**Chapter 13: Demand Forecasting Methods**

**Practice Problems**

**MULTIPLE CHOICE**

Miskatonic University’s student help center has been monitoring number of students who come in to seek support with their basic English course. Below you’ll find the number of students that have gone to the student help center during the last eight weeks.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 20 | 26 | 31 | 33 | 39 | 42 | 48 | 52 |

1. Produce a 2-week moving average forecast for Periods 3-8.

|  |  |
| --- | --- |
| a. | 26, 31, 33, 39, 42, 48 |
| b. | 23, 28.5, 32, 36, 40.5, 45 |
| c. | 27, 29.4, 34, 38, 42.4, 42 |
| d. | 23, 29.5, 32, 26, 40.5, 44 |

ANS: B PTS: 1 DIF: Easy

2. Produce a 3-week moving average forecast for the Periods 4-8.

|  |  |
| --- | --- |
| a. | 29.4, 34, 38, 42.4, 42 |
| b. | 28.5, 32, 36, 40.5, 45 |
| c. | 25.7, 30, 34.3, 38, 48 |
| d. | 29.5, 32, 26, 40.5, 44 |

ANS: C PTS: 1 DIF: Easy

3. Using the data for the Miskatonic University case, produce a weighted moving average forecast for Periods 4-8. Use the following weights. For the prior period, use a weight of 0.6; for the second, use 0.3; for the third, use 0.1.

|  |  |
| --- | --- |
| a. | 25.7, 30.0, 34.3, 38.0, 48.0 |
| b. | 28.4, 31.7, 36.4, 40.2, 45.3 |
| c. | 28.5, 32.0, 36.0, 40.5, 45.3 |
| d. | 29.4, 34.0, 38.6, 42.4, 42.7 |

ANS: B PTS: 1 DIF: Easy

4. Determine the mean absolute deviation for the 2-week moving average forecast.

|  |  |
| --- | --- |
| a. | 6.67 |
| b. | 7.72 |
| c. | 8.54 |
| d. | 9.62 |

ANS: A PTS: 1 DIF: Easy

5. Determine the mean absolute deviation for a forecast for the 3-week moving average.

|  |  |
| --- | --- |
| a. | 6.67 |
| b. | 8.60 |
| c. | 8.86 |
| d. | 9.04 |

ANS: B PTS: 1 DIF: Medium

6. Determine the mean absolute deviation for the weighted moving average.

|  |  |
| --- | --- |
| a. | 5.80 |
| b. | 6.04 |
| c. | 6.22 |
| d. | 6.40 |

ANS: D PTS: 1 DIF: Medium

John Albert of Johnny’s Farm is trying to forecast the number of bushels of apples he sells. He has data for the last 8 weeks of sales. The data are listed below.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 70 | 73 | 65 | 62 | 80 | 74 | 69 | 78 |

7. Provide a forecast for Period 9 utilizing a 4-week moving average.

|  |  |
| --- | --- |
| a. | 73.65 |
| b. | 75.25 |
| c. | 77.40 |
| d. | 77.90 |

ANS: B PTS: 1 DIF: Medium

8. Produce a forecast for Period 9 utilizing an exponential smoothing model with an alpha equal to 0.4. (Assume a first-period forecast equal to the actual value for Period 1.)

|  |  |
| --- | --- |
| a. | 73.9 |
| b. | 74.6 |
| c. | 77.2 |
| d. | 78.6 |

ANS: A PTS: 1 DIF: Medium

9. Find the mean absolute deviation for the 4-week moving average.

|  |  |
| --- | --- |
| a. | 5.99 |
| b. | 6.07 |
| c. | 6.13 |
| d. | 6.21 |

ANS: C PTS: 1 DIF: Medium

10. Find the mean absolute deviation for the exponential smoothing model.

|  |  |
| --- | --- |
| a. | 6.10 |
| b. | 6.43 |
| c. | 6.78 |
| d. | 7.01 |

ANS: A PTS: 1 DIF: Medium

City of Bridgeport, Connecticut, is attempting to forecast revenues coming from traffic citations. The data for the last 8 months are provided below.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 601 | 629 | 587 | 545 | 572 | 610 | 634 | 660 |

