

Chapter 17 (Homework)

Current Score

QUESTION

1

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TOTAL SCORE

POINTS

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0.0%

Due Date

FRI, AUG 7, 2020
11:58 PM CDT



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Assignment Submission & Scoring

Assignment Submission

For this assignment, you submit answers by question parts. The number of submissions remaining for each question part only changes if you submit or change the answer.

Assignment Scoring

Your last submission is used for your score.

1. [-/0.9 Points]

DETAILS

ASWSBE13 17.E.002.

MY NOTES

ASK YOUR TEACHER

PRACTICE ANOTHER

Consider the following time series data.

Week	1	2	3	4	5	6
Value	18	14	17	10	18	15

Using the average of all the historical data as a forecast for the next period, compute the following measures of forecast accuracy. (Round your answers to two decimal places.)

(a) mean absolute error

MAE =

(b) mean squared error

MSE =

(c) mean absolute percentage error

MAPE = %

(d) What is the forecast for week 7?

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2. [-/0.9 Points]

DETAILS

ASWSBE13 17.E.004.MI.

MY NOTES

ASK YOUR TEACHER

PRACTICE ANOTHER

Consider the following time series data.

Month	1	2	3	4	5	6	7
Value	31	20	27	19	26	30	22

- (a) Compute MSE using the most recent value as the forecast for the next period.

MSE =

What is the forecast for month 8?

- (b) Compute MSE using the average of all the data available as the forecast for the next period. (Round your answer to two decimal places.)

MSE =

What is the forecast for month 8?

- (c) Which method appears to provide the better forecast?

- ☐ The average of all the previous values provides a better forecast, because its MSE is smaller than the MSE using the most recent value.
- ☐ The most recent value provides a better forecast, because its MSE is smaller than the MSE using the average of all the previous values.
- ☐ The most recent value provides a better forecast, because its forecast for month 8 is smaller than the month 8 forecast using the average of all the previous values.
- ☐ The average of all the previous values provides a better forecast, because its forecast for month 8 is larger than the month 8 forecast using the most recent value.

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3. [–/0.9 Points]

DETAILS

ASWSBE13 17.E.005.

MY NOTES

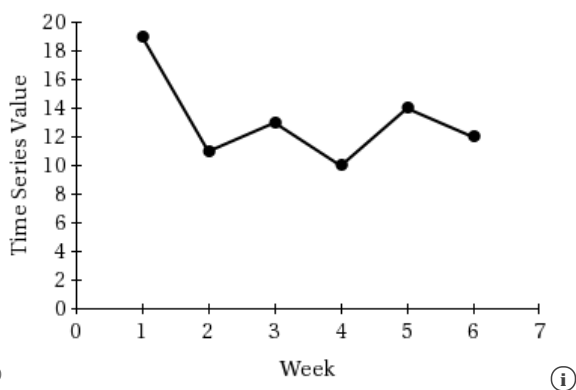
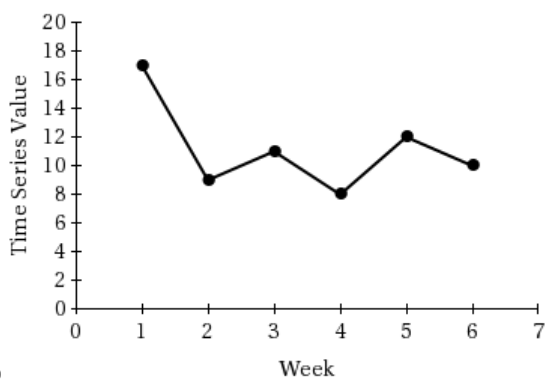
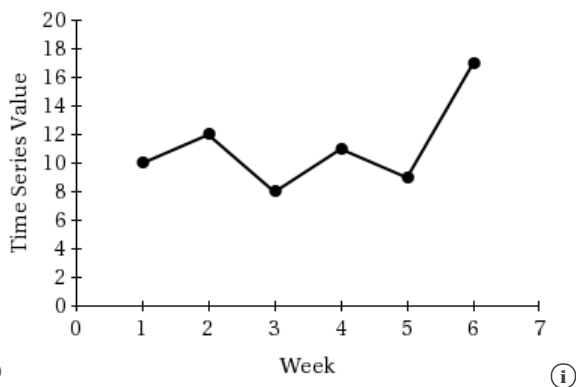
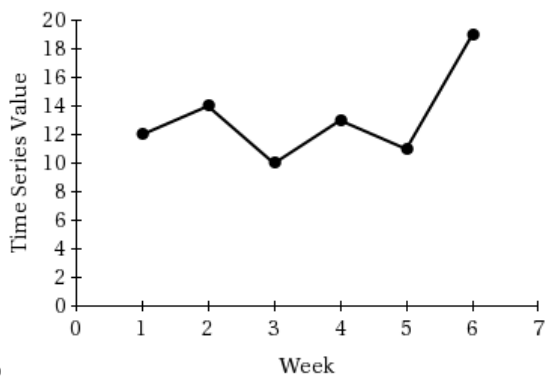
ASK YOUR TEACHER

PRACTICE ANOTHER

Consider the following time series data.

