1. Data on monthly demand for a product over 3 years(between 2013 and 2015) is given in the following table

|  |  |  |  |
| --- | --- | --- | --- |
| **Month** | **2013** | **2014** | **2015** |
| January | 15 | 23 | 25 |
| February | 16 | 22 | 25 |
| March | 18 | 28 | 35 |
| April | 18 | 27 | 36 |
| May | 23 | 31 | 36 |
| June | 23 | 28 | 30 |
| July | 20 | 22 | 30 |
| August | 28 | 28 | 34 |
| September | 29 | 32 | 38 |
| October | 33 | 37 | 47 |
| November | 33 | 34 | 41 |
| December | 38 | 44 | 53 |

* 1. Calculate the seasonality index using methods of averages
  2. De-seasonalize the data assuming that is product of trend and seasonality
  3. Develop the best forecasting model by comparing MAPE of MA, ES (exponential smoothing) and ARMA models. Compare the models using MAPE and Theil’s coefficient.

1. Television rating points of a television program over 30 episodes is shown in the following table:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Episode** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| **TRP** | 7.98 | 9.8 | 9.53 | 7.23 | 7.34 | 9.62 | 9.8 | 7.9 | 8.26 | 8.17 |
| **Episode** | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| **TRP** | 8.36 | 8.5 | 9.03 | 9.82 | 9.77 | 10.77 | 9.46 | 9.31 | 10.32 | 9.03 |
| **Episode** | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| **TRP** | 10.22 | 10.28 | 11.99 | 11.21 | 9.81 | 9.35 | 9.93 | 11.22 | 10.4 | 10.94 |

* 1. Develop a forecasting model using regression , where is the TRP at time t. Is there any trend in the data? Use the regression model developed to answer?
  2. Is there an auto-correlation in the data? Conduct an appropriate hypothesis test to justify your answer.
  3. The television channel would like to replace the program with a new program, the average TRP of new program will be 8 points. Based on the model developed, comment whether they should replace the program with a new program.
  4. Calculate the probability that the TRP for episode 31 will be more than 10.