

Movie Choices: Correlation Co-efficient

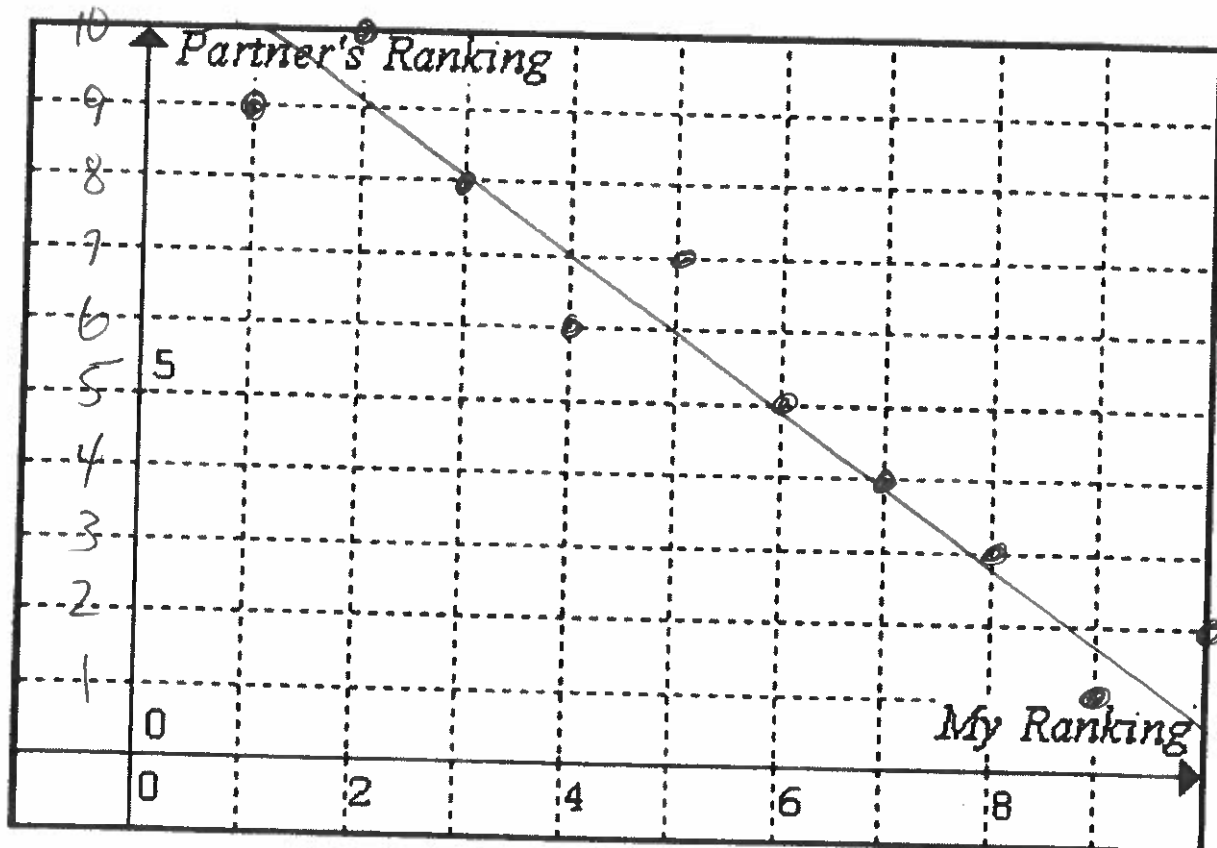
3.5 

Name: *Solutions*

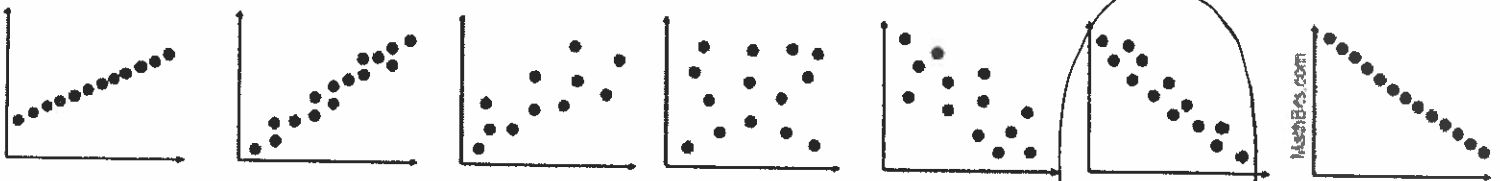
- How much do you want to see each movie? Rank each from 1 (worst) to 10 (best), use each number once.
 - Get your partner to rank it separately. Record their answer in the second column.

