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Tutorial 7.

Q.1) calculate the coefficient of corelation from the following data.

x	y	x^2	y^2	xy
65	67	4225	4489	4355
66	68	4356	4624	4488
67	66	4489	4356	4422
68	69	4624	4761	4692
69	72	4761	5184	4968
70	72	4900	5184	5040
71	69	5041	4761	4899
Σ 476	483	32,396	33,359	32,864

$$\overline{X} = \frac{\Sigma x_i}{n} = \frac{476}{7} = 68$$

$$\overline{Y} = \frac{\Sigma y_i}{n} = \frac{483}{7} = 69$$

$$r = \frac{n \Sigma x_i Y_i - (\Sigma x_i)(\Sigma Y_i)}{\sqrt{n \Sigma x_i^2 - (\Sigma x_i)^2}\sqrt{n \Sigma y_i^2 - (\Sigma Y_i)^2}}$$

$$r = \frac{7 \times (32.864) - (476) \times (483)}{\sqrt{7(32396) - (476)^2}\sqrt{7(33,359 - (483)^2}}$$

16/10 (6/12/22)

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$$r = \frac{230048 - 229908}{\sqrt{226772 - 226576}\sqrt{233513 - 233289}}$$

$$= \frac{140}{\sqrt{196}\sqrt{224}} = \frac{140}{14 \times 14.966}$$

$$\boxed{r = 0.668}$$

coefficient of correlation $r = 0.668$

Q.2) Calculate the coefficient of correlation From the following data.

	x	y	x^2	y^2	xy
	10	18	100	324	180
	14	12	196	144	168
	18	24	324	576	432
	22	6	484	36	132
	26	30	676	900	780
	30	36	900	1296	1080
Σ	120	126	2680	3276	2772

$$\bar{X} = \frac{\Sigma x_i}{n} = \frac{120}{6} = 20$$

$$\bar{Y} = \frac{\Sigma y_i}{n} = \frac{126}{6} = 21$$

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$$r = \frac{n\sum x_i y_i - (\sum x_i)(\sum y_i)}{\sqrt{n\sum (x_i)^2 - (\sum x_i)^2}\sqrt{n\sum (y_i)^2 - (\sum y_i)^2}}$$

$$= \frac{6(2772) - 120(126)}{\sqrt{6(2680) - (120)^2}\sqrt{6(3276) - (126)^2}}$$

$$= \frac{1512}{\sqrt{1680}\sqrt{3780}}$$

$$= \frac{1512}{40.987 \times 61.481} = \frac{1512}{2519.950}$$

$$= 0.6000$$

coefficient of correlation $r = 0.6000$

93) Given, covarience $= 12.5$ $r = 0.5$
varience of $x = 25$ find σY
where, varience of $x = \sigma x^2$
varience of $Y = \sigma y^2$

We know,

$$r = \frac{cov(x, Y)}{\sigma X, \sigma Y}$$

$$\sigma Y = \frac{cov(x, Y)}{r \cdot \sigma x}$$

$$\sigma x = \sqrt{var(x)}$$
$$= \sqrt{25}$$
$$\sigma(x) = 5$$
$$\therefore \sigma(Y) = \frac{12.5}{0.5 \times 5} = 5$$

Q.4) Use the following data obtain the regression equation of y on x & x on y.

	x	Y	xy	x^2	y^2
	6	9	54	36	81
	2	11	22	4	121
	10	5	50	100	25
	4	8	32	16	64
	8	7	56	64	49
Σ	30	40	214	220	340

$$\bar{X} = \frac{\Sigma x}{N} = \frac{30}{5} = 6$$

$$\bar{Y} = \frac{\Sigma y}{N} = \frac{40}{5} = 8$$

$$b_{yx} = \frac{\Sigma xy/N - (\Sigma x/N)(\Sigma Y/N)}{\Sigma x^2/N - (\Sigma x/N)^2}$$

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$$= \frac{214/5 - \frac{6\times 8}{25}}{220/5 - \frac{36}{25}}$$

$$byx = \frac{-26}{40} = -0.65$$

$$bxy = \frac{\Sigma xy/N - (\Sigma x/N)(\Sigma y/N)}{\Sigma y^2/N - \left(\frac{\Sigma y}{N}\right)^2}$$

$$= \frac{214/5 - (8\times 6)}{340/5 - 64}$$

$$bxy = \frac{214-240}{340-320} = -1.3$$

equation of y on x is

$$y - \bar{y} = byx(x - \bar{x})$$

$$y - 8 = -0.65(x - 6)$$

$$y - 8 = -0.65x + 3.9$$

$$y = -0.65x + 11.9$$

equation of x on y is,

$$x - \bar{x} = bxy(y - \bar{y})$$

$$x - 6 = -1.3(y - 8)$$

$$x - 6 = -1.3y + 10.4$$

$$x = -1.3y + 16.4$$

Q.5) Obtain two regressive equations from the following data.

