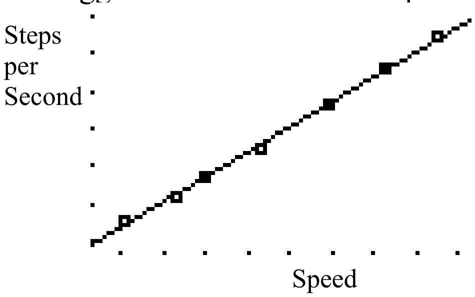
14.4

(a) The required plots are shown below. The correlation is0.998. Note that a look at the residual plot suggests that the relationship is other than linear.



(b) sum(LRESID)
1E-12

(c) $\alpha \approx 1.766$, $\beta \approx 0.80$, $\sigma \approx 0.009$

14.6

(a) The regression equation is $\widehat{(humerus)} = -3.6596 + 1.1969\,(femur)$

(b) $t = \dfrac{1.1969 - 0}{0.0751} = 15.9374$

(c) Since there are 5 specimens , t has 3 df. From table C, a t of 15.9 has a p-value of less than 0.0005.

(d) Since the p-value of our result is so low, we have strong evidence to support the claim that there is a positive association between these humerus lengths and femur lengths.

(e) The 99% C.I. for the slope of the linear relationship between humerus and femur is

$1.1969 \pm (5.841)(0.0751) = (0.7582, 1.6355)$

14.8

(a) We will test whether there is a negative association between wine consumption and disease heart disease death rates. That is, if β represents the slope of the true regression line modeling the linear relationship, we will test the hypotheses: $H_0 : \beta = 0$ vs $H_A : \beta < 0$.

We note from the scatterplot that there appears to be a strong negative, linear relationship and that $\hat{y} = 260.56 - 22.968x$ where y represents the heart disease death rate (per 100000) and x represents the alcohol consumption from wine (liters/yr). The residual plot shows no discernable pattern (though from it we may doubt that σ remains constant for all values of x). Finally, a normal probability plot of the residuals indicates no major deviations from normality... so we proceed.

The LinRegTTest gives $t = -6.4566$, df = 17, and p-value = 0.00000295. This low p-value indicates that we have strong statistical evidence against H_0. That is, there is strong evidence that there is a negative association between the amount of wine consumed per capita and the heart disease death rate.

(b) The 95% confidence interval for β is $(-30.47, -15.46)$

14.10

(a) There are two pieces of evidence from the output that suggest a strong linear relationship. The first is that the value of $r^2 = 99.8\%$. This means that 99.8% of the variation in the number of steps taken is accounted for by the linear relationship between speed and the number of steps taken. The second is that there is very little variation in the statistics that make up the regression line equation. This means that the line very well "fits" the data.

(b) The slope of the regression model gives the rate in question. We will construct a 99% C.I. for β, the slope of the regression model relating speed and the number of steps a runner takes.

Assume that our data come from random independent observations and that the data vary identically normally about the regression line. Also assume that the standard deviation of these normal distributions is the same for all values of x, the speed of the runners.

The 99% C.I. is $0.080284 \pm 4.032(0.0016) = 0.080284 \pm 0.0064$