You	Partner	Movie
9	1	a) The Narrow Road : Chak struggles to manage his cleaning company in the early days of COVID-19 bonding with newly hired cleaner Candy and her daughter Chu.
7	4	b) M3GAN : M3GAN is a prototype artificially intelligent lifelike doll. When it is put in charge of an 8-year-old girl, it leads to unimaginable consequences.
3	8	c) Winnie the Pooh: Blood and Honey : Now feral and bloodthirsty, Winnie-the-Pooh and Piglet terrorize Christopher Robin and a group of young women at a remote house.
2	10	d) Champions : A former minor-league basketball coach is ordered to manage a team with intellectual disabilities.
8	3	e) Mummies : In this animation, three ancient mummies end up in present-day London and search for an old ring, stolen by the ambitious archaeologist Lord Carnaby.
10	2	f) A Man Called Otto : When a family moves in next door, grumpy widower Otto Anderson meets his match in a pregnant woman named Marisol, leading to an unlikely friendship.
6	5	g) DEMON SLAYER - To the Swordsmith Village : After the murder of his family, Tanjiro Kamado resolves to become a demon slayer to turning his sister back into a human.
4	6	h) Quantumania : Ant-Man and the Wasp find themselves exploring the Quantum Realm and embarking on an adventure that pushes them beyond their limits.
1	9	i) Creed III : Adonis Creed is thriving in his career. When Damian, an old friend resurfaces, he's eager to prove himself. The face-off is more than just a fight.
5	7	j) Avatar: The Way of Water : Jake Sully and Ney'tiri have formed a family. When an ancient threat resurfaces, Jake must fight a difficult war against the humans.

- Plot each ranking in the form (Yours, Partners) as an (x, y) co-ordinate. Draw in a Line of Best Fit



3. Look at the following sequence of graphs. Circle the one which best matches yours:



$r = 1$	$r = 0.8$ (approx.)	$r = 0.6$ (approx.)	$r = 0$	$r = -0.6$	$r = -0.8$ (approx.)	$r = -1$ (approx.)
Perfect line	Not so perfect	Even less perfect	Big blob	Not so perfect	More perfect	Perfect line
Positive slope	Positive slope	Positive slope	No slope	Negative slope	Negative slope	Negative slope
If you like it, so does your partner	If you like it, your partner probably does too.	If you like it, your partner might too	If you like it, you have no idea if your partner does	If you like it, your partner might not	If you like it, your partner probably does not	If you like it, your partner does not
Your value predicts your partners'	Your value sort of predicts your partners'	Your value rarely predicts your partners'	Your value has no relation to your partners'	The opposite of your value rarely predicts your partners'	The opposite of your value sort of predicts your partners'	The opposite of your value predicts your partners'

4. Draw some conclusions from your graphs.

(a) What is your estimate for the r value? *... -0.8* (1, 0.8, 0.6, 0, -0.6, -0.8, -1)

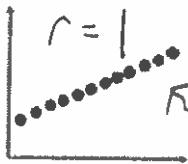
(b) What kind of slope did you have? *... negative* (positive, none, negative)

(c) If your partner likes a movie, should you go see it? Explain.

No. Our $r = -0.8$; so on average, if they liked the movie, I probably won't. We have opposite opinions.

(d) If your partner dislikes a movie, should you go see it? Explain.

Yes. The more they dislike a movie, the more likely I am to like it. We have opposite opinions.

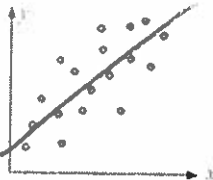
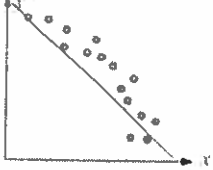
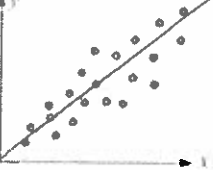


(e) Merritt has ranked their movie choices against yours and obtained this graph. Merritt tells you that they hated a certain movie. Should you go see it? Explain.

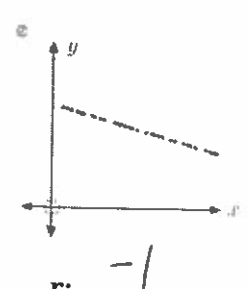
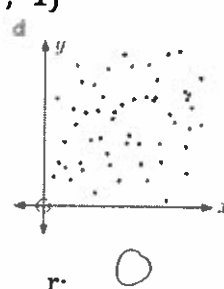
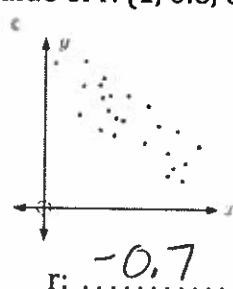
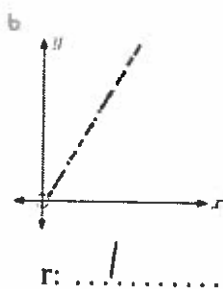
Merritt and I have similar opinions. If they hated it, it is likely I will too. No, I should not see it.

