Interpret computer output from a least-squares regression analysis: 5, 7, $\boxed{9, 11}$

Construct and interpret a confidence interval for the slope of the population regression line: 13, 15, 17, 19

Note Title 4/27/2015

5. **Prey attracts predators** Refer to Exercise 3. Computer output from the least-squares regression analysis on the perch data is shown below.

Predictor	Coef	Stdev.	t-ratio	p
Constant	0.12049	0.09269	1.30	0.215
x: Perch	0.008569	0.002456	3.49	0.004

$\boxed{S = 0.1886}$ R-Sq = 46.5% R-Sq(adj) = 42.7%

SE_b

Number of Perch	Proportion Killed			
10	0.0	0.1	0.3	0.3
20	0.2	0.3	0.3	0.6
40	0.075	0.3	0.6	0.725
60	0.517	0.55	0.7	0.817

The model for regression inference has three parameters: α, β, and σ. Explain what each parameter represents in context. Then provide an estimate for each.

$\mu_x = \alpha + \beta x \rightarrow$ Calc: $(y = a + bx)$

y int: the prop of fish killed extrapolation ∵ sm count of fish was 10.

$\alpha = 0.12$

$\beta = 0.0086 \rightarrow$ This is the proportion of fish count increased – on average – for every fish added to the tank.

σ = st. dev: the measure of prop-killed values about the population regression line.

$S = 0.1886$

7. **Prey attracts predators** Refer to Exercise 5.

(a) Interpret the value of SE_b in context.

(b) Find the critical value for a 90% confidence interval for the slope of the true regression line. Then calculate the confidence interval. Show your work.

(c) Interpret the interval from part (b) in context.

(d) Explain the meaning of "90% confident" in context.

(a) $SE_b \approx .0025$ This means a sample's slope could vary by 0.0025 from the true slope of the pop. LSRL of fish eaten by number of fish available.

(b) $t^* = 1.761$ w/ df = 14,

The CI $\quad \beta \pm SE_\beta$

$.0086 \pm 1.761(.0025)$

0.0086 ± 0.0044

$(.0042, .0130)$

(c) We are 90% confident the interval 0.0042 to 0.0130 captures the true slope of the pop. LSRL for predicting the proportion of fish eaten from the number of fish available.

(d) If we were to repeat the experiment many times & compute confidence intervals for the LSRL slope in each case, about 90% of the resulting intervals would contain the slope of the pop LSRL.

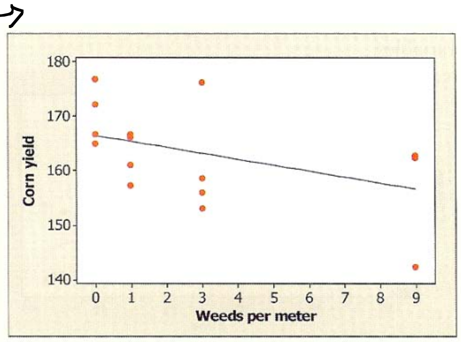
13. **Weeds among the corn** Lamb's-quarter is a common weed that interferes with the growth of corn. An agriculture researcher planted corn at the same rate in 16 small plots of ground and then weeded the plots by hand to allow a fixed number of lamb's-quarter plants to grow in each meter of corn row. The decision of how many of these plants to leave in each plot was made at random. No other weeds were allowed to grow. Here are the yields of corn (bushels per acre) in each of the plots:[8]

Weeds per meter	Corn yield	Weeds per meter	Corn yield
0	166.7	3	158.6
0	172.2	3	176.4
0	165.0	3	153.1
0	176.9	3	156.0
1	166.2	9	162.8
1	157.3	9	142.4
1	166.7	9	162.8
1	161.1	9	162.4

fords

direction
form
strength
outliers

(a) A scatterplot of the data with the least-squares line added is shown below. Describe what this graph tells you about the relationship between these two variables.



There is a somewhat weak negative linear relationship betw the number of weeds per meter & the corn yield of the plots.

Minitab output from a linear regression on these data is shown below.

```
Predictor   Coef     SE Coef   T      P
Constant    166.483  2.725     61.11  0.000
Weeds per   -1.0987  0.5712    -1.92  0.075
 meter
S = 7.97665 R-Sq = 20.9% R-Sq(adj) = 15.3%
```

$\widehat{\text{Corn yield}} = 166.483 - 1.0987(\text{weeds/m})$

(b) What is the equation of the least-squares regression line for predicting corn yield from the number of lamb's quarter plants per meter? Define any variables you use.

(c) Interpret the slope and y intercept of the regression line in context.

for $y = a + bx$

B: We expect a corn yield to decrease 1.0987 bushels for each additional weed per meter

(d) Do these data provide convincing evidence that more weeds reduce corn yield? Carry out an appropriate test at the $\alpha = 0.05$ level to help answer this question.

a: If there were no weeds per m, we'd predict 166.483 bushels of corn.

d) State: we want to perform a test at $\alpha = 0.05$ of

$H_0: \beta = 0$ & $H_a: \beta < 0$

where β is the true slope of the population regression line