11. Forecast the number of monthly traffic citations for Period 9 utilizing a three-period moving average.

|  |  |
| --- | --- |
| a. | 599.2 |
| b. | 623.1 |
| c. | 634.7 |
| d. | 643.1 |

ANS: C PTS: 1 DIF: Medium

12. Forecast the number of traffic citations for Period 9 utilizing an exponential smoothing model with an alpha equal to 0.3. (Assume a first-period forecast equal to the actual value for Period 1.)

|  |  |
| --- | --- |
| a. | 618.8 |
| b. | 620.2 |
| c. | 623.4 |
| d. | 628.2 |

ANS: B PTS: 1 DIF: Medium

13. Forecast for Period 9 utilizing a weighted moving average. For the first prior period weight, use a value of 0.4; for the second prior period weight, use a value of 0.4; and for the third prior period, use a value of 0.2. (Assume a first-period forecast equal to the actual value for Period 1.)

|  |  |
| --- | --- |
| a. | 589.2 |
| b. | 591.2 |
| c. | 593.4 |
| d. | 596.1 |

ANS: A PTS: 1 DIF: Medium

14. Determine the mean absolute deviation for the three-period moving average.

|  |  |
| --- | --- |
| a. | 44.9 |
| b. | 46.1 |
| c. | 47.3 |
| d. | 48.2 |

ANS: B PTS: 1 DIF: Medium

15. Determine the mean absolute deviation for the exponential smoothing model. (Assume a first-period forecast equal to the actual value for Period 1.)

|  |  |
| --- | --- |
| a. | 35.9 |
| b. | 36.1 |
| c. | 37.2 |
| d. | 44.3 |

ANS: A PTS: 1 DIF: Medium

16. Determine the mean absolute deviation for the weighted moving average model.

|  |  |
| --- | --- |
| a. | 29.6 |
| b. | 34.8 |
| c. | 39.8 |
| d. | 42.9 |

ANS: D PTS: 1 DIF: Medium

17. Determine the mean square error for the three-period moving average.

|  |  |
| --- | --- |
| a. | 2,701.7 |
| b. | 2,915.7 |
| c. | 3,015.2 |
| d. | 3,315.2 |

ANS: C PTS: 1 DIF: Medium

18. Determine the mean square error for the exponential smoothing model. (Assume a first-period forecast equal to the actual value for Period 1.)

|  |  |
| --- | --- |
| a. | 1,796.9 |
| b. | 1,744.9 |
| c. | 1,746.7 |
| d. | 1,753.6 |

ANS: A PTS: 1 DIF: Medium

19. Determine the mean square error for the weighted moving average model.

|  |  |
| --- | --- |
| a. | 2,644.3 |
| b. | 2,645.6 |
| c. | 2,748.0 |
| d. | 2,741.2 |

ANS: D PTS: 1 DIF: Medium

Police in the town of Arkham are reviewing the number of noise citations associated with students from Miskatonic University. The data are provided in the table below.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 110 | 118 | 124 | 90 | 78 | 60 | 88 | 102 | 118 | 130 | 138 | 146 |

20. Utilizing a trend exponential smoothing model, forecast the number of noise citations for Month 13. Use an alpha value equal to 0.2 and a beta value equal to 0.6.

|  |  |
| --- | --- |
| a. | 120.1 |
| b. | 125.3 |
| c. | 126.7 |
| d. | 128.9 |

ANS: B PTS: 1 DIF: Hard

21. Forecast the number of noise citations for Month 13 utilizing a linear regression trend approach.

|  |  |
| --- | --- |
| a. | 121 |
| b. | 125 |
| c. | 128 |
| d. | 130 |

ANS: C PTS: 1 DIF: Hard

Gladstone Community College is reviewing enrollment in its freshman composition class. Gladstone operates on a trimester basis. The data for the last 3 years worth of trimesters are provided in the table below.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Fall | Spring | Summer |
| 2013 | 80 | 96 | 42 |
| 2014 | 88 | 108 | 59 |
| 2015 | 94 | 121 | 68 |

