1. a Dry weight (Y) does increase with increasing Age (X) but the scatter diagram illustrates that the relationship may not be linear. An exponential relationship between X and Y may better fit the data.

Log dry weight (Z) increases linearly with increasing Age (X). The scatter diagram illustrates an almost perfect linear relationship between the independent variable X and the dependent variable Z.

b \[ Y = \beta_0 + \beta_1 X + E \quad \quad Z = \beta'_0 + \beta'_1 X + E \]

c The least squares estimates of the regression lines are:
\[ \hat{Y} = -1.885 + 0.235X \quad \quad \hat{Z} = -2.689 + 0.196X. \]

d The regression line for Log₁₀ dry weight regressed on Age has a better fit. It is more appropriate to run a linear regression of Z on X because there is an obvious linear relationship between Log₁₀ dry weight and Age.

![Graphs showing dry weight and log dry weight regressed on age.]

e \[ \hat{\beta}_1 = 0.196 \quad S_{\hat{\beta}_1} = 0.003. \quad \hat{\beta}_0 = 2.689 \quad S_{\hat{\beta}_0} = 0.031. \]

Using these values, we can calculate the 95% confidence intervals (CI):
95% CI for \( \beta_1 \): \( \hat{\beta}_1 \pm t_{n-2,0.975} \cdot S_{\hat{\beta}_1} = 0.196 \pm (2.262)(0.003) = (0.19, 0.20) \). We are 95% confident that the true slope is between 0.19 and 0.20. Since the interval does not contain zero we reject the null hypothesis that the slope equals zero at \( \alpha = 0.05 \).

95% CI for \( \beta_0 \): \( \hat{\beta}_0 \pm t_{n-2,0.975} \cdot S_{\hat{\beta}_0} = -2.689 \pm (2.262)(0.031) = (-2.76, -2.62) \). We are 95% confident that the true intercept is between -2.76 and -2.62. Since the interval does not contain zero we reject the null hypothesis that the slope equals zero at \( \alpha = 0.05 \).

f The confidence and prediction bands are shown on the plot above, and can be used to find the requested confidence interval. For a more accurate answer, the SAS output shown in the textbook can be used; observation 3 is for an eight-day-old chick, and the confidence interval is shown. We are 95% confident that the true mean Log₁₀ dry weight of an eight-day-old chick is between -1.15 and -1.10.