Data Analytics for Accounting 2025 Release 1st edition Richardson Solutions Manual

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Solutions Manual – Chapter 1 Labs

Lab 1-0 How to Complete Labs

Lab 1-0 Part 1 Explore Different Tool Tracks

Lab 1-0 Part 1 Objective Questions (LO 1-1, 1-5)

OQ1. According to your instructor, which track(s) or software will you be studying this semester? Will you be using Microsoft Excel or Tableau? Will you be using any of our select Connect only Alteryx labs?

Microsoft track

Tableau track

A combination of both tracks.

A combination of tracks including Alteryx

Answer: Answers vary. Could be Microsoft Track, Tableau Track, and/or a Combination Track including our option for select Alteryx labs.

OQ2. Where should you answer objective lab questions?

Answer: Objective lab questions should be answered either on Connect or on the lab document, depending on the instructor's preference.

Lab 1-0 Part 1 Analysis Questions (LO 1-1, 1-5)

AQ1. What is the purpose of taking screenshots of your progress through the labs? (Answer this on Connect or write your response in your lab document.)

Answer: The purpose of taking screenshots is to show your progress through the lab exercise and not only the final product.

Lab 1-0 Part 2 Take Screenshots of Your Tools

Lab 1-0 Part 2 Objective Questions (LO 1-1, 1-5)

OQ1. What computer are you using to access the software and complete the lab? How did you access the software?

I used software on my personal computer.

I used software on a university computer or computer lab.

I accessed the UARK Remote Desktop software on my personal computer.

I accessed the UARK Remote Desktop software at a university computer lab.

Answer: Answers vary but may include personal computer, school computer lab, remote desktop.

OQ2. What type of computer operating system do you normally use?

Windows

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Mac

Chromebook

Other

Answer: Answers vary but may include Windows, Mac, or Other.

Lab 1-0 Part 2 Analysis Questions (LO 1-1, 1-5)

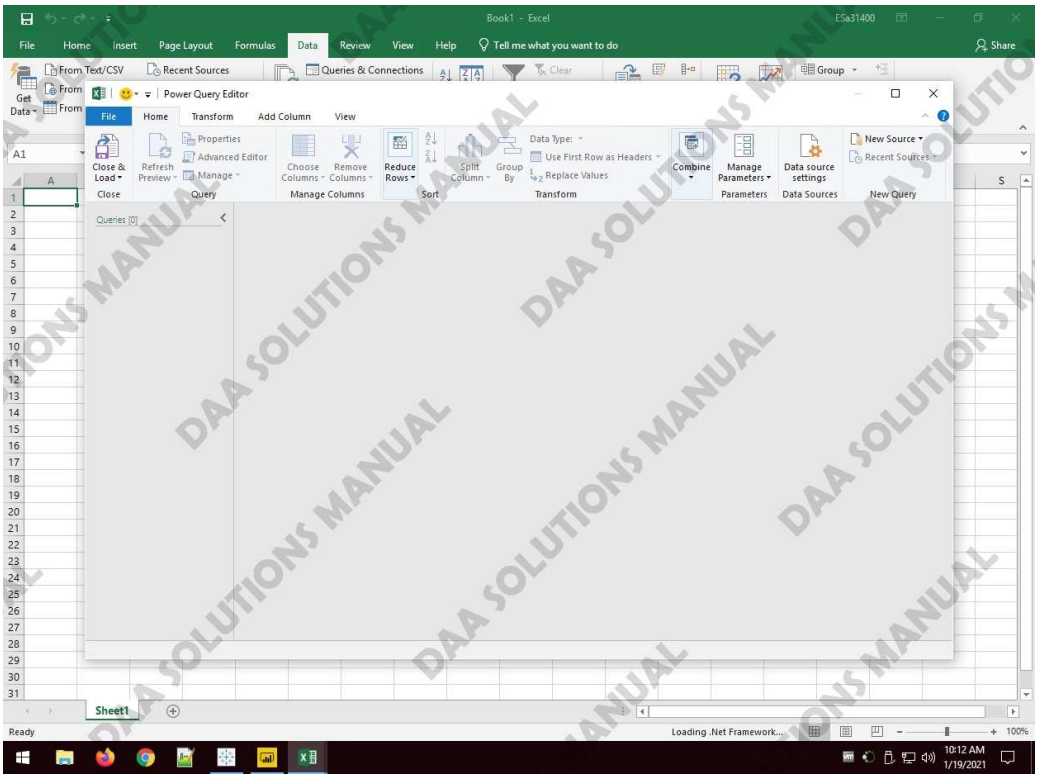
AQ3. Which tool or tools are you most interested in learning and why? What data analytics aspects are you interested in?

Answer: Student responses will vary depending if the class is using Microsoft, Tableau, Alteryx, or a combination of tools.