Week	1	2	3	4	5	6
Value	19	11	13	10	14	12

(a) Construct a time series plot.



What type of pattern exists in the data?

- ☐ The data appear to follow a cyclical pattern.
☐ The data appear to follow a trend pattern.
☐ The data appear to follow a horizontal pattern.
☐ The data appear to follow a seasonal pattern.

(b) Develop the three-week moving average forecasts for this time series. (Round your answers to two decimal places.)

Week	Time Series Value	Forecast
1	19	
2	11	
3	13	
4	10	
5	14	
6	12	

Compute MSE. (Round your answer to two decimal places.)

MSE =

What is the forecast for week 7?

- (c) Use $\alpha = 0.2$ to compute the exponential smoothing forecasts for the time series.

Week	Time Series Value	Forecast
1	19	
2	11	
3	13	
4	10	
5	14	
6	12	

Compute MSE. (Round your answer to two decimal places.)

MSE =

What is the forecast for week 7? (Round your answer to two decimal places.)

- (d) Compare the three-week moving average approach with the exponential smoothing approach using $\alpha = 0.2$. Which appears to provide more accurate forecasts based on MSE? Explain.
- ☐ The three-week moving average provides a better forecast since it has a larger MSE than the smoothing approach.
 - ☐ The exponential smoothing using $\alpha = 0.2$ provides a better forecast since it has a larger MSE than the three-week moving average approach.
 - ☐ The three-week moving average provides a better forecast since it has a smaller MSE than the smoothing approach.
 - ☐ The exponential smoothing using $\alpha = 0.2$ provides a better forecast since it has a smaller MSE than the three-week moving average approach.
- (e) Use a smoothing constant of $\alpha = 0.4$ to compute the exponential smoothing forecasts.

Week	Time Series Value	Forecast
1	19	
2	11	
3	13	
4	10	
5	14	
6	12	

Does a smoothing constant of 0.2 or 0.4 appear to provide more accurate forecasts based on MSE? Explain.

- ☐ The exponential smoothing using $\alpha = 0.2$ provides a better forecast since it has a larger MSE than the exponential smoothing using $\alpha = 0.4$.
- ☐ The exponential smoothing using $\alpha = 0.4$ provides a better forecast since it has a larger MSE than the exponential smoothing using $\alpha = 0.2$.
- ☐ The exponential smoothing using $\alpha = 0.4$ provides a better forecast since it has a smaller MSE than the exponential smoothing using $\alpha = 0.2$.

- ☐ The exponential smoothing using $\alpha = 0.2$ provides a better forecast since it has a smaller MSE than the exponential smoothing using $\alpha = 0.4$.

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4. [-/0.9 Points]

DETAILS

ASWSBE13 17.E.007.ALT.

MY NOTES

ASK YOUR TEACHER

DATAfile: [Gasoline](#)

These data show the number of gallons of gasoline sold by a gasoline distributor in Bennington, Vermont, over the past 12 weeks.

Week	Sales (1,000s of gallons)
1	17
2	21
3	19
4	23
5	18
6	16
7	20
8	18
9	22
10	20
11	15
12	22

(a) Compute four-week and five-week moving averages for the time series.

Week	Time Series Value	4-Week Moving Average Forecast	5-Week Moving Average Forecast
1	17		
2	21		
3	19		
4	23		
5	18		
6	16		
7	20		
8	18		
9	22		
10	20		
11	15		
12	22		



- (b) Compute the MSE for the four-week moving average forecasts. (Round your answer to two decimal places.)

Compute the MSE for the five-week moving average forecasts. (Round your answer to two decimal places.)

- (c) What appears to be the best number of weeks of past data (three, four, or five) to use in the moving average computation? MSE for the three-week moving average is 10.22.
- ☐ Three weeks appears to be best, because the three-week moving average provides the smallest MSE.
 - ☐ Three weeks appears to be best, because the three-week moving average provides the largest MSE.
 - ☐ Four weeks appears to be best, because the four-week moving average provides the smallest MSE.
 - ☐ Five weeks appears to be best, because the five-week moving average provides the smallest MSE.
 - ☐ None appear better than the others, because they all provide the same MSE.

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5. [-/0.9 Points]

DETAILS

ASWSBE13 17.E.008.

