

My signature on this assessment confirms I have used no outside resources and adhered to all assessment protocols assigned to this daily grade/quiz/test/exam.

AP STAT [50 total points] Quiz: Inference for Regression Name: _____

Part 1: Multiple Choice. Place best answer for each question on **YOUR NOTEBOOK PAPER** (with the statement and signature at the top). [2.5 pts each]

The following information is used in questions #1–4.

A random sample of **80 companies** from the Forbes 500 list was selected and the relationship between sales (in hundreds of thousands of dollars) and profits (in hundreds of thousands of dollars) was investigated by regression. A least-squares regression line was fit to the data using statistical software, with sales as the explanatory variable and profits as the response variable. Here is the output from the software:

| | | | |
|---|-------------|---------------------|---------|
| Dependent variable is Profits | | | |
| R squares = 66.2% | | | |
| s = 466.2 with 80 - 2 = 78 degrees of freedom | | | |
| Variable | Coefficient | s.e. of Coefficient | P-value |
| Constant | -176.644 | 61.16 | 0.0050 |
| Sales | 0.092498 | 0.0075 | 0.0001 |

- _____ 1. Using the above data, approximately what is the intercept of the least-squares regression line?
 (a) 0.0925 (b) 0.0075 (c) -176.64 (d) 61.16
- _____ 2. Using the above data, approximately what is a 90% confidence interval for the slope of the least-squares regression line?
 (a) 0.0925 ± 0.0075 (b) 0.0925 ± 0.012 (c) -0.0925 ± 0.0075 (d) -0.0925 ± 0.012
- _____ 3. Using the above data, what is the value of the *t* statistic for testing whether the slope of the least-squares regression line is 0?
 (a) 0.0075 (b) 0.092 (c) 0.757 (d) 12.33
- _____ 4. Using the above data, is there strong evidence (and if so, why) of a straight line relationship between sales and profits?
 (a) Yes, because the slope of the least-squares line is positive.
 (b) Yes, because the P-value, for testing if the slope, is 0 is quite small.
 (c) No, because the value of the square of the correlation is relatively small.
 (d) It is impossible to say because we are not given the actual value of the correlation.

The following information is used in Questions #5 – 8.

A marine biologist wants to test the effect of water temperature on the average dive duration for sea otters. Several otters are available for an experiment. The biologist wants to determine if water temperature is useful in predicting dive duration. Here is data he collected and the corresponding the Minitab output.

| Otter | Water | Dive |
|-------|-----------|----------------|
| | temp.°(C) | duration (sec) |
| | x | y |
| J2 | 4 | 63 |
| J1 | 8 | 75 |
| B7 | 8 | 84 |
| B9 | 12 | 91 |
| M3 | 12 | 101 |
| D4 | 16 | 110 |
| B8 | 20 | 115 |

| | | | | |
|-----------|--------------|-------------------|---------|-------|
| Predictor | Coef | Stdev | t-ratio | p |
| Constant | 52.789 | 5.257 | 10.04 | 0.000 |
| H2Otemp | 3.3684 | 0.4216 | **** | **** |
| s = 5.557 | R-sq = 92.7% | R-sq(adj) = 91.3% | | |

- _____ 5. An appropriate null hypothesis for a test would be “the slope of the true regression line is
 (a) positive.” (b) 3.3684.” (c) $s = 5.557$.” (d) zero.” (e) not zero.”

- _____6. The equation for the least-squares regression line is
 (a) $pred(\text{H}_2\text{O temp}) = 3.3684 + 52.789(\text{length of dive duration})$
 (b) $pred(\text{H}_2\text{O temp}) = 52.789 + 3.3684(\text{length of dive duration})$
 (c) $pred(\text{length of dive duration}) = 3.3684 + 52.789(\text{H}_2\text{O temp})$
 (d) $pred(\text{length of dive duration}) = 52.789 + 3.3684(\text{H}_2\text{O temp})$

- _____7. The t -statistic is necessary to test the claim for H_o . Using the output, the t -statistic has the value
 (a) 7.99 (b) 10.04 (c) 0.124 (d) 0.927 (e) 15.67

- _____8. The p -value is
 (a) less than 0.001 (b) between 0.001 and 0.01 (c) between 0.01 and 0.05
 (d) between 0.05 and 0.10 (e) greater than 0.10

Part 2: Free Response Answer completely, but be CONCISE. Write sequentially and show all steps.

WRITE YOUR ANSWERS ON NOTEBOOK PAPER (NAME AT THE TOP OF EACH PAGE). WRITE DARK SO I CAN SEE IT WHEN YOU SUBMIT THE PICTURE.

9. A mathematics professor wishes to analyze the relationship between the number of papers (in hundreds) graded by his department's student homework graders and the total amount of money paid to the graders. He collects data for 12 randomly chosen graders and uses MINITAB to do regression analysis. Below is a portion of the MINITAB output. The variables used are COST = amount paid, PAPERS = # papers in hundreds. The intervals are computed for 1,600 papers.

Is the number of papers graded useful for predicting the amount paid? Assume all necessary conditions have been met, however you should acknowledge these conditions. Use a significance level of 1%. [15 pts]

| The regression equation is _____ | | | | |
|----------------------------------|------------|------------------|---------|--------------------|
| Predictor | Coef | Stdev | t-ratio | P |
| Constant | 35.80 | 17.06 | 2.10 | 0.062 |
| PAPERS | 12.0835 | 0.9738 | **** | ***** |
| s = 6.526 | | R-sq = 93.9% | | R-sq (adj) = 93.3% |
| Fit | Stdev. Fit | 95% C.I. | | 95% P.I. |
| 229.13 | 2.34 | (223.93, 234.34) | | (213.68, 244.58) |

- **State:**

H_o :

H_a :

H_o : _____

H_a : _____

- **Parameter of Interest:**

- **Plan: Choice of Inference Test:**

Conditions:

- **Do:**

(Make sure all questions are answered in your conclusion statement.)

10. Boiling and melting points (in degrees Celsius) are recorded for **21** selected substances, and regression analysis is used to describe the relationship between these temperatures. The results of the analysis are shown below. We are interested in determining whether there is a positive linear relationship between the melting point and the boiling points of substances. Construct and interpret a 90% confidence interval to help make this decision. Discuss what your confidence interval implies. Assume all conditions for regression have been met, however you should acknowledge these conditions.[15 pts]

| Dependent Variable: _____ | | | | |
|---------------------------|---------|--------------|------|--------|
| Predictor | Coef | SE Coef | T | P |
| Constant | 309.914 | 146.7 | 2.11 | 0.0481 |
| Melting Point | 0.9594 | 0.2104 | 4.56 | 0.0001 |
| S = 626.4 | | R_sq = 73.4% | | |

- **State:**

H_0 :

H_a :

H_0 : _____

H_a : _____

- **Parameter of Interest:**

- **Plan: Choice of Inference Test:**

Conditions:

- **Do:**

(Make sure all questions are answered in your conclusion statement.)