Lab 1-0 Submit Your Screenshot Lab Document

Verify that you have captured all of your required screenshots and have answered any questions your instructor has assigned, then upload your screenshot lab document to Connect or the location indicated by your instructor.

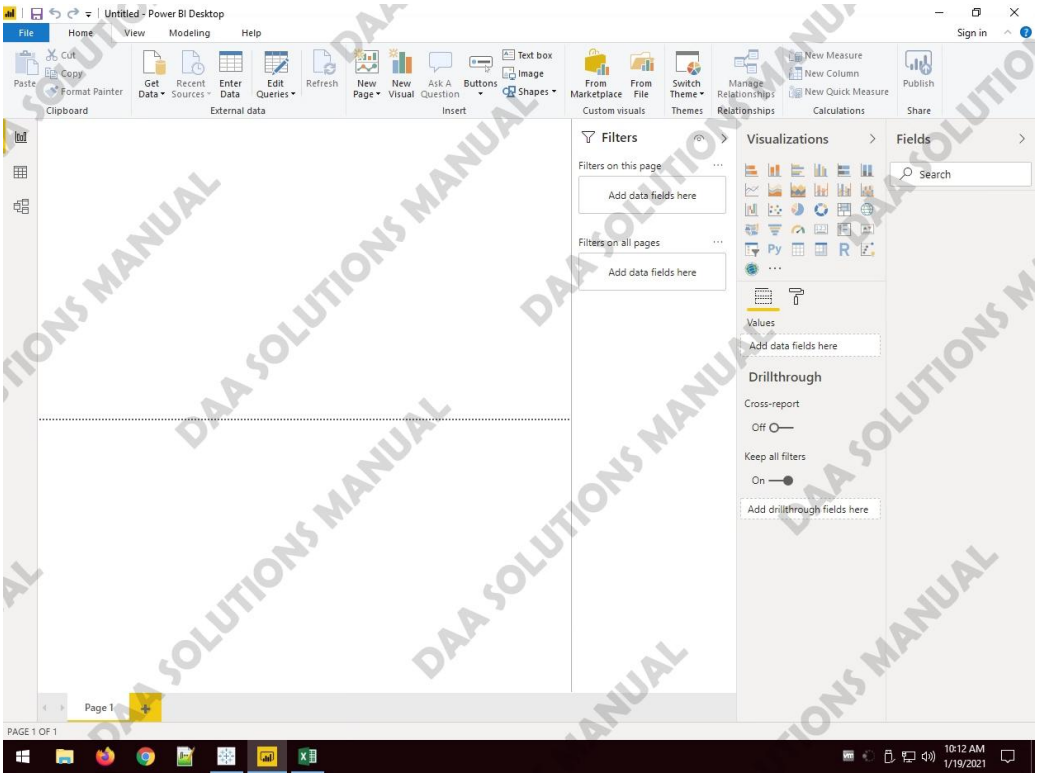