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x	y	xy	x^2	y^2
2	4	8	4	16
4	2	8	16	4
6	5	30	36	25
8	10	80	64	100
10	3	30	100	9
12	6	72	144	36
Σ 42	30	228	364	190

$\bar{x} = \Sigma x / N = 42/6 = 7$

$\bar{Y} = \Sigma y / N = 30/6 = 5$

$$byx = \frac{\Sigma xy/N - (\Sigma x/N)(\Sigma y/N)}{(\Sigma x^2/n) - (\Sigma x/n)^2}$$

$$= \frac{228/6 - \frac{(7\times5)}{36}}{364/6 - \frac{49}{36}}$$

$$= \frac{18}{70} = 0.257$$

$$bxy = \frac{\Sigma xy/N - (\Sigma x/N)(\Sigma Y/N)}{\Sigma y^2/N - (\Sigma y/N)^2}$$

$$= \frac{228/6 - \frac{35}{36}}{190/6 - \frac{25}{36}} = \frac{18}{40} = 0.45$$

equation of y on x :

$$y-\bar{y} = b_{yx}(x-\bar{x})$$

$$y-5 = 0.257(x-7)$$

$$y-5 = 0.257x - 1.799$$

$$y = 0.257x + 3.201$$

equation of x on y.

$$(x-\bar{x}) = b_{xy}(y-\bar{y})$$

$$x-7 = 0.45(y-5)$$

$$x-7 = 0.45y - 2.25$$

$$x = 0.45y + 4.75$$

Q6) obtain the two regression equations from the following data & predict the value of x when y=40 & value of y when x=50

	x	y	xy	x^2	y^2
	16	60	960	256	3600
	22	65	1430	484	4225
	28	63	728	784	3969
	29	66	1254	361	4356
	21	68	1628	441	4624
	25	61	1525	625	3721
	18	70	1260	324	4900
Σ	149	453	8585	3275	29395

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$$\bar{x} = \Sigma x / n = \frac{149}{7} = 21.28$$

$$\bar{y} = \Sigma y / n = \frac{453}{7} = 64.714$$

$$byx = \frac{\Sigma xy/N - (\Sigma x/N)(\Sigma y/N)}{\Sigma x^2/N - (\Sigma x/N)^2}$$

$$= \frac{8585/7 - (149/7 \times 453/7)}{3275/7 - (149/7)^2}$$

$$= \frac{-1056.77}{105.134}$$

$$= -10.032$$

$$bxy = \frac{\Sigma xy/N - (\Sigma x/N)(\Sigma y/N)}{\Sigma y^2/N - (\Sigma y/N)^2}$$

$$= \frac{1126.42 - 1377.113}{4199.28 - 4187.90} = \frac{-250.693}{11.38}$$

$$bxy = -22.029$$

equation of y on x,

$$x - \bar{x} = bxy(y - \bar{y})$$

$$x - 21.28 = -22.029(y - 64.714)$$

$$x = -22.029y + 1446.866$$

put $y = 60$

$$x = -22.029 \times 60 + 1446.866$$

$$x = 965.704$$

Correlation coefficient (r) $= -\sqrt{b_{xy} \cdot b_{yx}}$

$r = -16.865$

Q7) Given, varience of $x = 9$. The regression equation are $8x - 10y + 66 = 0$, $40x - 18y + 214 = 0$ find,

1) avarage value of x & y
2) correlation coefficient betn two variable.
3) standard deviation of y.

⇒ To get $\bar{x}$ & $\bar{y}$, solving the given equations simultaneously.

equations ① − equations ②

$$40x - 50y = -330$$
$$-\ \ 40x + 18y = -214$$
$$-32y = 544$$
$$y = -544/32 = 17$$

putting $y = 17$ in equation ②

$$40x - 18 \times 7 = 214$$
$$40x - 126 = 214$$
$$40x = 340$$
$$\boxed{x = 8.5}$$

∴ mean of x $(\bar{x}) = 8.5$

∴ mean of y $(\bar{y}) = 17$

let $8x - 10y + 66 = 0$ be a line of regression of y on x.

$$8x - 10y = -66$$

$$-10y = -66 - 8x$$

$$y = \frac{8x}{10} + 66$$

$$b_{yx} = \frac{8}{10} = \frac{4}{5}$$

let $40x - 18y + 214 = 0$ be a line of regression of x on y.

$$40x = -214 + 18y$$

$$x = \frac{-214}{40} + \frac{18}{40}y$$

$$b_{xy} = \frac{9}{20}$$

$$r = \pm\sqrt{b_{xy} \cdot b_{yx}} = \sqrt{\frac{9}{25}} = 0.6$$

Now we know,

$$b_{xy} = r\frac{\sigma x}{\sigma y}$$

$var(x) = 9 \qquad \sigma x = 3$

$$\sigma y = r\frac{\sigma x}{b_{xy}} = 0.6 \times \frac{3}{9/20}$$

$$= 0.6 \times \frac{20}{3}$$

$$\boxed{\sigma y = 4}$$