

# **Statistics and Probability**

# Quarter 4 – Module 18: **Calculating the Pearson's Sample Correlation Coefficient**



#### Statistics and Probability – Grade 11 Alternative Delivery Mode Quarter 4 – Module 18: Calculating the Pearson's Sample Correlation Coefficient First Edition, 2021

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# Statistics and Probability

# Quarter 4 – Module 18: Calculating the Pearson's Sample Correlation Coefficient



### **Introductory Message**

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-bystep as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.



# What I Need to Know

This module was designed and written with you in mind. It is here to help you master computing Pearson's sample correlation coefficient r. The scope of this module permits its use in many different learning situations. The language used recognizes the diverse vocabulary level of students. The concepts are arranged to follow the standard sequence of the learning area.

After going through this module, you are expected to:

- 1. define Pearson's sample correlation coefficient *r*,
- 2. state the formula for Pearson's sample correlation coefficient *r*,
- 3. compute the Pearson's sample correlation coefficient r; and
- 4. apply and solve real-life problems using Pearson's sample correlation coefficient.

Are you ready now to study about the calculation of Pearson's sample correlation coefficient using your ADM module? Good luck and may you find it helpful.



### What I Know

Choose the best answer to the given questions or statements. Write the letter of your choice on a separate sheet of paper.

- 1. Which of the following is a statistical method that measures the strength of the linear relationship between two variables?
  - a. z value
  - b. scatterplot
  - c. testing hypothesis
  - d. Pearson's sample correlation coefficient
- 2. Which of the following is the formula for Pearson's sample correlation coefficient r?

A. 
$$r = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{\sqrt{[n(\Sigma x^2) - (\Sigma x)^2][n(\Sigma y^2) - (\Sigma y)^2]}}$$
  
B. 
$$r = \frac{(\Sigma xy) - (\Sigma x)(\Sigma y)}{\sqrt{[(\Sigma x^2) - (\Sigma x)^2][(\Sigma y^2) - (\Sigma y)^2]}}$$
  
C. 
$$r = \frac{n(\Sigma xy) + (\Sigma x)(\Sigma y)}{\sqrt{[n(\Sigma x^2) + (\Sigma x)^2][n(\Sigma y^2) + (\Sigma y)^2]}}$$
  
D. 
$$r = \frac{(\Sigma xy) + (\Sigma x)(\Sigma y)}{\sqrt{[(\Sigma x^2) + (\Sigma x)^2][(\Sigma y^2) + (\Sigma y)^2]}}$$

- 3. In the Pearson *r*, what does *n* represent?
  - a. sum of x-values
  - b. sum of square x-values
  - c. number of paired values
  - d. sum of the products of paired values x and y
- 4. Which of the following is the first step in computing Pearson's sample correlation coefficient *r*?
  - a. Complete the table.
  - b. Construct the table.
  - c. Get the sum of all entries in all columns.
  - d. Substitute all the values obtained by all summations.
- 5. Which of the following values CANNOT represent a correlation coefficient r?
  - a. -1
  - b. 0
  - c. 0.25
  - d. 1.001

6. Based on the bivariate data below, which among the choices is the correctly constructed table?

Х	2	8	11	9
Y	13	20	22	5

d.

~					
a.	Х	Y	XY	$\mathbf{X}^2$	$\mathbf{Y}^2$
	13	2			
	20	8			
	22	11			
	5	9			

c.	Х	Y	XY	$X^2$	<b>Y</b> <sup>2</sup>
	2	13			
	8	20			
	11	22			
	9	5			

Х	Y	XY	X <sup>3</sup>	<b>Y</b> <sup>3</sup>
2	13			
8	20			
11	22			
9	5			

7. In the bivariate data on the right, which among the choices is the correct completed table?

Х	1	2	3
Y	18	13	7

 $\mathbf{X}^2$ 

 $\mathbf{Y}^2$ 

Х	Y	XY	$X^2$	$\mathbf{Y}^2$
1	18	18	1	324
2	13	26	4	169
3	7	21	9	64
6	39	68	14	557

XY

 $\mathbf{X}^2$ 

 $\mathbf{Y}^2$ 

d.

Х

Y

XY

c.

