Assignment_01

Data Science & AI

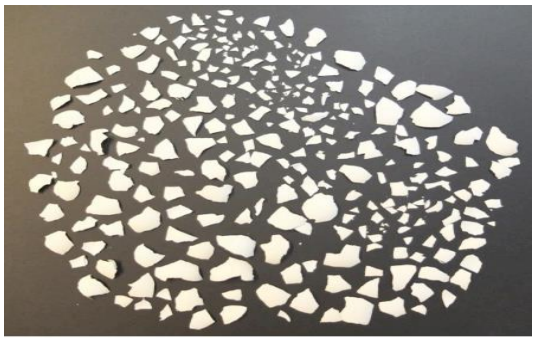
Deadline: 21 September 2022 **Total Marks: 60**

Submission Instructions

a. This is an individual assignment.
b. You are required to submit a pdf file with the naming convention **i22-xxxx_Section.**
c. With each question, you must briefly explain how you've done it, the data types, etc.
d. Late submissions are not acceptable in any case
e. Plagiarism(in any case) will lead to Zero marks in all assignments.

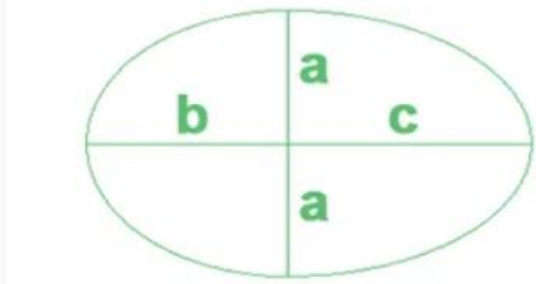
Problem

An archeological site contains the remains of a clutch of dinosaur eggs. The eggs were unfortunately broken into numerous fragments. What is the best way to determine the number of eggs? The most obvious way of counting them is to reconstruct the eggs. This could be done manually, or an algorithm could be created to take all the pieces and reconstruct them in a virtual manner. This is a complex algorithm because it requires matching up hundreds of shell fragments. A less time-consuming method is to derive an algorithm that determines the total area of the shell fragments and divides it by the average surface area of an egg, assuming we know the species of dinosaur and have a rough idea of the surface area of its eggs.



Task_01: Volume Calculation *Marks:10*

Your first task is to write an algorithm to calculate the volume of an eggshell given in the picture below.



$$V = \frac{2\pi}{3} a^2 \, (b + c)$$

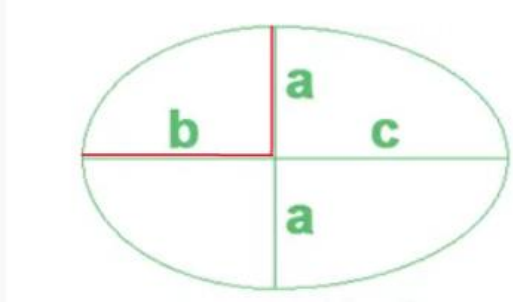
Where **a** is the equatorial radius, **b** defines the short polar radius which is the distance between the equator and the nearest pole & **c** is the long polar radius which is the distance from the egg's equator to the farthest pole.

a= 10, b=7, c=12

Task_02: Surface Area *Marks:25*

The next step is to calculate the surface area of 1 egg. Keeping in view the image given below, you can derive that the surface area of an egg is dependent on its major axis represented as **b,** and minor axis represented as **a.** You don't need to write the pseudocode in this step. You are required to show the flow of calculations in this step. Also, mention the data types being used.

Consider **a=44 and b=56**



$$A = 2\pi b^2 + \left(\frac{2\pi\, a\, b \cdot \arcsin e}{e} \right)$$

where e is the *eccentricity*:

$$e = \sqrt{1 - b^2/a^2}$$

Task_03: Number of Eggs Marks:15

After using the techniques of image processing, we got the area of image which is 147,682.907mm^2 and the area of eggshells is 25.77% of this area. Your job is to write the pseudocode to find the exact area using this information and calculate the number of eggs based on your derived results.

The formula for a number of eggs is given below:

$$\text{No. of eggs} = \frac{\text{Surface area of egg shells}}{\text{Surface area of an egg}}$$

Task_04: Total Volume of Egg yolk Marks:10

After the research, scientists discovered that egg yolk comprises 65% of the total egg volume. You have to find the volume of egg yolk for **n** number of eggs. Where n is the number of eggs you found in 3rd part?

Both the Pseudocode and flow of calculation are required in this step

Bonus (5 Marks)

You have to write pseudocode in which you'll save the dinosaurs' name along with its age in a single variable and display it.

Name='Spinosaurus'

Age=60