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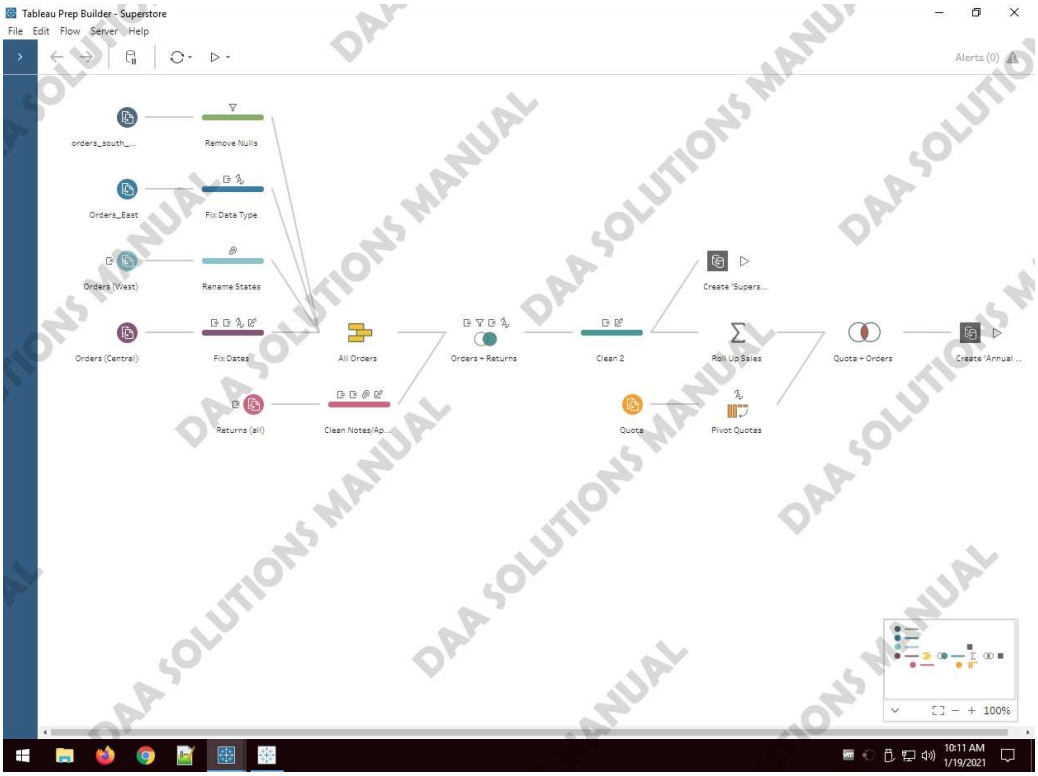
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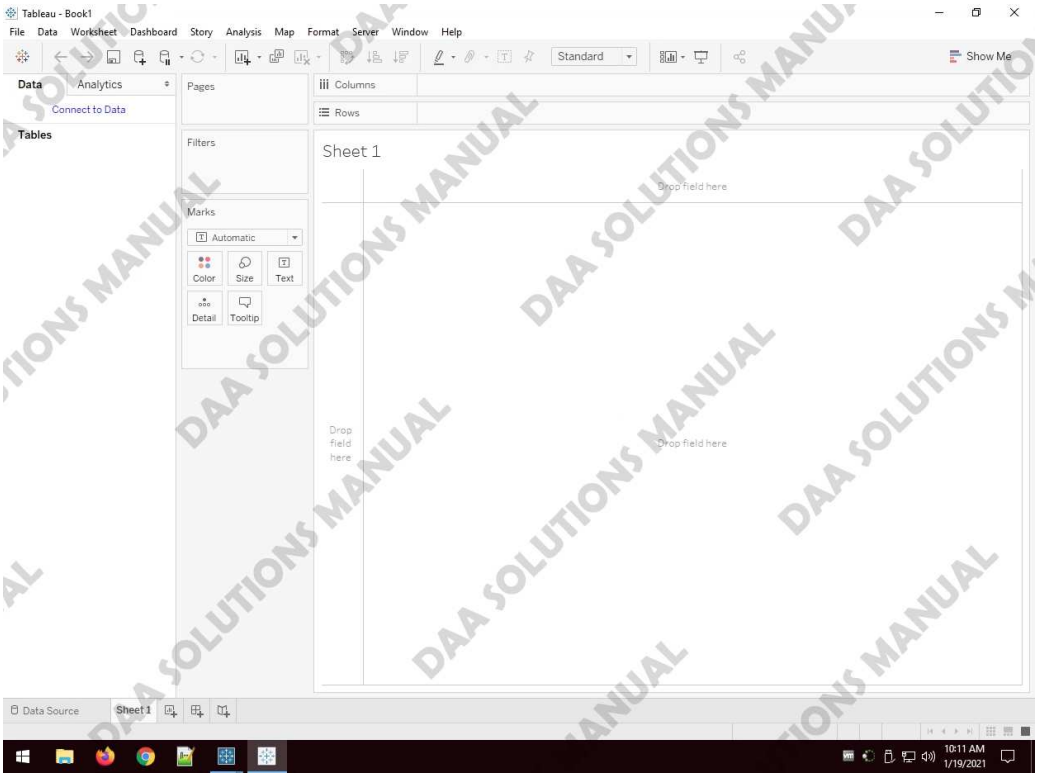
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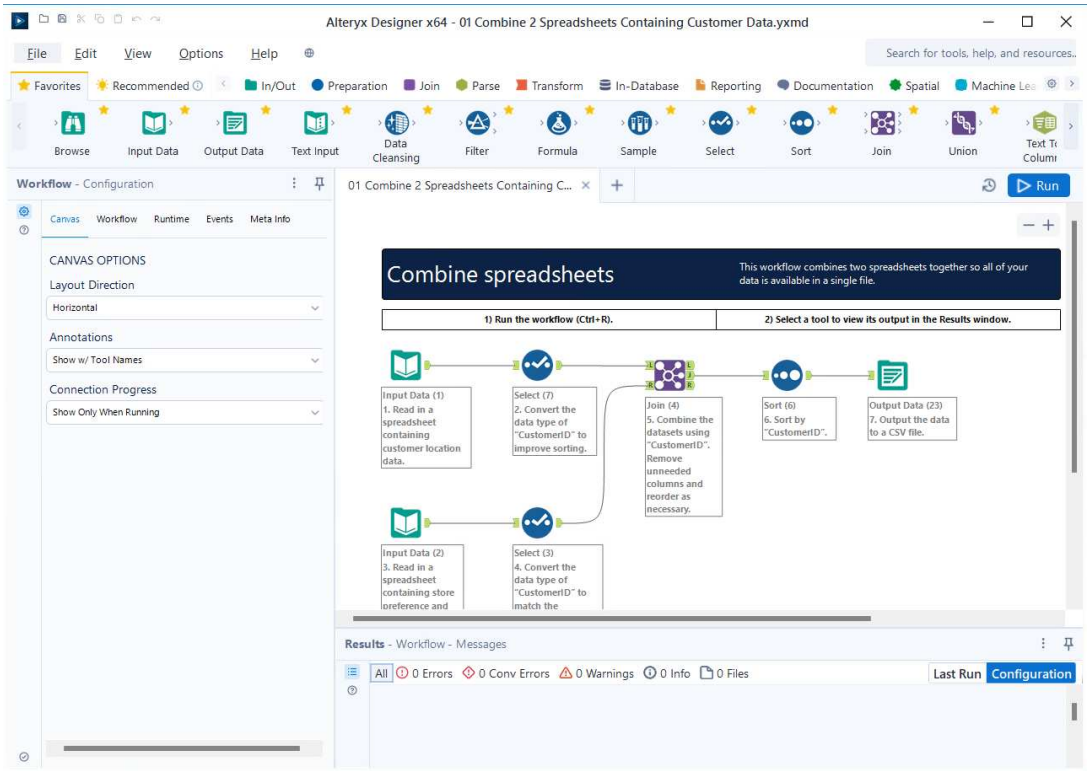
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Lab 1-1 Data Analytics Questions in Financial Accounting