Х	Y	XY	$X^2$	<b>Y</b> <sup>2</sup>
1	18	1	18	324
2	13	4	26	169
3	7	9	21	64
6	39	14	68	557

- 8. Using the following summation values below, what is the value of Pearson  $r \ge n = 4$   $\sum X = 10$   $\sum Y = 15$   $\sum XY = 39$   $\sum X^2 = 30$   $\sum Y^2 = 65$ 
  - a. -0.02

a.

b.

Х

Y 

- b. 0
- c. 0.23
- d. 1

9. Using the following summation values below, what is the value of Pearson r?

n = 3  $\sum X = 6$   $\sum Y = 39$   $\sum XY = 68$   $\sum X^2 = 14$   $\sum Y^2 = 557$ a. -1 b. -0. 74 c. 0 d. 0.39

For numbers 10-12, refer to the following bivariate data:

Х	1	2	3
Y	5	9	8

10. Which of the following is the CORRECT completed table for the bivariate data?

c.

a.

Х	Y	XY	$X^2$	$\mathbf{Y}^2$
1	5	1	25	5
2	9	4	81	18
3	8	9	64	24
6	22	14	170	47

Х	Y	XY	$\mathbf{X}^2$	$\mathbf{Y}^2$
1	5	1	5	25
2	9	4	18	81
3	8	9	24	64
6	22	14	47	170
-				

ĺ	Х	Y	XY	$\mathbf{X}^2$	$\mathbf{Y}^2$
	1	5	5	1	25
ĺ	2	9	18	4	81
ĺ	3	8	24	9	64
	6	22	47	14	170

Х	Y	XY X <sup>2</sup>		$\mathbf{Y}^2$
1	5	5	25	1
2	9	18	81	4
3	8	24	64	9
6	22	47	170	14

11. When you substitute all the summation ( $\Sigma$ ) values in the formula for Pearson *r*, which among the choices is its best representation?

A. 
$$r = \frac{4(47) - (6)(22)}{\sqrt{[3(14) - 22^2][3(170) - 6^2]}}$$
  
B.  $r = \frac{4(47) - (6)(22)}{\sqrt{[3(14) - 6^2][3(170) - 22^2]}}$   
C.  $r = \frac{3(47) - (6)(22)}{\sqrt{[3(14) - 22^2][3(170) - 6^2]}}$ 

D. 
$$r = \frac{3(47) - (6)(22)}{\sqrt{[3(14) - 6^2][3(170) - 22^2]}}$$

- 12. What is the value of r?
  - a. 0.93b. 0.72
  - D. U.12
  - c. 0.16
  - d. -0.16

For numbers	13-15,	refer to	the	bivariate	data	below:
-------------	--------	----------	-----	-----------	------	--------

Х	3	2	0	1	3
Y	10	24	21	15	28

13. Which of the following is the CORRECT completed table for the bivariate data?

c.

d.

Х	Y	XY	$\mathbf{X}^2$	<b>Y</b> <sup>2</sup>
10	3	30	9	100
24	2	48	4	576
21	0	0	0	441
15	1	15	1	225
28	3	84	9	784
98	9	177	23	2126

Х	Y	XY	$\mathbf{X}^2$	$\mathbf{Y}^2$
10	3	30	100	9
24	2	48	576	4
21	0	0	441	0
15	1	15	225	1
28	3	84	784	9
98	9	177	2126	23

$\mathbf{X}\mathbf{Y}^2$
.00
576
41
225
'84
126

Х	Y	XY	$X^2$	$\mathbf{Y}^2$
3	10	30	9	100
2	24	48	4	576
0	21	0	0	441
1	15	15	1	225
3	28	84	9	784
9	98	177	23	2126

14. When you substitute all the summation ( $\sum$ ) values in the formula for Pearson r, which among the choices is its best representation?

A. 
$$r = \frac{5(177)-(9)(98)}{\sqrt{[5(23)-9^2][5(2126)-98^2]}}$$
  
B.  $r = \frac{5(177)+(9)(98)}{\sqrt{[5(23)-9^2][5(2126)-98^2]}}$   
C.  $r = \frac{5(2126)-(9)(98)}{\sqrt{[5(23)-9^2][5(2126)-98^2]}}$   
D.  $r = \frac{5(2126)+(9)(98)}{\sqrt{[5(23)+9^2][5(2126)+98^2]}}$ 

- 15. What is the value of *r*?
  - a. 0b. 0.02

a.

