Written Work 4: Pearson Product Moment Correlation Coefficient

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Instruction: Compute and interpret the Pearson Product Correlation Coefficient.

1. The table below shows the scores of 10 students in Statistics and Biology.

Student	Score in Statistics	Score in Biology	xy	x^2	y^2
A	60	65	3900	3600	4225
B	77	80	6160	5929	6400
C	80	89	7120	6400	7921
D	70	76	5320	4900	5776
E	84	80	6720	7056	6400
F	74	78	5772	5476	6084
G	80	76	6080	6400	5776
H	78	79	6162	6084	6241
I	90	85	7650	8100	7225
J	80	95	7600	6400	9025
Σ	773	803	62484	60345	65073

Solution:

$n = 10$

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

$$r = \frac{10(62484) - (773)(803)}{\sqrt{[10(60345) - (773)^2][10(65073) - (803)^2]}}$$

$$r = \frac{(624840) - (620719)}{\sqrt{[603450 - 597529][650730 - 644809]}}$$

$$r = \frac{(624840) - (620719)}{\sqrt{[5921][5921]}}$$

$$r = \frac{4121}{5921}$$

$$r = 0.7$$

Interpretation:

The value of r = +0.7 which indicates that there is a moderately positive correlation between their score in statistics and in biology.

2. The table below shows the time in hours spent by 6 students in playing video games a day before the test and the scores they got on the test.

Student	Time (hours)	Score	xy	x^2	y^2
1	2	65	130	4	4225
2	1	80	80	1	6400
3	1.5	75	112.5	2.25	5625
4	0.5	84	42	0.25	7056
5	3	60	180	9	3600
6	2.5	72	180	6.25	5184
Σ	10.5	436	724.5	22.75	32090

Solution:

$n=6$

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

$$r=\frac{6(724.5)-(10.5)(436)}{\sqrt{[6(22.75)-(10.5)^2][6(32090)-(436)^2]}}$$

$$r=\frac{4347-4578}{\sqrt{[136.5-110.25][192540-190096]}}$$

$$r=\frac{-231}{\sqrt{[26.25][2444]}}$$

$$r=\frac{-231}{\sqrt{64155}}$$

$$r=\frac{-231}{253.29}$$

$$r=-0.91$$

Interpretation:

The value of r = -0.91 which indicates that there is a strong negative correlation between the time spent playing video games and the score.

3. Shown on the table below are bi variate data. Solve for the Pearson Product Moment Correlation Coefficient.

	x	y	xy	x^2	y^2
1	4	10	40	16	100
2	2	5	10	4	25
3	8	25	200	64	625
4	10	10	100	100	100
5	12	15	180	144	225
6	14	20	280	196	400
7	6	5	30	36	25
8	16	10	160	256	100
Σ	72	100	1000	816	1600

Solution:

$n=8$

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

$$r=\frac{8(1000)-(72)(100)}{\sqrt{[8(816)-(72)^2][8(1600)-(100)^2]}}$$

$$r=\frac{8000-7200}{\sqrt{[6528-5184][12800-10000]}}$$

$$r=\frac{800}{\sqrt{[1344][2800]}}$$

$$r=\frac{800}{\sqrt{3763200}}$$

$$r=\frac{800}{1939.9}$$

$$r=0.41$$

Interpretation:

The value of r = +0.41 which indicates that there is weakly positive correlation between x and y.