Learn By Doing Activity

Scenario: Olympic 1,500 Meter Times

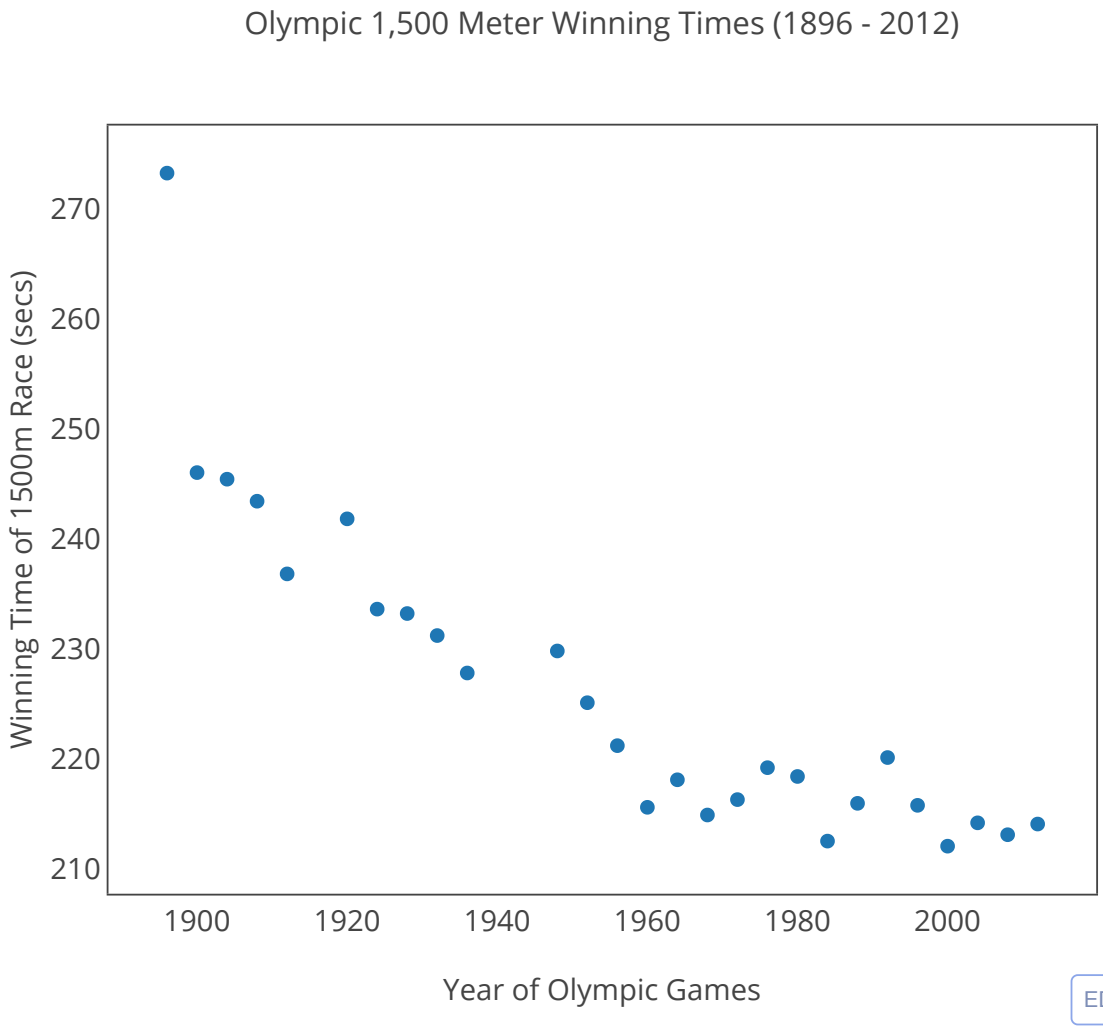
The modern Olympic Games have changed dramatically since their inception in 1896. For example, many commentators have remarked on the change in the quality of athletic performances from year to year. Regression will allow us to investigate the change in winning times for one event—the 1,500 meter race.

