1. A milk company has four machines that fill jugs with milk. The quality control manager is interested in determining whether the average fill for these machines is the same. The following data represent random samples of fill measures (in quarts) for 19 jugs of milk filled by the different machines. Use 1 percent level of significance to test the hypothesis. Discuss the business implication of your findings.

|  |  |  |  |
| --- | --- | --- | --- |
| Machine 1 | Machine 2 | Machine 3 | Machine 4 |
| 4.05 | 3.99 | 3.97 | 4.00 |
| 4.01 | 4.02 | 3.98 | 4.02 |
| 4.02 | 4.01 | 3.97 | 3.99 |
| 4.04 | 3.99 | 3.95 | 4.01 |
|  | 4.00 | 4.00 |  |
|  | 4.00 |  |  |

**The form of Data that required in SPSS Spreadsheet to run ANOVA**

|  |  |
| --- | --- |
| Milk level (In Quarts) | Type of Machine |
| 4.05 | 1 |
| 4.01 | 1 |
| 4.02 | 1 |
| 4.04 | 1 |
| 3.99 | 2 |
| 4.02 | 2 |
| 4.01 | 2 |
| 3.99 | 2 |
| 4.00 | 2 |
| 4.00 | 2 |
| 3.97 | 3 |
| 3.98 | 3 |
| 3.97 | 3 |
| 3.95 | 3 |
| 4.00 | 3 |
| 4.00 | 4 |
| 4.02 | 4 |
| 3.99 | 4 |
| 4.01 | 4 |

1. Family transportation costs are usually higher than most people believe because those costs include car payments, insurance, fuel costs, repairs, parking, and public transportation. Twenty randomly selected families in four major cities are asked to use their records to estimate a monthly figure for transportation cost. Use the data obtained and ANOVA to test whether there is a significant difference in monthly transportation costs for families living in these cities. Use 5 percent level of significance. Discuss the business implication of your findings.

|  |  |  |  |
| --- | --- | --- | --- |
| Atlanta | New York | Los Angeles | Chicago |
| 850 | 450 | 1050 | 740 |
| 680 | 725 | 900 | 650 |
| 750 | 500 | 1150 | 875 |
| 800 | 375 | 980 | 750 |
| 875 | 700 | 800 | 800 |

**The form of Data that required in SPSS Spreadsheet to run ANOVA**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Transportation cost** | **City** |  | **City** | **code** |
| 850 | 1 |  | Atlanta | 1 |
| 680 | 1 |  | New York | 2 |
| 750 | 1 |  | Los Angeles | 3 |
| 800 | 1 |  | Chicago | 4 |
| 875 | 1 |
| 450 | 2 |
| 725 | 2 |
| 500 | 2 |
| 375 | 2 |
| 700 | 2 |
| 1050 | 3 |
| 900 | 3 |
| 1150 | 3 |
| 980 | 3 |
| 800 | 3 |
| 740 | 4 |
| 650 | 4 |
| 875 | 4 |
| 750 | 4 |
| 800 | 4 |

1. A management consulting company presents a three-day seminar on project management to various clients. The seminar is basically the same each time it is given. However, sometimes it is presented to high-level manager, sometimes to midlevel managers, and sometimes to low-level managers. The seminar facilitators believe evaluations of the seminar may vary with the audience. Suppose the following data are some randomly selected evaluation scores from different levels of managers who attended the seminar. The ratings are on a scale from 1 to 10, with 10 being the highest. Use a one –way ANOVA to determine whether there is a significant difference in the evaluation according to manager level. Use 5% level of significance. Discuss the business implications of your findings.

|  |  |  |
| --- | --- | --- |
| High-level | Midlevel | Low level |
| 7 | 8 | 5 |
| 7 | 9 | 6 |
| 8 | 8 | 5 |
| 7 | 10 | 7 |
| 9 | 9 | 4 |
|  | 10 | 8 |
|  | 8 |  |

