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Resources for Teaching Research and Statistics in Psychology

Title of Resource Practice: Hand Calculation of Pearson Correlation (Math & Spelling)

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Brief Description: This activity can be used as practice after students have learned how to hand calculate a Pearson Correlation.

Keywords: Correlation; Hand Calculation

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Instructors:

Instructors should assign this problem to students as in-class practice or homework after students have learned how to calculate a Pearson Correlation by hand and test for significance. The activity leads students through determining the hypotheses, calculating the correlation coefficient, making a decision about the null hypotheses and summarizing the results. An answer key is included.

Pearson Correlation Practice

A random sample of seven junior high students is selected, and each student is given both a math and spelling test. Test at the .05 significance level whether test score on math and spelling are related. Their scores are as follows:

Student	Math	Spelling
1	15	13
2	5	6
3	16	14
4	10	13
5	11	11
6	3	5
7	12	10

What are the null and alternative hypotheses?

What is the correlation coefficient? What is the direction and strength of the relationship?

What is the critical value of r ?

What is your decision based on the null? Why?

Define the relation between the variables in this problem based on all your information. What does it all mean in the context of the problem?

ANSWERS
Pearson Correlation Practice

A random sample of seven junior high students is selected, and each student is given both a math and spelling test. Test at the .05 significance level whether test score on math and spelling are related. Their scores are as follows:

Student	Math (X)	X ²	Spelling (Y)	Y ²	XY
1	15	225	13	169	195
2	5	25	6	36	30
3	16	256	14	196	224
4	10	100	13	169	130
5	11	121	11	121	121
6	3	9	5	25	15
7	12	144	10	100	120
	ΣX = 72	ΣX ² = 880	ΣY = 72	ΣY ² = 816	ΣXY = 835

What are the null and alternative hypotheses?

Null: There is no relation between math and spelling scores.

Alternative: There is a relation between math and spelling scores.

What is the correlation coefficient? What is the direction and strength of the relationship?

$r = .921$ (see below)

$$r_{xy} = \frac{N\sum XY - \sum X\sum Y}{\sqrt{[N\sum X^2 - (\sum X)^2][N\sum Y^2 - (\sum Y)^2]}}$$

$$r_{xy} = \frac{7(835) - (72)(72)}{\sqrt{[7(880) - (72)^2][7(816) - (72)^2]}}$$

$$r_{xy} = \frac{5845 - 5184}{\sqrt{[6160 - 5184][5712 - 5184]}}$$

$$r_{xy} = \frac{661}{\sqrt{(976)(528)}}$$

$$r_{xy} = \frac{661}{\sqrt{515328}} \quad r_{xy} = \frac{661}{717.86} \quad r_{xy} = .921$$

What is the critical value of r ?

Critical $r = .754$

- $df = N - 2 \rightarrow 7 - 2 = 5$
- $p = .05$ with df

What is your decision based on the null? Why?

Reject the H_0 (null hypothesis) because the calculated value of r is greater than the critical value of r , so the null is rejected. There is a significant relationship between test scores on math and spelling.

Define the relationship between the variables in this problem based on all your information. What does it all mean in the context of the problem?

There is a strong and significant positive association between math and spelling ability. As math scores go up, so do the spelling scores.