22. Determine the fall’s trimester indice for enrollment.

|  |  |
| --- | --- |
| a. | 1.41 |
| b. | 1.04 |
| c. | 0.35 |
| d. | 0.40 |

ANS: B PTS: 1 DIF: Medium

23. Determine the summer’s trimester indice for enrollment.

|  |  |
| --- | --- |
| a. | 0.67 |
| b. | 0.44 |
| c. | 0.3481 |
| d. | 0.4035 |

ANS: A PTS: 1 DIF: Medium

Henderson Pool Pumps is reviewing the number of repairs of pool pumps for the last 3 years. Quarterly data for the last 3 years are provided in the table below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Q1 | Q2 | Q3 | Q4 |
| 2013 | 600 | 790 | 204 | 410 |
| 2014 | 640 | 960 | 223 | 492 |
| 2015 | 720 | 1104 | 284 | 561 |

24. Determine the unadjusted quarterly indices.

|  |  |
| --- | --- |
| a. | 0.251; 0.419; 0.109; 0.221 |
| b. | 0.267; 0.423; 0.111; 0.199 |
| c. | 0.275; 0.415; 0.123; 0.187 |
| d. | 1.12; 1.63; 0.41; 0.84 |

ANS: D PTS: 1 DIF: Medium

25. If the forecast for the year 2016 is 2,650, what would be the forecast for sales in the second quarter of 2016?

|  |  |
| --- | --- |
| a. | 665 |
| b. | 987 |
| c. | 1,082 |
| d. | 1,234 |

ANS: C PTS: 1 DIF: Medium

26. Determine the indices utilizing the centered moving average approach.

|  |  |
| --- | --- |
| a. | 0.251; 0.419; 0.109; 0.221 |
| b. | 0.267; 0.423; 0.111; 0.199 |
| c. | 0.275; 0.415; 0.123; 0.187 |
| d. | 1.12; 1.63; 0.41; 0.84 |

ANS: D PTS: 1 DIF: Hard

27. Determine the linear regression trend equation.

|  |  |
| --- | --- |
| a. | *y* = 445.56 + 5.9 × T |
| b. | *y* = 602.12 + 8.2 × T |
| c. | *y* = 544.02 + 5.9 × T |
| d. | *y* = 544.02 + 7.3 × T |

ANS: C PTS: 1 DIF: Medium

28. Forecast for the next two periods utilizing the linear regression trend equation (round off to a whole number).

|  |  |
| --- | --- |
| a. | 621, 627 |
| b. | 618, 625 |
| c. | 617, 624 |
| d. | 613, 619 |

ANS: A PTS: 1 DIF: Medium

29. Forecast for the first quarter 2016 utilizing a seasonal indices approach.

|  |  |
| --- | --- |
| a. | 545 |
| b. | 620 |
| c. | 695 |
| d. | 725 |

ANS: C PTS: 1 DIF: Hard

Aspen Winter Sports repairs snowmobiles. Quarterly data for the last 3 years of the number of snowmobiles that were repaired are provided below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Q1 | Q2 | Q3 | Q4 |
| 2013 | 16 | 28 | 46 | 62 |
| 2014 | 19 | 31 | 54 | 81 |
| 2015 | 24 | 28 | 63 | 9 |

30. Compute unadjusted seasonal indices.

|  |  |
| --- | --- |
| a. | 0.12; 0.21; 0.40; 0.27 |
| b. | 0.13; 0.19; 0.35; 0.33 |
| c. | 0.51; 0.75; 1.41; 1.32 |
| d. | 0.67; 0.25; 1.35; 1.25 |

ANS: C PTS: 1 DIF: Medium

31. Forecast the number of repairs for Q2 in the year 2016 if the forecast for that year’s demand is 160 (with rounding to a whole number).

