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Correlation

Question 20:

Calculate the correlation coefficient between X and Y and comment on their relationship

X	1	3	4	5	7	8
Y	2	6	8	10	14	16

ANSWER:

X	Y	XY	X^2	Y^2
1	2	2	1	4
3	6	18	9	36
4	8	32	16	64
5	10	50	25	100
7	14	98	49	196
8	16	128	64	256
$\sum X = 28$	$\sum Y = 56$	$\sum XY = 328$	$\sum X^2 = 164$	$\sum Y^2 = 656$

$$r = \frac{\sum XY - \frac{(\sum X)(\sum Y)}{N}}{\sqrt{\sum X^2 - \frac{(\sum X)^2}{N}}\sqrt{\sum Y^2 - \frac{(\sum Y)^2}{N}}}$$

$$= \frac{328 - \frac{28 \times 56}{6}}{\sqrt{164 - \frac{(28)^2}{6}}\sqrt{656 - \frac{(56)^2}{6}}}$$

$$= \frac{328 - \frac{1568}{6}}{\sqrt{164 - \frac{784}{6}}\sqrt{656 - \frac{3136}{6}}}$$

$$= \frac{328 - 261.33}{\sqrt{164 - 130.67}\sqrt{656 - 522.67}}$$

$$= \frac{66.67}{\sqrt{33.33}\sqrt{133.33}}$$

$$= \frac{66.67}{5.77 \times 11.55}$$

$$= \frac{66.6}{66.6}$$

$$= 1.00$$

$$= 1$$

As the correlation coefficient between the two variables is +1, so the two variables are perfectly positive correlated.