

Name: \_\_\_\_\_

Class: \_\_\_\_\_

Date: \_\_\_\_\_

(First Page)

Name: \_\_\_\_\_

Class: \_\_\_\_\_

Date: \_\_\_\_\_

(Subsequent Pages)

1.

Consider the following time series data.

Week	1	2	3	4	5	6
Value	18	13	16	11	17	14

Using the naïve method (most recent value) as the forecast for the next week, compute the following measures of forecast accuracy.

(a) Mean absolute error **MAE**

If required, round your answer to one decimal place.

4.4(b) Mean squared error **MSE**

If required, round your answer to one decimal place.

10.8(c) Mean absolute percentage error **MAPE**

If required, round your intermediate calculations and final answer to two decimal places.

31.88

(d) What is the forecast for week 7?

14

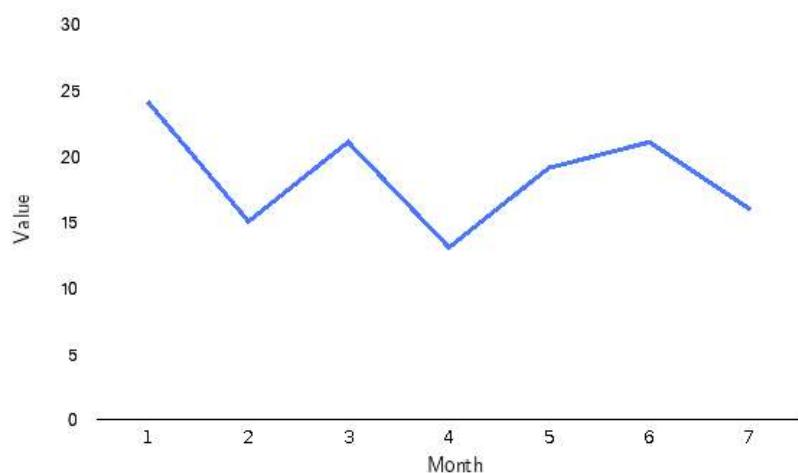
2.

Consider the following time series data:

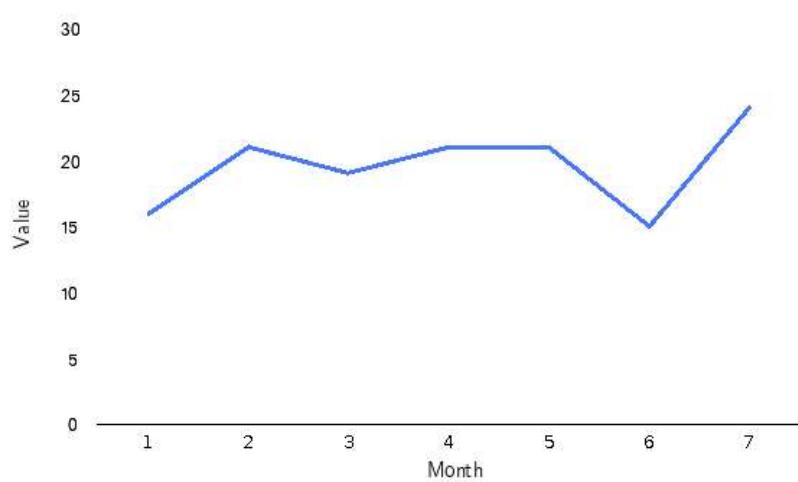
Month	1	2	3	4	5	6	7
Value	24	15	21	13	19	21	16

(a) Choose the correct time series plot.

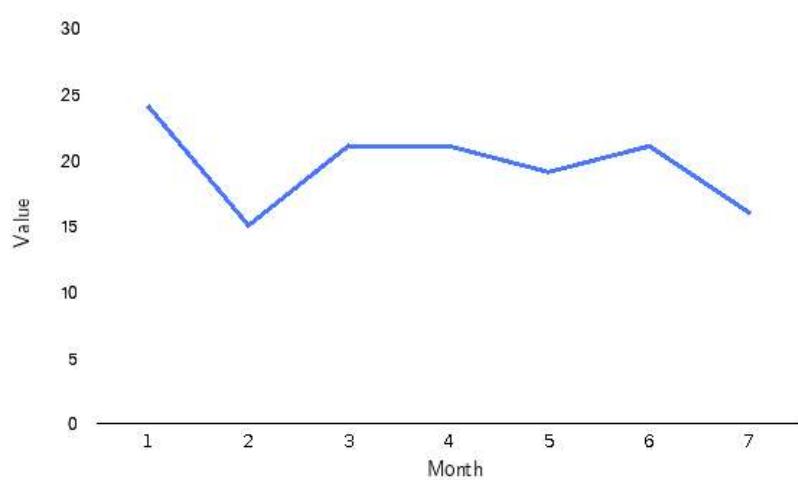
(i)