Here is a description of the variables:

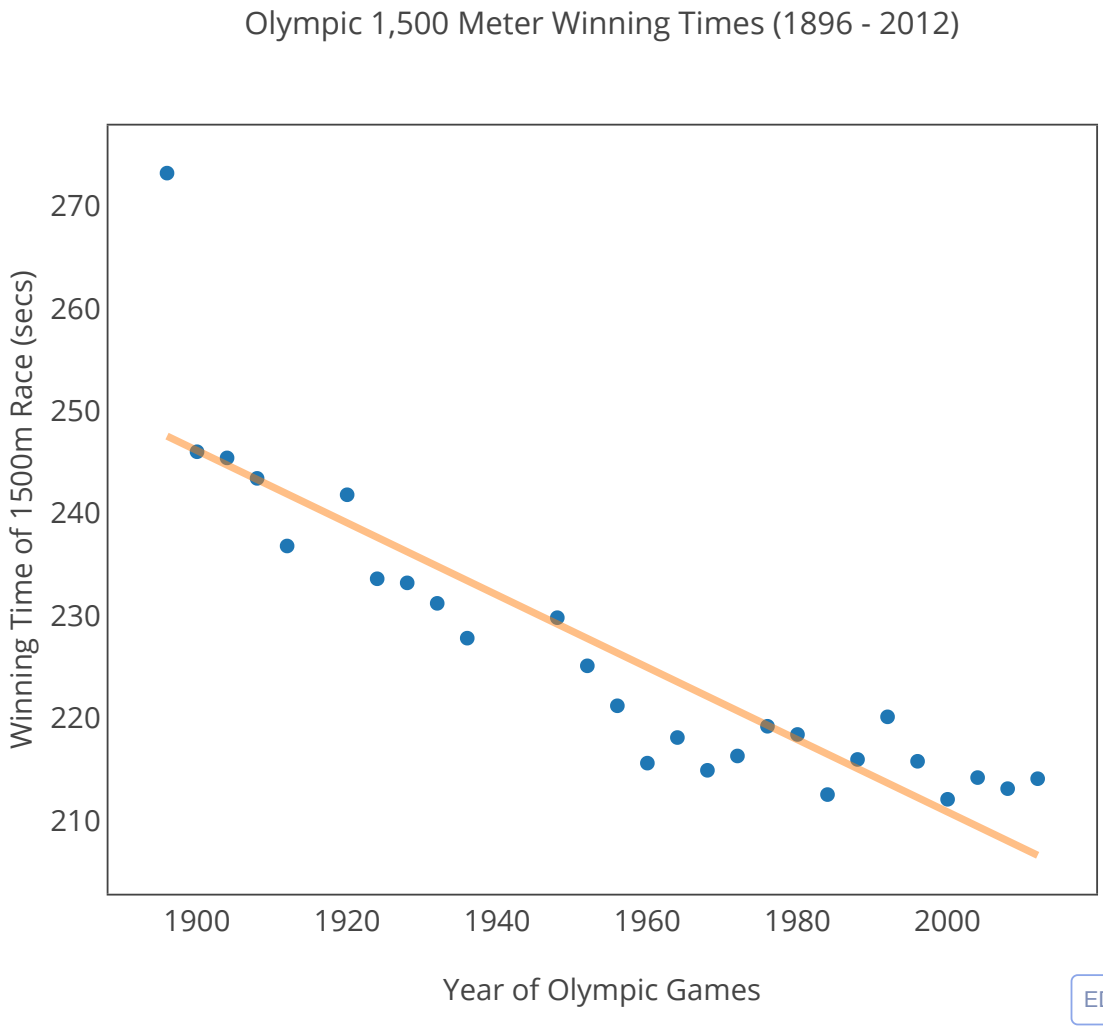
Year: the year of the Olympic Games, from 1896 to 2012.

Time: the winning time for the 1,500 meter race, in seconds.

First, let's explore the relationship between the two quantitative variables: year and time. Here is a scatterplot of the two variables.



Observe that the form of the relationship between the 1,500 meter race's winning time and the year is linear. The least squares regression line is therefore an appropriate way to summarize the relationship and examine the change in winning times over the course of the last century. We will now find the least squares regression line and plot it on a scatterplot.



Intercept = 916

Slope = -0.35

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Which of the following is the appropriate equation for this least squares regression line?

- (●) Time = 916 - 0.35 * Year ✔
- ( ) Time = -0.35 + 916 * Year
- ( ) Year = 916 - 0.35 * Time
- ( ) Year = -0.35 + 916 * Time

Answer

Correct:
The equation for the least squares regression line is: Time = 916 - 0.35 * Year. The slope of the line indicates that the winning time for the 1500 meter race decreases by about 0.35 seconds every year, or by about 4 * 0.35 = 1.56 seconds, on average, from one Olympiad to the next.

