

AP Statistics - Inference for the Slope of a Regression Line - Worksheet

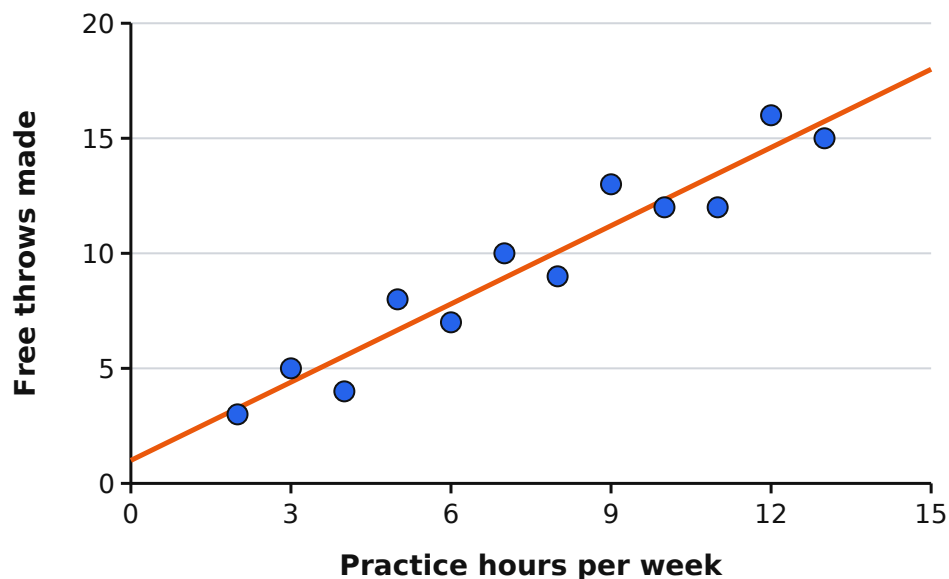
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Name: _____ Class: _____ Date: ____/____/____

These 20 problems practice AP Statistics topics 9.1 to 9.6. You will check LINER conditions, read computer output, build and interpret t intervals for a slope, test $H_0: \beta = 0$, and choose the correct inference procedure for a given situation.

AP Statistics · Common Core State Standards: **AP STAT 9.1, AP STAT 9.2, AP STAT 9.3, AP STAT 9.4, AP STAT 9.5, AP STAT 9.6, HSS-ID.B.6**

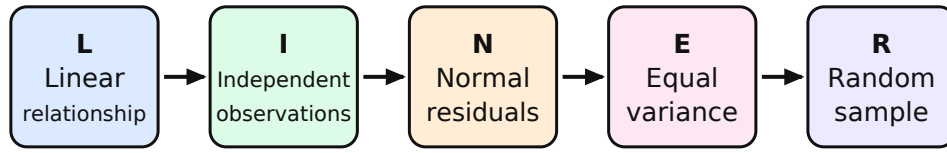
Exercise 1 - Parameters



Least-squares line: $\hat{y} = 1.00 + 1.133x$.

Using the scatterplot of practice hours and free throws made, define the true slope β in context and write the hypotheses to test for a linear relationship.

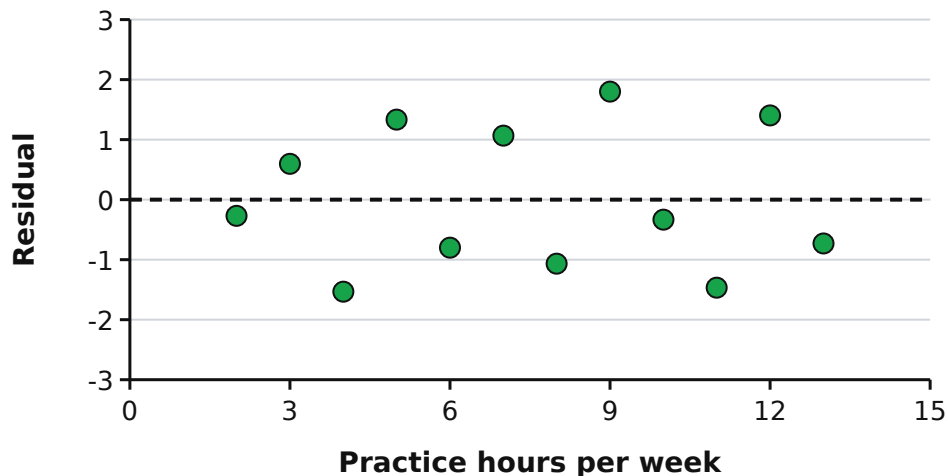
Exercise 2 - LINER conditions



The LINER conditions for inference about a slope.

List what each letter in LINER stands for and tell how Equal variance is checked.

