Business Statistics First Course 8th edition Levine Solutions Manual

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INSTRUCTOR'S SOLUTIONS MANUAL

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BUSINESS STATISTICS: A FIRST COURSE

EIGHTH EDITION

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Pearson

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Teaching Tips

Our Starting Point

Over a generation ago, advances in "data processing" led to new business opportunities as first centralized and then desktop computing proliferated. The Information Age was born. Computer science became much more than just an adjunct to a mathematics curriculum, and whole new fields of studies, such as computer information systems, emerged.

More recently, further advances in information technologies have combined with data analysis techniques to create new opportunities in what is more data *science* than data *processing* or *computer* science. The world of business statistics has grown larger, bumping into other disciplines. And, in a reprise of something that occurred a generation ago, new fields of study, this time with names such as informatics, data analytics, and decision science, have emerged.

This time of change makes what is taught in business statistics and how it is taught all the more critical. These new fields of study all share statistics as a foundation for further learning. We are accustomed to thinking about change, as seeking ways to continuously improve the teaching of business statistics have always guided our efforts. We actively participate in Decision Sciences Institute (DSI), American Statistical Association (ASA), and Making Statistics More Effective in Schools and Business (MSMESB) conferences. We use the ASA's Guidelines for Assessment and Instruction (GAISE) reports and combine them with our experiences teaching business statistics to a diverse student body at several large universities.

What to teach and how to teach it are particularly significant questions to ask during a time of change. As an author team, we bring a unique collection of experiences that we believe helps us find the proper perspective in balancing the old and the new. Our lead author, David M. Levine, was the first educator, along with Mark L. Berenson, to create a business statistics textbook that discussed using statistical software and incorporated "computer output" as illustrations—just the first of many teaching and curricular innovations in his many years of teaching business statistics. Kathryn A. Szabat has provided statistical advice to various business and non-business communities. Her background in statistics and operations research and her experiences interacting with professionals in practice have guided her, as departmental chair, in developing a new, interdisciplinary academic department, Business Systems and Analytics, in response to the technology- and data-driven changes in business today. David F. Stephan, developed courses and teaching methods in computer information systems and digital media during the information revolution, creating, and then teaching in, one of the first personal computer *classrooms* in a large school of business along the way. Early in his career, he introduced spreadsheet

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CHAPTER 1

1.1 The type of beverage sold yields categorical or "qualitative" responses.

1.2 Business size represents a categorical variable because each size represents a particular category.

1.3 The time it takes to download a video from the Internet is a continuous numerical or "quantitative" variable because time can have any value from 0 to any reasonable unit of time

1.4
(a) The number of cellphones is a numerical variable that is discrete because the outcome is a count.
(b) Monthly data usage is a numerical variable that is continuous because any value within a range of values can occur.
(c) Number of text messages exchanged per month is a numerical variable that is discrete because the outcome is a count.
(d) Voice usage per month is a numerical variable that is continuous because any value within a range of values can occur.
(e) Whether a cellphone is used for streaming video is a categorical variable because the answer can be only yes or no.

1.5
(a) numerical, continuous
(b) numerical, discrete
(c) categorical
(d) categorical

1.6
(a) Categorical
(b) Numerical, continuous
(c) Categorical
(d) Numerical, discrete
(e) Categorical

1.7
(a) numerical, continuous *
(b) categorical
(c) categorical
(d) numerical, discrete
*Some researchers consider money as a discrete numerical variable because it can be "counted."

1.8
(a) numerical, continuous *
(b) numerical, discrete
(c) numerical, continuous *
(d) categorical
*Some researchers consider money as a discrete numerical variable because it can be "counted."

1.9
(a) Income may be considered discrete if we "count" our money. It may be considered continuous if we "measure" our money; we are only limited by the way a country's monetary system treats its currency.
(b) The first format would provide more information because it includes a ratio scale value while the second measure would only include a range of values for each choice category.

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1.10 The underlying variable, ability of the students, may be continuous, but the measuring device, the test, does not have enough precision to distinguish between the two students.

1.11 (a) The population is "all working women from the metropolitan area." A systematic or random sample could be taken of women from the metropolitan area. The director might wish to collect both numerical and categorical data.
(b) Three categorical questions might be occupation, marital status, type of clothing. Numerical questions might be age, average monthly hours shopping for clothing, income.

1.12 (a) Data distributed by an organization or individual.
(b) The American Community Survey is based on a sample.

1.13 The answer depends on the specific story.

1.14 The answer depends on the specific story.

1.15 The transportation engineers and planners should use primary data collected through an observational study of the driving characteristics of drivers over the course of a month.

1.16 The information presented there is based mainly on a mixture of data distributed by an organization and data collected by ongoing business activities.

1.17 (a) 001
(b) 040
(c) 902

1.18 Sample without replacement: Read from left to right in 3-digit sequences and continue unfinished sequences from end of row to beginning of next row.

