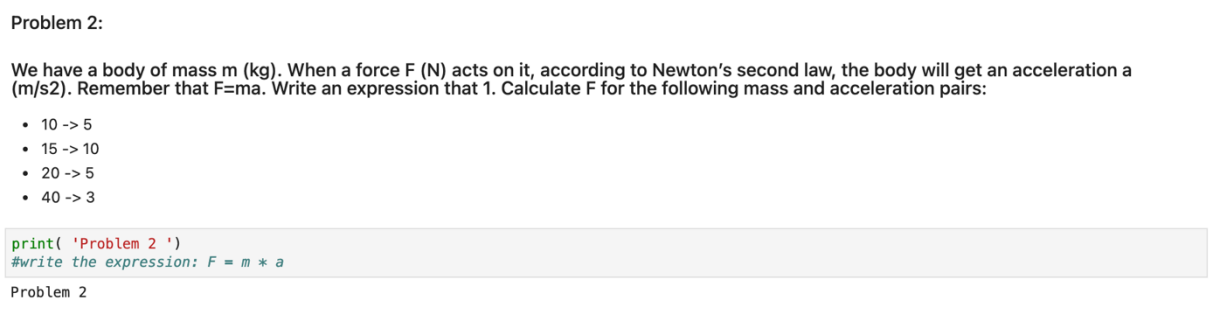
UCF Physics PHZ 3150: Introduction to Numerical Computing
Fall 2021 Homework 4
Due September 16 2021

Goals: Become familiar with Python, modules, lists and tuples.
Reading and study: Read Think Python Chapters 2 and 3 (you can also start 10).

Problems to Hand In: For this assignment, your log is part of your homework. In one of the entries, it should identify the start and end of HW4 and list the problem numbers in order. Keep notes about what you are doing for each exercise/problem, as well as the answers to the problems. If you made a HW4 entry in your log in a prior session and want to change it, just copy it to the current (last) session, and edit there. We will grade the last entry only. All text related to one assignment should be in one entry, with the problems done in order.

Problem 1 (**5 points**). Make a new folder named `hw4_<yourname>` under you `handin` folder.
For this homework your main homework file is a Python file named `hw4_<username>.ipynb`. Save it in your homework folder. Remember to commit your files and push to GitHub (also, great backup!).

Your name, assignment number, and the date should appear as comments at the top of the notebook. At the start of every problem write the problem number using markdown comments. Any remarks or written answers you may make should also be written with markdown. If you need to comment something in the code (for coding clarity) do so with a normal comment (i.e., `# this is a comment`). **Print the problem number (as in "Problem 1:") before each problem's output.** Use the print() function to print, don't just type the expression. Below you can see an example of what your notebook should look like.



Problem 2:

We have a body of mass m (kg). When a force F (N) acts on it, according to Newton's second law, the body will get an acceleration a (m/s2). Remember that F=ma. Write an expression that 1. Calculate F for the following mass and acceleration pairs:

- 10 -> 5
- 15 -> 10
- 20 -> 5
- 40 -> 3

```
7]: print( 'Problem 2 ')
    #write the expression: F = m * a
```

```
Problem 2
```

Problem 2 (**15 points**). We have a body of mass `m` (kg). When a force `F` (N) acts on it, according to Newton's second law, the body will get an acceleration `a` (m/s^2).

Remember that `F=ma`. Write an expression that 1. Calculate F for the following mass and acceleration pairs: m

m [kg]	a [m/s^2]
10	5
15	10
20	5
40	3

Make a function `force_to_acceleration` that calculates the acceleration of a body of mass `m[kg]` when a force `F[N]` is applied on it. Remember to use a good docstring! Calculate the acceleration of a body of mass 150kg when forces `F` of `100, 22` and `450 (N)` are applied to it.

Problem 3 (**20 points**). The acceleration of a body can be approximated by the ratio of the change of a body's speed (u2-u1) over a time span (t1-t1) as: a=(u2-u1)/(t2-t1). Write a function called `acceleration(u1,u2,t1,t2)` that takes the different speeds (u1,u2) of a body at times t1 and t2 and calculates the acceleration of the body. Save it in a separate file, not your main homework file. Remember to start it with a docstring. In your main homework file, import the function and calculate the acceleration of a body for the following times and speeds

t1 [s]	t2 [s]	u1 [m/s]	u2 [m/s]
0	2	10	13
10	14	15	30
14	16	32	36
28	32	42	20
0	10	20	22

Calculate these numbers some other way to check that they are correct (in general, always check your code in this way). State in comments how you checked (calculator, web site, etc.). Name 2 test cases you could use to verify the code works as it should.

Bonus Problem 4 (**10 points**). Some of you had problems with setting up GitHub, starting a repository for your `handin` folder and/or naming correctly your log, files and screenshots for homework 2 and 3. If so, explain in your log, in detail, all changes you have done to correct these errors (e.g., how did you rename your log file and why, how did you start a new repository, added files and committed them, etc). Remember that these notes should appear as part of your HW4 log. **Do not** go back and alter any of the HW2, HW3 entries of your log!

Problem 5. (**10 points**) Prepare and submit your homework. Copy the finalized Jupyter notebook to the `handin/hw4_*` folder and don't forget to commit and push it to GitHub. Explain what you did to do that in your log. Make a screenshot that shows you committed the file and add it to your `handin/hw4_*` folder (remember to use an appropriate name for the screenshot!). Write what you did to make and submit the zip file into your log. When satisfied, close the log, copy it to your homework directory one last time, and run the commands to make and submit the zip file. Turn the file in on WebCourses.