Soap: Regression Diagnostics — Name:

TRUE! *by Daryl Cagle*

Question: How long does a bar of soap last?

Data Collection: A high school student in Australia performed the following observational study. He bought a new bar of soap and used it in his shower. Periodically he weighed the bar over a course of approximately three weeks.
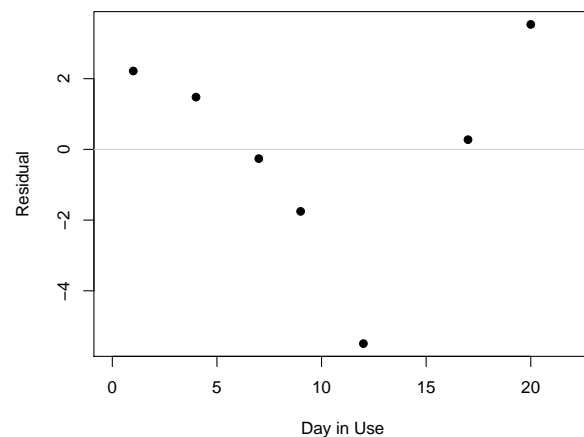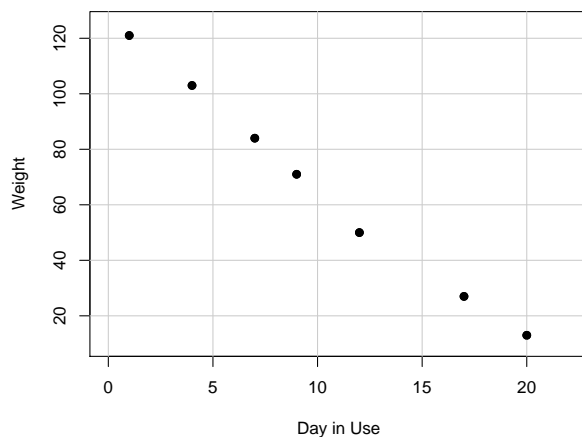
Data:

Day in use	1	4	7	9	12	17	20
Weight (grams)	121	103	84	71	50	27	13

Model:

$\hat{Y} = 124.5 - 5.75X$

$R^2 = 0.994$

Weight — *Day in Use*

Residual — *Day in Use*

1. Interpret the model. Which is the best answer?

   A. Weight of soap decreases by 5.75g for each day it is used.

   B. Weight of soap increases by 5.75g for each day it is used.

2. How would you describe the pattern in the **residual plot**? Check all that apply.

   ☐ Randomly scattered   ☐ Strong positive linear association

   ☐ Nonlinear association, not randomly scattered.

3. Diagnose the fit. Which of these is the best answer?

   A. R^2 is really close to 1, which says that the linear model is excellent.

   B. R^2 is really close to 1, but the residual plot reveals a non-linear dependence, so the linear model is inadequate.

4. Predict the weight of the soap at 25 days. Is this realistic?

5. Which is the best summary of the model?

   A. The model does not summarize soap use at all, because the residual plot has patterns in it.

   B. The model is a good summary of soap use early in its use, but as more days go by the relationship between weight and time becomes nonlinear.

   C. The model is a great summary of soap use for all the time that its used, because the R^2 is really close to 1.