Lab 1-1 Part 1 Identify the Questions

Lab 1-1 Part 1 Analysis Questions

AQ1. Use what you know about financial statement analysis (or search the web if you need a refresher) to generate three different metrics for evaluating financial performance. For example, if you wanted to evaluate a company's profit margin from one year to the next your question might be, "Has Apple Inc's gross margin increased in the last three years?"

Answer: Answers vary but should be written in question form: "Has Apple Inc's gross margin increased in the last three years?"

AQ2. Next to each question generate a hypothetical answer to the question to help you identify what your expected output would be. You may use some insight or intuition or search for industry averages to inform your hypothesis. For example: "Hypothesis: Apple Inc's gross margin has increased slightly in the past 3 years."

Answer: Answers vary but should be written in statement form: "Hypothesis: Apple Inc's gross margin has increased slightly in the past 3 years."

AQ3. Evaluate each question from Part 1. There are specific data attributes that will help you find the answer you're looking for. For example, if your question was "Has [Company X's] gross margin increased in the last 3 years?" and the expected answer is "Apple Inc's gross margin has increased slightly in the past 3 years," this tells you what attributes (or fields) to look for: company name, gross margin (sales revenues − cost of goods sold), year.

Answer: Answers vary but should be written as a list of attributes or tags: "company name, gross margin (sales revenues − cost of goods sold), year."

Lab 1-1 Part 2 Master the Data

Lab 1-1 Part 2 Analysis Questions

AQ1. For each of your questions, identify the account or data attribute you need to answer your question. Then use FASB's XBRL taxonomy to identify the specific XBRL tags that represent those accounts.

Answer: Answers vary but should be written in XBRL tag format: "EntityRegistrantName, Revenues, CostOfGoodsSold, CurrentFiscalYearEndDate"

Example solutions:

AQ1	*AQ2*	*AQ3/Part 2 AQ1*
Has [Company X's] current ratio increased over the past four years?	*Target's current ratio has increased slightly over the past five years*	*Company Name=EntitySectorIndustryClassificationPrimary Current Assets=AssetsCurrent Current Liabilities=LiabilitiesCurrent Year=DocumentPeriodEndDate*

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What was [Company X's] rate of increase/decrease of gross profit this past year?	*Target's gross profit increased by 3% this past year*	*Company Name=EntitySectorIndustryClassificationPrimary Net Income=NetIncomeLoss Total Assets=Assets Year=DocumentPeriodEndDate*
Has [Company X's] debt-to-equity ratio decreased over the past four years?	*Target's debt-to-equity ratio has increased over the past 5 years*	*Company Name=EntitySectorIndustryClassificationPrimary Total Liabilities=Liabilities Stockholder's Equity=StockholdersEquity Year=DocumentPeriodEndDate*

Lab 1-1 Submit Your Screenshot Lab Document

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Lab 1-2 Data Analytics Questions in Managerial Accounting

Lab 1-2 Part 1 Identify the Questions

Lab 1-2 Part 1 Analysis Questions (LO 1-3, 1-4)

AQ1. Use what you know about loan risk (or search the web if you need a refresher) to identify three different questions that might influence risk. For example, if you suspect risky customers live in a certain location, your question might be "Where do the customers with highest risk live?"

Answer: Answers vary but should be written in question form: "Where do the customers with the highest risk live?"

AQ2. For each question you identified in Q1, generate a hypothetical answer to each question to help you identify what your expected output would be. You may use some insight or intuition or search the Internet for ideas on how to inform your hypothesis. For example: "Hypothesis: High-risk customers likely live in coastal towns."

