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Topic- Coefficient of Correlation by Indirect method

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Q. Calculate Karl Pearson's Coefficient of Correlation by indirect method:

X: 25 26 27 27 28 29 30 31 32
Y: 103 102 105 107 108 111 110 113 115

X	x from assumed av. 29	x^2	Y	y from assy med average 110	y^2	Product xy
25	25-29=-4	$(-4)^2=16$	103	103-110=-7	$(-7)^2=49$	$-4 \times -7=28$
26	26-29=-3	$(-3)^2=9$	102	102-110=-8	$(-8)^2=64$	$-3 \times -8=24$
27	27-29=-2	$(-2)^2=4$	105	105-110=-5	$(-5)^2=25$	$-2 \times -5=+10$
27	27-29=-2	$(-2)^2=4$	107	107-110=-3	$(-3)^2=9$	$-2 \times -3=6$
27	27-29=-2	$(-2)^2=4$	108	108-110=-2	$(-2)^2=4$	$-1 \times -2=2$
28	28-29=-1	$(-1)^2=1$	111	111-110=-1	$(-1)^2=1$	$0 \times -1=0$
29	29-29=0	$(0)^2=0$	110	110-110=0	$(0)^2=0$	$1 \times 0=0$
30	30-29=1	$(1)^2=1$	113	113-110=3	$(3)^2=9$	$2 \times 3=6$
31	31-29=2	$(2)^2=4$	115	115-110=5	$(5)^2=25$	$3 \times 5=15$
32	32-29=3	$(3)^2=9$				
$\Sigma X=255$	$\Sigma x=-6$	$\Sigma x^2=48$	$\Sigma Y=974$	$\Sigma Y=-16$	$\Sigma y^2=186$	$\Sigma xy=91$

$$\bar{X} = \frac{\sum X}{n} = \frac{255}{9} = 28.33 \rightarrow \text{assumed average } 29$$

$$\bar{Y} = \frac{\sum Y}{n} = \frac{974}{9} = 108.22 \rightarrow \text{assumed average } 110$$

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

$$r = \frac{91 \times 9 - (-6 \times -16)}{\sqrt{[48 \times 9 - (-6)^2][186 \times 9 - (-16)^2]}}$$

$$r = \frac{819 - 96}{\sqrt{[432 - 36][1674 - 256]}}$$

$$r = \frac{723}{\sqrt{396 \times 1418}}$$

$$r = \frac{723}{\sqrt{561528}}$$

$$r = \frac{723}{749.35}$$

$$r = 0.9648 \rightarrow \text{High degree of Correlation exist.}$$

Note: Direct method is based on true mean. Indirect method is based on assumed mean.