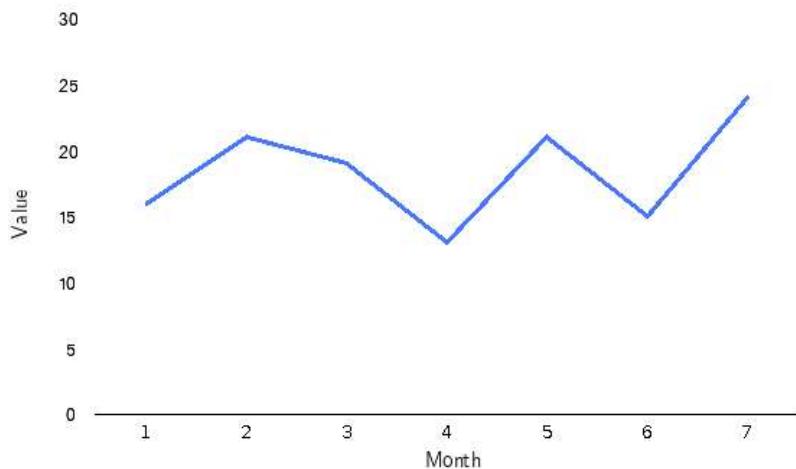
(ii)



(iii)



(iv)



What type of pattern exists in the data?

Horizontal

- (b) Develop a three-month moving average for this time series. Compute MSE and a forecast for month 8.

If required, round your answers to two decimal places. Do not round intermediate calculation.

MSE:

17.5

The forecast for month 8:

18.67

- (c) Use  $\alpha = 0.2$  to compute the exponential smoothing values for the time series. Compute MSE and a forecast for month 8.

If required, round your answers to two decimal places. Do not round intermediate calculation.

MSE:

30.4

The forecast for month 8:

19.32

- (d) Compare the three-month moving average forecast with the exponential smoothing forecast using  $\alpha = 0.2$ . Which appears to provide the better forecast based on MSE?

The 3-month moving average forecast

- (e) Use trial and error to find a value of the exponential smoothing coefficient  $\alpha$  that results in the smallest MSE.

Do not round intermediate calculations. Use a two-decimal digit precision for the exponential smoothing coefficient.

$\alpha =$

0.91

3.

Corporate triple A bond interest rates for 12 consecutive months are as follows:

9.6    9.4    9.5    9.7    9.9    9.5    9.8    10.6    10.1    9.9    9.5    9.8

- (a) Choose the correct time series plot.

(i)



(ii)



(iii)



(iv)



What type of pattern exists in the data?

Horizontal |

- (b) Develop three-month and four-month moving averages for this time series.

If required, round your answers to two decimal places.

Month	Sales	3 Month	4 Month
		Moving Average	Moving Average
1	9.6		
2	9.4		
3	9.5		
4	9.7	9.50	
5	9.9	9.53	9.55
6	9.5	9.70	9.63
7	9.8	9.70	9.65
8	10.6	9.73	9.73
9	10.1	9.97	9.95
10	9.9	10.17	10.00
11	9.5	10.20	10.10
12	9.8	9.83	10.03

Enter the Mean Square Errors for the three-month and the four-month moving average forecasts. If required, round your answers to three decimal digits.

3-month moving average	4-month moving average
<u>0.173</u>	<u>0.171</u>

Does the three-month or the four-month moving average provide the better forecasts based on MSE? Explain.

The four-month moving average provides better forecast  
Because it has lower MSE

- (c) What is the moving average forecast for the next month? If required, round your answer to two decimal places.

9.83

4.

