

# What is a Y-hat, in statistics?

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## RECOMMENDED CITATION

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In statistics, the term **y hat** (written as **y?**) refers to the estimated value of a response variable in a .

We typically write an estimated regression equation as follows:

$$y = \beta_0 + \beta_1x$$

where:

**y?**: The estimated value of the response variable

**$\beta_0$** : The average value of the response variable when the predictor variable is zero

**$\beta_1$** : The average change in the response variable associated with a one unit increase in the predictor variable

For example, suppose we have the following dataset that shows the number of hours studied by six different students along with their final exam scores:

Hours Studied	Exam Score
1	68
2	77
2	81
3	82
4	88
5	90

Suppose we use some statistical software (like , , , or even ) to fit the following regression model using *hours studied* as the predictor variable and *exam score* as the response variable:

$$\text{Score} = 66.615 + 5.0769 * (\text{Hours})$$

The way to interpret the regression coefficients in this model is as follows:

The average exam score for a student who studies zero hours is **66.615**.

Exam score increases by an average of **5.0769** points for each additional hour studied.

We can use this regression equation to *estimate* the score of a given student based on the number of hours they studied.

For example, a student who studies for 3 hours is predicted to get a score of:

$$\text{Score} = 66.615 + 5.0769*(3) = \mathbf{81.85}$$

### Why is Y Hat Used?

The "hat" symbol in statistics is used to denote any term that is "estimated." For example,  $\hat{y}$  is used to denote an estimated response variable.

Typically when we fit linear regression models, we use a of data from a population since it's more convenient and less time-consuming than collecting data for every possible observation in a population.

This is why we use the term  $\hat{y}$  in the regression equation instead of  $y$ .

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