

ECON 256: Final Exam Practice Math/Formula Questions

1. Given the following table, compute the mean value of X (i.e. compute $\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i$)

	Obs. 1	Obs. 2	Obs. 3
X	-4	13	27

2. Calculate the covariance between X and Y for the below table, where

$$\text{Cov}(X, Y) \equiv \frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})$$

Note that here $\bar{x} = 7$ and $\bar{y} = 4$.

	Obs. 1	Obs. 2
X	13	1
Y	2	6

3. The correlation coefficient between X and Y is defined as

$$r \equiv \frac{\text{Cov}(X, Y)}{\sqrt{\text{Var}(X)} \times \sqrt{\text{Var}(Y)}}$$

Suppose $\text{Cov}(X, Y) = 3$, while $\text{Var}(X) = 4$ and $\text{Var}(Y) = 9$. What is r to 2 digits?

4. Suppose we have the below regression relating hours spent procrastinating

$$\log(\text{Score}_i) = 95 - 3 \times \log(\text{Hours Procrastinating}_i) + \epsilon_i$$

If we increase hours spent procrastinating by 10%, by approximately what percent (percent, not percentage points) should we expect the score to rise/decline?

5. Suppose we have the following table

Data Series	Observation 1	Observation 2	Observation 3	Observation 4	Observation 5
X	12	47	21	37	25
Y	-8	15.5	-39.5	41.5	-7.5

which gives us the estimated regression coefficients plugged into the formula before

$$y_i = -30 + 0.5x_i + \epsilon_i$$

What is the predicted value of Y when $X = 47$? What is the error for observation 2?

6. For the above regression, how much would we expect Y to change between $X = 12$ and $X = 47$? How much did it actually change by?

7. In the above regression we have an estimated slope coefficient $\beta_X = 0.5$. The standard error of the estimate is approximately 0.97. What is the 95% confidence interval for β_X ? Is β_X statistically significant?
8. Suppose we have the following table

Category	Millions of People
Number of 12-19 Year Olds Enrolled in Secondary School	5
Number of Non -12-19 Year Olds Enrolled in Secondary School	2
Population of 12-19 Year Olds	11
Total Population	30

What is the Gross Secondary School Enrollment Rate in percent?

For the above table, what is the Net Secondary School Enrollment Rate in percent?

9. Suppose a bank pays depositors 2%. How high of an interest rate would a bank have to charge on a loan to break even if there is only a 50% chance of full repayment? Suppose that if a borrower defaults, they have zero liability and pay back nothing. Recall the simple formula for breakeven interest rate with no liability is given by:

$$i = \frac{100 + r}{p} - 100$$

10. Suppose we have the same set-up as the previous question, except now if a borrower defaults, they still pay back 30% of the initial loan. Recall the general formula for the breakeven interest rate is given by:

$$i = \frac{100 + r - (1 - p)l}{p} - 100$$

11. Suppose a borrower has zero liability if a project fails. Suppose the borrower invests in a risky project where there is a 30% chance of failure where the borrower receives nothing. There is also a 70% chance of success where the borrower gets 5 times their investment.

Suppose the interest rate is 50%. What is the expected return for a borrower who borrows \$100 to invest in a risky project? What is the expected return for the bank giving the loan?

Would both the bank and borrower want this loan to happen with the given interest rate?