Row 05: 338 505 855 551 438 855 077 186 579 488 767 833 170
Rows 05-06: 897
Row 06: 340 033 648 847 204 334 639 193 639 411 095 924
Rows 06-07: 707
Row 07: 054 329 776 100 871 007 255 980 646 886 823 920 461
Row 08: 893 829 380 900 796 959 453 410 181 277 660 908 887
Rows 08-09: 237
Row 09: 818 721 426 714 050 785 223 801 670 353 362 449
Rows 09-10: 406
Note: All sequences above 902 and duplicates are discarded.

1.19 (a) Row 29: 12 47 83 76 22 99 65 93 10 65 83 61 36 98 89 58 86 92 71
Note: All sequences above 93 and all repeating sequences are discarded.
(b) Row 29: 12 47 83 76 22 99 65 93 10 65 83 61 36 98 89 58 86
Note: All sequences above 93 are discarded. Elements 65 and 83 are repeated.

1.20 A simple random sample would be less practical for personal interviews because of travel costs (unless interviewees are paid to attend a central interviewing location).

1.21 This is a probability sample because the selection is based on chance. It is not a simple random sample because A is more likely to be selected than B or C.

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1.22 Here all members of the population are equally likely to be selected and the sample selection mechanism is based on chance. But not every sample of size 2 has the same chance of being selected. For example the sample "B and C" is impossible.

1.23 (a) Since a complete roster of full-time students exists, a simple random sample of 200 students could be taken. If student satisfaction with the quality of campus life randomly fluctuates across the student body, a systematic 1-in-20 sample could also be taken from the population frame. If student satisfaction with the quality of life may differ by gender and by experience/class level, a stratified sample using eight strata, female freshmen through female seniors and male freshmen through male seniors, could be selected. If student satisfaction with the quality of life is thought to fluctuate as much within clusters as between them, a cluster sample could be taken.

(b) A simple random sample is one of the simplest to select. The population frame is the registrar's file of 4,000 student names.

(c) A systematic sample is easier to select by hand from the registrar's records than a simple random sample, since an initial person at random is selected and then every 20th person thereafter would be sampled. The systematic sample would have the additional benefit that the alphabetic distribution of sampled students' names would be more comparable to the alphabetic distribution of student names in the campus population.

(d) If rosters by gender and class designations are readily available, a stratified sample should be taken. Since student satisfaction with the quality of life may indeed differ by gender and class level, the use of a stratified sampling design will not only ensure all strata are represented in the sample, it will also generate a more representative sample and produce estimates of the population parameter that have greater precision.

(e) If all 4,000 full-time students reside in one of 10 on-campus residence halls which fully integrate students by gender and by class, a cluster sample should be taken. A cluster could be defined as an entire residence hall, and the students of a single randomly selected residence hall could be sampled. Since each dormitory has 400 students, a systematic sample of 200 students can then be selected from the chosen cluster of 400 students. Alternately, a cluster could be defined as a floor of one of the 10 dormitories. Suppose there are four floors in each dormitory with 100 students on each floor. Two floors could be randomly sampled to produce the required 200 student sample. Selection of an entire dormitory may make distribution and collection of the survey easier to accomplish. In contrast, if there is some variable other than gender or class that differs across dormitories, sampling by floor may produce a more representative sample.

1.24 (a)

Row 16: 2323 6737 5131 8888 1718 0654 6832 4647 6510 4877
Row 17: 4579 4269 2615 1308 2455 7830 5550 5852 5514 7182
Row 18: 0989 3205 0514 2256 8514 4642 7567 8896 2977 8822
Row 19: 5438 2745 9891 4991 4523 6847 9276 8646 1628 3554
Row 20: 9475 0899 2337 0892 0048 8033 6945 9826 9403 6858
Row 21: 7029 7341 3553 1403 3340 4205 0823 4144 1048 2949
Row 22: 8515 7479 5432 9792 6575 5760 0408 8112 2507 3742
Row 23: 1110 0023 4012 8607 4697 9664 4894 3928 7072 5815
Row 24: 3687 1507 7530 5925 7143 1738 1688 5625 8533 5041
Row 25: 2391 3483 5763 3081 6090 5169 0546

Note: All sequences above 5000 are discarded. There were no repeating sequences.

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1.24 cont. (b)

089	189	289	389	489	589	689	789	889	989
1089	1189	1289	1389	1489	1589	1689	1789	1889	1989
2089	2189	2289	2389	2489	2589	2689	2789	2889	2989
3089	3189	3289	3389	3489	3589	3689	3789	3889	3989
4089	4189	4289	4389	4489	4589	4689	4789	4889	4989

(c) With the single exception of invoice #0989, the invoices selected in the simple random sample are not the same as those selected in the systematic sample. It would be highly unlikely that a random process would select the same units as a systematic process.

1.25 (a) A stratified sample should be taken so that each of the three strata will be proportionately represented.

