Section 12.2 — Linear Regression

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Outline

Introduction

Examples

Warning!

Introduction

Definition

Definition (Least-Squares Regression Line)

The least-squares regression line is the line for which the best average variation from the data is the smallest. It is sometimes called the line of best fit. It is given by

$$\hat{y} = b_0 + b_1 x$$

Slope and Intercept

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The slope of the least-squares regression line is

$$b_1 = \frac{s_y}{s_x} r$$

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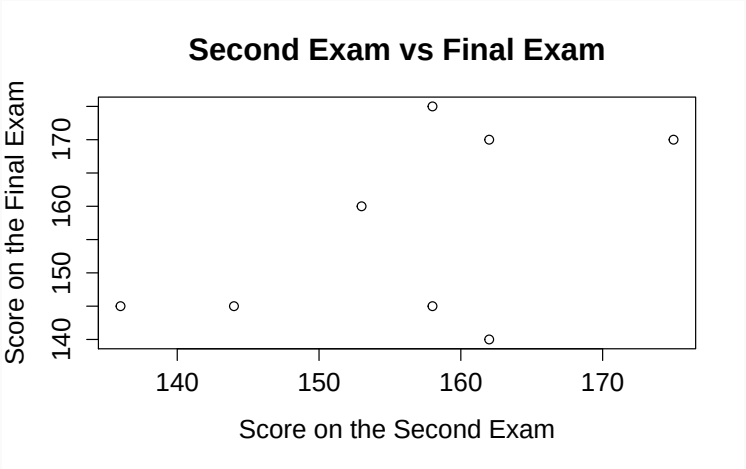
y–intercept

The y–intercept of the least-squares regression line is

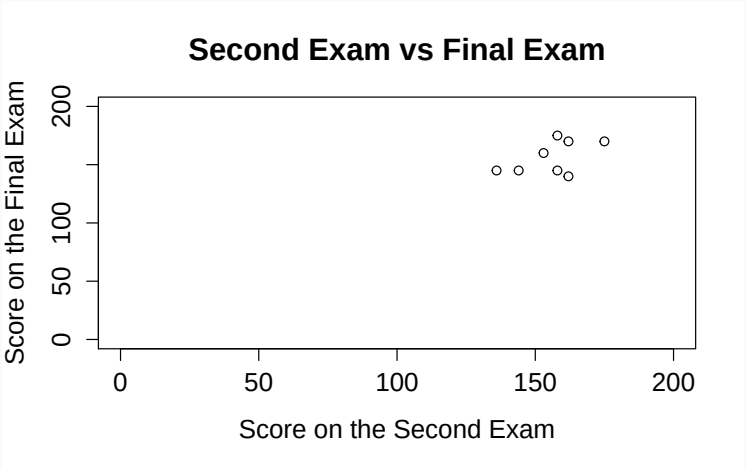
$$b_0 = \bar{y} - b_1 \bar{x}$$

Examples

More test scores!



More test scores!



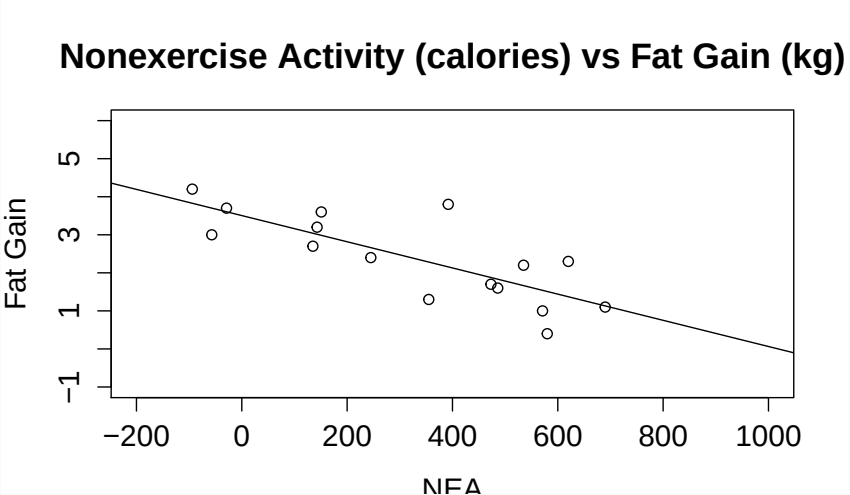
More test scores!

Second test score	158	162	144	162	136	158	175	153
Final exam score	145	140	145	170	145	175	170	160

Fidgeting vs Weight Gain

NEA increase (cal)	-94	-57	-29	135	143	151	245	355
Fat gain (kg)	4.2	3.0	3.7	2.7	3.2	3.6	2.4	1.3
NEA increase (cal)	392	473	486	535	571	580	620	690
Fat gain (kg)	3.8	1.7	1.6	2.2	1.0	0.4	2.3	1.1

Fidgeting vs Weight Gain



Fidgeting vs Weight Gain

- How much fat gain would you expect if the non-exercise-activity increased by 50 calories?

Fidgeting vs Weight Gain

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- What about 1500?

Fidgeting vs Weight Gain

- How much fat gain would you expect if the non-exercise-activity increased by 50 calories?
- What about 1500?
- Which do you think is more accurate?

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A prediction should not be made with a regression model if

- The data do not fall in a linear pattern when graphed as a scatter plot.
- The correlation coefficient is not statistically significant.
- You wish to make a prediction about a value outside the range of the sample data.
- The population is different than that from which the sample data were drawn.