

Module 1 Lab

Objective: Use knowledge from this weeks lessons to start performing simple vector analysis. Lets get started!

Preparing your session

1. Create a new directory on your computer for this course.
2. Launch a Jupyter Lab session
3. Create a new Jupyter notebook for this lab and save it as `bana6040_lab1_bcboehmke.ipynb` where "bcboehmke" is your first and middle initial followed by your last name.
4. For each question you should create a second-level heading (i.e. `## Question 1`) followed by one or more code chunks used to answer the question.

Question 1: BMI

Given the equation for calculating Body Mass Index (BMI) is:

$$BMI = \frac{\text{weight in pounds} \times 703}{\text{height in inches}^2}$$

Say an individual weighs 150 lbs and is 68 inches tall. What is their BMI?

wt = ____
ht = ____
bmi = _____

Question 2: Math Library

1. Import the `math` library.
2. Find a function within the `math` library that will compute the square root of 14×0.51
3. Find a function with the `math` library that will compute $3.25^{2.784}$. Now compute this with a simple math operator provided by standard Python.

Question 3: Cost of Pizza

Say you have a 12" diameter pizza. And given the area of a circle is $A = \pi(\text{diameter}/2)^2$, compute the area of the pizza and assign that value to the variable `area`. Now say the cost of the pizza was \$8. Compute the cost per square inch of this pizza. **Hint**: the `math` library contains a `pi` object to use as π .

Now say you have the option to buy the above pizza or a 15" pizza that costs \$12. Which is a better deal?

Question 4: Conditional Statements and Snakes

Given the variable `language` which contains a string, use `if/elif/else` to write a program that:

- returns "I love snakes!" if `language` is "python" (any kind of capitalization)
- returns "Are you a pirate?" if `language` is "R" (any kind of capitalization)
- returns "What is language?" if `language` is anything else.

Question 5: Analyzing a Vector of Weights

1. Create a list called `weight` containing the weight (in kg) of 10 children: 69, 62, 57, 59, 59, 64, 56, 66, 67, 66.
2. Try and convert these weights to pounds using (1kg = 2.20462lbs). If you try `weight * 2.20462` what results?
3. Import the `numpy` library and use the alias `np`.
4. Now convert `weight` to an array with `np.array()`.
5. Now try and convert the array of weights to pounds using `weight * 2.20462` what results?
6. Use numpy functions to compute the mean and standard deviation of the weights in pounds.
7. How many children weigh more than the average?

Question 6: Back to BMI

Say we have the following height (in inches) for our 10 children: 62, 58, 61, 61, 59, 64, 63, 61, 60, 62. Use the weights from the last exercise and these height values to compute the BMI for each child. What is the average BMI across all the children?

Question 7: Nested Dictionary

Given this nested dictionary, extract the element containing the word "BANA"

```
In [1]: d = {  
    "a_list": [1, 2, 3,],  
    "a_dict": {"first": ["this", "is", "inception"],  
               "second": [1, 2, 3, "BANA"]}  
}
```

Question 8: Sorting Arrays

Lets create 20 random integers where the values are randomly created from the value range of 50-100. We'll say these random integers represent the weight of 20 children. We'll use `numpy` to generate these numbers. Be sure to use `seed(123)` so we get the same results.

```
In [2]: # random generating functions  
from numpy.random import seed  
from numpy.random import randint  
  
# seed random number generator  
seed(123)  
  
# generate 20 random numbers between 50-100  
weights = randint(low=50, high=100, size=20)
```

Identify the weights of the three children that have the lightest weight values. Hint: figure out how to sort these values in ascending order and index the first three values.

Question 9: The Zen of Python

Run the following code. Read and embrace this mantra throughout this class and your Python code-writing lives!

```
import this
```