Tutorial 6

You are evaluating a new pizza oven and have been given the corresponding temperature (K) and pressure (kPa) data. Given the following OLS output, covariance matrix and ANOVA table, answer the following questions.

OLS Output

Results: Ordinary least squares

Model:	OLS	Adj. R-squared:	0.996
Dependent Variable:	Pressure	AIC:	68.0642
Date:	2023-10-23 14:27	BIC:	69.8449
No. Observations:	18	Log-Likelihood:	-32.032
Df Model:	1	F-statistic:	3776.
Df Residuals:	16	Prob (F-statistic):	1.98e-20
R-squared:	0.996	Scale:	2.3141

	Coef.	Std.Err.	t	P>|t|	[0.025	0.975]

Omnibus:	3.010	Durbin-Watson:	1.582
Prob(Omnibus):	0.222	Jarque-Bera (JB):	1.453
Skew:	0.348	Prob(JB):	0.484
Kurtosis:	1.794	Condition No.:	1153

ANOVA Table

	df	sum_sq	mean_sq	F	PR(>F)
Temperature	1.0	8737.4742	8737.474200	3775.734433	1.977749e-20
Residual	16.0	37.0258	2.314112	NaN	NaN

Covariance Matrix

$$\begin{bmatrix} cov(temperature, temperature) & cov(temperature, pressure) \\ cov(pressure, temperature) & cov(pressure, pressure) \end{bmatrix} = \begin{bmatrix} 11400 & 2420.588 \\ 2420.588 & 516.15 \end{bmatrix}$$

Data Summary

	Temperature	Pressure
count	18.000000	18.00000
mean	330.000000	67.50000
std	106.770783	22.71887
min	160.000000	30.00000
25%	245.000000	48.25000
50%	330.000000	69.00000
75%	415.000000	84.25000
max	500.000000	105.00000

1) Compute the least-squares regression line. Show the work by hand.

2) Interpret the estimated slope of the line; what does it mean in words? Include units in your discussion.

3) At the 0.05 level of significance, test the null hypothesis that the true population slope is equal to zero. You have been given that SS_x = 193800.What do you conclude?

4) Provide a supporting 95% confidence interval (2-sided) and show the formula. Show this work by hand. What do you conclude?

5) What is the estimated mean pressure for the population of ovens whose temperature is 230K? Show your work.