

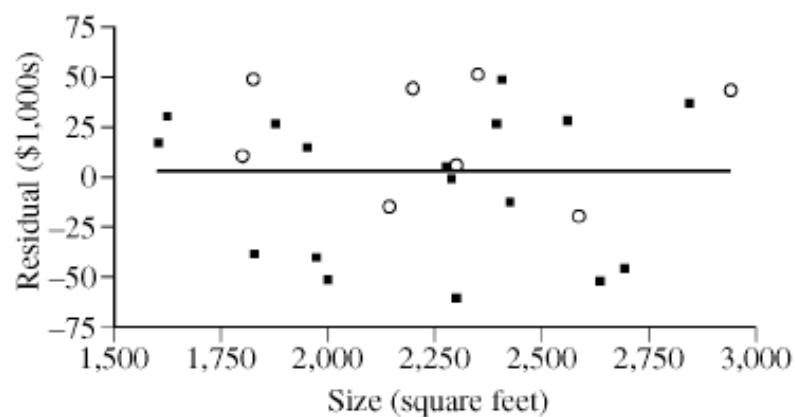
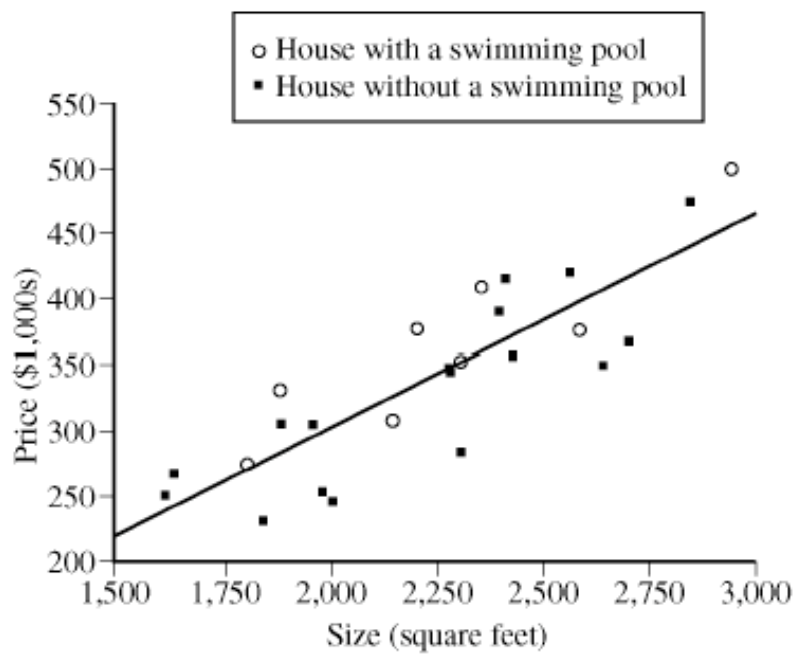


“FRAPPY” {Free Response AP Problem...Yay!}

The following problem is taken from an actual Advanced Placement Statistics Examination. Your task is to generate a complete, concise statistical response in 25 minutes. You will be graded based on the AP rubric and will earn a score of 0-4. After grading, keep this problem in your binder for your AP Exam preparation.

A real estate agent is interested in developing a model to estimate the prices of houses in a particular part of a large city. She takes a random sample of 25 recent sales and, for each house, records the price (in thousands of dollars), the size of the house (in square feet), and whether or not the house has a swimming pool. This information, along with regression output for a linear model using size to predict price, is shown below and on the next page.

Price (\$1,000s)	Size (square feet)	Pool	Residual (\$1,000s)
274	1,799	yes	6
330	1,875	yes	49
307	2,145	yes	-18
376	2,200	yes	42
352	2,300	yes	1
409	2,350	yes	50
375	2,589	yes	-23
498	2,943	yes	42
248	1,600	no	13
265	1,623	no	26
228	1,829	no	-45
303	1,875	no	22
303	1,950	no	10
251	1,975	no	-46
244	2,000	no	-57
347	2,274	no	1
345	2,279	no	-2
282	2,300	no	-69
389	2,392	no	23
413	2,410	no	44
353	2,428	no	-19
419	2,560	no	26
348	2,639	no	-58
365	2,701	no	-52
474	2,849	no	33



Linear Fit

$$\text{Price} = -28.144 + 0.165 \text{ Size}$$

Summary of Fit

RSquare 0.722

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	-28.144	48.259	-0.58	0.5654
Size	0.165	0.0213	7.72	<.0001

Scoring:

(a) Interpret the slope of the least squares regression line in the context of the study.

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Scoring:

(b) The second house in the table has a residual of 49. Interpret this residual value in the context of the study.

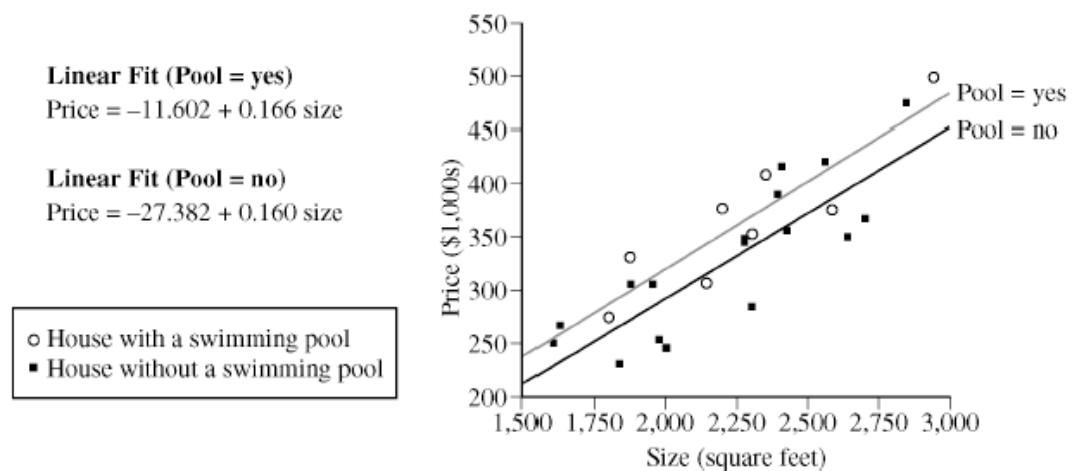
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The real estate agent is interested in investigating the effect of having a swimming pool on the price of a house.

(c) Use the residuals from all 25 houses to estimate how much greater the price for a house with a swimming pool would be, on average, than the price for a house of the same size without a swimming pool.

E P I

To further investigate the effect of having a swimming pool on the price of a house, the real estate agent creates two regression models, one for houses with a swimming pool and one for houses without a swimming pool. Regression outputs for these two models is shown below.



(d) The conditions for inference have been checked and verified, and a 95 percent confidence interval for the true difference in the two slopes is $(-0.099, 0.110)$. Based on this interval, is there a significant difference in the two slopes? Explain your answer.

(e) Use the regression model for houses with a swimming pool and the regression model for houses without a swimming pool to estimate how much greater the price for a house with a swimming pool would be than the price for a house of the same size without a swimming pool. How does this estimate compare with your result from part (c)?

E P I

Total: __/4