**Solutions to**

**Case Problems**

**Chapter 2**

**Descriptive Statistics: Tabular and Graphical Displays**

**Case Problem 1: Pelican Stores**

1. There were 70 Promotional customers and 30 Regular customers. Because there are 100 observations in the sample, the frequency and percent frequency distribution are the same. Percent frequency distributions for many of the variables are given.

|  |  |
| --- | --- |
| No. of Items | Percent Frequency |
| 1 | 29 |
| 2 | 27 |
| 3 | 10 |
| 4 | 10 |
| 5 | 9 |
| 6 | 7 |
| 7 or more | 8 |
| Total: | 100 |

|  |  |
| --- | --- |
| Net Sales | Percent Frequency |
| 0.00 - 24.99 | 9 |
| 25.00 - 49.99 | 30 |
| 50.00 - 74.99 | 25 |
| 75.00 - 99.99 | 10 |
| 100.00 - 124.99 | 12 |
| 125.00 - 149.99 | 4 |
| 150.00 - 174.99 | 3 |
| 175.00 - 199.99 | 3 |
| 200 or more | 4 |
| Total: | 100 |

|  |  |
| --- | --- |
| Method of Payment | Percent Frequency |
| American Express | 2 |
| Discover | 4 |
| MasterCard | 14 |
| Proprietary Card | 70 |
| Visa | 10 |
| Total: | 100 |

|  |  |
| --- | --- |
| Gender | Percent Frequency |
| Female | 93 |
| Male | 7 |
| Total: | 100 |

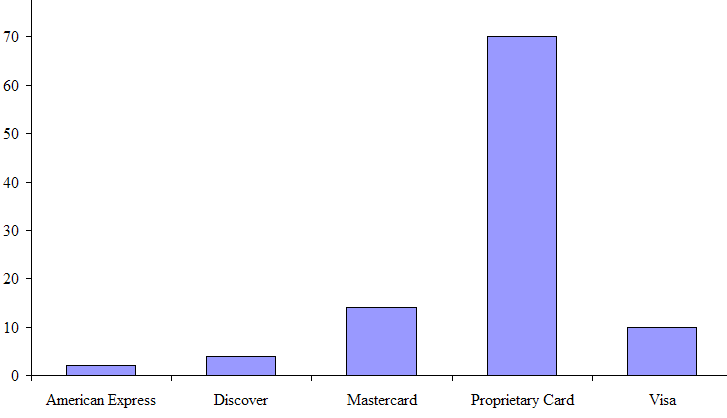
|  |  |
| --- | --- |
| Marital Status | Percent Frequency |
| Married | 84 |
| Single | 16 |
| Total: | 100 |

|  |  |
| --- | --- |
| Age | Percent Frequency |
| 20 - 29 | 10 |
| 30 - 39 | 30 |
| 40 - 49 | 33 |
| 50 - 59 | 16 |
| 60 - 69 | 7 |
| 70 - 79 | 4 |
| Total: | 100 |

These percent frequency distributions provide a profile of Pelican's customers. Many observations are possible, including:

* A large majority of the customers use National Clothing’s proprietary credit card.
* Over half of the customers purchase 1 or 2 items, but a few make numerous purchases.
* The percent frequency distribution of net sales shows that 61% of the customers spent $50 or more.
* Customers are distributed across all adult age groups.
* The overwhelming majority of customers are female.
* Most of the customers are married.

2.



3. A crosstabulation of type of customer versus net sales is shown.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Net Sales | | | | | | | | | | |  |
| Customer | 0-  25 | 25-  50 | 50-  75 | 75-  100 | 100-  125 | 125-  175 | 175-  200 | 200-  225 | 225-  250 | 250-  275 | 275-  300 | Total |
| Promotional | 7 | 17 | 17 | 8 | 9 | 3 | 2 | 3 | 1 | 2 | 1 | 70 |
| Regular | 2 | 13 | 8 | 2 | 3 | 1 | 1 |  |  |  |  | 30 |
| Total | 9 | 30 | 25 | 10 | 12 | 4 | 3 | 3 | 1 | 2 | 1 | 100 |

From the crosstabulation it appears that net sales are larger for promotional customers.

4. A scatter diagram of net Sales vs. age is shown below. A trendline has been fitted to the data. From this, it appears that there is no relationship between net sales and age.

Age is not a factor in determining net sales.

**Case Problem 2: The Motion Picture Industry**

This case provides the student with the opportunity to use tabular and graphical presentations to analyze data from the motion picture industry. Developing and interpreting frequency distributions, percent frequency distributions and scatter diagrams are emphasized. The interpretations and insights can be quite varied. We illustrate some below.

