Q. 1

One of your friend has doubts on this mathematical formula and you are requested to prove it using Python Programming that the right hand side and left had side are equal. So write a program to assure your friend about the correctness of the formula.

$a^5-b^5= (a-b)(a^4+a^3b+a^2b^2+ab^3+b^4)$

Q3.

A balloon contains 7.2L of He. The pressure is reduced to 2.00atm and the balloon expands to occupy a volume of 25.1L. What was the initial pressure exerted on the balloon? Use the Boyle's Law $\mathbf{P_1V_1 = P_2V_2}$

During the initial moments of a chemical reaction, the reactants collide and form products. As the reaction continues the amount of product increases and in certain situations, can turn back into reactants. When the rate of the forward reaction is equal to the rate of the reverse reaction, chemical equilibrium is established.

In a reaction that has reached equilibrium, a constant can be calculated using the law of mass action. The law of mass action uses a ratio of products over reactants with the following setup.

In the reaction: $aA + bB \rightleftharpoons xX + yY$

$$K_c = \frac{X^x.Y^y}{A^a.B^b}$$

Where:

K_c = the equilibrium constant using the molar concentrations of reactants and products

X^x and Y^y are the product concentrations raised to the power of their coefficients

A^a and B^b are the reactant concentrations raised to the power of their coefficients

$\rightleftharpoons$ Signifies the reaction is at equilibrium

Calculate the equilibrium constant, K_c, for the following reaction where $[N_2]$ = 1.5 M, $[H_2]$ = 2.4 M and $[NH_3]$ = 3.8 M.

$$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$$

The brackets surrounding a reactant or product (for example:$[N_2]$) signifies a molar concentration.

$$K_c = \frac{[3.8]^2}{[1.5].[2.4]^3}$$

Q4.

There was a mango party going on in a north India City. One farmer was supposed to bring x number of mangoes for the party. On the way he was stopped by dacoits. They let him off only on the condition that he will leave back half of the mangoes. When he reached the city, 10% of the leftover mangoes were to be given to the tax officials as city tax. He reached the party venue with the remaining mangoes. 10 mangoes were required for making Aam-Panna, 35 mangoes were required for making mango chutney. As there were 23 guests in the party, so one mango was required for each of the guest to take up with cold milk.

The Chef and his staff kept 10 mangoes for themselves from the farmer. 7 mangoes were used for the mango shake. 5 mangoes were used to be given as gifts to the children. by this way, all x number of mangoes were used. Please find out the value of x by writing a program in python.

Note: Remember to use proper comments in your program wherever required.

Q5.

A team of coding enthusiasts were playing with the python operators. They were on a planet called magic-python. Operators were made of wood and as they play, similar things will playout on their screen and coding. So, whatever they will throw on the screen, same will be automatically converted into expressions and statements. As per the rules of the game they should throw the blocks such that it makes the syntactic sense as per the Python syntax. First person started the play with a wooden block marked as 10, other one throws *, next one throws 9, next one throws +, next one throws 8, next one throws -, next one throws 7, next one throws //, next one throws 6,next one throws %,next one throws 5,next one throws **,next one throws 4,next one throws &,next one throws 3,next one throws |,next one throws 2, next one throws << and the last player throws 1. What will be the Output on the screen as a result of this sequence of literals and operators?

Q6.

In a battle of the armies, the winners are decided by the total strength and might of their weapons. Tanks, Fighter Aircraft, Sea-Carrier and Missile Defence Systems are considered of double the power in the given sequence. That means One Fighter Aircraft is equal in strength of two Tanks. One Sea-Carrier is equal in strength of two fighter aircrafts. One Missile defence System is equal in strength of two Sea-Carriers.
One army known as Martians has 20 Tanks, 100 Fighter Aircrafts, 6 Sea Carriers and 3 Missile Defence Systems. Other army known as plutonian does not have any tanks because they are not sustainable on that planet. They have 118 Fighter Aircrafts. Plutonian have not advanced to the stage of having any Missile Defence Systems. However, as a whole, both the armies have equal strength. How many Sea Carriers are there with Plutonian?