

Correlation Checkpoint

Compute r and read the pattern.

HIGH SCHOOL • MA.912.DP.2.7

MA.912.DP.2.7 "Compute the correlation coefficient of a linear model using technology. Interpret the strength and direction of the correlation coefficient."

NAME _____

DATE _____

READ THE COEFFICIENT

Enter each matched x,y pair into a spreadsheet or correlation tool to find r . To check a small data set, use $r = [n\sum xy - (\sum x)(\sum y)] / \sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}$. The sign of r gives the direction, and an absolute value closer to 1 means a stronger linear correlation.

WORKED EXAMPLE

Use the formula to verify the correlation coefficient for the pairs (11,20), (13,25), and (15,30).

1. $n=3$, $\sum x=39$, $\sum y=75$, $\sum xy=995$, $\sum x^2=515$, and $\sum y^2=1925$.
2. $r = [3(995) - 39(75)] / \sqrt{[3(515) - 39^2][3(1925) - 75^2]}$.
3. $r = 60 / \sqrt{24(150)} = 60/60 = 1$.

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

PRACTICE 6 problems

- 1** A correlation tool reports $r=0.82$ for weekly volunteer hours and number of community-service events attended. State the strength and direction of the correlation.

ANSWER _____

- 2** A correlation tool reports $r=-0.18$ for days absent and test score. State the strength and direction of the correlation.

ANSWER _____

- 3** A data set has $r=-1$. State the strength and direction of the correlation.

ANSWER _____

- 4** For the pairs (1,6), (2,8), and (3,7), compute r using the formula in the concept box.

ANSWER _____

- 5** For the pairs (4,2), (5,0), and (6,1), compute r using the formula in the concept box.

ANSWER _____

- 6** A student reports a correlation coefficient of $r=1.06$. Is this possible? Explain.

ANSWER _____

APPLY IT Show your work

- 1** Four students track the number of short videos they watch after school, x , and their homework scores, y . The pairs are $(2,74)$, $(4,76)$, $(6,76)$, and $(8,74)$. Compute r , then describe the strength and direction of the linear correlation.

WORK SPACE

ANSWER _____

- 2** Students record social-media minutes during the hour before bed, x , and hours of sleep, y . The pairs are $(12,10)$, $(24,9)$, $(36,8)$, and $(48,7)$. Compute r , then describe the strength and direction of the linear correlation.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A spreadsheet reports $r=-0.58$ between daily social-media minutes, x , and sleep hours, y . A researcher creates a new variable $s=12-y$, where s is the number of hours below a 12-hour sleep target. What is the correlation coefficient between x and s ? Explain your reasoning.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	A correlation tool reports $r=0.82$ for weekly volunteer hours and number of community-service events attended. State the strength and direction of the correlation.	Strong positive linear correlation.
2	A correlation tool reports $r=-0.18$ for days absent and test score. State the strength and direction of the correlation.	Weak negative linear correlation.
3	A data set has $r=-1$. State the strength and direction of the correlation.	Perfect negative linear correlation.
4	For the pairs (1,6), (2,8), and (3,7), compute r using the formula in the concept box.	$r=1/2$, so the data have a moderate positive linear correlation.
5	For the pairs (4,2), (5,0), and (6,1), compute r using the formula in the concept box.	$r=-1/2$, so the data have a moderate negative linear correlation.
6	A student reports a correlation coefficient of $r=1.06$. Is this possible? Explain.	No. A correlation coefficient must be from -1 to 1.

PART 2 • APPLY IT

- $r=0$, so there is no linear correlation.** The x deviations from the mean are -3, -1, 1, and 3, and the y deviations are -1, 1, 1, and -1. The products of the deviations add to 0, so $r=0$.
- $r=-1$, so there is a perfect negative linear correlation.** Every increase of 12 social-media minutes matches a decrease of 1 sleep hour. The points follow one decreasing line exactly, so $r=-1$.

CHALLENGE

$r=0.58$. The new variable s is found by multiplying y by -1 and adding 12, so the direction flips while the strength stays the same.

Accept $1/2$ or 0.5 , and accept equivalent wording for correlation strength and direction. For $r=0$, accept "no linear correlation" rather than "no relationship," because a nonlinear relationship may still exist.