Check Your Understanding Questions

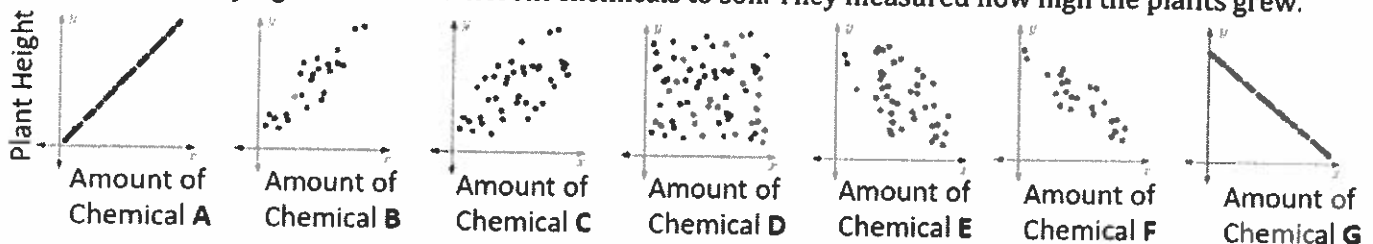
5. For each graph, draw a line of best fit. Then, answer the questions.

Draw a line of best fit.	Is there a pattern? (Positive, negative, none)	How strong is the relationship? (weak, moderate, strong, none)	Is the relationship linear? (linear, not linear)
	positive	moderate	linear
	negative	strong	linear
	positive	moderate	linear

6. Match each scatterplot with the correct value of r . (1, 0.6, 0, -0.7, -1)



7. Scientists added varying amounts of different chemicals to soil. They measured how high the plants grew.



(a) If the plant was a weed, which chemical should you use? Explain.

.. (G) .. We don't want weeds. As G increases, the plant decreases so G will kill the weed.

(b) If the plant was a vegetable, which chemical should you use? Explain.

.. (A) .. We do want vegetables. As A increases, the plant increases, so A helps the plant grow.

(c) Which chemical has no effect on the plants at all? Explain.

.. (D) .. Because there is a big blob, there is no correlation between plant height and D. It has no effect on the plant.

8. If r^2 is 0.3, it means that **30% of the changes in Y can be explained by X**. Both X and Y must be **numerical** (quantitative), they cannot be **categorical** (qualitative).

Other ways of stating that is, (if r^2 is 0.3):

- 30% of the variation of Y is linked to changes in X.
- X appears to cause 30% of the value of Y.
- The proportion of variance of Y that can be explained by variance of X is 30%
- 30% of Y's value depends on X.

Calculate the proportion of the variance of Y which:

(a) can be predicted from (or explained by) the variance of X if:

i. $r = 0.8$

$$r^2 = (0.8)^2 = 64\%$$

ii. $r = -0.9$

81%

(b) ~~can~~ cannot be predicted from (or explained by) the variance of X if

i. $r = 0.7$

51%

Not 49%

ii. $r = -0.6$

64%

Not 36%

The following three questions are multiple choice questions. Select the best answer.

9. A research study has reported that there is a correlation of $r = -0.59$ between the eye colour (blue, green, brown) of an experimental animal and the amount of nicotine that is fatal to the animal when consumed. This indicates:

- Nicotine is less harmful to one eye colour than the others.
- The lethal dose of nicotine goes down as the eye colour of the animal changes.
- One should consider the eye colour of animals in making statements about the effects of nicotine.
- The researchers need to do further study to explain the causes of this negative correlation.
- The researchers need to take a course in statistics because correlation is not an appropriate measure of association in this situation.

10. The correlation co-efficient provides:

- A measure of the extent to which changes in one variable cause changes in another variable.
- A measure of the strength of the linear association between two categorical variables.
- A measure of the strength of association between two categorical variables.
- A measure of the strength of the linear association between two quantitative variables.
- A measure of the strength of the linear association between a quantitative variable and a categorical variable.

11. On May 11th, 2020, 550 randomly selected subjects had their systolic blood pressure (SBP) recorded twice – the first time at about 9:00 am and the second time at about 2:00 pm. If one were to examine the relationship between the morning and the afternoon readings, then one might expect:

- The correlation to be near zero, as morning and afternoon readings would be independent.
- The correlation to be high and positive, as those with relatively high readings in the morning will tend to have relatively high readings in the afternoon.
- The correlation to be high and negative, as those with relatively high readings in the morning will tend to have relatively low readings in the afternoon.
- The correlation to be near zero, as the correlation measures the strength of the linear association.
- The correlation to be near zero, as blood pressure readings should follow a bell curve.