(b) The number of observations in each of the three strata out of the total of 1,000 should reflect the proportion of the three categories in the customer database. For example, 3,500/10,000 = 35% so 35% of 1,000 = 350 customers should be selected from the prospective buyers; similarly 4,500/10,000 = 45% so 450 customers should be selected from the first time buyers, and 2,000/10,000 = 20% so 200 customers from the repeat buyers.

(c) It is not simple random sampling because, unlike the simple random sampling, it ensures proportionate representation across the entire population.

1.26 (a) For the third value, Apple is spelled incorrectly. The twelfth value should be Blackberry not Blueberry. The fifteenth value, APPLE, may lead to an irregularity. The eighteenth value should be Samsung not Samsun.

(b) This list contains 19 names, where one would expect to find 20 names.

1.27 Only the second value, 2.7MB, contains units and the eighth value, 1,079, might be confused with 1, 79.

1.28 (a) The times for each of the hotels would be arranged in separate columns.

(b) The hotel names would be in one column and the times would be in a second column.

1.29 A recoded variable PriceLevel could be defined, assigning the value Budget for hotels with budget-priced rooms, Moderate for hotels with moderate-priced rooms, and Deluxe for hotels with deluxe-priced rooms.

1.30 Before accepting the results of a survey of college students, you might want to know, for example:

Who funded the survey? Why was it conducted? What was the population from which the sample was selected? What sampling design was used? What mode of response was used: a personal interview, a telephone interview, or a mail survey? Were interviewers trained? Were survey questions field-tested? What questions were asked? Were they clear, accurate, unbiased, valid? What operational definition of "vast majority" was used? What was the response rate? What was the sample size?

1.31 (a) Possible coverage error: Only employees in a specific division of the company were sampled.

(b) Possible nonresponse error: No attempt is made to contact nonrespondents to urge them to complete the evaluation of job satisfaction.

(c) Possible sampling error: The sample statistics obtained from the sample will not be equal to the parameters of interest in the population.

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1.31 cont. (d) Possible measurement error: Ambiguous wording in questions asked on the questionnaire.

1.32 Coverage error could result if bank executives are systematically excluded from the population thereby not allowing them to be part of any sample that is used to generate the results. This could lead to selection bias. Non-response error that results in non-response bias could result if not all bank executives who were selected for inclusion in the sample are contacted even after multiple attempts to do so. In this case, data that was desired and necessary for inclusion in the sample would then not be present. Sampling error reflects the variability in outcomes when taking different samples. Sampling error is unavoidable. One can obtain an impression of the size of the sampling error by creating interval estimates. Measurement error could arise if the bank executives self-report results or if the methods of reporting are not standardized, i.e. if questions are not asked in the same manner from respondent to respondent, or if those conducting the survey do not do so in a consistent manner.

1.33 We need the sample to be representative for the population, avoiding any coverage error that can cause selection bias. Assurance that all CEOs who have been selected as a part of the sample are contacted to provide the necessary information is necessary. This would minimize non-response bias. Sampling error reflects the variability in outcomes when taking different samples. Sampling error is unavoidable. One can obtain an impression of the size of the sampling error by creating interval estimates. Finally, the survey should be conducted in a systematic and consistent manner to minimize the possibility of measurement error.

1.34 Before accepting the results of the survey, you might want to know, for example:

Who funded the survey? Why was it conducted? What was the population from which the sample was selected? What sampling design was used? What mode of response was used: a personal interview, a telephone interview, or a mail survey? Were interviewers trained? Were survey questions field-tested? What questions were asked? Were they clear, accurate, unbiased, valid? What was the response rate? What was the margin of error? What was the sample size? What frame was used?

1.35 A population contains all the items of interest whereas a sample contains only a portion of the items in the population.

1.36 A statistic is a summary measure describing a sample whereas a parameter is a summary measure describing an entire population.

1.37 Categorical random variables yield categorical responses such as yes or no answers. Numerical random variables yield numerical responses such as your height in inches.

1.38 Discrete random variables produce numerical responses that arise from a counting process. Continuous random variables produce numerical responses that arise from a measuring process.

1.39 Both nominal scaled and ordinal scaled variables are categorical variables but no ranking is implied in nominal scaled variable such as male or female while ranking is implied in ordinal scaled variable such as a student's grade of A, B, C, D and F.

1.40 Both interval scaled and ratio scaled variables are numerical variables in which the difference between measurements is meaningful but an interval scaled variable does not involve a true zero such as standardized exam scores while a ratio scaled variable involves a true zero such as height.

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1.41 Items or individuals in a probability sampling are selected based on known probabilities while items or individuals in a nonprobability samplings are selected without knowing their probabilities of selection.

1.42 Missing values are values that were not collected for a variable. Outliers are values that seem excessively different from most of the other values

1.43 In unstacked arrangements, separate numerical variables are created for each group in the data. For example, you might create a variable for the weights of men and a second variable for the weights of women. In stacked arrangements, a single numerical variable is paired with a categorical variable that represents the categories. For example, all weights would be in one variable, with a categorical variable indicating male or female.

1.44 Coverage error is error generated due to an improperly or inappropriately framed population which can result in a sample that may not be representative of the population that one wishes to study. Non-response error is error generated due to members of a chosen sample not being contacted even after repeated attempts so that information that should be provided is missing.

1.45 Sampling error results from the variability of outcomes of different samples. This sample to sample variation is inevitably connected to the sampling process. Measurement error is error that results from either self-reported data or data that is collected in an inconsistent manner by those who are responsible for collecting and summarizing the desired information.

1.46 Microsoft Excel:
This product features a spreadsheet-based interface that allows users to organize, calculate, and organize data. Excel also contains many statistical functions to assist in the description of a dataset. Excel can be used to develop worksheets and workbooks to calculate a variety of statistics including introductory and advanced statistics. Excel also includes interactive tools to create graphs, charts, and pivot tables. Excel can be used to summarize data to better understand a population of interest, compare across groups, predict outcomes, and to develop forecasting models. These capabilities represent those that are generally relevant to the current course. Excel also includes many other statistical capabilities that can be further explored on the Microsoft Office Excel official website.

Minitab 18:
Minitab 18 has a comprehensive set of statistical methods including introductory and advanced statistical procedures. Minitab 18 features include basic descriptive statistical procedures, graph and chart creation, diagnostic tests, analysis of variance, regression, time series and forecasting analyses, nonparametric analyses, cross-tabulation, chi-square and related tests, and other statistical procedures. Minitab 18 utilizes a user friendly interface that allows one to quickly identify the appropriate procedure. The interface also allows one to easily export results including charts and graphs to facilitate the creation of presentations and reports. These Minitab 18 features would allow one to summarize data to better understand a population of interest, compare across groups, predict outcomes, and to develop forecasting models. These capabilities represent those that are generally relevant to the current course. Minitab 18 also includes many other statistical capabilities that can be further explored on the Minitab official website.

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1.46 cont. JMP:
JMP has a comprehensive set of statistical methods including introductory and advanced statistical procedures. JMP features include basic descriptive statistical procedures, graph and chart creation, diagnostic tests, analysis of variance, regression, time series and forecasting analyses, nonparametric analyses, cross-tabulation, chi-square and related tests, and other statistical procedures. JMP utilizes a user friendly interface that allows one to quickly identify the appropriate procedure. JMP also contains predictive analytic tools such as classification trees to classify data into groups. These JMP features would allow one to summarize data to better understand a population of interest, compare across groups, predict outcomes, and to develop forecasting models. These capabilities represent those that are generally relevant to the current course. JMP also includes many other statistical capabilities that can be further explored on the JMP official website.

1.47 (a) The population of interest include banking executives representing institutions of various sizes and U.S. geographic locations.
(b) The collected sample includes 163 banking executives from institutions of various sizes and U.S. geographic locations.
(c) A parameter of interest is the percentage of the population of banking executives that identify customer experience initiatives as an area where increased spending is expected.
(d) A statistic used to the estimate the parameter in (c) is the percentage of the 163 banking executives included in the sample who identify customer experience initiatives as an area where increased spending is expected. In this case, the statistic is 55%.

1.48 The answers are based on an article titled "U.S. Satisfaction Still Running at Improved Level" and written by Lydia Saad (August 15, 2018). The article is located on the following site:
https://news.gallup.com/poll/240911/satisfaction-running-improved-level.aspx?g_source=link_NEWSV9&g_medium=NEWSFEED&g_campaign=item_&g_content=U.S.%2520Satisfaction%2520Still%2520Running%2520at%2520Improved%2520Level

The population of interest includes all individuals aged 18 and older who live within the 50 U.S. states and the District of Columbia.
The collected sample includes a random sample of 1,024 individuals aged 18 and older who live within the 50 U.S. states and the District of Columbia.
A parameter of interest is the percentage of the population of individuals aged 18 and older and live within the 50 U.S. states and the District of Columbia who are satisfied with the direction of the U.S.
A statistic used to the estimate the parameter in (c) is the percentage of the 1,024 individuals included in the sample. In this case, the statistic is 36%.

1.49 The answers were based on information obtained from the following site:
https://www.pwc.com/gx/en/ceo-survey/2017/pwc-ceo-20th-survey-report-2017.pdf
(a) The population of interest included CEOs representing a mix of industries from 79 countries.
(b) The sample included 1,379 CEOs. The percentage of CEOs by continent were as follows: North America (11%), Western Europe (21%), Central and Eastern Europe (11%), Latin America (12%), Middle East and Africa (9%), and Asia Pacific (36%).
(c) A parameter of interest would be the percentage of CEOs among the population of interest that believe social media could have a negative impact on the level of stakeholder trust in their industry over the next few years.

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1.49 cont. (d) The statistic used to estimate the parameter in (c) is the percentage of CEOs among the 1,379 CEOs included in the sample who believe social media could have a negative impact on the level of stakeholder trust in their industry over the next few years. In this case, the statistic is 87%.

1.50 (a) One variable collected with the American Community Survey is marital status with the following possible responses: now married, widowed, divorced, separated, and never married.

