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Tutor marked assignment (TMA) 02

Introduction

TMA 02 contributes up to 6% to your overall module score. It covers a range of activities that you have undertaken while studying *Python 1* and the *Topics 1, 2* and *3* in Weeks 5–11.

You should submit your completed assignment to arrive no later than **12 noon** (UK local time) on the cut-off date, as outlined in your Assessment tab or Study Calendar. (Please note that although this assignment will be marked out of 50, the total marks for the four questions in this TMA count for 6% of the assessment for the whole module.)

There are five questions in this assignment. Question 1 relates to *Python 1: Introduction to Python*; Question 2 relates to *Topic 1: Forces around you*, Question 3 relates to *Topic 2: An introduction to energy*, Question 4 relates to *Topic 3: Material worlds*, and Question 5 involves self-reflection on your skills development across these weeks of your study.

Each question is associated with up to three of the module's learning outcomes. You will be assessed on how well your work demonstrates that you have achieved the learning outcomes using the following scale:

- well demonstrated (WD)
- demonstrated (D)
- just demonstrated (JD)
- not quite demonstrated (NQD)
- not demonstrated (ND).

Each of these levels corresponds with a learning outcome score of between 0 (ND) and 4 (WD). The mark for the TMA is calculated from a weighted sum of these scores.

The assignment requires you to assemble the outputs of some of the activities you have undertaken from each week's work. Rather than completing the assignment just prior to the cut-off date, you may find it helpful to complete each question during the week you are studying the corresponding work. That way, you should have little extra work to do before submitting your assignment.

Often a question will instruct you to ‘copy and paste’ your answers from material that you have previously saved in your Open Studio resources. When doing so, be sure to paste your written answers into your TMA document as *text* and not as an image or picture of the text. This will ensure that your tutor is able to annotate your answers as part of their feedback on your assignment.

Where word limits are specified in questions, please include a word count with your submitted answer. Exceeding the word limit by up to 10% will not be penalised.

The main purpose of this assignment is for you to receive feedback on your skills development from your tutor prior to you undertaking assignments that contribute more substantially to your overall module score.

Identifying your work and submitting your TMA

This module uses the online TMA/EMA service for submission of TMAs.

Create a document and save it in Word format (.doc or .docx). Name your document using your surname, your student number, the module and assignment number (e.g. Jones_A1234567_SM123_02) and ensure that these details are included as a header or footer on every page of your assignment.

Assemble, as instructed in this TMA, the various components you need to submit for your assignment.

Please *do not* include the question text or learning outcomes in your submission. This can make files unnecessarily large and more difficult to navigate through during marking. Additionally, if a (previous) student has breached Open University rules and placed any question or part of a question on the Internet, a script which includes the question will show up on the plagiarism checks and will be held, pending manual checks; this can delay the return of your script considerably.

To submit your completed TMA document, please go to your StudentHome page and follow the link(s) provided.

If you foresee any difficulty with submitting your assignment on time then you should contact your tutor in advance of the cut-off date.

For further information about policy, procedure and general submission of assignments, refer to the Assessment Handbook, which can also be accessed via your StudentHome page.

Question 1 (*8 marks*)

This question carries 16% of the marks for this assignment.

It is associated with your study of *Python 1: Introduction to Python* (Week 7).

You will be assessed according to how well you demonstrate, in your answer, the following learning outcomes and learning outcome ‘spokes’ as detailed in the skills radar diagrams:

CS3 Analyse problems in physical science and design logical plans for the development of software solutions to them.

- Analyse problems (**4 marks**)

PPS4 Implement software solutions in Python to simple problems in physical science.

- Data types and structures; Sequences and iterations (**4 marks**)

In Activity 2.2, you were presented with a Python program which uses Euclid's algorithm to find the greatest common divisor of two integers greater than zero. You were presented with some tasks concerning this program and asked to upload your responses to the appropriate slot in your OpenStudio online notes.

a. First, you were asked to write a series of bullet points which explained clearly what each line of the program does. You should copy and paste into your TMA document this set of bullet points.
b. You were then asked how you might write a while-loop around each of the input statements to ensure that the program repeatedly asks the user for input if the value entered is less than or equal to zero, and only proceeds once a value greater than zero is entered. You should copy and paste into your TMA document the additional lines of code needed to achieve this and your explanation of what they do. (N.B. Be sure to paste your lines of code as text, not as an image or picture of the lines of code. This is so that your tutor can copy and paste your code into a Jupyter Notebook and run it for themselves.)

Question 2 (*12 marks*)

This question carries 24% of the marks for this assignment.

It is associated with your study of *Topic 1: Forces around you* (Weeks 5-6).

You will be assessed according to how well you demonstrate, in your answer, the following learning outcomes and learning outcome ‘spokes’ as detailed in the skills radar diagrams:

PPS1 Carry out practical science; make and accurately record observations, and use these to draw informed conclusions about the subject of the investigation.

- Designing experiments **(4 marks)**
- Making/recording observations **(4 marks)**

CS2 Apply basic mathematics developed in MST124 to solve problems in physical science.

