

Predictions from the least-squares regression line

QUESTION

The well-known psychologist Dr. Elbod has established what he calls his Generalized Anxiety Scale (GAS). The GAS, which is a scale from 0 to 10, measures the "general anxiety" of an individual, with higher GAS scores corresponding to more anxiety. (Dr. Elbod's assessment of anxiety is based on a variety of measurements, both physiological and psychological.)

We're interested in making predictions about individuals' sleep behavior based on their GAS scores. The bivariate data below give the GAS score (denoted by x) and the number of hours of sleep last night (denoted by y) for each of the fifteen adults in a study. The least-squares regression line for these data has equation $\hat{y} = 8.43 - 0.28x$. This line, along with a scatter plot of the sample data, is shown in Figure 1.

GAS score, x	Sleep time, y (in hours)
5.1	5.8
2.0	8.3
6.9	6.8
8.0	5.2
4.1	6.9
0.9	7.2
3.8	8.7
6.1	8.1
7.9	7.3
1.4	8.7
9.0	6.1
3.7	7.5
6.5	6.1
2.9	6.9
9.0	5.3

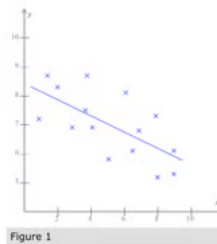


Figure 1

Using this information, answer the following:

1. Fill in the blank: For these data, sleep times that are greater than the mean of the sleep times tend to be paired with GAS scores that are _____ the mean of the GAS scores.	less than
2. According to the regression equation, for an increase of one in GAS score, there is a corresponding decrease of how many hours in sleep time?	0.28
3. From the regression equation, what is the predicted sleep time (in hours) when the GAS score is 3.0? (Round your answer to at least one decimal place.)	7.6
4. From the regression equation, what is the predicted sleep time (in hours) when the GAS score is 5.1? (Round your answer to at least one decimal place.)	7.0

Use the equation
 GAS score = $x = 5.1$
 $\hat{y} = 8.43 - 0.28(5.1)$
 $\hat{y} = 8.43 - 1.428 = 7.002$

Since this line is negative,
 as the GAS score increase
 the sleep time decreases

Use the slope $\frac{-0.28}{1}$ rise run

Use the equation
 GAS score = $x = 3$

$$\hat{y} = 8.43 - 0.28(3)$$

$$\hat{y} = 8.43 - 0.84$$

$$\hat{y} = 7.59$$