

10 A *7. Regression Equation: calculate from summary stats

For a hypothetical population of men, **waist size** is **positively correlated** with **height**, such that:

- Pearson's $r = +.6$
- The mean **height** (μ_X) for this group is 69 inches with $\sigma_X = 3$
- The mean **waist** measurement (μ_Y) is 32 inches with $\sigma_Y = 4$.

<p>a) What is the slope of the regression line predicting waist size from height?</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Formula 10.3A $slope = r \frac{\sigma_Y}{\sigma_X}$</p> </div> <div style="border: 1px solid black; border-radius: 10px; width: 150px; margin: 10px auto; padding: 5px; text-align: center;"> <p>slope = _____</p> </div>	<p>b) What is the value of the Y intercept?</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Formula 10.3B $y - int = \bar{Y} - slope \cdot \bar{X}$</p> </div> <div style="border: 1px solid black; border-radius: 10px; width: 150px; margin: 10px auto; padding: 5px; text-align: center;"> <p>y-intercept = _____</p> </div>
<p>c) Does the value found in part b above make any sense?</p>	<p>d) Write the raw-score regression equation predicting waist size from height.</p> <div style="border: 1px solid black; border-radius: 10px; width: 150px; margin: 10px auto; height: 30px;"></div>

10 A *8. Regression Equation: make predictions

Based on the regression equation found in Exercise 7:

<p>a) What waist size would you predict for a man who is 6 feet tall?</p> <div style="border: 1px solid black; border-radius: 10px; width: 150px; margin: 10px auto; padding: 5px; text-align: center;"> <p>waist = _____ inches</p> </div>	<p>b) What waist size would you predict for a man who is 62 inches tall?</p> <div style="border: 1px solid black; border-radius: 10px; width: 150px; margin: 10px auto; padding: 5px; text-align: center;"> <p>waist = _____ inches</p> </div>	<p>c) How tall would a man have to be for his predicted waist size to be 34 inches?</p> <div style="border: 1px solid black; border-radius: 10px; width: 150px; margin: 10px auto; padding: 5px; text-align: center;"> <p>height = _____ inches</p> </div>
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10 A 9. Regression Equation: variance measures

<p>a) In Exercise 7, what is the value of the coefficient of determination?</p>	<div style="border: 1px solid black; border-radius: 10px; width: 100px; margin: 10px auto; padding: 5px; text-align: center;"> <p>$r^2 =$ _____</p> </div>
<p>b) How large is the coefficient of nondetermination?</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Formula 10.8A $k^2 = 1 - r^2$</p> </div>	<div style="border: 1px solid black; border-radius: 10px; width: 100px; margin: 10px auto; padding: 5px; text-align: center;"> <p>$k^2 =$ _____</p> </div>
<p>c) How large is the variance of the estimate ("residual variance")? (formula 10.8B)</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Formula 10.8B $\sigma_{est Y}^2 = \sigma_Y^2(1 - r^2)$</p> </div>	<div style="border: 1px solid black; border-radius: 10px; width: 100px; margin: 10px auto; padding: 5px; text-align: center;"> <p>$\sigma_{est Y}^2 =$ _____</p> </div>

10 B 6. Regression: swap X and Y

A cognitive psychologist is interested in the relationship between spatial ability (e.g., ability to rotate objects mentally) and mathematical ability, so she measures 12 participants on both variables. The data appear in the following table:

ID	Spatial Ability Score	Math Score
1	13	19
2	32	25
3	41	31
4	26	18
5	28	37
6	12	16
7	19	14
8	33	28
9	24	20
10	46	39
11	22	21
12	17	15

a) Find the regression equation for predicting the **math score** from the **spatial** ability score. **Code: R notebook**

b) Find the regression equation for predicting the **spatial ability** score from the **math** score. **Code: R notebook**

c) According to your answer to **part a**, what **math score** is predicted from a spatial ability score of 20? (*by hand*)

d) According to your answer to **part b**, what **spatial ability score** is predicted from a math score of 20? (*by hand*)

A cognitive psychologist is interested in the relationship between spatial ability (e.g., ability to rotate objects mentally) and mathematical ability, so she measures 12 participants on both variables. The data appear in the following table:

- a) Find the regression equation for **predicting shoe size** from age.

- b) Find the regression equation for **predicting reading level** from age.

- c) Use the equations from parts a and b to make shoe size and reading level predictions for each child. Subtract each prediction from its actual value to find the residual.

Child	Age	Shoe Size			Reading Level		
		Actual	Predicted	Residual	Actual	Predicted	Residual
1	8	5.2			1.7		
2	6	4.7			1.5		
3	7	7.0			2.7		
4	8	5.8			3.1		
5	9	7.2			3.9		
6	10	6.9			4.5		
7	11	7.7			5.1		
8	12	8.0			7.4		

- a) Calculate **Pearson's r** for **shoe size** and **reading level** using the data from Exercise 9.

$$r = \underline{\hspace{2cm}}$$

- b) Calculate **Pearson's r** for the two sets of **residuals** you found in part c of Exercise 9.

$$r = \underline{\hspace{2cm}}$$

- c) **Compare** your answer in **part b** with your answer to **part a**. The correlation in part b is the partial correlation between shoe size and reading level after the confounding effect of age has been removed from each variable (see Chapter 17 for a much easier way to obtain partial correlations).

10 B *15. Regression Equation: effect size

According to the guidelines suggested by J. Cohen (1988), $d = .8$ is a large effect size; any effect size much larger would probably be too obvious to require an experiment.

a) What **proportion of population variance** is accounted for when d reaches this value?

Formula 10.15

$$\omega^2 = \frac{d^2}{d^2 + 4}$$

$\omega^2 = \underline{\hspace{2cm}}$

b) What **proportion of population variance** is accounted for when d is moderate in size, i.e., $d = .5$?

$\omega^2 = \underline{\hspace{2cm}}$

c) How high does d have to be for **half** of the **population variance to be accounted for**?

$d = \underline{\hspace{2cm}}$

10 C 1. Regression Code: R notebook

Perform a linear regression to predict **statquiz** from **phobia**, and write out the raw-score **regression formula**.

$\underline{\hspace{15cm}}$

Do the slope and Y intercept differ **significantly from zero**? **Explain** how you know.

SLOPE:
 diff from zero -or- no such evidence
 Explain...

Y-INTERCEPT:
 diff from zero -or- no such evidence
 Explain...

What stats quiz score would be **predicted** for a student with a phobia rating of 9? (*by hand*)

Stats quiz = $\underline{\hspace{2cm}}$

Approximately **what phobia rating** would a student need to have in order for her predicted statquiz score to be 7.2? (*by hand*)

Phobia rating = $\underline{\hspace{2cm}}$

- a) Perform a linear regression to predict **prequiz anxiety** from **phobia**, and write out the raw-score regression formula.

- b) Repeat part a separately for men and women. (use SPSS)

MEN**WOMEN**

For each gender, **what prequiz anxiety rating** would be predicted for someone reporting a phobia rating of 8? (*by hand*)

MEN**WOMEN**

Prequiz anxiety = _____

Prequiz anxiety = _____

For which gender should you really not be making predictions at all? Men -or- Women
Explain.