Answer: Answers vary but should be written in statement form: "Hypothesis: risky customers likely live in coastal towns."

AQ3. Finally, identify the data that you would need to answer each of your questions. For example, to determine customer location, you might need the city, state, and zip code. Additionally, if you hypothesize a specific region, you'd need to know which cities, state, and/or zip codes belong to that region.

Answer: Answers vary but should be written as a list of attributes: "City, state, zip code"

Lab 1-2 Part 2 Master the Data

Lab 1-2 Part 2 Analysis Questions (LO 1-3, 1-4)

AQ1. Evaluate each of your questions from Part 1. Do the data you identified in your questions exist in the table provided? If so, write the applicable fields next to each question in your document.

Answer: Answers vary but should be written as a list of attributes: "Zip_code, addr_state"

AQ2. Are there data values you identified in Part 1 that don't exist in the table? Explain how you might collect the missing data or where you might locate it.

Answer: Answers vary but should be written as a list of attributes: "Total employment length"

Example Solutions

Q1	*Q2*	*Q3/Q4*	*Q5*
Does the customer have many credit accounts?	*Risky customers likely have many credit accounts*	*1. Customer's member number (member_id)* *2. The number of credit accounts a customer has (total_acc)* *3. The customer's total available credit (revol_bal)*	

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How long is the employment time of the customer?	*People with short employment time are potential risky customers*	1. *Customer's member number (member_id)* 2. *The length of the employment time (emp_length)* 3. *The total time of full-time work experience*	*Total employment length*
How long will the customer pay back the loan?	*Risky customers are likely to have longer time for payment.*	1. *Customer's member number (member_id)* 2. *The time length customers promised to pay back the loan*	*Loan term*

Lab 1-2 Submit Your Screenshot Lab Document

No screenshots are required for this Lab.

Lab 1-3 Data Analytics Questions in Auditing

Lab 1-3 Part 1 Identify the Questions

Lab 1-3 Part 1 Analysis Questions (LO 1-3, 1-4)

AQ1. Use what you know about internal controls over the order-to-cash process (or search the web if you need a refresher) to identify three different questions that might indicate internal control weakness. For example, if you suspect that a manager may be delaying approval of shipments sent to customers, your question might be "Are any shipping managers approving shipments more than 2 days after they are received?"

Answer: Answers vary but should be written in question form: "What is the percentage of errors to total shipments?"

AQ2. Next to each question generate a hypothetical answer to each question to help you identify what your expected output would be. You may use some insight or intuition or search the Internet for ideas on how to inform your hypothesis. For example: "Hypothesis: Only one or two shipping managers are approving shipments more than 2 days after they are received."

Answer: Answers vary but should be written in statement form: "Hypothesis: Good internal control should have error percentage under 1%."

AQ3. Finally, identify the data that you would need to answer each of your questions. For example, to determine the timing of approval and who is involved, you might need the approver ID, the order date, and the approval date.

Answer: Answers vary but should be written as a list of attributes: "the total number of errors concerning shipments for a quarter, the total number of shipments for a quarter, The shipment id"

Lab 1-3 Part 2 Master the Data

Lab 1-3 Part 2 Analysis Questions (LO 1-3, 1-4)

AQ1. List some of the tables and fields from the audit data standard that relate to each question you identified in Part 1. For example, if you're looking for the shipment timing and approval data, you would

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need the Shipments_Made_YYYYMMDD_YYYYMMDD table and Approved_By, Entered_Date, and Approved_Date fields.

Answer: Answers vary but should be written as a list of attributes: "Shipments_Made_YYYYMMDD_YYYYMMDD, Shipment_ID, Shipment_Period"

AQ2. Are there data values you identified in Part 1 that don't exist in the tables? Explain how you might collect the missing data or where you might locate it.

Answer: Q5. Answers vary but should be written as a list of attributes: "Total approver employment length"

Example Solutions

Q1	***Q2***	***Q3/Q4***	***Q5***
How long will it take from receiving sales orders to shipments made?	*Good internal control should take 1–3 days from receiving sales orders to shipments made*	1. *Sales orders date* 2. *Shipments date* 3. *Sales orders id* 4. *Shipments id* *Sales_Orders_YYYYMMDD_YYYYMMDD* *Sales_Order_ID* *Sales_Order_Date* *Shipments_Made_YYYYMMDD_YYYYMMDD* *Shipment_ID* *Shipment_Date*	*No additional data needed.*
What is the percentage of errors to total shipments?	*Good internal control should have error percentage under 1%*	1. *The total number of errors concerning shipments for a quarter* 2. *The total number of shipments for a quarter* 3. *The shipment id* *Shipments_Made_YYYYMMDD_YYYYMMDD* *Shipment_ID*	*Total number of errors.*