MY NOTES

ASK YOUR TEACHER

PRACTICE ANOTHER

Suppose these data show the number of gallons of gasoline sold by a gasoline distributor in Bennington, Vermont, over the past 12 weeks.

Week	Sales (1,000s of gallons)
1	17
2	21
3	19
4	23
5	18
6	16
7	20
8	18
9	22
10	20
11	15
12	22

- (a) Using a weight of $\frac{1}{2}$ for the most recent observation, $\frac{1}{3}$ for the second most recent observation, and $\frac{1}{6}$ for third most recent observation, compute a three-week weighted moving average for the time series. (Round your answers to two decimal places.)

Week	Time Series Value	Weighted Moving Average Forecast
1	17	
2	21	
3	19	
4	23	
5	18	
6	16	
7	20	
8	18	
9	22	
10	20	
11	15	
12	22	

(b) Compute the MSE for the weighted moving average in part (a).

MSE =

Do you prefer this weighted moving average to the unweighted moving average? The MSE for the unweighted moving average is 10.22.

- ☐ The unweighted moving average is preferred because it has a smaller MSE compared to the weighted moving average.
- ☐ The weighted moving average is preferred because it has a larger MSE compared to the unweighted moving average.
- ☐ The unweighted moving average is preferred because it has a larger MSE compared to the weighted moving average.
- ☐ The weighted moving average is preferred because it has a smaller MSE compared to the unweighted moving average.

(c) Suppose you are allowed to choose any weights as long as they sum to 1. Could you always find a set of weights that would make the MSE at least as small for a weighted moving average than for an unweighted moving average? Why or why not?

- ☐ No, an unweighted moving average always has a smaller MSE than a weighted moving average.
- ☐ No, sometimes you need to let the weights sum to a number higher/lower than 1 in order to get a smaller MSE than the one for an unweighted moving average.
- ☐ Yes, a weighted moving average always has a smaller MSE than an unweighted moving average.
- ☐ Yes, because an unweighted moving average is just a weighted moving average where the weights are equal.

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6. [–/0.9 Points]

DETAILS

ASWSBE13 17.E.009.ALT.

MY NOTES

ASK YOUR TEACHER

DATAfile: [Gasoline](#)

These data show the number of gallons of gasoline sold by a gasoline distributor in Bennington, Vermont, over the past 12 weeks.

Week	Sales (1,000s of gallons)
1	17
2	21
3	19
4	23
5	18
6	16
7	20
8	18
9	22
10	20
11	15
12	22

Show the exponential smoothing forecasts using $\alpha = 0.1$. (Round your answers to two decimal places.)

Week	Time Series Value	Forecast
1	17	
2	21	
3	19	
4	23	
5	18	
6	16	
7	20	
8	18	
9	22	
10	20	
11	15	

12	22	
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- (a) Applying the MSE measure of forecast accuracy, would you prefer a smoothing constant of $\alpha = 0.1$ or $\alpha = 0.2$ for the gasoline sales time series?
- ☐ $\alpha = 0.1$ provides more accurate forecasts based upon MSE.
 - ☐ $\alpha = 0.2$ provides more accurate forecasts based upon MSE.
 - ☐ Both provide the same level of accuracy of forecasts based upon MSE.
- (b) Are the results the same if you apply MAE as the measure of accuracy?
- ☐ $\alpha = 0.1$ provides more accurate forecasts based upon MAE, so the results are the same.
 - ☐ $\alpha = 0.1$ provides more accurate forecasts based upon MAE, so the results are not the same.
 - ☐ $\alpha = 0.2$ provides more accurate forecasts based upon MAE, so the results are the same.
 - ☐ $\alpha = 0.2$ provides more accurate forecasts based upon MAE, so the results are not the same.
 - ☐ Both provide the same level of accuracy based on MAE, so the results are the same.
 - ☐ Both provide the same level of accuracy based on MAE, so the results are not the same.
- (c) What are the results if MAPE is used?
- ☐ $\alpha = 0.1$ provides more accurate forecasts based upon MAPE.
 - ☐ $\alpha = 0.2$ provides more accurate forecasts based upon MAPE.
 - ☐ Both provide the same level of accuracy of forecasts based upon MAPE.

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7. [–/0.9 Points]

DETAILS

ASWSBE13 17.E.021.