|  |  |
| --- | --- |
| a. | 26 |
| b. | 30 |
| c. | 57 |
| d. | 63 |

ANS: B PTS: 1 DIF: Medium

Miskatonic University requires all entering freshmen to take a math competency test. They are examining the relationship between the average SAT score of entering freshman with the percentage of freshmen who pass this math competency test. The results for the last three years and each of the three trimesters are provided below.

|  |  |  |  |
| --- | --- | --- | --- |
| **2013** | Fall | Spring | Summer |
| Math SAT Score | 550 | 520 | 620 |
| % Pass Math Competency | 68% | 71% | 82% |

|  |  |  |  |
| --- | --- | --- | --- |
| **2014** | Fall | Spring | Summer |
| Math SAT Score | 530 | 580 | 630 |
| % Pass Math Competency | 73% | 78% | 83% |

|  |  |  |  |
| --- | --- | --- | --- |
| **2015** | Fall | Spring | Summer |
| Math SAT Score | 500 | 600 | 630 |
| % Pass Math Competency | 72% | 84% | 81% |

32. What is the correct linear regression equation for this dataset?

|  |  |
| --- | --- |
| a. | % Pass = 0.2345 + 0.00023 × (SAT Score) |
| b. | % Pass = 0.1786 + 0.00263 × (SAT Score) |
| c. | % Pass = 0.2678 + 0.00329 × (SAT Score) |
| d. | % Pass = 0.1774 + 0.00103 × (SAT Score) |

ANS: D PTS: 1 DIF: Hard

33. If an SAT score was 575, what would be the expected percentage of entering freshmen who would pass the math competency test?

|  |  |
| --- | --- |
| a. | 72% |
| b. | 77% |
| c. | 81% |
| d. | 85% |

ANS: B PTS: 1 DIF: Medium

34. If an SAT score was 655, what would be the expected percentage of entering freshmen who would pass the math competency test?

|  |  |
| --- | --- |
| a. | 72% |
| b. | 77% |
| c. | 81% |
| d. | 85% |

ANS: D PTS: 1 DIF: Medium

35. The R squared value for this regression?

|  |  |
| --- | --- |
| a. | 0.636 |
| b. | 0.687 |
| c. | 0.733 |
| d. | 0.747 |

ANS: D PTS: 1 DIF: Hard

36. What is the correlation coefficient for this regression?

|  |  |
| --- | --- |
| a. | 0.561 |
| b. | 0.645 |
| c. | 0.747 |
| d. | 0.864 |

ANS: D PTS: 1 DIF: Hard

37. What is the standard error for this regression equation?

|  |  |
| --- | --- |
| a. | 0.001 |
| b. | 0.012 |
| c. | 0.032 |
| d. | 0.054 |

ANS: C PTS: 1 DIF: Hard

Vesper Auto Wash is reviewing its sales for the last 9 months. Executives at Vesper are in disagreement over the driving force behind sales of their basic carwash package. Some argue its the price of a carwash while others argue its the number of ads on the radio. The data for the monthly sales of basic carwashes, the corresponding price, and the number of monthly radio ads are presented below.

|  |  |  |
| --- | --- | --- |
| Sales | Price | Ads |
| 7,006 | 10.7 | 61 |
| 7,234 | 10.46 | 73 |
| 7,692 | 10.21 | 84 |
| 7,486 | 10.51 | 78 |
| 7,526 | 10.26 | 82 |
| 8,012 | 10.12 | 96 |
| 8,121 | 10.01 | 104 |
| 7,924 | 10.11 | 100 |
| 8,131 | 9.99 | 109 |

38. What would be the linear regression equation for examining the relationship among sales, price, and the number of radio waves?

|  |  |
| --- | --- |
| a. | Sales = 8,763.2 + 123.78 × Price + 20.23 × Ads |
| b. | Sales = 8,763.2 ?2- 123.78 × Price + 20.23 × Ads |
| c. | Sales = 9,406.6 ?2- 336.94 × Price + 19.82 × Ads |
| d. | Sales = 9,406.6 ?2- 19.82 × Price + 336.94 × Ads |

