MR2020 (Summer 2024) Midterm Practice/Review

1. Suppose you have a numpy array that contains the following numbers assigned to a variable 'numbers':

```
array([8.4, 3.6, 1.3, 9.5, 6.4, 3.2, 7.4, 5.5, 4.1, 2.3])
```

Write a for-loop or list comprehension that creates a variable 'count' and ends with 'count' being equal to the number of elements in 'numbers' that are less than 4.

2. What would the following return for the variable A?

```
A = 2
for i in range(5):
    A *= 2
```

3. Create a list called 'mylist' that contains the numbers 2, 5, and 8.

4. Create a tuple called 'mytuple' that contains the numbers 8, 4, and 16.

5. Create a dictionary called 'mydict' containing the following information:

Key	Value
City	Monterey, CA
Latitude	36.60
Longitude	-121.89

6. Write a Python comparison statement for each of the following English statements. You can assume that numpy was imported as np.

a. A is not equal to B.

b. X is greater than or equal to the mean of numpy array B.

c. X is equal to the maximum value in B.

d. A is less than B and B is less than C.

e. Either both A is equal to B and A is less than C or just A is greater than C.

7. Translate the following Python statements to written English.

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

b. `A != B + 1`

c. `if B < 5: B += 1`

d. `A <= B or A == 0`

e. `np.mean(A[:,0]) > B`

8. Write a sample code that attempts to assign the variable A an array of zeros with the same dimensions of B using `np.zeros_like(B)`. However, prints "This operation failed" if the variable assignment fails. Assume that numpy is already imported as np.

9. Generate a while loop that repeatedly creates a random integer from 1 to 10 and does not stop until the integer is 10. You can use `number = random.randint(1, 10)` to create the random number within the while loop.

10. Suppose you have the following arrays of data for temperature (T) and relative humidity (RH) and that numpy is imported as np.

```
T = 30*np.random.random(1000)+5     # degrees C
RH = 100*np.random.random(1000)     # %
```

Write a function called 'myfunc' that returns 1 if the temperature exceeds 20°C and RH exceeds 80% but returns 0 if that condition is not met.

11. Define a class called Cloud that is initialized with the following attributes (with data type for each attribute in parentheses): base (float), height (float), width (float), raining (boolean). Give the class a method (function) that computes the depth (height minus base) of the cloud. Then, in one line, create an object ‘mycloud’ that is a member of the class ‘Cloud’ with a base of 500, height of 2500, width of 1000, and with raining assigned False.

12. For each separate, not related, problem, respond with what the following **bolded red** lines of code would return (or be evaluated as) in Python.

a.
```
[j for j in range(5)]
```

b.
```
A = np.array([(2,3),(4,5)])
A[0,1]
```

c.
```
A = np.array([3,5,6,7,8,2,10,34,54,32])
A[4:]
```

```
A = np.array([3,5,6,7,8,2,10,34,54,32])
A[2:5]
```

```
A = np.array([3,5,6,7,8,2,10,34,54,32])
A[::2]
```

d.
```
weather =
{'temp':[43,45,47],'rain':['True','True','False']}
weather['temp'][2]
```