ASSIGNMENT NO.1

(STA404)

Question # 1

A biologist assumes that there is a linear relationship between the amount of fertilizer supplied to tomato plants and the subsequent yield of tomatoes obtained. Eight tomato plants, of the same variety, were selected at random and treated weekly with a solution in which x grams of fertilizer was dissolved in a fix quantity of water. The yield y kilograms of tomatoes were recorded.

Plant	A	B	C	D	E	F	G	H
x	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5
y	2.9	4.4	4.8	5.6	7	7.2	7.3	7.5

Calculate the equation of the least square regression line of y on x.

Solution:

Regression line:

$$\hat{y} = a + bx$$

$$a = \hat{y} - b(\overline{x})$$

$$\overline{x} = \frac{\sum x}{n} \qquad \overline{y} = \frac{\sum y}{n}$$

$$b = \frac{n\left(\sum xy\right) - \left(\sum x\right)\left(\sum y\right)}{n\left(\sum x\right)^2 - \left(\sum y\right)^2}$$

n	X	Y	xy	x^2
A	1	2.9	2.9	1
B	1.5	4.4	6.6	2.25
C	2	4.8	9.6	4
D	2.5	5.6	14	6.25
E	3	7	21	9
F	3.5	7.2	25.2	12.25
G	4	7.3	29.2	16
H	4.5	7.5	33.75	20.25
n=8	$\sum x$ =22	$\sum y$ =46.7	$\sum xy$ =142.3	$\sum x^2$ =71

$$\bar{x} = \frac{\sum x}{n} = \frac{22}{8} = 2.75 \qquad \bar{y} = \frac{\sum y}{n} = \frac{46.7}{8} = 5.8375$$

$$b = \frac{n\left(\sum xy\right) - \left(\sum x\right)\left(\sum y\right)}{n\left(\sum x^2\right)^2 - \left(\sum y\right)^2} = \frac{8(142.3) - (22)(46.7)}{8(71) - (22)^2}$$

$$b = \frac{1138.4 - 1027.4}{568 - 484} = \frac{111}{84} = 1.3214$$

Equation the regression line:

$$\hat{y} = a + bx = 2.2036 + 1.321x$$

Question # 2

One end A of an elastic string was attached to a horizontal bar and a mass m gram was attached to the other end B. The mass was suspended freely and allowed to settle vertically below A. the length AB, 1mm was recorded for various masses as follows.

m	100	200	300	400	500	600
l	218	239	259	268	275	322

Draw a scatter diagram to illustrate the above information.

Solution:

