

A sample case for a statistical analysis with a suggested solution

Case 1: Heavenly Chocolates Website Transactions

Heavenly Chocolates manufactures and sells quality chocolate products at its plant and retail store located in Saratoga Springs, New York. Two years ago the company developed a website and began selling its products over the internet. Website sales have exceeded the company's expectations, and management is now considering strategies to increase sales even further. To learn more about the website customers, a sample of 50 Heavenly Chocolate transactions was selected from the previous month's sales. Data showing the day of the week each transaction was made, the type of browser the customer used, the time spent on the website, the number of website pages viewed, and the amount spent by each of the 50 customers are obtained. Heavenly Chocolates would like to use the sample data to determine if online shoppers who spend more time and view more pages also spend more money during their visit to the website. The company would also like to investigate the effect that the day of the week and the type of browser have on sales.

Questions

1. Obtain Graphical and numerical summaries for the length of time the shopper spends on the website, the number of pages viewed, and the mean amount spent per transaction. Discuss what you learn about Heavenly Chocolates' online shoppers from these numerical summaries.
2. Summarize the frequency, the total dollars spent, and the mean amount spent per transaction for each day of week. What observations can you make about Heavenly Chocolates' business based on the day of the week'? Discuss.
3. Summarize the frequency, the total dollars spent, and the mean amount spent per transaction for each type of browser. What observations can you make about Heavenly Chocolate's business based on the type of browser'? Discuss.
4. Use appropriate graphical methods to explore the relationship between the time spent on the website and the dollar amount spent, between the number of website pages viewed and the amount spent, and between the time spent on the website and the number of pages viewed. Discuss.

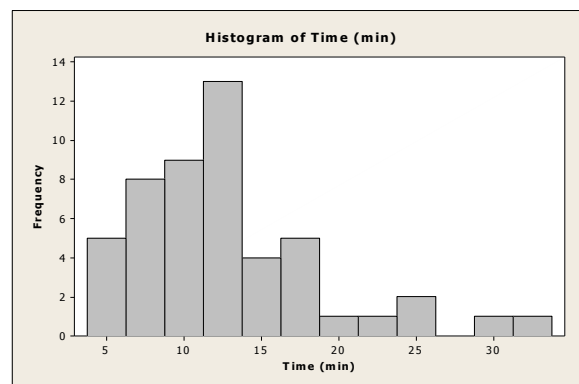
Suggested solution

Case 1: Heavenly Chocolates Website Traffic

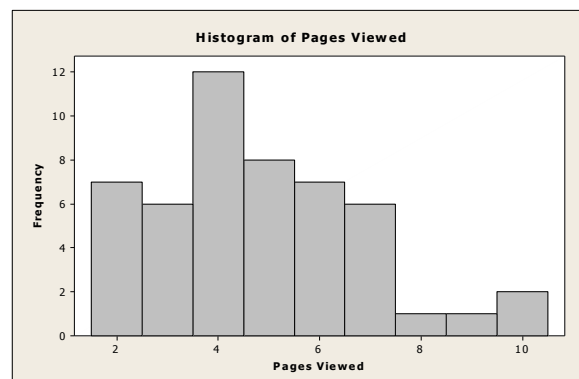
1. Descriptive statistics for the time spent on the website, number of pages viewed, and amount spent are shown below.

	Time (min)	Pages Viewed	Amount Spent (\$)
Mean	12.8	4.8	68.13
Median	11.4	4.5	62.15
Standard Deviation	6.06	2.04	32.34
Skewness	1.45	.65	1.05
Range	28.6	8	140.67
Minimum	4.3	2	17.84
Maximum	32.9	10	158.51
Sum	640.5	241	3406.41

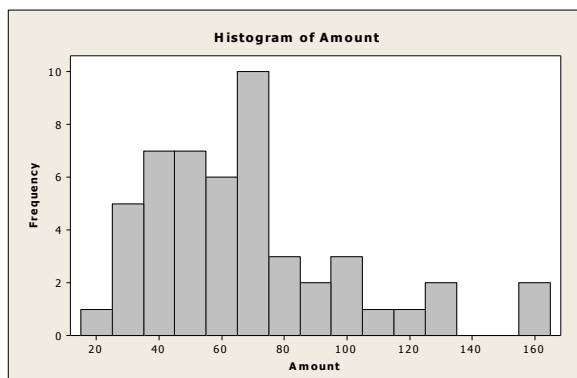
The mean time a shopper is on the Heavenly Chocolates website is 12.8 minutes, with a minimum time of 4.3 minutes and a maximum time of 32.9 minutes. The fact that the mean time on the website (12.8 minutes) is greater than the median time (11.4 minutes) and the value of skewness is 1.45 indicates that the time on the website is skewed to the right. The following histogram provides further evidence of the skewness in the data.



The mean number of pages viewed during a visit is 4.8 pages with a minimum of 2 pages and a maximum of 10 pages. The fact that the mean number of pages viewed (4.8) is greater than the median (4.5) and the value of skewness is .65 indicates the number of pages viewed is slightly skewed to the right. A histogram of the number of pages viewed provides additional evidence that the data are slightly skewed to the right.



The mean amount spent for an on-line shopper is \$68.13 with a minimum amount spent of \$17.84 and a maximum amount spent of \$158.51. The fact that the median amount spent (\$68.13) is greater than the median amount spent (\$62.15) and the value of skewness is 1.05 indicates that the amount spent is skewed to the right. The following histogram provides further evidence of the skewness in the data.



2. Summary by Day of Week

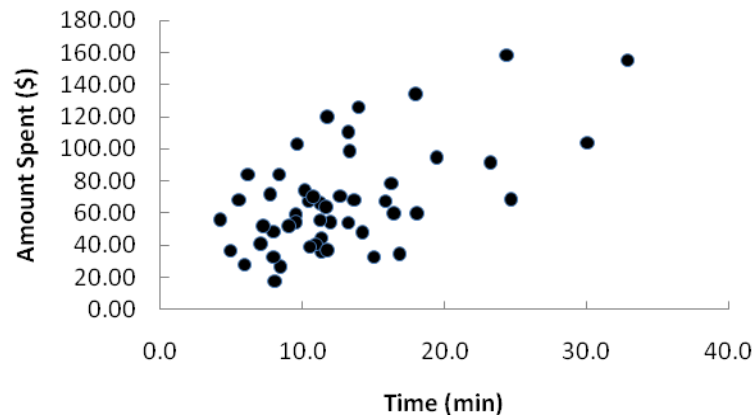
Day of Week	Frequency	Total Amount	Average Amount
Sunday	5	218.15	43.63
Monday	9	813.38	90.38
Tuesday	7	414.86	59.27
Wednesday	6	341.82	56.97
Thursday	5	294.03	58.81
Friday	11	945.43	85.95
Saturday	7	378.74	54.11
Total	50	3406.41	68.13

The above summary shows that Monday and Friday are the best days in terms of both the total amount spent and the average amount spent per transaction. Friday had the most purchases (11) and the highest value for total amount spent (\$945.43). Monday, with nine transactions, had the highest average amount spent per transaction (\$90.38). Sunday was the worst sales day of the week in terms of number of transactions (5), total amount spent (\$218.15), and average amount spent per transaction (\$43.63). However, the sample size for each day of the week are very small, with only Friday having more than ten transactions. We would suggest a larger sample size be taken before recommending any specific strategy based on the day of week statistics.

3. Summary by Type of Browser

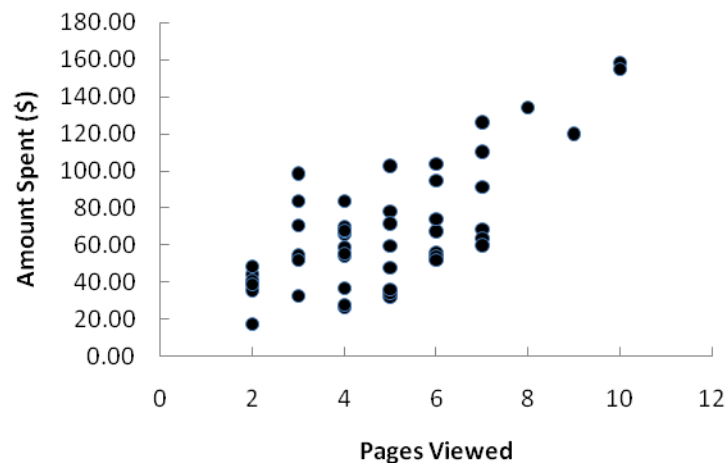
Browser	Frequency	Total Amount	Average Amount
Firefox	16	1228.21	76.76
Internet Explorer	27	1656.81	61.36
Other	7	521.39	74.48

Internet Explorer was used by 27 of the 50 shoppers (54%). But, the average amount spent by customers who used Internet Explorer (\$61.36) is less than the average amount spent by customers who used Firefox (\$76.76) or some other type of browser (\$74.48). This result would suggest targeting special promotion offers to Firefox users or users of other types of browsers. But, before recommending any specific strategies based upon the type of browser, we would suggest taking a larger sample size.



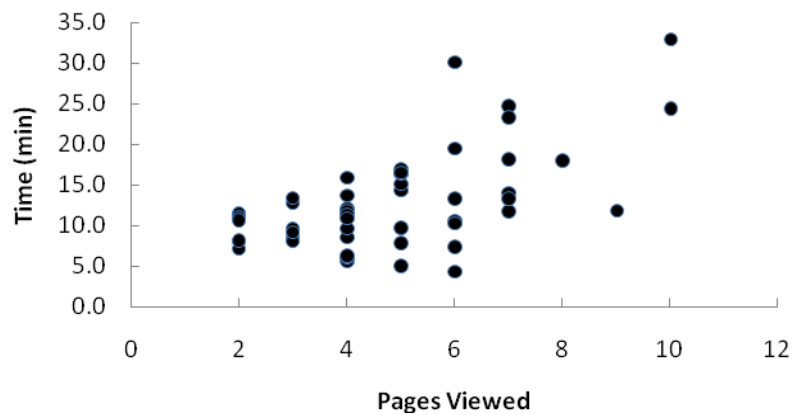
4. A scatter diagram showing the relationship between time spent on the website and the amount spent follows: The sample correlation coefficient between these two variables is .580. The scatter diagram and the sample correlation coefficient indicate a positive relationship between time spent on the website and the total amount spent. Thus, the sample data support the conclusion that customers who spend more time on the website spend more.

A scatter diagram showing the relationship between the number of pages viewed and the amount spent follows:



The sample correlation coefficient between these two variables is .724. The scatter diagram and the sample correlation coefficient indicate a positive relationship between time spent on the website and the number of pages viewed. Thus, the sample data support the conclusion that customers who view more website pages spend more.

A scatter diagram showing the relationship between the number of pages viewed and the time spent on the website follows:



The sample correlation coefficient between these two variables is .596. The scatter diagram and the sample correlation coefficient indicate a positive relationship between the number of pages viewed and the time spent on the website.

Summary:

The analysis indicates that on-line shoppers who spend more time on the company's website and/or view more website pages spend more money during their visit to the website. If Heavenly Chocolates can develop an attractive website such that on-line shoppers are willing to spend more time on the website and/or view more pages, there is a good possibility that the company will experience greater sales. And, consideration should also be given to developing marketing strategies based upon possible differences in sales associated with the day of the week as well as differences in sales associated with the type of browser used by the customer.