(b) The variable in (a) represents a categorical variable.

(c) Because the variable in (a) is a categorical, this question is not applicable. If one had chosen age in years from the American Community Survey as the variable, the answer to (c) would be discrete.

1.51 Answers will vary depending on the specific sample survey used. The below answers were based on the sample survey located at: http://www.zarca.com/Online-Surveys-Non-Profit/association-salary-survey.html

(a) An example of a categorical variable included in the survey would be whether one had obtained an undergraduate degree with yes or no as possible answers.

(b) An example of a numerical variable included in the survey would be the respondent's annual base salary for the past year.

1.52 (a) The population of interest consisted of 10,000 benefited employees of the University of Utah.

(b) The sample consisted of 3,095 employees of the University of Utah.

(c) Gender, marital status, and employment category represent categorical variables. Age in years, education level in years completed, and household income represent numerical variables.

1.53 (a) Key social media platforms used represents a categorical variable. The frequency of social media usage represents a discrete numerical variable. Demographics of key social media platform users represent categorical variables.

(b) 1. Which of the following is your preferred social media platform: YouTube, Facebook, or Twitter?
2. What time of the day do you spend the most amount of time using social media: morning, afternoon, or evening?
3. Please indicate your ethnicity?
4. Which of the following do you most often use to access social media: mobile device, laptop computer, desktop computer, other device?
5. Please indicate whether you are a home owner: Yes or No?

(c) 1. For the past week, how many hours did you spend using social media?
2. Please indicate your current age in years.
3. What was your annual income this past year?
4. Currently, how many friends have you accepted on Facebook?
5. Currently, how many twitter followers do you have?

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Chapter 2 Solutions

2.1 (a)

Category	Frequency	Percentage
A	13	26%
B	28	56%
C	9	18%

(b) Category "B" is the majority.

2.2 (a) Table frequencies for all student responses

	Student Major Categories			
Gender	A	C	M	Totals
Male	14	9	2	25
Female	6	6	3	15
Totals	20	15	5	40

(b) Table percentages based on overall student responses

	Student Major Categories			
Gender	A	C	M	Totals
Male	35.0%	22.5%	5.0%	62.5%
Female	15.0%	15.0%	7.5%	37.5%
Totals	50.0%	37.5%	12.5%	100.0%

Table based on row percentages

	Student Major Categories			
Gender	A	C	M	Totals
Male	56.0%	36.0%	8.0%	100.0%
Female	40.0%	40.0%	20.0%	100.0%
Totals	50.0%	37.5%	12.5%	100.0%

Table based on column percentages

	Student Major Categories			
Gender	A	C	M	Totals
Male	70.0%	60.0%	40.0%	62.5%
Female	30.0%	40.0%	60.0%	37.5%
Totals	100.0%	100.0%	100.0%	100.0%

2.3 (a) You can conclude that in 2011 Android, iOS, and OtherOS dominated the market in 2011. In 2012, 2013, 2014, and 2015 Android and iOS dominated the market. Android has increased its market share from 49.2% in 2011 to 80.7% in 2016. iOS has seen a slight decrease in market share from 18.8% in 2011 to 17.7% in 2016. OtherOS market share has declined from 19.8% in 2011 to 0.2% in 2016 Blackberry has also seen a significant decrease from 10.3% in 2011 to 0.2% in 2016. Microsoft reached its highest market share in 2013 with 3.3% and its lowest in 2015 and 2016 with 1.1%.

(b) iOS decreased its market share from 18.8% in 2011 to 17.7% in 2016. Android's market share has increased from 2011 to 2016 while Microsoft, Blackberry, and OtherOS have all lost market share.

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2.4 (a)

Category	Total	Percentages
Bank Account or Service	202	9.330%
Consumer Loan	132	6.097%
Credit Card	175	8.083%
Credit Reporting	581	26.836%
Debt Collection	486	22.448%
Mortgage	442	20.416%
Student Loan	75	3.464%
Other	72	3.326%
Grand Total	2165	

(b) There are more complaints for credit reporting, debt collection, and mortgage than the other categories. These categories account for about 70% of all the complaints.

(c)

Company	Total	Percentage
Bank of America	42	3.64%
Capital One	93	8.07%
Citibank	59	5.12%
Ditech Financial	31	2.69%
Equifax	217	18.82%
Experian	177	15.35%
JPMorgan	128	11.10%
Nationstar Mortgage	39	3.38%
Navient	38	3.30%
Ocwen	41	3.56%
Synchrony	43	3.73%
Trans-Union	168	14.57%
Wells Fargo	77	6.68%
Grand Total	1153	

(d) Equifax, Trans-Union, and Experion, all of which are credit score companies, have the most complaints.

2.5 The respondents from the sample of companies included in the survey indicated that they would be most likely to use business analytics within the next five years with more than half planning to use this technology. Slightly less than half of the respondents plan to use machine language technology and only 21% of the respondents plaining to use self-learning robots. Nearly half of the respondents had no plans to use self-learning robots. It could be concluded that business analytics will likely be the most impactful technology within the next five years followed by machine language technology and self-learning robots.

