

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.

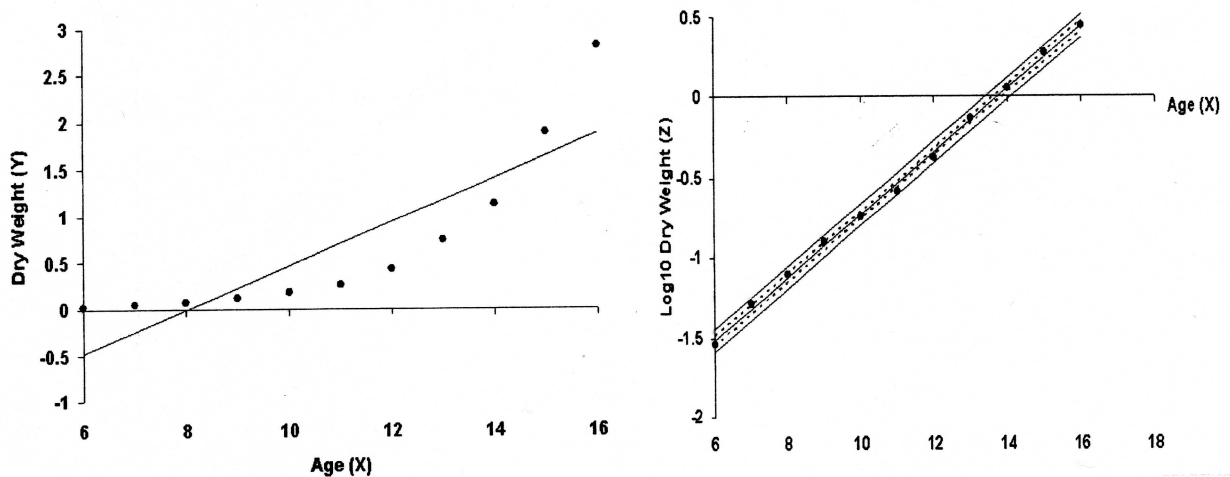
Log dry weight (Z) increases linearly with increasing Age (X). The scatter diagram illustrates an almost perfect linear relationship between the independent variable X and the dependent variable Z .

b $Y = \beta_0 + \beta_1 X + E$ $Z = \beta_0' + \beta_1' X + E$

- c The least squares estimates of the regression lines are:

$\hat{Y} = -1.885 + 0.235X$ $\hat{Z} = -2.689 + 0.196X$.

- d The regression line for Log_{10} 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 Log_{10} dry weight and Age.



e $\hat{\beta}_1' = 0.196$ $S_{\hat{\beta}_1'} = 0.003$. $\hat{\beta}_0' = -2.689$ $S_{\hat{\beta}_0'} = 0.031$.

Using these values, we can calculate the 95% confidence intervals (CI):

95% CI for β_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 β_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 Log_{10} dry weight of an eight-day-old chick is between -1.15 and -1.10.