- c. 0.16
- d. 0.61

## Lesson

# Calculating the Pearson's Sample Correlation Coefficient

In the previous lesson, you learned about bivariate data and pairs of variables that are related to each other. You also learned how to construct the scatter plots of these bivariate data and determine the strength and direction of their association or relationship based on how the points are scattered. In this module, you will focus on the correlation of bivariate data. Check your readiness for this lesson by answering the following exercises.



Identify the trend and strength of correlation of the scatter plots below. Choose

your answer from the choices inside the box.

perfect positive correlation strong positive correlation weak positive correlation no or negligible correlation

perfect negative correlation strong negative correlation weak negative correlation





How can we determine if there is a correlation between two variables: *X* and *Y*? By observing the scatter plot, you can tell if the correlation is positive, negative, or non-existent. If the points on the scatter plot closely resemble a straight line, then the correlation may be positive or negative depending on the trend of the line. It has a positive correlation if the line is increasing or rising from left to right. It has a negative correlation if the line is decreasing or it is trending downward from left to right. Meanwhile, the variables have no or negligible correlation if the points are scattered randomly on the scatter plot.

You can only estimate the direction and strength of the relationship between variables using a scatter plot. Is there a way to get the exact direction and strength of the relationship between variables? Just like any other measurement, correlation between two variables can be represented by a single number. This number can determine exactly whether the relationship is negative or positive. It can also tell exactly the degree or strength of the relationship. Let's try the next activity.



The following tables show the bivariate data x and y. Without constructing a scatter plot, tell whether they have positive, negative, or no/negligible correlation. Then, briefly explain your answer.

1.								
1.	x	1	2	3	4	5	6	
	у	5	10	10	15	25	30	
2.	x	1	3	11	10	6	9	
	У	14	6	12	11	10	9	
3.	x	10	8	6	4	2	1	
	у	16	19	26	24	29	36	

#### **Guide Questions:**

- 1. How do you assess the bivariate data to determine the trend of its correlation?
- 2. Do you think it is easy to determine the trend of its correlation? Why or why not?
- 3. Is there a way to get the exact number that will represent its correlation?

The scatter plot helps us visualize the relationship of the variables in a bivariate data. However, only the trend of the correlation can be exactly determined. We can only estimate the degree of the association whether the variables have weak, moderate, or high degree of relationship. Meanwhile, there is a statistical method that can be used to evaluate the strength of relationship between two quantitative variables.



The **Pearson's sample correlation coefficient** (also known as Pearson r), denoted by r, is a test statistic that measures the strength of the linear relationship between two variables. To find r, the following formula is used:

$$r = \frac{n(\Sigma XY) - (\Sigma X)(\Sigma Y)}{\sqrt{\left[n(\Sigma X^2) - (\Sigma X)^2\right]\left[n(\Sigma Y^2) - (\Sigma Y)^2\right]}}$$

The *correlation coefficient (r)* is a number between -1 and 1 that describes both the strength and the direction of correlation. In symbol, we write  $-1 \le r \le 1$ .

#### **Illustrative Example:**

Teachers of Pag-asa National High School instilled among their students the value of time management and excellence in everything they do. The table below shows the time in hours spent in studying (X) by six Grade 11 students and their scores in a test (Y). Solve for the **Pearson's sample correlation coefficient**  $\underline{r}$ .