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2.6 The largest sources of electricity in the United States are coal followed by natural gas. Nuclear energy is the third most used source of energy. Hydroelectric and Renewable sources other than hydroelectric and solar are about the same followed by Other gas, Petroleum coke and liquids, and Other.

2.7 (a)

Technologies	Frequency	Percentage
Wearable technology	9	10.00%
Blockchain technology	9	10.00%
Artificial Intelligence	17	18.89%
Iot: retail insurance	23	25.56%
Iot: commerical insurance	5	5.56%
Social media	27	30.00%
Grand Total	90	

(b) Professionals expect to be using Social media and Iot: retail insurance technologies the most over the next year followed by Artificial Intelligence. Professionals do not expect to be using Wearable, Blockchain, and Iot: commercial insurance technologies much over the next year.

2.8 (a) Table of row percentages:

	GENDER		
OVERLOADED	Male	Female	Total
Yes	44.08%	55.92%	100.00%
No	53.54%	46.46%	100.00%
Total	51.64%	48.36%	100.00%

Table of column percentages:

	GENDER		
OVERLOADED	Male	Female	Total
Yes	17.07%	23.13%	20.00%
No	82.93%	76.87%	80.00%
Total	100.00%	100.00%	100.00%

Table of total percentages:

	GENDER		
OVERLOADED	Male	Female	Total
Yes	8.82%	11.18%	20.00%
No	42.83%	37.17%	80.00%
Total	51.64%	48.36%	100.00%

(b) Approximately the same percentages of males and females as a percentage of the total number of people surveyed feel overloaded with too much information. As percentages of those who do and do not feel overloaded, the genders differ mildly. However, four times as many people do not feel overloaded at work than those that do.

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2.9 (a)

Column Percentage

	OUTCOME		
CATEGORY	Successful	Not Successful	Total
Film & Video	36.02%	36.81%	36.51%
Games	15.44%	18.24%	17.19%
Music	40.20%	24.38%	30.34%
Technology	8.34%	20.56%	15.96%
Total	100.00%	100.00%	100.00%

Row Percentages

	OUTCOME		
CATEGORY	Successful	Not Successful	Total
Film & Video	37.15%	62.85%	100.00%
Games	33.84%	66.16%	100.00%
Music	49.91%	50.09%	100.00%
Technology	19.69%	80.31%	100.00%
Total	37.67%	62.33%	100.00%

Total Percentages

	OUTCOME		
CATEGORY	Successful	Not Successful	Total
Film & Video	13.57%	22.95%	36.51%
Games	5.82%	11.37%	17.19%
Music	15.14%	15.20%	30.34%
Technology	3.14%	12.82%	15.96%
Total	37.67%	62.33%	100.00%

(b) The row percentages are most informative because they provide a percentage of successful projects within each category which allows one to compare across categories.

(c) Music kick starter projects were the most successful with approximately 50% of the projects succeeding compared to less than 20% of the Technology projects. The Film & Video and Games categories had success rates in between the Music and Technology categories, with success rates of 37% and 34% respectively.

2.10 Approximately 11.7% of the total people surveyed answered window tinting as their preferred luxury upgrade. A higher percentage of women than men prefer window tinting as a luxury upgrade.

2.11 Ordered array: 63 64 68 71 75 88 94

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2.12 Ordered array: 73 78 78 78 85 88 91

2.13 (a) (166 + 100)/591 * 100 = 45.01%
(b) (124 + 77)/591 * 100 = 34.01%
(c) (59 + 65)/591 * 100 = 20.98%
(d) 45% of the incidents took fewer than 2 days and 66% of the incidents were detected in less than 8 days. 79% of the incidents were detected in less than 31 days.

2.14 $\frac{216,000 - 61,000}{6} = 33,333.33$ so choose 40,000 as interval width

(a) $60,000 – under $100,000; $100,000 – under $140,000; $140,000 – under $180,000; $180,000 – under $220,000; $220,000 – under $260,000; $260,000 – under $300,000

(b) $40,000

(c) $\frac{60,000 + 100000}{2} = 80000$ similarly, the remaining class midpoints are $120,000; $160,000; $200,000; $240,000; $280,000

2.15 (a)

222.67	262.50	262.67	276.40	278.00	290.83	292.87
298.00	318.67	324.33	332.93	345.09	346.70	380.67
398.55	418.14	422.45	423.50	429.00	441.00	492.71
505.77	539.68	571.50	585.20	696.33	718.50	726.40
789.20	878.20					

(b)

NBA Cost

Cost $	Frequency	Percentage
200 but less than 300	8	27%
300 but less than 400	7	23%
400 but less than 500	6	20%
500 but less than 600	4	13%
600 but less than 700	1	3%
700 but less than 800	3	10%
800 but less than 900	1	3%
Total	30	100%

(c) 70% of the costs to attend a NBA basketball game are between $200 and $500 with 27% of the costs between $200 and $300. Three teams or 10% of the NBA teams have costs between $700 and $800.