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		Shipment_Period	
How long will it take from sending sales invoice to opening accounts receivable	*Good internal control should finish the process within one day*	*1. The date of sending sales invoice* *2. Invoice id* *3. The date of opening accounts receivable* *4. The customer membership id* *5. The transaction date* *6. The balance amount* *Invoices_Generated_YYYYMMDD_YYYYMMDD* *Invoice_ID* *Invoice_Date* *Open_Accounts_Receivable_YYYYMMDD* *Customer_Account_ID* *Transaction_Date* *Balance_Amount*	*Process exception data.*

Lab 1-3 Submit Your Screenshot Lab Document

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Lab 1-4 Comprehensive Case: Questions About Dillard's Store Data

Lab 1-4 Part 1 Identify the Questions

Lab 1-4 Part 1 Analysis Questions (LO 1-1, 1-3, 1-4)

AQ1. Assume that Dillard's management is interested in improving profitability. Write three questions that could be asked to assess current profitability levels for each product and how profitability could be improved in the near future.

Answer: Answers will vary but should be written in question form: "What is the current profitability of each product category?"

AQ2. Assume that Dillard's management wishes to improve its online sales and profitability on those sales. What three questions could be asked to see where Dillard's stands on its online sales?

Answer: Answers will vary but should be written in question form: "What percentage of sales are online?"

Lab 1-4 Part 2 Master the Data

Lab 1-4 Part 2 Objective Questions (LO 1-1, 1-3, 1-4)

OQ1. What table and fields could address the question of the profit margin (sales price less cost) on each product (SKU) available for sale? *Select all that apply.*

Answer:

  TRANSACT.TRAN_TYPE
x TRANSACT.SALE_PRICE
  TRANSACT.REGISTER
  TRANSACT.TRAN_AMT
  TRANSACT.TRAN_DATE
  SKU_STORE.STORE
x SKU_STORE.SKU
x SKU_STORE.COST

OQ2. If you're interested in learning which product is sold most often at each store, which tables and fields would you consider? *Select all that apply.*

Answer:

  TRANSACT.CUST_ID
x TRANSACT.SKU
x TRANSACT.STORE
x TRANSACT.TRANSACTION_ID
  TRANSACT.TRAN_DATE
  TRANSACT.TRAN_AMT
  SKU_STORE.RETAIL
  SKU_STORE.COST

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Lab 1-4 Part 2 Analysis Questions (LO 1-1, 1-3, 1-4)

AQ1. You're trying to learn about where Dillard's stores are located to identify locations for the next additional store. Consider the STORE table. What questions could be asked about store location given data availability?

Answer: Answers will vary but should be written in question form: "How many stores are located in each state?"

AQ2. What questions would you have regarding data fields in the SKU table that could be used to help address the cost of shipping? What additional information would be helpful to address this question?

Answer: Answers will vary but should be written in question form: "Because shipping is based on weight and volume, what are the weight and dimensions of the package? We need data on shipment weight and dimensions."

Lab 1-4 Submit Your Screenshot Lab Document

No screenshots are required for this Lab.

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Lab 1-5 Comprehensive Case: Connect to Dillard's Store Data

Lab 1-5 Part 1 Load the Dillard's Data in Excel + Power Query and Tableau Prep, and Alteryx Designer

Lab 1-5 Part 1 Analysis Questions (LO 1-3, 1-4)

AQ1. Why would you want to filter the date field before loading data into your model for analysis?

Answer: Dates limit the amount of data for analysis.

AQ2.What are some limitations introduced into your analysis by filtering on such a small date range?

Answer: Q2. Smaller data is more efficient for processing but may not provide a generalizable model for overall activity.

Lab 1-5 Part 2 Tableau Desktop and Power BI Desktop

Lab 1-5 Part 2 Analysis Questions (LO 1-3, 1-4)

AQ1. Compare the tools you used in Part 2 with the tools you used in Part 1. What are some of the differences between these visualization tools (Power BI Desktop or Tableau Desktop) and those data prep tools (Power Query or Tableau Prep or Alteryx)?

Answer: Visualization tools are more focused on creating charts and graphs and have many more options available to quickly create those graphs. Data prep tools are focused on cleaning data so they are more focused on manipulation and previewing sample data.

