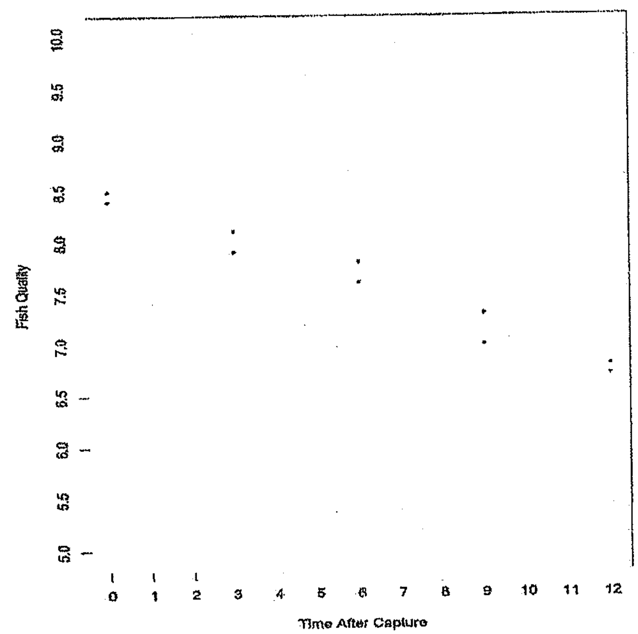
2. a. A scatterplot of the data is given here:

Effect of Exposure Time on Fish Quality



(b) $\Sigma x = 60, \quad \Sigma y = 76.1$

$\Sigma x^2 = 540, \quad \Sigma xy = 431.1, \quad \Sigma y^2 = 582.85$

$S_{xx} = \Sigma x^2 - \frac{(\Sigma x)^2}{n} = 180, \quad S_{xy} = \Sigma xy - \frac{(\Sigma x)(\Sigma y)}{n} = -25.5$

$\bar{x} = 6, \quad \bar{y} = 7.61$

$\hat{\beta}_1 = S_{xy}/S_{xx} = -25.5/180 = -0.142$

$\hat{\beta}_0 = \bar{y} - \hat{\beta}_1 \bar{x} = 7.61 - (-0.142) \times 6 = 8.46$

L.S. regression line is $\hat{y} = 8.46 - 0.142x$

(c) The average quality of fish decreases by 0.142 for each 1 hour increase in the time between the fish being caught and being placed in ice storage.

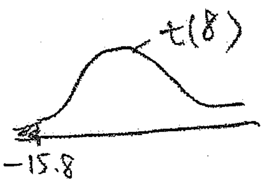
Prob. 3. $H_0: \beta_1 = 0 \qquad H_a: \beta_1 < 0$

$S_{yy} = \Sigma y^2 - (\Sigma y)^2/n = 3.729$

$S_\varepsilon = \sqrt{\frac{S_{yy} - (S_{xy})^2/S_{xx}}{n-2}} = 0.1207$

$SE_{\hat{\beta}_1} = S_\varepsilon / \sqrt{S_{xx}} = 0.1207/\sqrt{180} = 0.0090$

$t = \frac{\hat{\beta}_1 - 0}{SE_{\hat{\beta}_1}} = -0.142/0.009 = -15.8, \quad df = n-2 = 8$



p-value $= P(t(8) \le -15.8)$

$< .0005$ (table 2) $< \alpha$

$\Rightarrow$ reject H_0.

Yes, there is a statistically significant negative association between the time from fish being caught to fish being placed in the ice storage and the quality of fish.

prob. 4. 95% C.I for β_1:

$$\hat{\beta}_1 \pm t(n-2)_{\alpha/2} \; SE_{\hat{\beta}_1}$$

$$= -0.142 \pm 2.306\,(0.009) = (-0.163,\ -0.121)$$

We are 95% confident that, for each 1 hour increase in the time between the fish being caught and being placed in ice storage, the average quality of fish decreases by an amount between 0.121 and 0.163.

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prob. 5. $\hat{y}_{n+1} = 10.27 + 4.92(8) = 49.63$

95% C.I. for $E(y_{n+1})$:

$$49.63 \pm 2.16\,(2.32)\sqrt{\frac{1}{15} + \frac{(8-3.28)^2}{34.784}}$$

$$= 49.63 \pm 4.21 = (45.42,\ 53.84)$$

We are 95% confident that the mean damage for many fires 8 miles from the nearest fire station will be between \$45.42k and \$53.84k.

95% P.I. for y_{n+1}:

$$49.63 \pm 2.16\,(2.32)\sqrt{1 + \frac{1}{15} + \frac{(8-3.28)^2}{34.784}}$$

$$= (49.63 \pm 6.55) = (43.08,\ 56.18)$$

We are 95% confident ~~that~~ the damage for a single fire 8 miles from the nearest fire station will be between \$43.08k and \$56.18k.