np.array([(6,2,3,9),(7,5,1,4),(8,0,2,6)])
B[1, 2]
```

b.

```
B = np.array([2,4,6,8,10,12,14,16,18,20])
B[2:]
```

c.

```
B = np.array([2,4,6,8,10,12,14,16,18,20])
B[1:7]
```

d.

```
B = np.array([2,4,6,8,10,12,14,16,18,20])
B[::4]
```

e.

```
data = {'season':[1,2,'Offseason',4],'played':[False,True,True,False]}
data[season][2]
```