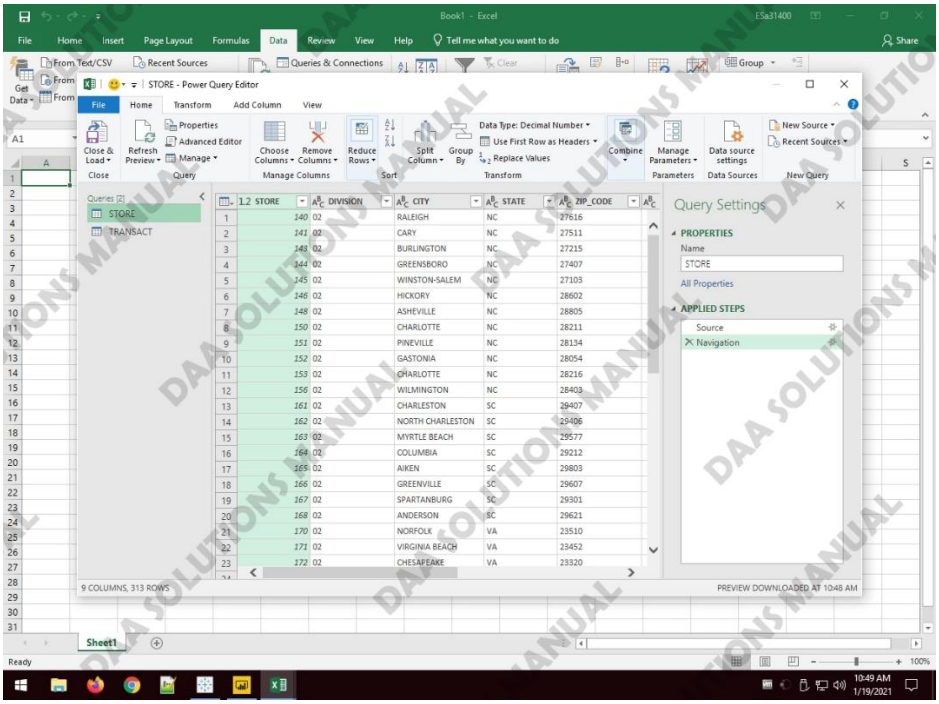
Lab 1-5 Submit Your Screenshot Lab Document