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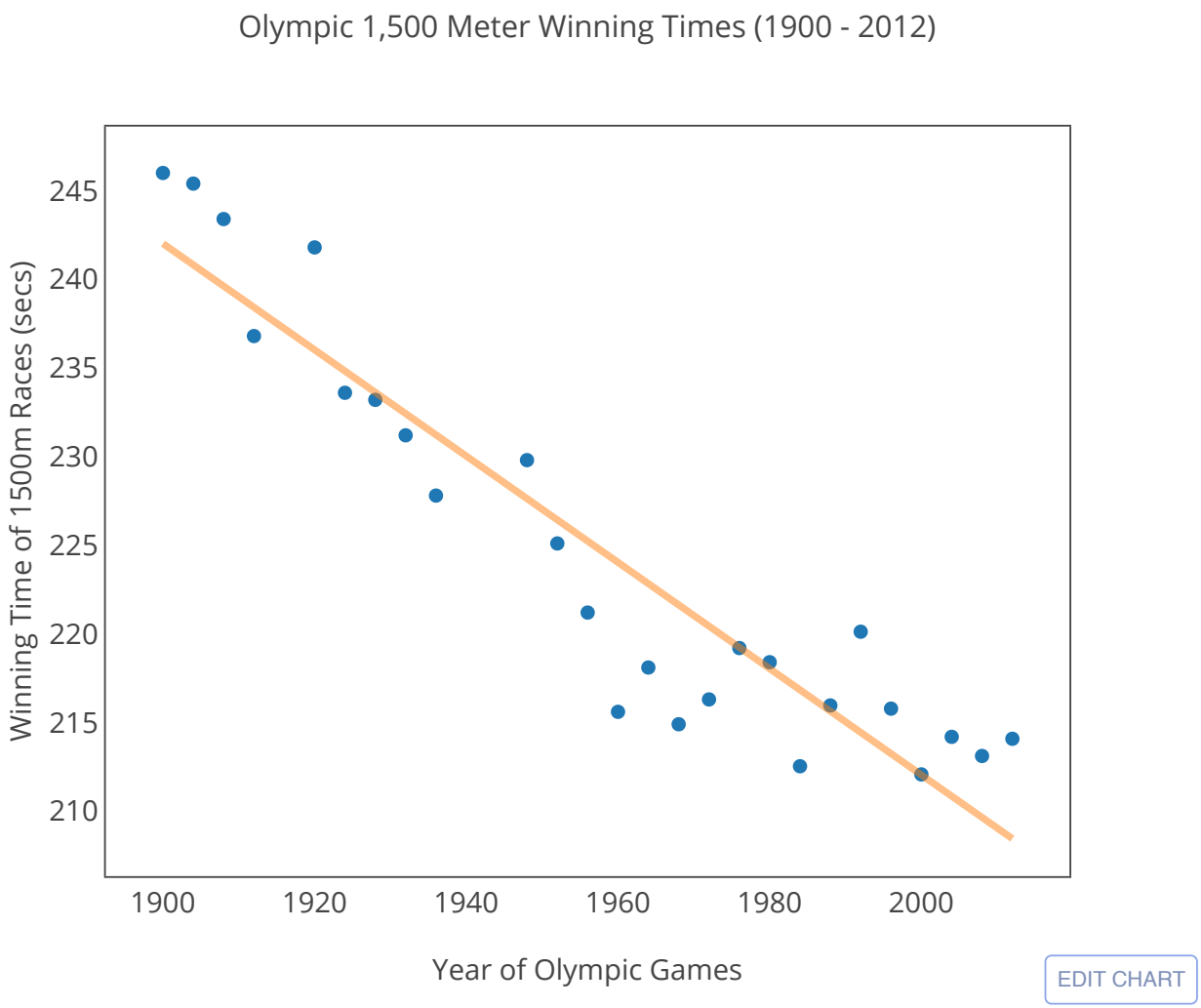
Notice that there is an outlier (Year = 1896). Let's remove the outlier and create the least-squares regression line with the outlier removed. You will now see that the least squares regression line and the values in the equation have changed.



Intercept = 812

Slope = -0.30

New least squares regression equation: Time = 812 - 0.30 * Year

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Our least squares regression line associates years as an explanatory variable, with times in the 1,500 meter race as the response variable. Use the least squares regression line Time = 812 - 0.30 * Year to predict what the 1,500 meter time might be in the 2016 Olympic Games in Rio de Janeiro. Report your answers to TWO decimal places.

207.20 ✔

207.20

Answer

Correct: 812 + (- 0.30 * 2016) = 207.20 seconds

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