1. In recent years, the debate over The U.S. economy has been constant. The electorate seems somewhat divided as to whether the economy is in a recovery or not. Suppose a survey was undertaken to ascertain whether the perception of economic recovery differs according to political affiliation. People were selected for the survey from the Democratic Party, the Republican Party, and those classifying themselves as independents. A 25-point scale was developed in which respondents gave a score of 25 if they felt the economy was definitely in complete recovery. A 0 if the economy was definitely not in a recovery, and some value in between for more uncertain responses. To control for differences in socioeconomic class, a blocking variable was maintained using five different socioeconomic categories. The data given here in the form of a randomized block design. Sue 1 percent level of significance to determine there is a significant difference in mean responses according to political affiliation.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Political affiliation** | | |
| **Socioeconomic class** | Democrat | Republican | Independent |
| Upper | 11 | 5 | 8 |
| Upper middle | 15 | 9 | 8 |
| Middle | 19 | 14 | 15 |
| Lower middle | 16 | 12 | 10 |
| Lower | 9 | 8 | 7 |

**The form of Data that required in SPSS Spreadsheet to run ANOVA**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Public opinion in 1 to 25 scale | Socioeconomic Class | Political Affiliation |  | **Socioeconomic class** | **Code** | **Political affiliation** | **Code** |
| 11 | 1 | 1 |  | Upper | 1 | Democrat | 1 |
| 15 | 2 | 1 |  | Upper middle | 2 | Republican | 2 |
| 19 | 3 | 1 |  | Middle | 3 | Independent | 3 |
| 16 | 4 | 1 |  | Lower middle | 4 |  |  |
| 9 | 5 | 1 |  | Lower | 5 |  |  |
| 5 | 1 | 2 |
| 9 | 2 | 2 |
| 14 | 3 | 2 |
| 12 | 4 | 2 |
| 8 | 5 | 2 |
| 8 | 1 | 3 |
| 8 | 2 | 3 |
| 15 | 3 | 3 |
| 10 | 4 | 3 |
| 7 | 5 | 3 |

1. A shoe retailer conducted a study to determine there is a difference in the number of pairs of shoes sold per day by stores according to the number of competitors within a 1-mile radius and the location of the store. The company researcher selected three types of store for consideration in the study: stand-alone suburban stores, mall stores, and downtown stores. These stores vary in the number of competing stores within a 1-mile radius, which have been reduced to four categories: 0 competitor, 2 competitors, and 3 or more competitors. Suppose the following data represents the number of pairs of shoes sold per day for each of these types of stores with the given number of competitors. Use 5 percent level of significance and a two-way ANOVA to analyze the data.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | **Number of competitors** | | | |
|  |  | 0 | 1 | 2 | 3 or more |
| **Store location** | Stand-alone | 41 | 38 | 59 | 47 |
|  | 30 | 31 | 48 | 40 |
|  | 45 | 39 | 51 | 39 |
| Mall | 25 | 29 | 44 | 43 |
|  | 31 | 35 | 48 | 42 |
|  | 22 | 30 | 50 | 53 |
| Downtown | 18 | 22 | 29 | 24 |
|  | 29 | 17 | 28 | 27 |
|  | 33 | 25 | 26 | 32 |

**The form of Data that required in SPSS Spreadsheet to run ANOVA**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Sales of Shoes | Locations | Number of Competitors |  | location | Code | Number of Competitors | Code |
| 41 | 1 | 1 |  | Stand-alone | 1 | 0 | 1 |
| 30 | 1 | 1 |  | Mall | 2 | 1 | 2 |
| 45 | 1 | 1 |  | Downtown | 3 | 2 | 3 |
| 25 | 2 | 1 |  |  |  | 3 or More | 4 |
| 31 | 2 | 1 |
| 22 | 2 | 1 |
| 18 | 3 | 1 |
| 29 | 3 | 1 |
| 33 | 3 | 1 |
| 38 | 1 | 2 |
| 31 | 1 | 2 |
| 39 | 1 | 2 |
| 29 | 2 | 2 |
| 35 | 2 | 2 |
| 30 | 2 | 2 |
| 22 | 3 | 2 |
| 17 | 3 | 2 |
| 25 | 3 | 2 |
| 59 | 1 | 3 |
| 48 | 1 | 3 |
| 51 | 1 | 3 |
| 44 | 2 | 3 |
| 48 | 2 | 3 |
| 50 | 2 | 3 |
| 29 | 3 | 3 |
| 28 | 3 | 3 |
| 26 | 3 | 3 |
| 47 | 1 | 4 |
| 40 | 1 | 4 |
| 39 | 1 | 4 |
| 43 | 2 | 4 |
| 42 | 2 | 4 |
| 53 | 2 | 4 |
| 24 | 3 | 4 |
| 27 | 3 | 4 |
| 32 | 3 | 4 |

Sales

Location

Competitors