x	1	2	3	4	5	6
Y	5	10	10	15	25	30

STEPS			S	OLUTI	ON		
1. Construct a table as shown on the right side		v	v	vv	<b>V</b> 2	<b>N</b> 2	7
		1	5	ΛΙ	Λ2	12	_
		2	10				_
		3	10				
		4	15				
		5	25				
		6	30				
2. Complete the table.							_
a. Multiply entries in the <b>X</b> and <b>Y</b>		X	Y	XY	<b>X</b> <sup>2</sup>	<b>Y</b> <sup>2</sup>	
XY column.		1	5	5	1	25	_
		2	10	20	4	100	_
b. Square all the entries in the $\mathbf{X}$		3	10	30	9	100	_
column.		4	15	60	16	225	
		5	25	125	25	625	_
c. Square all the entries in the <b>Y</b> column. Put them under <b>Y</b> <sup>2</sup>		6	30	180	36	900	
column.							
3.	Ī				1		
a. Get the sum of all entries in the <b>X</b> column. This is $\Sigma X$ .		X	Y	XY	<b>X</b> <sup>2</sup>		<b>Y</b> 2
		1	5	5	1	2	25
b. Get the sum of all entries in the $\mathbf{V}$ column. This is $\mathbf{\nabla} \mathbf{V}$		2	10	20	4	1	00
		3	10	30	9	1	00
c. Get the sum of all entries in the		4	15	60	16	2	25
<b>XY</b> column. This is $\sum XY$ .		5	25	125	25	6	25
d. Get the sum of all entries in the		6	30	180	36	9	00
$X^2$ column. This is $\sum X^2$ .		$\sum X =$	$\Sigma Y =$	$\sum XY =$	$\sum X^2$	$r = \sum_{i=1}^{n}$	$Y^{2} =$
e. Get the sum of all entries in the		21	<b>9</b> 5	420	91	1,	975
<b>Y</b> <sup>2</sup> column. This is $\sum Y^2$ .							
4. Substitute the values obtained	H	ere n	= 6 be	ecause	there	are s	ix (6)
from Step 3 in the formula:	pa	airs of	values	•			
$r = \frac{n(\sum XY) - (\sum X)(\sum Y)}{n(\sum Y)}$	<b>r</b> .		$n(\sum \lambda)$	$(XY) - (\Sigma)$	$X)(\sum Y)$	)	
$V = \frac{1}{\sqrt{[n(\sum X^2) - (\sum X)^2][n(\sum Y^2) - (\sum Y)^2]}}$	$r = \frac{1}{\sqrt{\left[n(\sum X^2) - (\sum X)^2\right]\left[n(\sum Y^2) - (\sum Y)^2\right]}}$					$)^{2}]$	
			6(42	0) – (21	L)(95)		
	=	√ <u>[6(9</u>	1) – (2	$1)^{2}][6(1)$	,975) ·	- (95)	2]

The next section will guide you on how to compute the Pearson product moment correlation r.

	2,520 - 1,995
	$-\frac{1}{\sqrt{[546-441][11,850-9,025]}}$
calculator here!	525
	$=\frac{1}{\sqrt{[105][2,825]}}$
	$=\frac{525}{\sqrt{296.625}}$
	<i>r</i> ≈ 0.96395 of <u>0.96</u>
	The value of $r$ is a positive
	number. Therefore, we can say
	correlation between hours spent in
	studying and their scores in a test.
	Note: For consistency of our answer,
	round your final answer into two
	decimal places.

In the next module, we will interpret the strength of value of computed r and we will involve more real-life problems to solve using Pearson r. In the meantime, let's focus on computing the Pearson's sample correlation coefficient r.

Let's try to answer all the activities that follow.





What's More

#### Activity 1.1 Let Me Guide You!

In this activity, you will be guided on how to compute the Pearson's sample correlation coefficient r. First, fill in the blank parts of the table with the correct values of each cell. After completing the table, get the sum of each column. Then, substitute the values obtained in the given formula. Finally, perform the indicated operations to calculate the value of r.

Γ	X	1	3	4		5	7	]
	Y	35	20	15		10	15	
x		Y	X	(		<b>X</b> <sup>2</sup>		Y <sup>2</sup>
1		35	35	5				
3		20				9	4	00
4		15	60	)			2	25
5		10				25		
7		15	10	5			2	25
$\sum_{\substack{\sum X = \\ 20}} X =$	-	$\sum Y =$	$\frac{\sum X}{31}$	Y= 0	2	$\Sigma X^2 =$	Σ 2,	Y <sup>2</sup> = 175

n = 5 (since there are 5 pairs of values)

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n(\sum x^2) - (\sum x)^2][n(\sum y^2) - (\sum y)^2]}}$$

$$= \frac{5(310) - (20)(\_)}{\sqrt{[5(\_] - (20)^2][5(2,175) - (\_)^2]}}$$
Be careful in substituting the values, make sure they are correct.  

$$= \frac{1,550 - \_}{\sqrt{[\_] - 400][10,875 - \_]}}$$

$$= \frac{-\_}{\sqrt{[\_] - 1}}$$

$$= \frac{-\_}{\sqrt{\_}}$$

$$r \approx -0.81$$

### Activity 1.2 Complete Me!

Complete the table below. Then, fill in the blanks in the formula to arrive at the computed Pearson r.