MY NOTES

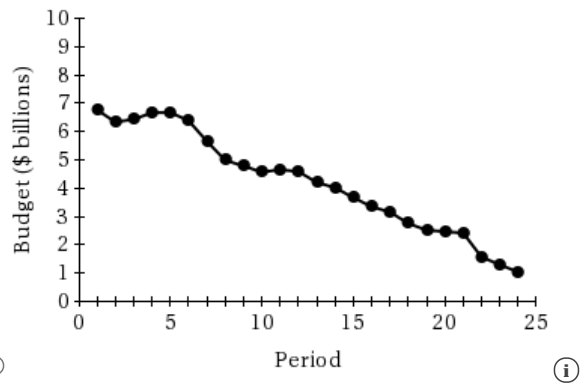
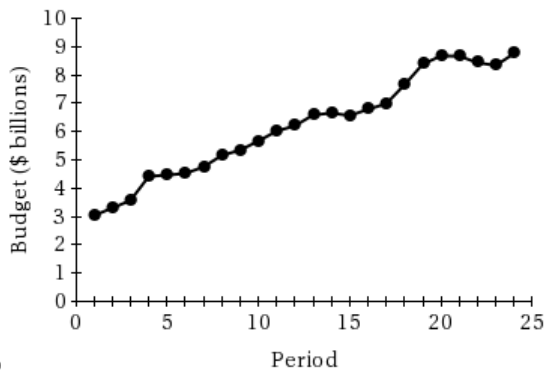
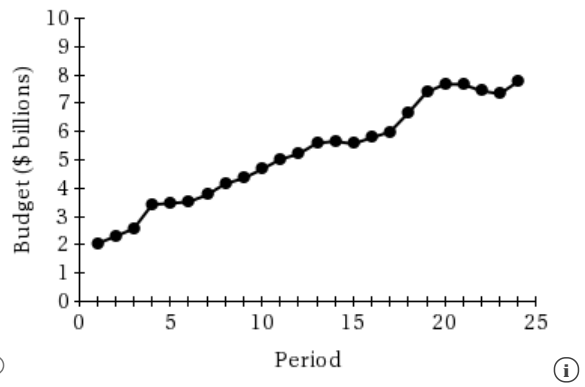
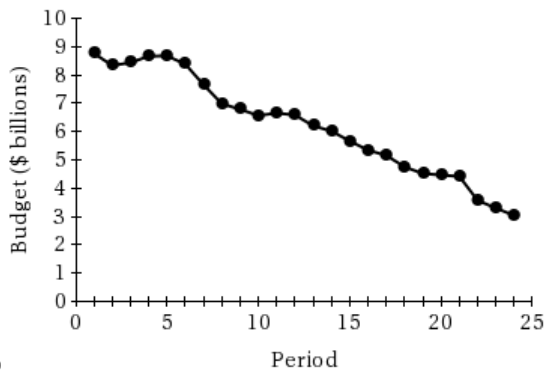
ASK YOUR TEACHER

PRACTICE ANOTHER

The general fund budget (in billions of dollars) for a U.S. state for 1988 (period 1) to 2011 (period 24) follows.

Year	Period	Budget (\$ billions)
1988	1	3.03
1989	2	3.29
1990	3	3.56
1991	4	4.41
1992	5	4.46
1993	6	4.51
1994	7	4.75
1995	8	5.15
1996	9	5.34
1997	10	5.66
1998	11	6.01
1999	12	6.20
2000	13	6.58
2001	14	6.65
2002	15	6.56
2003	16	6.78
2004	17	6.98
2005	18	7.65
2006	19	8.38
2007	20	8.67
2008	21	8.66
2009	22	8.43
2010	23	8.33
2011	24	8.76

(a) Construct a time series plot.



What type of pattern exists in the data?

- ☐ The time series plot shows a nonlinear trend.
- ☐ The time series plot shows a horizontal pattern.
- ☐ The time series plot shows a linear trend.
- ☐ The time series plot shows a seasonal pattern.

(b) Develop a linear trend equation for this time series to forecast the budget (in billions of dollars). (Round your numerical values to three decimal places.)

$T_t =$

(c) What is the forecast (in billions of dollars) for period 25? (Round your answer to two decimal places.)

