

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

CHALLENGE

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.

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

- $r = 1$. 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, $r = 1$.
- $r = -1$. 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 .