X	Y	XY	<b>X</b> <sup>2</sup>	<b>Y</b> <sup>2</sup>
15	5		225	
23	3			
11	8			64
9	10			100
15	8			64
20	20	400		
$\sum X =$	$\sum Y =$	$\sum XY =$	$\sum X^2 =$	$\sum Y^2 =$
		842	1,581	

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{\left[n(\sum x^2) - (\sum x)^2\right] \left[n(\sum y^2) - (\sum y)^2\right]}} \qquad n = \___$$

$$r = \frac{\__{(842)} - (\__{)}(\__{)})}{\sqrt{\left[\__{(1,581)} - (\__{)}^2\right] \left[\__{(\__{)}} - (\__{)}^2\right]}} \qquad \begin{bmatrix} r \approx 0.03 \end{bmatrix}$$

#### Activity 1.3 Let Me Guide You Because...

The title of the activity is incomplete and to reveal the real message, follow the given directions. Using the given sum, substitute each to the formula of Pearson's sample correlation coefficient. Then, compute the value of r. Choose your answer from the LETTER BOX below. Write the letter that corresponds to your answer on the DECODING AREA. (Show your solution.)

1.	n = 5	$\sum X = 17$	$\sum Y = 85$	$\sum XY = 375$	$\sum X^2 = 75$	$\sum Y^2 = 1,875$
2.	n = 8	$\sum X = 72$	$\sum Y = 105$	∑ <i>XY</i> =1,020	$\sum X^2 = 816$	$\sum Y^2 = 1,725$
3.	n = 6	$\sum X = 22$	$\sum Y = 34$	$\sum XY = 79$	$\sum X^2 = 734$	∑Y <sup>2</sup> = 364

Letter Box

Y	Т	T I		R
1	0.73	-0.14	0.31	0

DECODE...

Let me guide you because			
	3	2	1

### Activity 1.4 You Can Do It!

In Mapalad Integrated High School, a guidance counselor believes that aptitude score is related to performance. The following sample data obtained from six students show their aptitude and performance score. Compute the Pearson *r*. Show your solution.

Aptitude	Quarterly Assessment
Score (X)	Score (Y)
8	14
15	5
11	8
7	12
5	2
10	11



# What I Have Learned

Answer the following questions below:

- 1. What do you call a statistical method that measures the strength of correlation between two variables?
- 2. To find Pearson *r*, what is the formula to be used?
- 3. Briefly discuss the steps in computing the Pearson's sample correlation coefficient r.



# What I Can Do

Ask your 10 classmates about their previous grade in Mathematics and Science subjects. Create a table for the data obtained from the survey and solve for Pearson's sample correlation coefficient r between the grades in Mathematics and Science.

Nomoo	Previous Grade			
Names	Mathematics	Science		
1.				
2.				
3.				
4.				
5.				
б.				
7.				
8.				
9.				
10.				



### Assessment

Choose the best answer to the given questions or statements. Write the letter of your choice on a separate sheet of paper.

- 1. Which of the following is used to measure the strength of the association between bivariate data?
  - a. z value
  - b. diagram
  - c. Pearson b
  - d. Pearson's sample correlation coefficient
- 2. Which of the following is the Pearson *r* formula?