\$ billion

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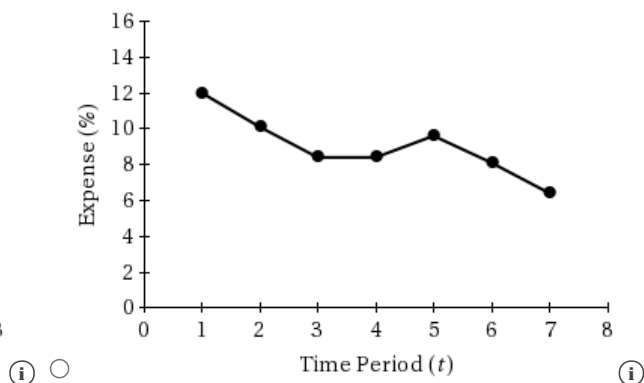
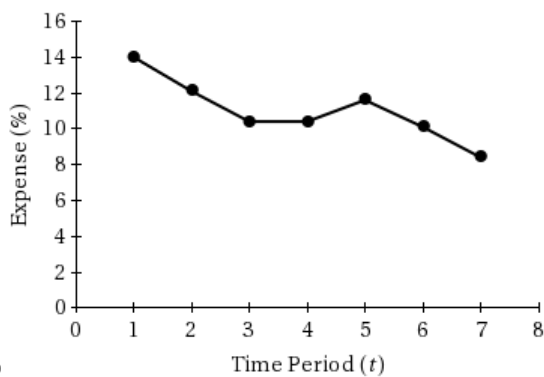
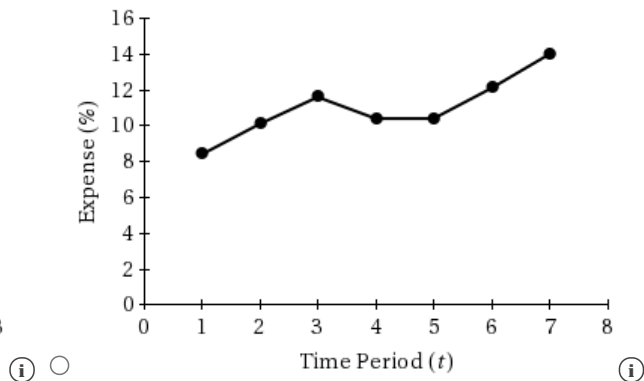
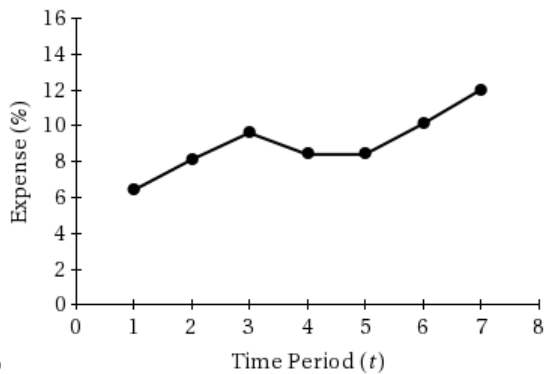
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The Seneca Children's Fund (SCF) is a local charity that runs a summer camp for disadvantaged children. The fund's board of directors has been working very hard in recent years to decrease the amount of overhead expenses, a major factor in how charities are rated by independent agencies. The following data show the percentage of the money SCF has raised that was spent on administrative and fund-raising expenses for a seven-year period.

Year	Period (t)	Expense (%)
1	1	14.0
2	2	12.1
3	3	10.4
4	4	10.4
5	5	11.6
6	6	10.1
7	7	8.4

(a) Construct a time series plot.



What type of pattern exists in the data?

- ☐ The time series plot shows an upward linear trend.
- ☐ The time series plot shows an exponential trend.
- ☐ The time series plot shows a quadratic trend.
- ☐ The time series plot shows a downward linear trend.

(b) Develop the linear trend equation for this time series to forecast expense percentage.

$T_t =$

- (c) Forecast the percentage of administrative expenses for year 8.

%

- (d) If SCF can maintain their current trend in reducing administrative expenses, during which period will they first achieve a level of 5% or less?

Expenses will first reach a level of 5% or less in period .

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9. [-/0.9 Points]

DETAILS

ASWSBE13 17.E.025.

