



STA301 2nd Assignment Solution Spring 2012

Question 1: Marks: 7

For the given cumulative frequency table of students of different age groups, calculate the coefficient of standard deviation and coefficient of variation.

Question 2: Marks: 8

From the following data of hours worked in a factory (x) and output units (y), determine the regression line of y on x, the linear correlation coefficient and interpret the result of correlation coefficient.

Hours (X)

Solution with concepts

Question
No- 1

Abdul Rehman Ansari

<u>Age</u>	<u>C.f</u>	<u>X</u>	<u>f</u>	<u>fx</u>	<u>fx²</u>
5-8	3	6.5	3	19.5	126.75
9-12	15	10.5	12	126	1323
13-16	24	14.5	9	130.5	1892.25
17-20	51	18.5	27	499.5	9240.75
21-24	57	22.5	6	135	3037.5
25-28	60	26.5	3	79.5	2106.75
		<u>$\Sigma X = 99$</u>	<u>$\Sigma f = 60$</u>	<u>$\Sigma fx = 990$</u>	<u>$\Sigma fx^2 = 17727$</u>

$$\begin{aligned}\text{Variance} = S^2 &= \frac{\sum x^2}{\sum x} - \left(\frac{\sum x}{\sum x} \right)^2 \\ S^2 &= \frac{17727}{60} - \left(\frac{990}{60} \right)^2 \\ S^2 &= 295.45 - 272.25 \\ \boxed{S^2} &= \boxed{23.2} \\ \text{Standard Deviation} &= \sqrt{S^2} = \sqrt{23.2} = 4.82\end{aligned}$$

$$\underline{\text{Coefficient of Standard Deviation}} = \frac{S}{\bar{X}}$$

As we know $\bar{X} = \frac{\sum x}{\sum f}$

So $\bar{X} = \frac{990}{60} = 16.5$

Now $= \frac{S}{\bar{X}}$

(Coefficient of Standard Deviation $= \frac{4.82}{16.5} = 0.29$)

$$\underline{\text{Coefficient of Variance}} = \frac{S}{\bar{X}} \times 100$$

$$= \frac{4.82}{16.5} \times 100$$

$$= 29.21 \%$$

Question
No - 2

Abdul Rehman Ansari
Abdullah

<u>Hours</u>	<u>Production</u>			
<u>X</u>	<u>Y</u>	<u>X.Y</u>	<u>Y²</u>	<u>X²</u>
91	300	27300	90000	8281
102	302	30804	91204	10404
83	315	26145	99225	6889
93	330	30690	108900	8649
89	300	26700	90000	7921
72	250	18000	62500	5184
82	300	24600	90000	6724
85	340	28900	115600	7225
79	315	24885	99225	6241
<u>776</u>	<u>2752</u>	<u>238024</u>	<u>846654</u>	<u>67518</u>

Question
No - 2

Abdul Rehman Ansari
Alhamdulillah

<u>Hours</u> <u>X</u>	<u>Production</u> <u>Y</u>	<u>X.Y</u>	<u>Y²</u>	<u>X²</u>
91	300	27300	90000	8281
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<u>776</u>	<u>2752</u>	<u>238024</u>	<u>846654</u>	<u>67518</u>

$$\Sigma X = 776$$

$$\Sigma Y = 2752$$

$$\Sigma XY = 238024$$

$$\Sigma Y^2 = 846654$$

$$\Sigma X^2 = 67518$$

Regression Line of Y on X

$$b_{yx} = \frac{n \sum xy - (\sum x)(\sum y)}{n \sum x^2 - (\sum x)^2}$$

$$b_{yx} = \frac{9(238024) - (776)(2752)}{9(67518) - (776)^2}$$

$$b_{yx} = \frac{2142216 - 2135552}{607662 - 602176}$$

$$b_{yx} = \frac{6664}{5486}$$

$$b_{yx} = 1.21$$

5486

$$b_{yx} = 1.21$$

$$a = \bar{y} - b\bar{x}$$

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

$$= \frac{2752}{9} - 1.21\left(\frac{776}{9}\right)$$

$$a = 201.04$$

$$y = a + b\bar{x}$$

$$y = 201.04 + 1.21x$$

Linear Correlation Coefficient

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

$$r = \frac{9(238024) - (776)(2752)}{\left[9(67518) - (776)^2 \right] \left[9(846654) - (2752)^2 \right]}$$

$$r = 0.42$$

Interpretation :-

As we can see that

$$r = 0.42$$

which lies between 0 - 1

that means it is positive
correlation