

~~U3 L1~~ I3 Correlation Coefficient~~2-6~~

- I can determine the strength and direction of the linear model based on the correlation coefficient.
- I can determine if statements of correlation or causation seem reasonable and defend my opinion mathematically.

In the United States, we seem to be “rank happy.” Sports teams are ranked on games won; motion pictures are ranked by viewer preference or gross revenue; DVDs are ranked on the number of rentals; automobiles are ranked by safety; and colleges are ranked on quality.

- 1a. Rank your favorite type of music with a 1. Continue ranking with a 2 for your second favorite and an 8 for your least favorite. Ties are not allowed! Once complete, share your data with your partner.

Answers vary

My rankings:

Rock:

1

Hip-Hop/Rap:

7

Dance/Electronic:

3

Classical:

4

R &amp; B/Soul:

5

Pop:

2

Country:

8

Latin:

6

Partner's rankings:

Rock:

6

Hip-Hop/Rap:

4

Dance/Electronic:

7

Classical:

2

R &amp; B/Soul:

5

Pop:


1

Country:

8

Latin:

3

- 1b. One the large graph given to you, make a graph of (one partner's rank, other partner's rank). For example, if Bob and Susan are partners, and Bob ranks “Rock” 1, and Susan ranks “Rock” 4. They decide that Susan's will go on the x-axis and Bob will go on the y-axis. Then they would have the point (4, 1) on their graphs. They would then repeat the same procedure for each category. Label the axes with your names. Your coordinates need to be marked with dots this big:  We will need to see them from across the room.

Answers vary

- 1c. Does there seem to be an association (relationship) between your ranking and your partner's ranking? Explain.

Not particularly. Two of the rankings are the same + that's it.

- 1d. Make a scatterplot of the data on your calculator. Does it match the scatterplot you made for question 1b?

Yes!

- 1e. Run a linear regression on the *lists and spreadsheet* page of your document. What is the  $r$  value (correlation coefficient)? Write your correlation coefficient on your graph large enough for everyone to see. After you have completed your graph and have written your correlation coefficient on it, tape it to the wall in numerical order.  $r \approx 0.238$  → Answers vary

Use the graphs on the wall to answer the following questions.

- 2a. The plots that have a **strong positive association** are \_\_\_\_\_.
- 2b. The plots that have a **strong negative association** are \_\_\_\_\_.
- 2c. The plots that have a **weak or no association** are \_\_\_\_\_.
- 2d. Which graphs do you feel comfortable predicting one student's rank when the other is known? What do those graphs have in common?

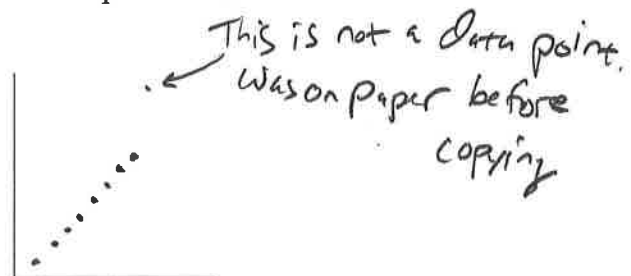
Graph's with  $r$ -values close to 1 or -1.  
The graphs look quite linear.

- 2e. Describe the meaning of your correlation coefficient value.

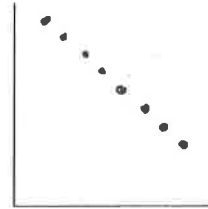
My partner and my tastes in music do not have much of a relationship/association.

Study the scatterplots and correlation coefficients displayed in your classroom.

- 3a. The scatterplot that has a correlation coefficient closest to 1 is varies.  
Their taste in music is similar.
- 3b. The scatterplot that has a correlation coefficient closest to -1 is varies.  
Their taste in music is opposite → high rank for one is low for other person.
- 3c. The scatterplot that has a correlation coefficient closest to 0 is varies.  
Their taste in music is not related in any way.
- 3d. Suppose you had ranked the types of music in exactly the same way as your partner did. The correlation coefficient would be 1 and the scatterplot would look like:



- 3e. Suppose you had ranked the types of music exactly opposite of the way your partner ranked the music. The correlation coefficient would be -1 and the scatterplot would look like:



Correlation coefficient or “ $r$ ” values are broken down into 5 different categories. There is very strong, strong, moderate, weak and very weak. The table below gives the ranges for each of the categories.

$r$	Interpretation
Less than 0.20	Very Weak
0.20-0.40	Weak
0.40-0.70	Moderate
0.70-0.90	Strong
0.90-1.00	Very Strong

→ Around 0.5

The sign of the “ $r$ ” value describes the direction of the slope. If the correlation coefficient is positive, then the slope is also positive, and when “ $r$ ” is negative, the slope is negative.

- 4a. Write as much as possible about a graph that has a correlation coefficient of 0.75?

Positive, strong relationship/association

- 4b. Write as much as possible about a graph that has a correlation coefficient of -0.15?

Negative, weak association

- 4c. What is/are the difference(s) between a graph that has a correlation coefficient of -0.95 and one that has a correlation coefficient of 0.95?

Both are very strong associations  
 ↓ Positive      ↓ Negative

Examine the plots below, showing paired rankings of favorite movies. Match each correlation coefficient below with the appropriate scatterplot. The scales on each scatterplot are the same.

5a. The graph with a  $r = 0.1$  is graph III. I know this because... it is the most scattered (no pattern) scatterplot.

5b. The graph with a  $r = 0.8$  is graph IV. I know this because... it is the strongest (most linear), positive relationship.

5c. The graph with a  $r = -0.9$  is graph I. I know this because... it is the only negative correlation (negative slope).

5d. The graph with a  $r = 0.5$  is graph II. I know this because... it has a slight, positive, linear pattern.