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2.16 (a)

Electricity Costs	Frequency	Percentage
$80 but less than $100	4	8%
$100 but less than $120	7	14%
$120 but less than $140	9	18%
$140 but less than $160	13	26%
$160 but less than $180	9	18%
$180 but less than $200	5	10%
$200 but less than $220	3	6%

(b)

Electricity Costs	Frequency	Percentage	Cumulative %
$ 99	4	8.00%	8.00%
$119	7	14.00%	22.00%
$139	9	18.00%	40.00%
$159	13	26.00%	66.00%
$179	9	18.00%	84.00%
$199	5	10.00%	94.00%
$219	3	6.00%	100.00%

(c) The majority of utility charges are clustered between $120 and $180.

2.17 (a)

Commuting Time (minutes)	Frequency	Percentage
200 but less than 230	12	40%
230 but less than 260	9	30%
260 but less than 290	4	13%
290 but less than 320	3	10%
320 but less than 350	1	3%
350 but less than 380	1	3%
	30	**100%**

(b)

Commuting Time (minutes)	Frequency	Percentage	Cumulative %
200 but less than 230	12	40%	40%
230 but less than 260	9	30%	70%
260 but less than 290	4	13%	83%
290 but less than 320	3	10%	93%
320 but less than 350	1	3%	97%
350 but less than 380	1	3%	100%
	30	**100%**	

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2.17 cont. (c) The majority of commuters living in or near cities spend from 200 up to 230 minutes commuting each week. 70% of commuters spend from 200 up to 260 minutes commuting each week.

2.18 (a), (b)

Credit Score	Frequency	Percent (%)	Cumulative Percent (%)
560 – under 580	4	0.16	0.16
580 – under 600	24	0.93	1.09
600 – under 620	68	2.65	3.74
620 – under 640	290	11.28	15.02
640 – under 660	548	21.32	36.34
660 – under 680	560	21.79	58.13
680 – under 700	507	19.73	77.86
700 – under 720	378	14.71	92.57
720 – under 740	168	6.54	99.11
740 – under 760	22	0.86	99.96
760 – under 780	1	0.04	100.00

(c) The average credit scores are concentrated between 620 and 720.

2.19 (a), (b)

Bin	Frequency	Percentage	Cumulative %
-0.00350 but less than -0.00201	13	13.00%	13.00%
-0.00200 but less than -0.00051	26	26.00%	39.00%
-0.00050 but less than 0.00099	32	32.00%	71.00%
0.00100 but less than 0.00249	20	20.00%	91.00%
0.00250 but less than 0.00399	8	8.00%	99.00%
0.004 but less than 0.00549	1	1.00%	100.00%

(c) Yes, the steel mill is doing a good job at meeting the requirement as there is only one steel part out of a sample of 100 that is as much as 0.005 inches longer than the specified requirement.

2.20 (a), (b)

Time in Seconds	Frequency	Percent (%)
5 – under 10	8	16%
10 – under 15	8	30%
15 – under 20	8	36%
20 – under 25	8	12%
25 – under 30	8	6%

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2.20 (b)
cont.

Time in Seconds	Percentage Less Than
5	0
10	16
15	46
20	82
25	94
30	100

(c) The target is being met since 82% of the calls are being answered in less than 20 seconds

2.21 (a)

Call Duration (seconds)	Frequency	Percentage
60 up to 119	7	14%
120 up to 179	12	24%
180 up to 239	11	22%
240 up to 299	11	22%
300 up to 359	4	8%
360 up to 419	3	6%
420 and longer	2	4%
	50	100%

(b)

Call Duration (seconds)	Frequency	Percentage	Cumulative %
60 up to 119	7	14%	14%
120 up to 179	12	24%	38%
180 up to 239	11	22%	60%
240 up to 299	11	22%	82%
300 up to 359	4	8%	90%
360 up to 419	3	6%	96%
420 and longer	2	4%	100%
	50	100%	

(c) The call center's target of call duration less than 240 seconds is only met for 60% of the calls in this data set.

2.22 (a), (b) Manufacturer A:

Bin Cell	Frequency	Percentage	Cumulative Pctage.
6,500 but less than 7,500	3	7.50%	7.50%
7,500 but less than 8,500	5	12.50%	20.00%
8,500 but less than 9,500	20	50.00%	70.00%
9,500 but less than 10,500	9	22.50%	92.50%
10,500 but less than 11,500	3	7.50%	100.00%

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2.22 cont. (a), (b) Manufacturer B:

Bin Cell	Frequency	Percentage	Cumulative Pctage.
7,500 but less than 8,500	2	5.00%	5.00%
9,500 but less than 9,500	8	20.00%	25.00%
9,500 but less than 10,500	16	40.00%	65.00%
10,500 but less than 11,500	9	22.50%	87.50%
11,500 but less than 12,500	5	12.50%	100.00%

