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ECON 0150 | MiniExam 4 | Fall 2025

This MiniExam will take 8 minutes with a quick break to follow. MiniExams are designed to both test your knowledge and challenge you to apply familiar concepts in new environments. Treat it as if you're trying to show me that you understand the material. Answer clearly, completely, and concisely.

Academic Conduct Code

The following academic conduct code is designed to protect the integrity of your work. Print your name/initials beside the three academic honesty agreements. I pledge to my fellow students, the university, and the instructor, that:

KO I will complete this MiniExam solely using my own work.
KO I will not use any digital resources unless explicitly allowed by the instructor.
KO I will not communicate directly or indirectly with others during the MiniExam.

Q1. A study uses data from 80 employees to examine whether remote workers have different productivity scores than in-office workers. Remote workers have an average productivity score of 82 and in-office workers have an average score of 78.

a) If we code `remote` as 1 for remote workers and 0 for in-office workers, write the regression model:

productivity score = β_0 + β_1 × remote workers + ε

b) Based on the information given, what would β_0 equal? $\beta_0 = 78$

c) Based on the information given, what would β_1 equal? $\beta_1 = 82 - 78 = 4$

d) What is the default null hypothesis for β_1? $H_0: \beta_1 = 0$

Q2. You want to test whether temperature predicts ice cream sales using daily data from a local shop with variables `temperature` (in °F) and `sales` (in dollars).

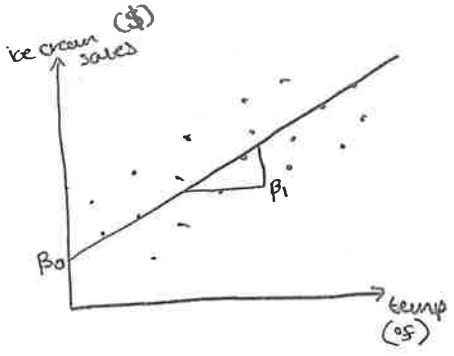
a) Write down a statistical model to test this question.

ice cream sales = β_0 + β_1 × temperature + ε

b) What part of your statistical model would indicate that temperature affects sales?

the value of β_1 being either positive or negative

c) Sketch (*to the right* ->) how you would visualize this model.



Q3. You want to examine whether `age` predicts `hourly_wages` using a sample of n=250 workers.

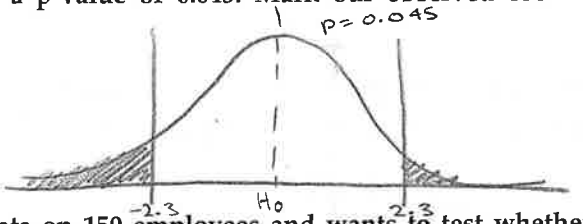
a) Write down a statistical model to test this relationship.

hourly wages = β_0 + β_1 × age + ε

b) If your regression yields $\beta_1 = 0.85$, interpret this coefficient in context:

as age increases by 1 year, hourly wage increases by 0.85

Q4. Draw the sampling distribution under the null hypothesis (H_0: $\beta_1 = 0$) for a slope coefficient that has an observed value of -2.3 with a p-value of 0.045. Mark our observed coefficient and shade the region(s) that represent the p-value.

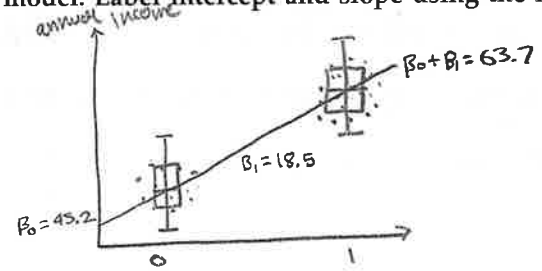


Q5. A researcher collected data on 150 employees and wants to test whether having a graduate degree affects annual income. The regression output shows:

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	45.200	2.100	21.524	0.000	41.044	49.356
graduate_degree	18.500	5.250	3.524	0.001	8.129	28.871

Note: `graduate_degree` is coded as 1 = Yes, 0 = No; income is in thousands of dollars.

a) Sketch (*to the right* ->) how you would visualize the fitted model. Label intercept and slope using the fitted values.



b) Interpret the Intercept coefficient (45.20) in context:

the average annual income for those with no graduate degree

c) Interpret the coefficient on `graduate_degree` (18.50) in context:

the additional income for those with a graduate degree; as you move from no grad degree to a grad degree, your annual income increases by 18.5 units

d) What does the p-value of 0.001 for the graduate_degree coefficient mean? *(select one)*

- ☐ Out of 1000 samples where graduate degrees truly matter, only 1 would show a coefficient this large
- ☑ If graduate degrees are unrelated to income, 0.1% of samples would have a coefficient this far from zero
- ☐ Only 0.1% of the income difference between groups is due to random chance
- ☐ There's a 99.9% probability that the true coefficient is at least 18.5
- ☐ The coefficient of 18.5 has a 0.1% margin of error

e) Sketch (*to the right* ->) a residual plot showing heteroskedasticity in this model.