Problems

Questions 1

Honest Al's Used Cars wants to predict how many cars are sold each month. He has collected data for 12 months. He needs your help in analyzing this data using moving averages.

	A	B	C
1		Number of	4-Month
2	Time Period	Cars Sold	Moving Avg.
3	1	70	
4	2	80	
5	3	66	
6	4	74	
7	5	64	
8	6	76	
9	7	72	
10	8	82	
11	9	82	
12	10	76	
13	11	84	
14	12	80	
15	13		
16	14		
17			
18		MSE	

a) Calculate the 4-month moving average forecast from month 5 onwards.

b) Compute the mean squared error (MSE).

Questions 2

Honest Al's Used Cars wants to predict how many cars are sold each month. He has collected data for 12 months. He needs your help in analyzing this data using exponential smoothing and compute MSE.

1		Number of	Exp Smoothing			
2	Time Period	Cars Sold	Prediction			
3	1	70			alpha	0.346
4	2	80				
5	3	66				
6	4	74				
7	5	64				
8	6	76				
9	7	72				
10	8	82				
11	9	82				
12	10	76				
13	11	84				
14	12	80				
15						
16		MSE				

a) Forecast the car sales in column C using exponential smoothing.

b) Compute the mean squared error (MSE).

c) Assume the forecasted value for month 13 is 79.64. What is the forecasted value for month 16?

3. A company has built a regression model to predict the number of labor hours (Yi) required to process a batch of parts (Xi). It has developed the following Excel spreadsheet of the results.

	A	B	C	D	E	F	G
1	*Regression Statistics*						
2	Multiple R	0.9970					
3	R Square	0.9941					
4	Adjusted R Square	0.9933					
5	Standard Error	0.3679					
6	Observations	10					
7							
8	ANOVA						
9		*df*	*SS*	*MS*	*F*	*Significance F*	
10	Regression	1	181.5971	181.5971	1341.5500	0.0000	
11	Residual	8	1.0829	0.1354			
12	Total	9	182.6800				
13							
14		*Coefficients*	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
15	Intercept	4.8400	0.2513	19.2571	0.0000	4.2604	5.4196
16	X Variable 1	1.4836	0.0405	36.6272	0.0000	1.3902	1.5770

a) What is the estimated regression function for this problem? Explain what the terms in your equation mean.

b) Predict the mean number of labor hours for a batch of 5 parts.

c) Interpret the meaning of R Square in cell B3 of the spreadsheet.

4. The owner of Tim's Toys wants to predict monthly sales. He has collected data for 12 months. He needs your help in analyzing this data using exponential smoothing.

	A	B	C	D	E	F
1		Number of	Exp Smoothing			
2	Time Period	Toys Sold	Prediction			
3	1	174			alpha	0.440
4	2	189				
5	3	168				
6	4	180				
7	5	165				
8	6	183				
9	7	177				
10	8	192				
11	9	192				
12	10	183				
13	11	195				
14	12	189				
15						
16		MAPE				

a) Work out the exponential smoothing prediction in column C.

b) If the predicted value for Period 12 is 189.61, what is the forecast for time period 13?

c) Compute the Mean Absolute Percentage Error (MAPE) and comment on the accuracy of the prediction.

5. Maryland Confectionary wants to predict their quarterly sales for 2018 based on their sales records for the past three years, from 2015 to 2017. The sales data are tabulated as shown below:

Year	Qtr	Actual Sales
2015	1	55.2
	2	60
	3	86.4
	4	74.4
2016	1	62.4
	2	67.2
	3	115.2
	4	86.4
2017	1	74.4
	2	100.8
	3	127.2
	4	103.2

a) Using the Multiplicative time series model, perform a forecast for 2018
Hint: Perform the following steps:
i). Smooth the data using a centered 4 period moving average.
ii). Calculate the seasonal indices.
iii). Deseasonalise the data.
iv). Fit a least squares regression line to the data.
v). Forecast sales for 2018.

b) If it turned out that sales in 2008 were: 85.7, 104.5, 150.8 and 121.7, calculate the MAPE and MSE of the forecast.

6. The business analyst in Maryland Confectionary decided to fit a multiple regression to the data. Hence, the following output was generated:

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.970885
R Square	0.942618
Adjusted R Square	0.76697
Standard Error	6.918299
Observations	12

	Coefficients
Intercept	43.75
Period	4.05
1	0
2	7.95
3	37.5
4	11.85

a) Using the sales data in Question 3, as well as the regression output above, predict their quarterly sales for 2018 using the Additive Time Series Model.

b) If it turned out that sales in 2018 were: 85.7, 104.5, 150.8 and 121.7, calculate the MAPE and MSE of the forecast.