Exercise 3 - Residual plot



No pattern in the residuals and roughly constant spread: a linear model is appropriate.

Does the residual plot support the Linear and Equal variance conditions? Explain.

Exercise 4 - Read the output

Predictor	Coef	SE Coef	T	P
Constant	1.003	0.859	1.17	0.270
Hours	1.133	0.104	10.89	0.0000
S = 1.244	R-Sq = 92.2%			

Regression output: the Hours row gives the slope, its standard error, t, and the two-sided P.

From the computer output, state the regression equation and the standard error of the slope.

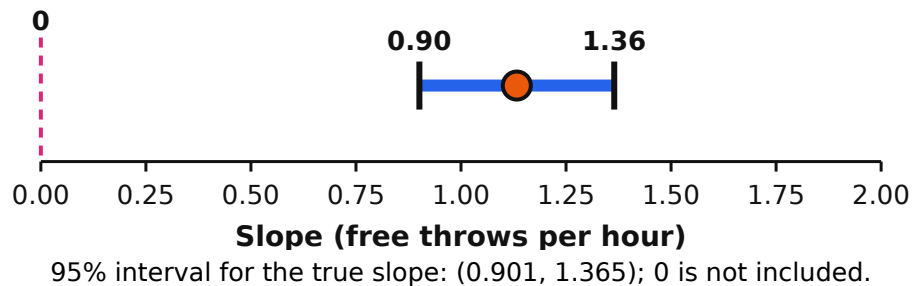
Exercise 5 - Interpret the slope

Interpret the slope 1.133 in the free-throw regression.

Exercise 6 - Degrees of freedom and t^*

For a sample of 12 players, find df and the critical value t^* for a 95% interval for the slope.

Exercise 7 - Confidence interval



Construct the 95% confidence interval for the true slope.

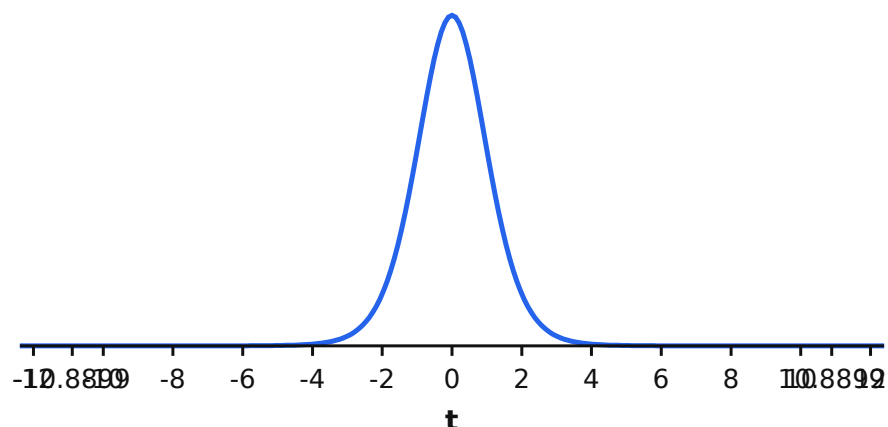
Exercise 8 - Interpret the interval

Interpret the interval (0.901, 1.365) in context.

Exercise 9 - t statistic

From the output, compute t for $H_0: \beta = 0$.

Exercise 10 - Conclusion



Two-sided p-value for the slope: 0.0000.

The output P value is 0.0000. State the conclusion at $\alpha = 0.05$.

Exercise 11 - Interval and test

A 95% interval for the slope is $(-0.4, 1.9)$. What is the conclusion of a two-sided test of $H_0: \beta = 0$ at $\alpha = 0.05$?

Exercise 12 - Temperature and sales

Predictor	Coef	SE Coef	T	P
Constant	59.452	2.743	21.67	0.000
Temp	-1.603	0.137	-11.73	0.0000
S = 2.057	R-Sq = 94.5%			

Output for hot cocoa sales.

The output comes from a random sample of 10 days, predicting hot cocoa sales (cups) from the high temperature (degrees C). Test whether sales and temperature have a linear relationship at $\alpha = 0.05$, and write the equation.

Exercise 13 - Interval from output

Using the hot cocoa output, find a 99% interval for the true slope.