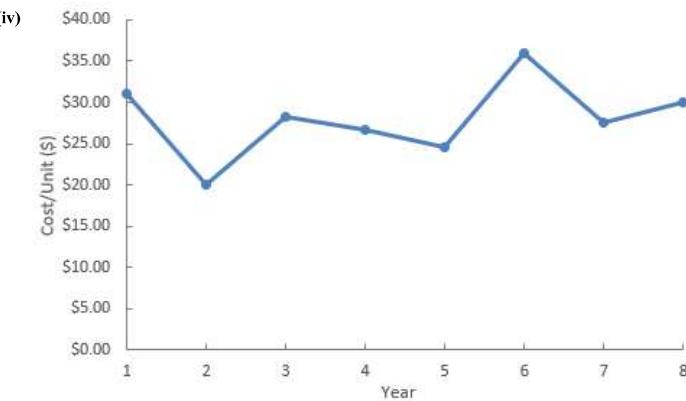
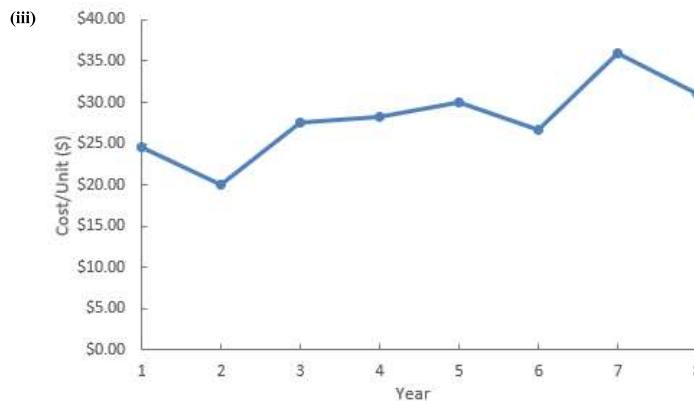
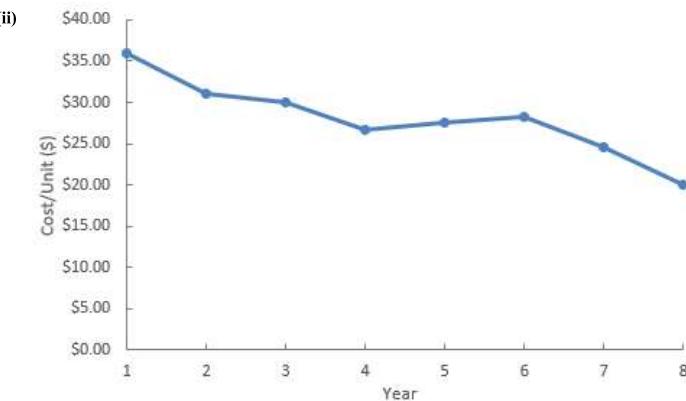
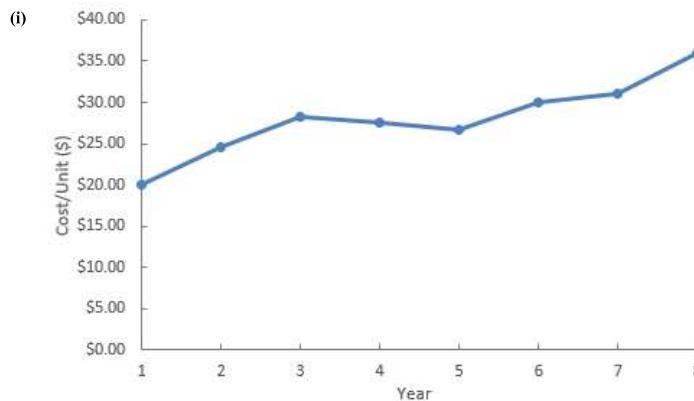
The president of a small manufacturing firm is concerned about the continual increase in manufacturing costs over the past several years. The table below provides a time series of the cost per unit for the firm's leading product over the past eight years.

Click on the datafile logo to reference the data.



Year	Cost/Unit (\$)	Year	Cost/Unit (\$)
1	20.00	5	26.60
2	24.50	6	30.00
3	28.20	7	31.00
4	27.50	8	36.00

(a) Choose the correct time series plot.



What type of pattern exists in the data?

Trend

(b) Use simple linear regression analysis to find the parameters for the line that minimizes MSE for this time series.

If required, round your answers for the parameters to four decimal places and your answer for the MSE to two decimal places. Do not round your intermediate calculations.

y-intercept,  $b_0$  = 19.9929

Slope,  $b_1$  = 1.7738

MSE = 2.92

(c) What is the average cost increase that the firm has been realizing per year?

If required, round your answer to two decimal places.

\$ 1.77

(d) Compute an estimate of the cost/unit for next year.

If required, round your answer to two decimal places. Do not round your intermediate calculations.

\$ 35.96

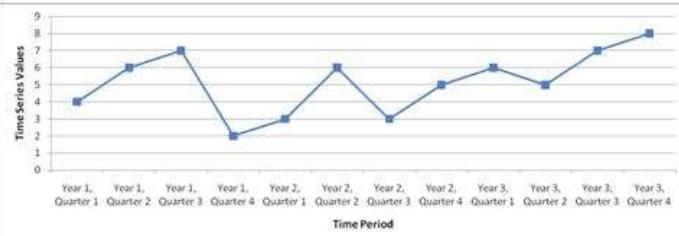
5.