A. 
$$r = \frac{(\sum xy) - (\sum x)(\sum y)}{\sqrt{[(\sum x^2) - (\sum x)^2][(\sum y^2) - (\sum y)^2]}}$$
  
B. 
$$r = \frac{n(\sum xy) + (\sum x)(\sum y)}{\sqrt{[n(\sum x^2) + (\sum x)^2][n(\sum y^2) + (\sum y)^2]}}$$
  
C. 
$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n(\sum x^2) - (\sum x)^2][n(\sum y^2) - (\sum y)^2]}}$$
  
D. 
$$r = \frac{(\sum xy) + (\sum x)(\sum y)}{\sqrt{[(\sum x^2) + (\sum x)^2][(\sum y^2) + (\sum y)^2]}}$$

- 3. In the formula of Pearson *r*, what is the meaning of  $\sum xy$ ?
  - a. sum of x-values
  - b. sum of square x-values
  - c. sum of the square of paired values x and y
  - d. sum of the products of paired values x and y
- 4. In computing Pearson *r*, which of the following is the next step after obtaining the sum of all entries in all columns in the table?
  - a. Construct a table.
  - b. Complete the table.
  - c. Simplify and compute for the value of *r*.
  - d. Substitute all the sum and *n* in the formula.
- 5. Which of the following is the range of the correlation coefficient (r)?
  - a.  $0 \le r \le 1$ b.  $1 \le r \le -1$ c. -1 < r < 1d.  $-1 \le r \le 1$ e.

6. In the given bivariate data, which among the choices is the correctly constructed table?

Х	-1	0	1	2
Y	10	13	9	15

5

c.

d.

a.	Х	Y	XY	$X^2$	<b>Y</b> <sup>2</sup>
	-1	10			
	0	13			
	1	9			
	2	15			
b.	Х	Y	XY	$X^2$	<b>Y</b> <sup>2</sup>
5.	-1	15			
	0	9			
	1	13			
	2	10			

c.	Х	Y	XY	$X^2$	<b>Y</b> <sup>2</sup>
	10	-1			
	13	0			
	9	1			
	15	2			

d.	Х	Y	XY	X <sup>3</sup>	<b>Y</b> <sup>3</sup>
	-1	15			
	0	9			
	1	13			
	2	10			

7. In the bivariate data on the right, which among the choices is the correct completed table? X 2 4 6

= =	-	-	
Y	1	3	

Х	Y	XY	$X^2$	Y <sup>2</sup>
2	1	2	4	1
4	3	12	16	9
6	5	30	36	25
12	9	35	56	44

a.

b.

Х	Y	XY	$\mathbf{X}^2$	<b>Y</b> <sup>2</sup>
2	1	2	1	4
4	3	12	9	16
6	5	30	25	36
12	9	44	35	56

Х	Y	XY	$\mathbf{X}^2$	<b>Y</b> <sup>2</sup>
2	1	2	4	1
4	3	12	16	9
6	5	30	36	25
12	9	44	56	35

Х	Y	$X^2$	<b>Y</b> <sup>2</sup>	XY
2	1	2	4	1
4	3	12	16	9
6	5	30	36	25
12	9	44	56	35

8. Using the given summation values below, what is the value of Pearson *r*?  $n = 3 \quad \sum X = 6 \quad \sum Y = 30 \quad \sum XY = 60 \quad \sum X^2 = 14 \quad \sum Y^2 = 450$ 

a. -0.06b. 0 c. 0.11 d. 1

9. Using the given summation values below, what is the value of Pearson r?

n = 5  $\Sigma X = 10$   $\Sigma Y = 15$   $\Sigma XY = 90$   $\Sigma X^2 = 60$   $\Sigma Y^2 = 135$ a. -1 b. 0 c. 0.99 d. 1 For numbers 10-12, refer to the following bivariate data:

Х	1	2	3
Y	10	8	9

 $\mathbf{Y}^2$ 

14

10. Which of the following is the CORRECT completed table for the bivariate data?

						-				
a	Х	Y	XY	$X^2$	<b>Y</b> <sup>2</sup>	c.	Х	Y	XY	$X^2$
	1	10	100	10	1		1	10	100	10
	2	8	64	16	4		2	8	64	16
	3	9	81	27	9		3	9	81	27
	6	27	245	53	14		6	27	245	53
h	_					 4				
υ.	Х	Y	XY	$X^2$	$\mathbf{Y}^2$	u.	Х	Y	XY	$\mathbf{X}^2$
	1	10	10	1	100		1	10	10	1
	2	8	16	4	64		2	8	16	4
	3	9	27	9	81		3	9	27	9
	6	27	53	14	245		6	27	53	245

11. When you substitute all the summation ( $\Sigma$ ) values in the formula for Pearson *r*, which among the choices is its best representation?

