LESSON MAKER PRO

Correlation Clues

Compute r and explain what a linear fit shows.

HIGH SCHOOL · HSS-ID.C.8

CCSS.Math.Content.HSS-ID.C.8 "Compute (using technology) and interpret the correlation coefficient of a linear fit."

NAME _____ DATE _____

READ THE VALUE OF R

The correlation coefficient r tells how closely paired data follow a linear pattern. Its value is between -1 and 1: the sign shows direction, and values with an absolute value closer to 1 show a stronger linear association. Use a regression or statistics tool to compute r, then use its sign and size to interpret the fit.

WORKED EXAMPLE

Compute the correlation coefficient r for the data pairs (31, 14), (37, 20), and (43, 26).

1. Mean x = 37 and mean y = 20.
2. The x deviations are -6, 0, 6, and the y deviations are -6, 0, 6.
3. r = [(-6)(-6) + 0 + (6)(6)] / sqrt[(36 + 0 + 36)(36 + 0 + 36)] = 72/72 = 1.

Answer: r = 1, so the data have a perfect positive linear association.

PRACTICE 6 problems

1 A regression tool reports r = -0.86 for the relationship between two variables. Describe the direction and strength of the linear association.

ANSWER _____

2 A regression tool reports r = 0.04. What does this value tell you about the linear association?

ANSWER _____

3 Compute r for the data pairs (1, 4), (2, 7), (3, 10), and (4, 13).

ANSWER _____

4 Compute r for the data pairs (2, 18), (3, 15), (4, 12), and (5, 9).

ANSWER _____

5 Compute r for the data pairs (1, 24), (2, 28), (3, 28), and (4, 24).

ANSWER _____

6 Data Set A has r = 0.65. Data Set B has r = -0.65. Compare the two linear associations.

ANSWER _____

APPLY IT Show your work

1 A student on the school media team tracks hours spent editing a video, x, and the video's views after one week, y. The data pairs are (0, 120), (1, 150), (2, 180), and (3, 210). Compute r and interpret it in this context.

WORK SPACE

ANSWER _____

2 Over four weeks, a student records late-night gaming hours on school nights, x, and average sleep hours, y: (1, 9), (2, 8), (3, 7), and (4, 6). Compute r, interpret it, and state whether r proves that gaming caused less sleep.

WORK SPACE

ANSWER _____

CHALLENGE One step up

A data set contains the pairs (1, 1), (2, 2), (3, 3), (4, 4), and (5, 0). Compute r for all five pairs. Then remove the pair (5, 0), compute r for the remaining pairs, and explain why the values are so different.

WORK SPACE AND ANSWER

ANSWER KEY

Correlation Clues

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A regression tool reports r = -0.86 for the relationship between two variables. Describe the direction and strength of the linear association.	**There is a strong negative linear association.**
2	A regression tool reports r = 0.04. What does this value tell you about the linear association?	**There is a very weak positive linear association, essentially no linear relationship.**
3	Compute r for the data pairs (1, 4), (2, 7), (3, 10), and (4, 13).	**r=1**
4	Compute r for the data pairs (2, 18), (3, 15), (4, 12), and (5, 9).	**r = -1**
5	Compute r for the data pairs (1, 24), (2, 28), (3, 28), and (4, 24).	**r=0**
6	Data Set A has r = 0.65. Data Set B has r = -0.65. Compare the two linear associations.	**They have the same strength. Data Set A is positive, and Data Set B is negative.**

PART 2 · APPLY IT

1. **r = 1. There is a perfect positive linear association: in this data set, more editing hours are associated with more views after one week.** The points follow y = 120 + 30x exactly, so they lie on one increasing line. Therefore, r = 1.
2. **r = -1. There is a perfect negative linear association: more late-night gaming hours are associated with fewer sleep hours. No, r does not prove that gaming caused less sleep.** The points lie exactly on the decreasing line y = 10 - x, so r = -1. Correlation describes an association, not proof of causation.

CHALLENGE

For all five pairs, r = 0. After removing (5, 0), r = 1. The pair (5, 0) is an outlier that disrupts the positive linear pattern formed by the other four pairs.

Accept r = +1 as r = 1. Accept equivalent descriptions of association strength and direction when they correctly identify the sign and relative strength of r.