Consider the following time series data.

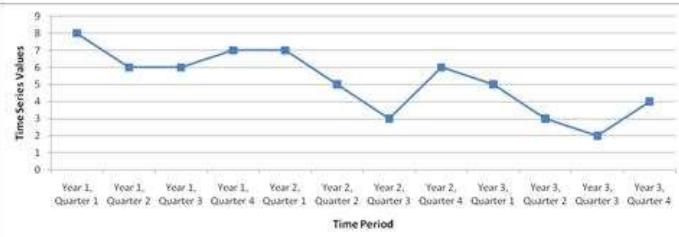
Quarter	Year 1	Year 2	Year 3
1	4	6	7
2	2	3	6
3	3	5	6
4	5	7	8

(a) Choose the correct time series plot.

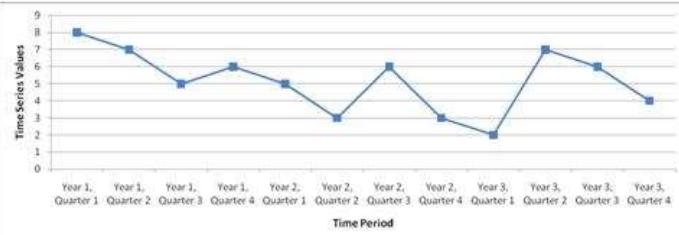
(i)



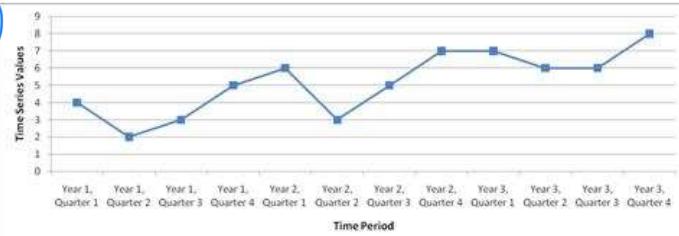
(ii)



(iii)



(iv)



What type of pattern exists in the data?

Seasonality with trend

(b) Use a multiple regression model with dummy variables as follows to develop an equation to account for seasonal effects in the data: Qtr1 = 1 if Quarter 1, 0 otherwise; Qtr2 = 1 if Quarter 2, 0 otherwise; Qtr3 = 1 if Quarter 3, 0 otherwise.

If required, round your answers to three decimal places. For subtractive or negative numbers use a minus sign even if there is a + sign before the blank (Example: -300). If the constant is "1" it must be entered in the box. Do not round intermediate calculation.

$$\hat{y} = 6.667 + (-1) \text{Qtr1} + (-3) \text{Qtr2} + (-2) \text{Qtr3}$$

(c) Compute the quarterly forecasts for next year based on the model you developed in part (b).

If required, round your answers to three decimal places. Do not round intermediate calculation.

Year	Quarter	F <sub>t</sub>
4	1	

		<u>5.667</u>
4	2	<u>3.667</u>
4	3	<u>4.667</u>
4	4	<u>6.667</u>

- (d) Use a multiple regression model to develop an equation to account for trend and seasonal effects in the data. Use the dummy variables you developed in part (b) to capture seasonal effects and create a variable  $t$  such that  $t = 1$  for Quarter 1 in Year 1,  $t = 2$  for Quarter 2 in Year 1, ...,  $t = 12$  for Quarter 4 in Year 3.

If required, round your answers to three decimal places. For subtractive or negative numbers use a minus sign even if there is a + sign before the blank (Example: -300).

$$\hat{y} = \underline{3.417} + \underline{0.219} \text{ Qtr1} + \underline{(-2.188)} \text{ Qtr2} + \underline{(-1.599)} \text{ Qtr3} + \underline{0.406} t$$

- (e) Compute the quarterly forecasts for next year based on the model you developed in part (d).

Do not round your interim computations and round your final answer to three decimal places.

Year	Quarter	Period	Ft
4	1	13	<u>8.917</u>
4	2	14	<u>6.917</u>
4	3	15	<u>7.917</u>
4	4	16	<u>9.917</u>

- (f) Calculate the MSE for the regression models developed in parts (b) and (d).

If required, round your intermediate calculations and final answer to three decimal places.

Model developed in part (b)	Model developed in part (d)
MSE	<u>1.889</u>

Is the model you developed in part (b) or the model you developed in part (d) more effective?

The model developed in part d is more effective because it has the lower MSE.