A. 
$$r = \frac{3(53) - (6)(27)}{\sqrt{[3(14) - 6^2][3(245) - 27^2]}}$$
  
B.  $r = \frac{3(53) - (6)(27)}{\sqrt{[3(14) + 6^2][3(245) + 27^2]}}$   
C.  $r = \frac{3(27) - (6)(27)}{\sqrt{[3(14) - 6^2][3(245) - 27^2]}}$   
D.  $r = \frac{3(53) - (6)(27)}{\sqrt{[3(6) - 14^2][3(27) - 245^2]}}$ 

12. What is the value of r?

a.	0.95	c.	-0.25
b.	0.75	d.	-0.5

For numbers 13-15, refer to the following bivariate data:

Х	-2	0	3	4	1
Y	8	5	8	13	20

d.

13.Which of the following is the CORRECT completed table for the bivariate data?

a.	Х	Y	XY	$X^2$	<b>Y</b> <sup>2</sup>
	-2	8	-16	4	64
	0	5	0	0	25
	3	8	24	9	64
	4	13	52	16	169
	1	20	20	1	400
	6	54	80	722	30

c.	Х	Y	XY	$X^2$	<b>Y</b> <sup>2</sup>
	-2	8	-16	4	64
	0	5	0	0	25
	3	8	24	9	64
	4	13	52	16	169
	1	20	20	1	400
	6	54	80	30	722

b.	Х	Y	XY	$X^2$	<b>Y</b> <sup>2</sup>
	-2	8	64	4	-16
	0	5	25	0	0
	3	8	64	9	24
	4	13	169	16	52
	1	20	400	1	20
	6	54	722	30	80

Х	Y	XY	$\mathbf{X}^2$	$\mathbf{Y}^2$
-2	8	-16	64	4
0	5	0	25	0
3	8	24	64	9
4	13	52	169	16
1	20	20	400	1
6	54	80	722	30

14. When you substitute all the summation (  $\Sigma$  ) values in the formula for Pearson *r*, which among the choices is its best representation?

A. 
$$r = \frac{5(80) - (6)(54)}{\sqrt{[5(30) - 6^2][5(722) - 54^2]}}$$
  
B.  $r = \frac{5(80) - (6)(54)}{\sqrt{[5(30) + 6^2][5(722) + 54^2]}}$   
C.  $r = \frac{5(80) - (6)(54)}{\sqrt{[5(6) - 30^2][5(54) - 722^2]}}$   
D.  $r = \frac{(6)(54) - 5(80)}{\sqrt{[5(30) - 6^2][5(722) - 54^2]}}$ 

15.What is the value of r?



# **Additional Activities**

An ice cream vendor records the maximum daily temperature and the number of ice creams he sells each day. An eight-day result is shown in the table below.

Maximum Temperature (°C)	26	28	24	28	23	24	27	32
Number of Ice Creams Sold	21	38	42	47	29	19	52	56

Follow the directions below:

- 1. Display the data in a scatter plot and identify the trend of correlation.
- 2. Compute the Pearson's sample correlation coefficient r.
- 3. Interpret the result of the data.

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- High values of one variable correspond to either high or low values of another 2. No/Negligible Correlation As X values increase, the Y values also increase and vice versa. 1. Positive Correlation
- As X values increase, the Y values decrease and vice versa. 3. Negative Correlation

12' B	10. C	2' D		
14. A	A.9	4' C		
13. D	8. C	3 <sup>.</sup> B		
12. B	A .7	2. A		
11. D	9 <sup>.</sup> C	1. D		
	WonX I JadW			

Answer Key

P. D



- 1. strong negative correlation
- 2. no/negligible correlation
- strong positive correlation .6
- 4. perfect positive correlation
- 5. perfect negative correlation



Let me Guide You because... ILY

2.  $r \approx 0.31$ 3.  $r \approx -0.14$ 

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<b>4.</b> I	Activity			6.1 viivitsA
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