MY NOTES

ASK YOUR TEACHER

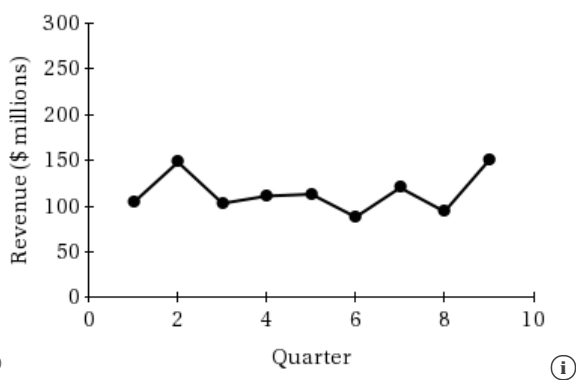
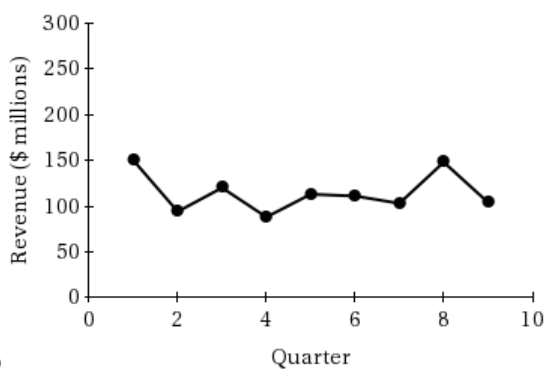
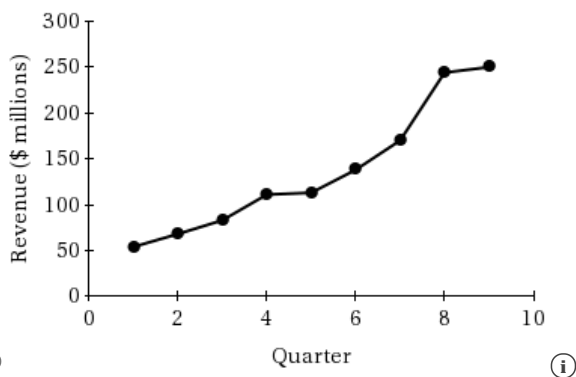
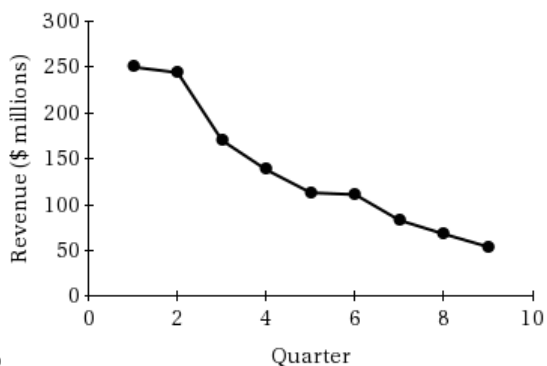
PRACTICE ANOTHER

A statistical program is recommended.

Quarterly revenue (\$ millions) for a certain website for the first quarter of 2012 through the first quarter of 2014 are shown below.

Quarter	Revenue (\$ millions)
1	54
2	68
3	83
4	111
5	113
6	138
7	170
8	244
9	250

(a) Construct a time series plot.



What type of pattern exists in the data?

- ☐ The time series plot shows a cyclical pattern.
- ☐ The time series plot shows a downward trend.
- ☐ The time series plot shows an upward trend.
- ☐ The time series plot shows a horizontal pattern.

- (b) Using Excel or Minitab, develop a linear trend equation for this time series to forecast revenue (in millions of dollars). (Round your numerical values to one decimal place.)

$T_t =$

- (c) Using Excel or Minitab, develop a quadratic trend equation for this time series to forecast revenue (in millions of dollars). (Round your numerical values to one decimal place.)

$T_t =$

- (d) Compare the MSE for each model. (Round your answers to one decimal place.)

Linear model MSE =

Quadratic model MSE =

Which model appears better according to MSE?

- ☐ According to MSE, the linear model is the better model.
- ☐ According to MSE, both models are just as good.
- ☐ According to MSE, the quadratic model is the better model.

- (e) Use the models developed in parts (b) and (c) to forecast revenue (in millions of dollars) for the tenth quarter. (Round your answers to the nearest million dollars.)

Linear model \$ million

Quadratic model \$ million

- (f) Which of the two forecasts in part (e) would you use? Explain.

This answer has not been graded yet.

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10. [-/0.9 Points]

DETAILS

ASWSBE13 17.E.028.