**Frequency Distribution and Percent Frequency Distribution**

The choice of the classes for frequency distributions or percent frequency distributions can be expected to vary. The frequency distributions we developed are as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| **Opening Gross Sales**  **(Millions)** | | | **Frequency**  **(or Percentage)** |
| $0 | – | 9.99 | 70 |
| 10 | – | 19.99 | 15 |
| 20 | – | 29.99 | 8 |
| 30 | – | 39.99 | 2 |
| 40 | – | 49.99 | 1 |
| 50 | – | 59.99 | 1 |
| 60 | – | 69.99 | 0 |
| 70 | – | 79.99 | 1 |
| 80 | – | 89.99 | 0 |
| 90 | – | 99.99 | 0 |
| 100 | – | 109.99 | 2 |
| Total | | | 100 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Total Gross Sales**  **(Millions)** | | | **Frequency**  **(or Percentage)** |
| $0 | – | 49.99 | 77 |
| 50 | – | 99.99 | 16 |
| 100 | – | 149.99 | 1 |
| 150 | – | 199.99 | 1 |
| 200 | – | 249.99 | 3 |
| 250 | – | 299.99 | 1 |
| 300 | – | 349.99 | 0 |
| 350 | – | 399.99 | 1 |
| Total | | | 100 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Number**  **of Theaters** | | | **Frequency**  **(or Percentage)** |
| 0 | – | 499 | 51 |
| 500 | – | 999 | 3 |
| 1000 | – | 1499 | 6 |
| 1500 | – | 1999 | 7 |
| 2000 | – | 2499 | 5 |
| 2500 | – | 2999 | 6 |
| 3000 | – | 3499 | 17 |
| 3500 | – | 3999 | 5 |
| Total | | | 100 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Number of Weeks**  **in Top 60** | | | **Frequency**  **(or Percentage)** |
| 0 | – | 4 | 33 |
| 5 | – | 9 | 28 |
| 10 | – | 14 | 18 |
| 15 | – | 19 | 15 |
| 20 | – | 24 | 5 |
| 25 | – | 29 | 1 |
| Total | | | 100 |

**Histograms**

The following histograms are based on the frequency distributions shown above.

**Interpretation**

**Opening Weekend Gross Sales.** The distribution is skewed to the right. Numerous motion pictures have somewhat low opening weekend gross sales, while a relatively few (7%) have an opening weekend gross sales of $30 million or more. Only 2% had opening weekend gross sales of $100 million or more. 70% of the motion pictures had opening weekend gross sales less than $10 million and 85% of the motion pictures had opening weekend gross sales less than $20 million. Unless there is something unusually attractive about the motion picture, an opening weekend gross sales less than $10 million appears typical.

**Total Gross Sales.** This distribution is also skewed to the right. Again, the majority of the motion pictures have relatively low total gross sales with 77% less than $50 million and 93% less than $100 million. Highly successful blockbuster motion pictures are rare. Total gross sales over $200 million occurred only 5% of the time and over $300 million occurred only 1% of the time. No motion picture reported $400 million in total gross sales. Unless there is something unusually attractive about the motion picture, a total gross sales less than $50 million appears typical.

**Number of Theaters.** This distribution is skewed to the right, but not so much as sales data distributions. The number of theaters range from less than 500 to almost 4000. 51% of the motion pictures had the smaller market exposure with the number of theaters less than 500. Interestingly enough, 22% of the motion pictures had the widest market exposure, appearing in over 3000 theaters. 3000 to 4000 theaters is typical for a highly promoted motion picture.

**Number of Weeks in Top 60.** This distribution is skewed to the right, but not as much as the other distributions. It appears that almost all newly released movies initially make it into the top 60, with 67% staying in the top 60 for 5 or more weeks. Even motion pictures with relative low gross sales can appear in the top 60 motion pictures for a month or more. Almost 40% of the motion pictures are in the top 60 for 10 or more weeks, with 6% of the motion pictures in the top 60 for 20 or more weeks.

**General Observations**. The data show that there are relative few high-end, highly successful motion pictures. The financial rewards are there for the pictures that make the blockbuster level. But the majority of motion pictures will have low opening weekend gross sales and low total gross sales. Motion pictures being shown in less than 1500 theaters and motion pictures less than 10 weeks in the top 60 are common.

**Scatter Diagrams**

Three scatter diagrams are suggested to show how Total Gross Sales is related to each of the other three variables.





**Interpretation**

**Opening Weekend Gross Sales.** The scatter plot of total gross sales and opening weekend gross sales shows a strong positive relationship. Motion pictures with the highest total gross sales were the motion pictures with the highest opening weekend gross sales. How the motion picture does during its opening weekend should be a very good predictor of how the motion picture will do in terms of total gross sales. Note in the scatter diagram that the majority of the motion pictures show a low opening weekend gross sales and a low total gross sales.

**Number of Theaters.** The scatter plot of the total gross sales and number of theaters also shows a positive relationship. For motion pictures playing in less than 3000 theaters, the total gross sales has a positive relationship with the number of theaters. If the motion picture is shown in more theaters, higher total gross sales are anticipated. For motion pictures playing in more than 3000 theaters, the relationship is not as strong. 3000 to 4000 represents the maximum number of theaters possible. If a motion picture is shown in this many theaters, 15 motion pictures did slightly better in terms of total gross sales. However, the blockbuster motion pictures in this category showed extremely high total gross sales for the number of theaters where the motion picture was shown.

**Number of Weeks in Top 60.** The scatter plot of the total gross sales and number of weeks in the top 60 shows a positive relationship, but this relationship appears to be the weakest of the three relationships studied. Generally, the more successful, higher gross sales motion pictures are in the top 60 for more weeks. However, this is not always the case. Four of the six motion pictures with the highest total gross sales appeared in the top 60 less than 20 weeks. At the same time, four motion pictures with 20 or more weeks in the top 60 did not have unusually high total gross sales. This suggests that in some cases blockbuster movies with high gross sales may run their course quickly and not have an excessively long run on the top 60 motion picture list. At the same time, perhaps quality motion pictures with a limited audience may not generate the high total gross sales but may still show a run of 20 or more weeks on the top 60 motion picture list. The number of weeks in the top 60 does not appear to the best predictor of total gross sales.