(c) Manufacturer B produces bulbs with longer lives than Manufacturer A. The cumulative percentage for Manufacturer B shows 65% of its bulbs lasted less than 10,500 hours, contrasted with 70% of Manufacturer A's bulbs, which lasted less than 9,500 hours. None of Manufacturer A's bulbs lasted more than 11,499 hours, but 12.5% of Manufacturer B's bulbs lasted between 11,500 and 12,499 hours. At the same time, 7.5% of Manufacturer A's bulbs lasted less than 7,500 hours, whereas all of Manufacturer B's bulbs lasted at least 7,500 hours

2.23 (a)

Amount of Soft Drink	Frequency	Percentage
1.850 – 1.899	1	2%
1.900 – 1.949	5	10%
1.950 – 1.999	18	36%
2.000 – 2.049	19	38%
2.050 – 2.099	6	12%
2.100 – 2.149	1	2%

Amount of Soft Drink	Frequency Less Than	Percentage Less Than
1.899	1	2%
1.949	6	12%
1.999	24	48%
2.049	43	86%
2.099	49	98%
2.149	50	100%

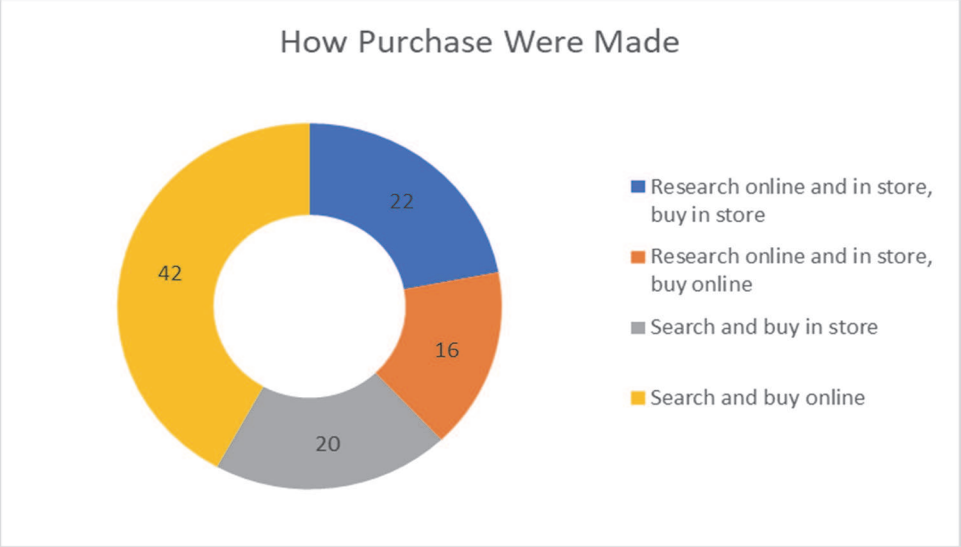
(b) The amount of soft drink filled in the two liter bottles is most concentrated in two intervals on either side of the two-liter mark, from 1.950 to 1.999 and from 2.000 to 2.049 liters. Almost three-fourths of the 50 bottles sampled contained between 1.950 liters and 2.049 liters.

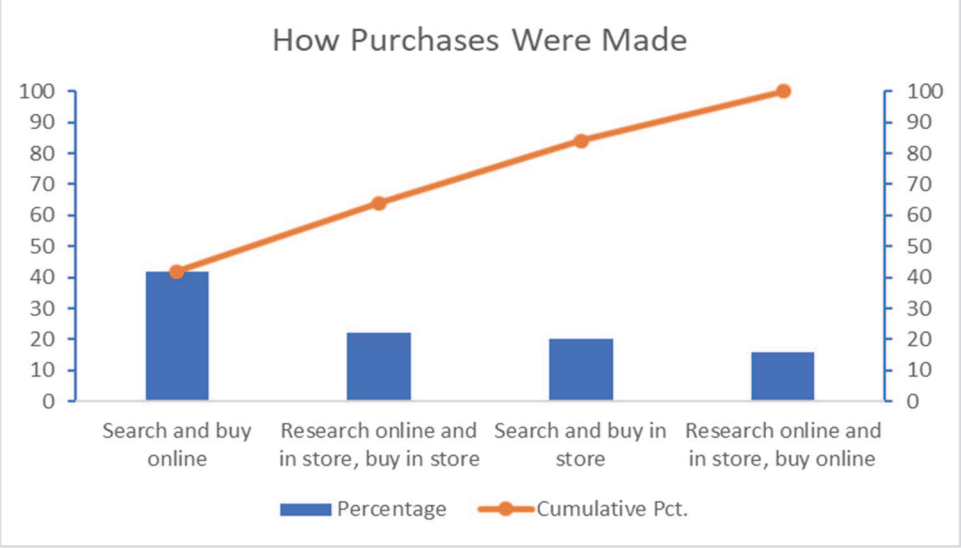
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2.24 (a)







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