ANS: C PTS: 1 DIF: Hard

39. What would be the R squared of this equation

|  |  |
| --- | --- |
| a. | 0.786 |
| b. | 0.899 |
| c. | 0.967 |
| d. | 0.983 |

ANS: C PTS: 1 DIF: Hard

40. What would be the correlation coefficient of this equation?

|  |  |
| --- | --- |
| a. | 0.877 |
| b. | 0.903 |
| c. | 0.967 |
| d. | 0.983 |

ANS: D PTS: 1 DIF: Medium

41. What is the standard error of estimate for this equation?

|  |  |
| --- | --- |
| a. | 19.82 |
| b. | 83.97 |
| c. | 336.94 |
| d. | 9,406.62 |

ANS: B PTS: 1 DIF: Hard

42. Based on this regression equation, if they drop the price for the basic carwash by $0.20, what would be expected change in sales? (Round your answer up or down.)

|  |  |
| --- | --- |
| a. | 20 |
| b. | 67 |
| c. | 198 |
| d. | 337 |

ANS: B PTS: 1 DIF: Hard

43. Based on this regression equation, if they increased the number of ads for the basic carwash by 20, what would be expected change in sales? (Round your answer up or down.)

|  |  |
| --- | --- |
| a. | 198 |
| b. | 336 |
| c. | 396 |
| d. | 9,407 |

ANS: C PTS: 1 DIF: Hard

44. What would be the forecast for the number of basic carwashes if the price were $10.60 and there were 95 radio ads?

|  |  |
| --- | --- |
| a. | 6,754.2 |
| b. | 7,562.9 |
| c. | 7,717.6 |
| d. | 8,024.5 |

ANS: C PTS: 1 DIF: Hard

45. What would be the forecast for the number of basic carwashes if the price were $10.25 and there were 120 radio ads?

|  |  |
| --- | --- |
| a. | 8,128.9 |
| b. | 8,331.0 |
| c. | 8,453.2 |
| d. | 9,406.6 |

ANS: B PTS: 1 DIF: Hard

Best Bedding has brought in consultants to help them improve their monthly sales of beds. Two consultants have provided forecasting models F1 and F2, based upon the last 9 months of sales. The results of the two forecasts are given below.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Actual | 438 | 396 | 352 | 375 | 406 | 430 | 452 | 426 | 406 |
| F1 | 418 | 410 | 342 | 388 | 399 | 438 | 444 | 436 | 412 |
| F2 | 410 | 406 | 372 | 365 | 412 | 420 | 456 | 420 | 400 |

46. What would be the mean absolute deviation for forecast model one (F1)?

|  |  |
| --- | --- |
| a. | 10.23 |
| b. | 10.67 |
| c. | 11.11 |
| d. | 12.01 |

ANS: B PTS: 1 DIF: Medium

47. What would be the mean absolute deviation for forecast model two (F2)?

|  |  |
| --- | --- |
| a. | 10.23 |
| b. | 10.67 |
| c. | 11.11 |
| d. | 12.01 |

ANS: C PTS: 1 DIF: Medium

48. What would be the mean squared error for model F1 and model F2?

|  |  |
| --- | --- |
| a. | 100.44; 191.22 |
| b. | 147.25; 201.00 |
| c. | 151.44; 215.32 |
| d. | 163.37; 215.32 |

ANS: B PTS: 1 DIF: Medium

49. What would be the mean absolute percentage error for forecast model one (F1)?

|  |  |
| --- | --- |
| a. | 1.65% |
| b. | 2.04% |
| c. | 2.62% |
| d. | 2.89% |

ANS: C PTS: 1 DIF: Medium

50. What would be the mean absolute percentage error for forecast model two (F2)?

|  |  |
| --- | --- |
| a. | 2.64% |
| b. | 2.76% |
| c. | 2.89% |
| d. | 3.02% |

ANS: B PTS: 1 DIF: Medium