PH2150 Scientific Computing Skills

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The aim of this first problem sheet is that when complete you will have successfully created an account for Canopy and been introduced to some of the ways that you can interact with the *Python* environment.

1 Problem Sheet 1, Ex1:

Create an account for access to the Canopy packages via Enthought's website,
https://www.enthought.com/products/canopy/,
With this user account, you will be able to add additional package libraries when using the teaching lab machines, and download a free version for home use. Log onto *Canopy* on a PC Lab machine and use the *Package Manager* to add the package mayavi to your account.

2 Problem Sheet 1, Ex2:

Using Python as a calculator, write a program that:

1. prints the square root of nineteen
2. prints the factorial of 19
3. prints the sine of 33 degrees
4. prints the result of 4/7 where 4 and 7 are floating point numbers
5. prints the result of 4/7 where 4 and 7 are integer numbers

What is the difference between running the code from the developer environment or typing directly into the interpreter? add a comment to your code.

Note these functions have not be defined in the notes and you will need to search the online tutorial or interactive help to get the correct answers.

3 Problem Sheet 1, Ex3:

A question to practice requesting inputs from users and returning the output after evaluation: The problem is as follows. A ball is dropped from a tower of height h, built on level ground. The ball has initial velocity zero and accelerates downwards under gravity. The challenge is to write a program that asks the user to enter the height in meters of the tower and a time interval t in seconds, then prints on the screen the height of the ball from the ground at time t after it is dropped, ignoring air resistance.

4 Problem Sheet 1, Ex4:

A satellite is to be launched into a circular orbit around the Earth so that it orbits the planet once every T seconds.

a) Show (on paper) that the altitude h above the Earths surface that the satellite must have is $h = (GMT^2/4\pi^2)^{1/3} - R$, where $G = 6.67\text{x}10^{-11}$ $\text{m}^3 kg^{-1} s^{-2}$ is Newtons gravitational constant, $M = 5.97\text{x}10^{24}$ kg is the mass of the Earth, and $R = 6371$ km is its radius. Before writing a program it is important that you understand what your variables are and what you want the algorithm to do.

b) Write a program that asks the user to enter the desired value of T and then calculates and prints out the correct altitude in meters.

c) Use your program to calculate the altitudes of satellites that orbit the Earth once a day (so-called geosynchronous orbit), once every 90 minutes, and once every 45 minutes. What do you conclude from the last of these calculations?

5 Problem Sheet 1, Ex5:

Using the write() method described in the notes, create a file containing the first law of thermodynamic:

"In all cases in which work is produced by the agency of heat, a quantity of heat is consumed which is proportional to the work done; and conversely, by the expenditure of an equal quantity of work an equal quantity of heat is produced."

Write a program to read out the sixth word of the string and then print the whole statement.

Print (to screen) a list of the functions that can operate on the string, *hint type the string name in the interpreter window followed by a '.' and then press tab (auto complete) to see available functions*

6 Submit via Turnitin

When complete, the code plus comments should be submitted as a single file (PS1.py) via Turnitin Problem Sheet 1. The turnitin page will be available in the Autumn term after the

Moodle changeover. For now save your work on your y: drive (+ usb memory) This problem sheet will be assessed in the first week of the Autumn term.