MY NOTES

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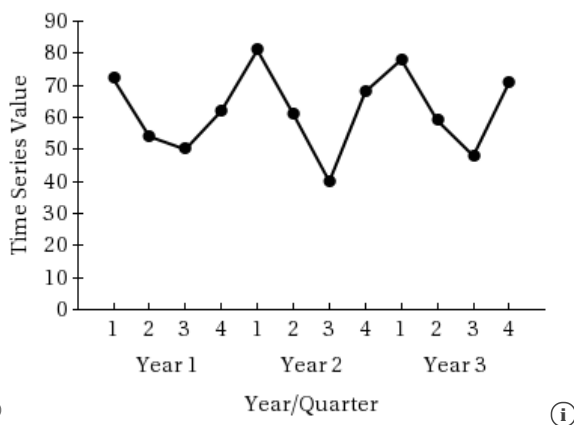
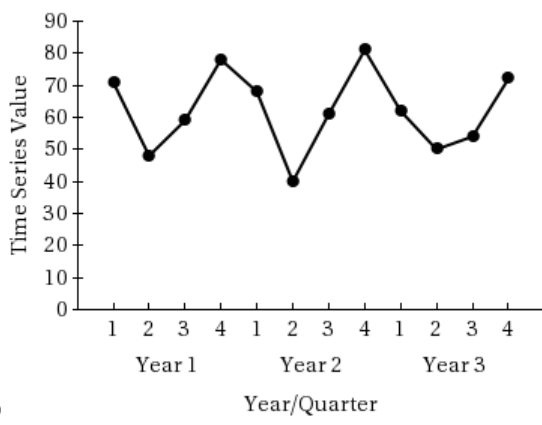
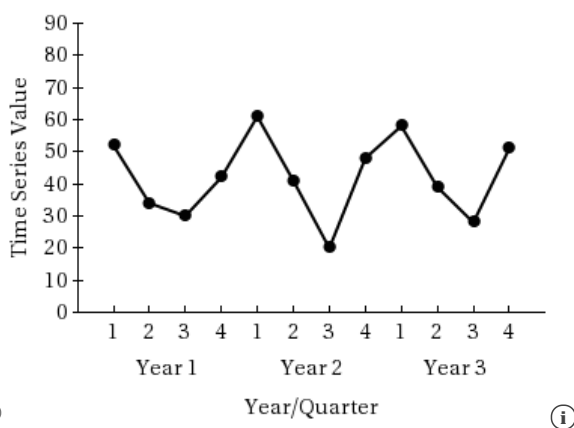
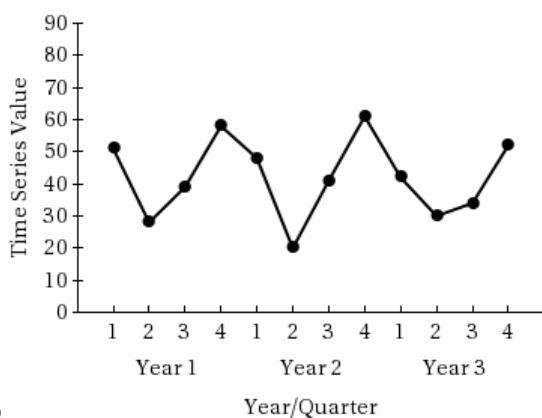
PRACTICE ANOTHER

A statistical program is recommended.

Consider the following time series.

Quarter	Year 1	Year 2	Year 3
1	71	68	62
2	48	40	50
3	59	61	54
4	78	81	72

(a) Construct a time series plot.



What type of pattern exists in the data?

- The time series plot shows a trend pattern with no seasonal pattern present.
- The time series plot shows a horizontal pattern, but there is also a seasonal pattern in the data.
- The time series plot shows a horizontal pattern with no seasonal pattern present.
- The time series plot shows a trend pattern, but there is also a seasonal pattern in the data.

(b) Use the following dummy variables to develop an estimated regression equation to account for seasonal effects in the data:

$x_1 = 1$ if quarter 1, 0 otherwise; $x_2 = 1$ if quarter 2, 0 otherwise; $x_3 = 1$ if quarter 3, 0 otherwise.

$\hat{Y} =$

(c) Compute the quarterly forecasts for next year.

quarter 1 forecast

quarter 2 forecast

quarter 3 forecast

quarter 4 forecast

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11. [-/1 Points]

DETAILS

ASWSBE13 17.E.030.ALT.

MY NOTES

ASK YOUR TEACHER

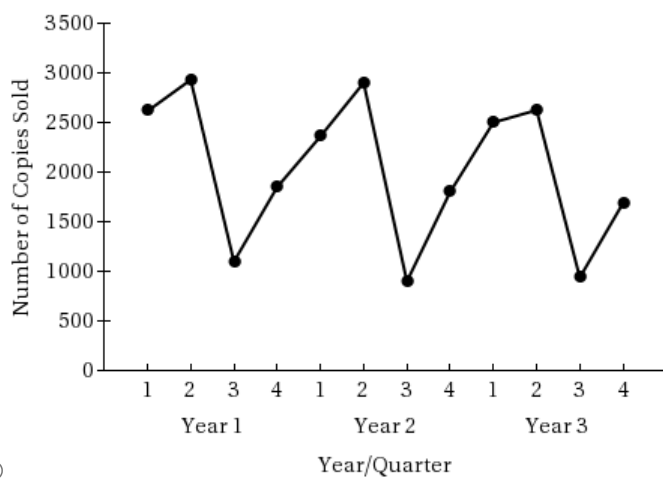
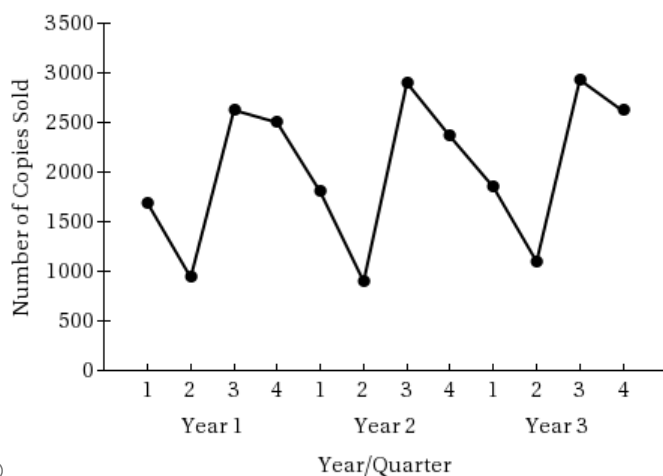
DATAfile: [Textbooks](#)