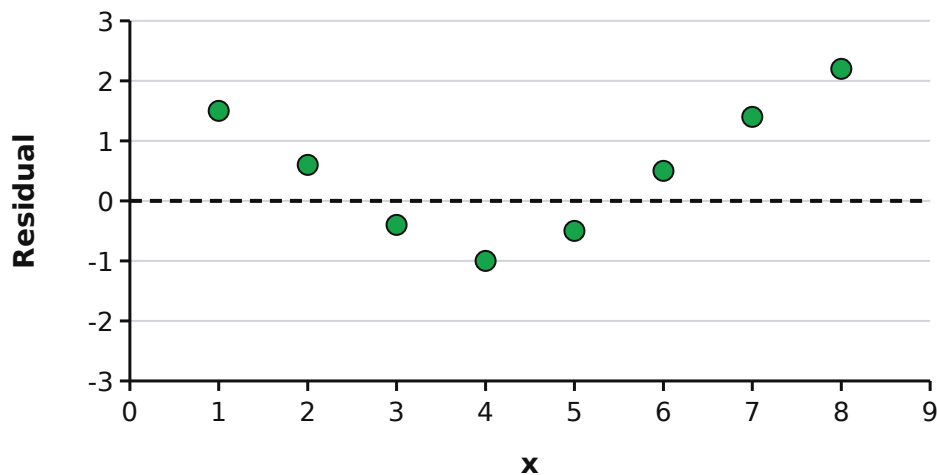
Exercise 14 - R squared and r

The output shows $R\text{-Sq} = 94.5\%$. Find r and interpret r squared.

Exercise 15 - One-sided test

A researcher believes more rainfall leads to more mud on a trail. The output for a sample of 15 days shows slope 0.62, SE 0.30, and a two-sided P value of 0.059. Test $H_a: \beta > 0$ at $\alpha = 0.05$.

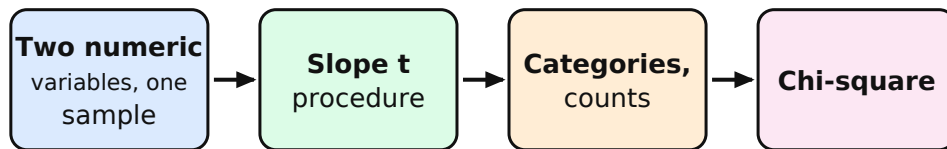
Exercise 16 - Residual plot warning



A curved residual pattern.

The residual plot of a regression is shown. Is a t procedure for the slope appropriate?

Exercise 17 - Choose a procedure



Choosing a procedure.

Name the best procedure: (a) estimate the change in average salary per year of experience from a random sample of 40 workers; (b) test whether the proportion of defective items differs between two machines; (c) test whether a die is fair.

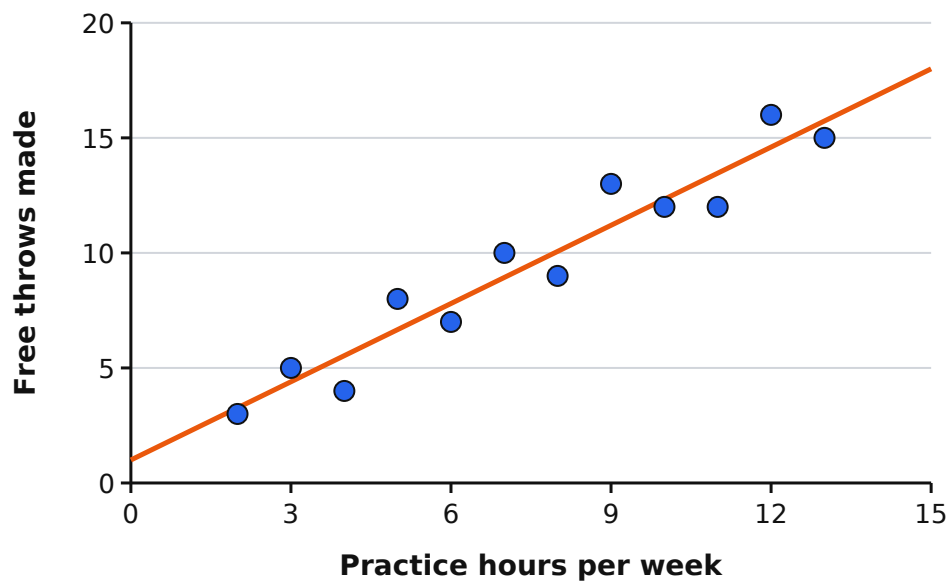
Exercise 18 - Standard error of the slope

For a regression with $s = 2.4$ (standard deviation of residuals), $n = 20$, and $s_x = 3$, find the standard error of the slope.

Exercise 19 - Multi-step

A random sample of 18 used cars gives slope -1.35 (thousand dollars per year of age) and $SE_b = 0.21$. Test $H_0: \beta = 0$ and give a 95% interval for the slope.

Exercise 20 - Predict and caution



Least-squares line: $\hat{y} = 1.00 + 1.133x$.

Using $\hat{y} = 1.00 + 1.133x$ for the free-throw data (x between 2 and 13 hours), predict y at $x = 8$ and explain why $x = 40$ should not be used.