- Angular measure **(4 marks)**

In Activity 2.2, you were asked to measure the angle, θ, at which a food can starts to slide down an inclined surface, and to use this value to calculate the value of the coefficient of friction, μ.

a. You were asked to make notes on your observations, which were to be uploaded to your electronic lab book. Using your notes:

   i. In your TMA document, write a description of the experiment you performed and the equipment you used. You should include sufficient information for other people to be able to repeat your experiment. (N.B. Do not simply copy the "method" from Section 2.3.1 verbatim. You should describe how *you* actually carried out the experiment in practice.)

   ii. In your TMA document, write the value for your measured angle, θ, and explain how you measured it. Include your raw data showing all repeated measurements, as well as your average value of the angle. Again you should provide sufficient detail to allow the experiment to be repeated by someone else.

b. You were then asked to use your measured angle θ to calculate μ, the coefficient of friction. By considering the forces acting on the can, write into your TMA document all the steps you took to derive an expression for μ in terms of θ, and then show how you calculated its value.

Question 3 (*12 marks*)

This question carries 24% of the marks for this assignment.

It is associated with your study of *Topic 2: An introduction to energy* (Weeks 8-9).

You will be assessed according to how well you demonstrate, in your answer, the following learning outcomes and learning outcome ‘spokes’ as detailed in the skills radar diagrams:

CS1 Use appropriate searching, graphical, mathematical, and presentational methods to gather, analyse and interpret physical science data and information.

- Extracting information (**4 marks**)

CS2 Apply basic mathematics developed in MST124 to solve problems in physical science.

- Algebra & Units (**4 marks**)

PPS2 Work collaboratively and flexibly with others through sharing knowledge, information and data to solve problems and/or obtain a common outcome.

- Sharing digital content (**4 marks**)

a. In Activity 2.2, you investigated the energy of an orbiting planet by using data about the mass, velocity and distance from the Sun of that planet at its perihelion and aphelion to calculate potential, kinetic and total energies. You should copy and paste into your TMA document:

   i. A table showing your chosen planet's name and mass, its distance from the Sun, and its orbital velocities at perihelion and aphelion, together with your calculated values for its potential, kinetic and total energies at these points in its orbit.

   ii. Your full workings for your calculations of potential and kinetic energy at both perihelion and aphelion.

b. In Activity 2.2, you were asked to share with your tutor group the values you calculated for the total energy of planets in orbit, to see how your calculations compare with those for other planets.

   You should copy and paste into your TMA document the short paragraph (no more than 100 words) that you prepared reflecting on the total energy values obtained by your tutor group for planets in orbit, describing what you noticed and what conclusions you reached.

Question 4 (*12 marks*)

This question carries 24% of the marks for this assignment.

It is associated with your study of *Topic 3: Material worlds* (Weeks 10-11).

You will be assessed according to how well you demonstrate, in your answer, the following learning outcomes and learning outcome ‘spokes’ as detailed in the skills radar diagrams:

CS1 Use appropriate searching, graphical, mathematical, and presentational methods to gather, analyse and interpret physical science data and information.

- Extracting information (**8 marks**)

KS2 Communicate physical science ideas, using different types of technology, and using a range of formats including the written word, pictures, diagrams, tables and computer programs.

- Scientific writing (**4 marks**)

a. In Activity 3.4, you plotted data from a table to investigate the electrical conductivity of two ionic compounds. You should copy and paste into your TMA document the graph you plotted, showing your best fit straight lines drawn through each data set.
b. You were then given a particular concentration and asked to determine the conductivity of the two solutions at this concentration. You should copy and paste into your TMA document a full explanation of how you determined the conductivities using your graph, and the results of these determinations, in each case.
c. Finally you were asked to comment on which compound has the higher conductivity and to discuss why you think this is the case. You should copy and paste into your TMA document the short paragraph (no more than 100 words) that you prepared containing your conclusion as to which compound has the higher conductivity and why you think this is.

Question 5 (*6 marks*)

This question carries 12% of the marks for this assignment.

It is associated with your reflection of your skills development through the use of the radar diagrams.

You will be assessed according to how well you demonstrate, in your answer, the following learning outcome and learning outcome 'spokes' as detailed in the skills radar diagrams:

PPS3 Plan your learning, reflect on your development and use these reflections to inform your future work.

- Personal development plan (**6 marks**)

In the 'Reflect and plan' sections of *Python 1* and of *Topics 1, 2* and *3*, you were asked to update several of your skills diagrams including CS1 Gathering and evaluating information, CS2 Mathematics, CS3 Analyse problems and plan software solutions, KS1 Scientific method, KS2 Communicating ideas, and PPS1 Practical work.

Create a table like the one below in your TMA document. Copy and paste your original versions of these six radar diagrams in the 'Original diagram' column and your current versions in the 'Current diagram'

column. (The ‘Original diagrams’ should either be the ones you submitted in TMA 00, or the ones you submitted in TMA 01, whichever are the most recent ones in each case that you sent to your tutor before this TMA.) This arrangement will allow an easy comparison between the two sets to be made.

Learning outcome	Original diagram	Current diagram
CS1		
CS2		
CS3		
KS1		
KS2		
PPS1		

Choose one of the six radar diagrams that you feel reflects where you have made most improvement since the previously submitted version of the diagram, and similarly the one of the six radar diagrams where you feel you need to make the most improvement. For *both* of the diagrams you have identified explain, in no more than 50 words for each, why you have rated your ability as you have done.