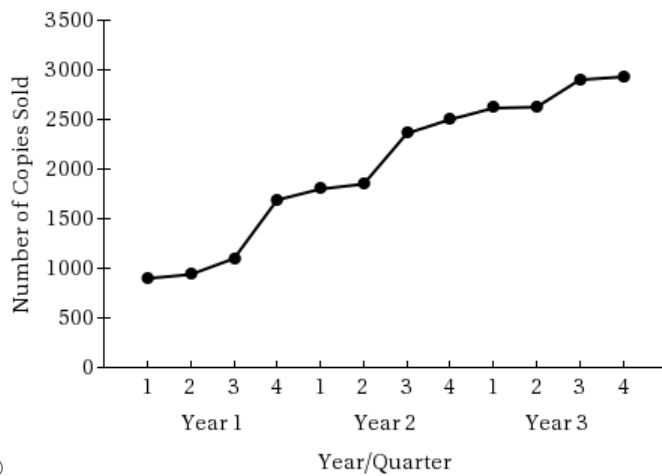
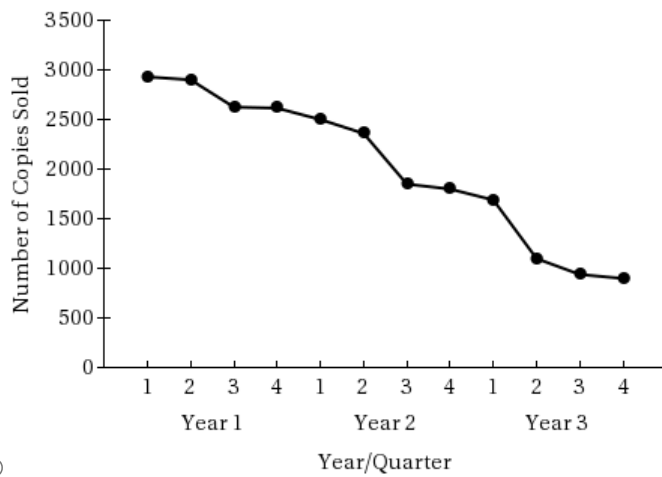
A statistical program is recommended.

The quarterly sales data (number of copies sold) for a college textbook over the past three years follow.

Quarter	Year 1	Year 2	Year 3
1	1,690	1,800	1,850
2	940	900	1,100
3	2,625	2,900	2,930
4	2,500	2,360	2,615

(a) Construct a time series plot.




☐
☒

☐
☒

What type of pattern exists in the data?

- ☐ There appears to be a seasonal pattern in the data and perhaps a moderate downward linear trend.
- ☐ There appears to be an upward linear trend but no seasonal pattern in the data.
- ☐ There appears to be a seasonal pattern in the data and perhaps a moderate upward linear trend.
- ☐ There appears to be a downward linear trend but no seasonal pattern in the data.

(b) Use the following dummy variables to develop an estimated regression equation to account for any seasonal effects in the data. (Round your numerical values to the nearest integer.)

$x_1 = 1$ if quarter 1, 0 otherwise; $x_2 = 1$ if quarter 2, 0 otherwise; $x_3 = 1$ if quarter 3, 0 otherwise

$\hat{Y} =$

(c) Using the equation developed in part (b), compute the quarterly forecasts for year 4. (Round your answers to the nearest ten.)

quarter 1 forecast	
quarter 2 forecast	
quarter 3 forecast	
quarter 4 forecast	

(d) Let $t = 1$ refer to the observation in quarter 1 of year 1; let $t = 2$ refer to the observation in quarter 2 of year 1; ... and $t = 12$ to refer to the observation in quarter 4 of year 3. Using the dummy variables defined in part (b) and t , develop an estimated regression equation to account for seasonal effects and any linear trend in the time series. (Round your numerical values to the nearest integer.)

$\hat{Y}_t =$

Based upon the seasonal effects in the data and linear trend, compute the quarterly forecasts for year 4. (Round your answers to the nearest ten.)

quarter 1 forecast	
quarter 2 forecast	
quarter 3 forecast	
quarter 4 forecast	

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