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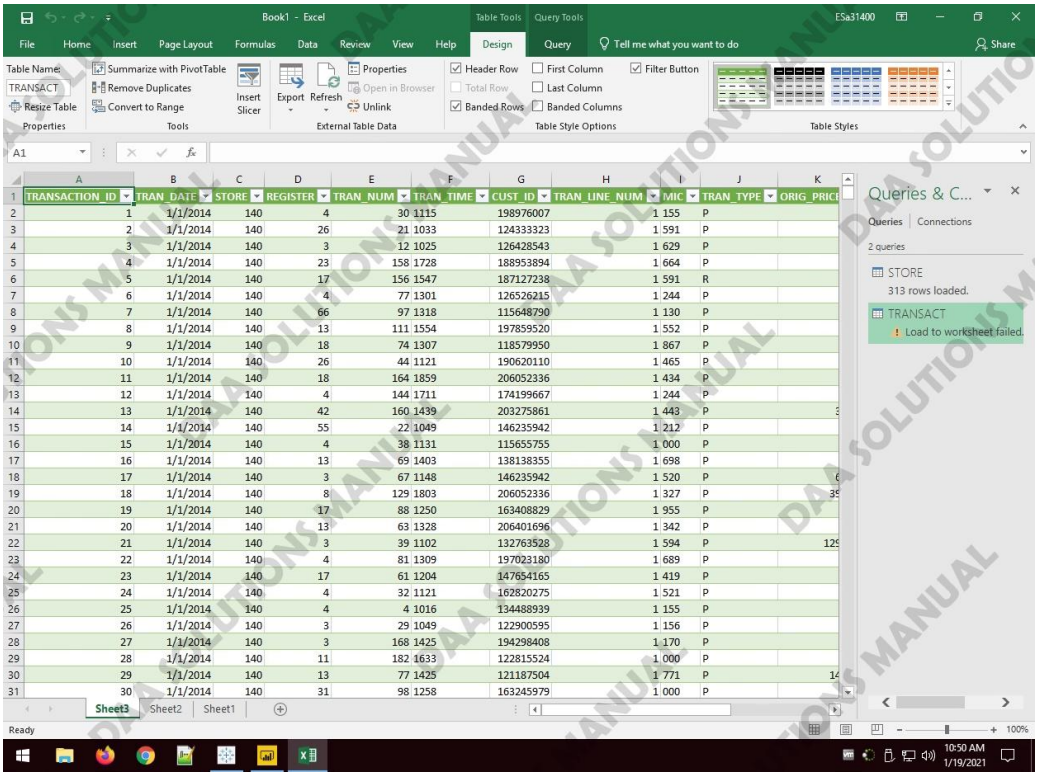
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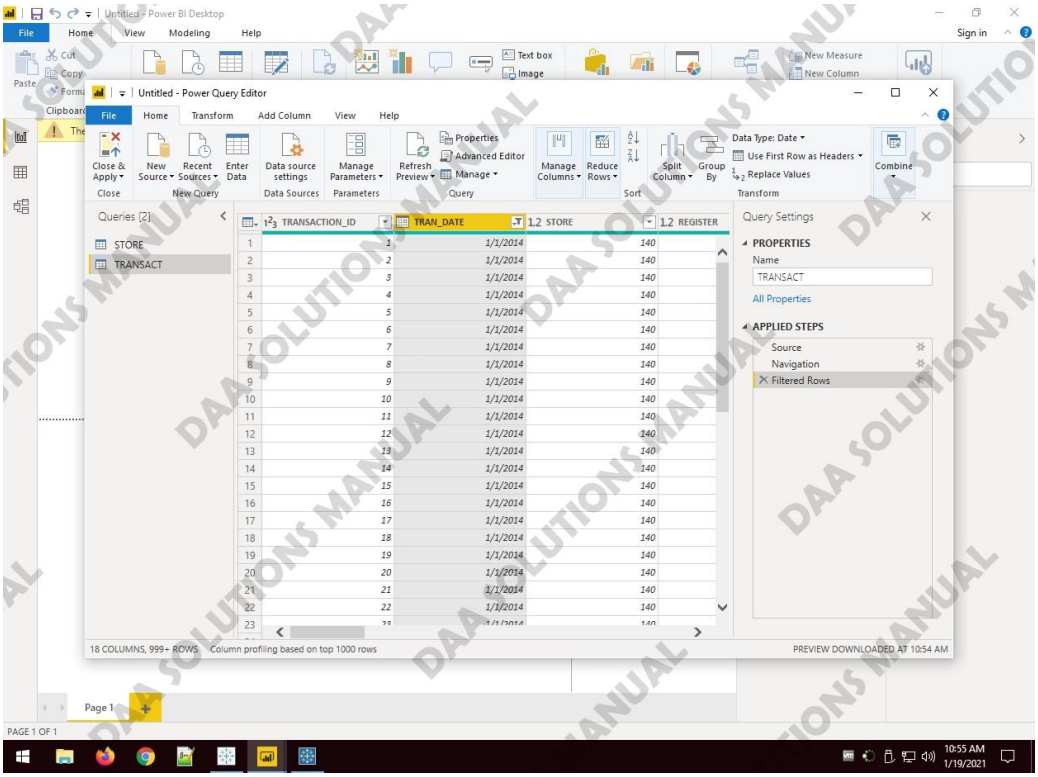
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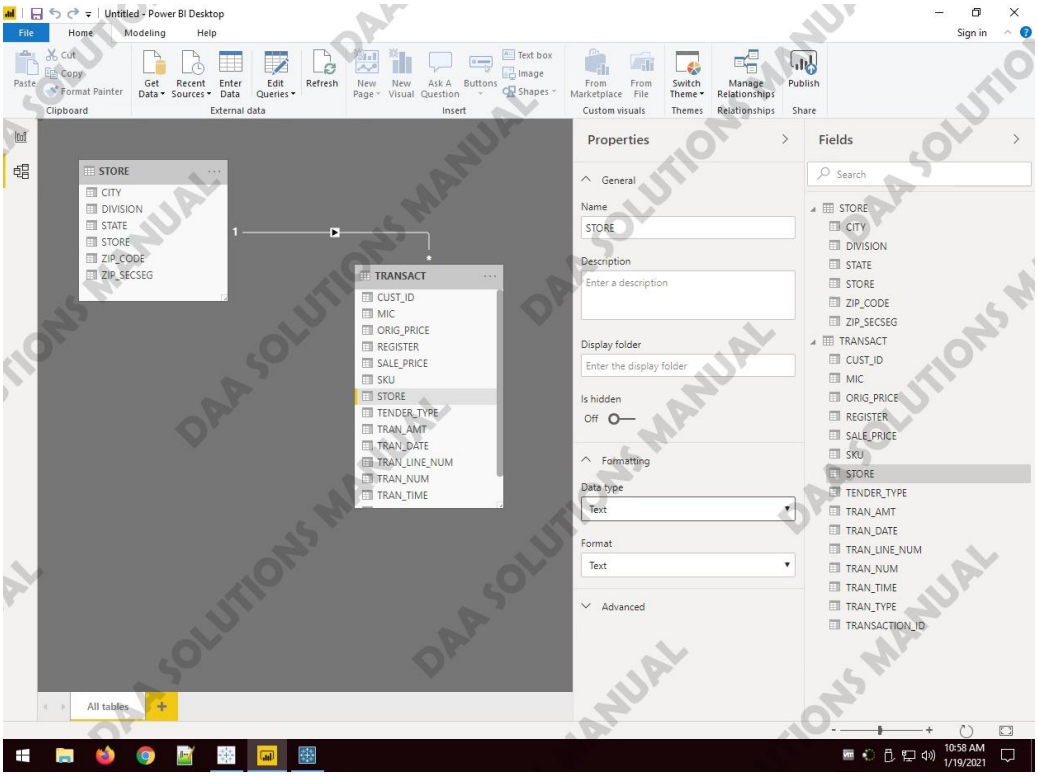
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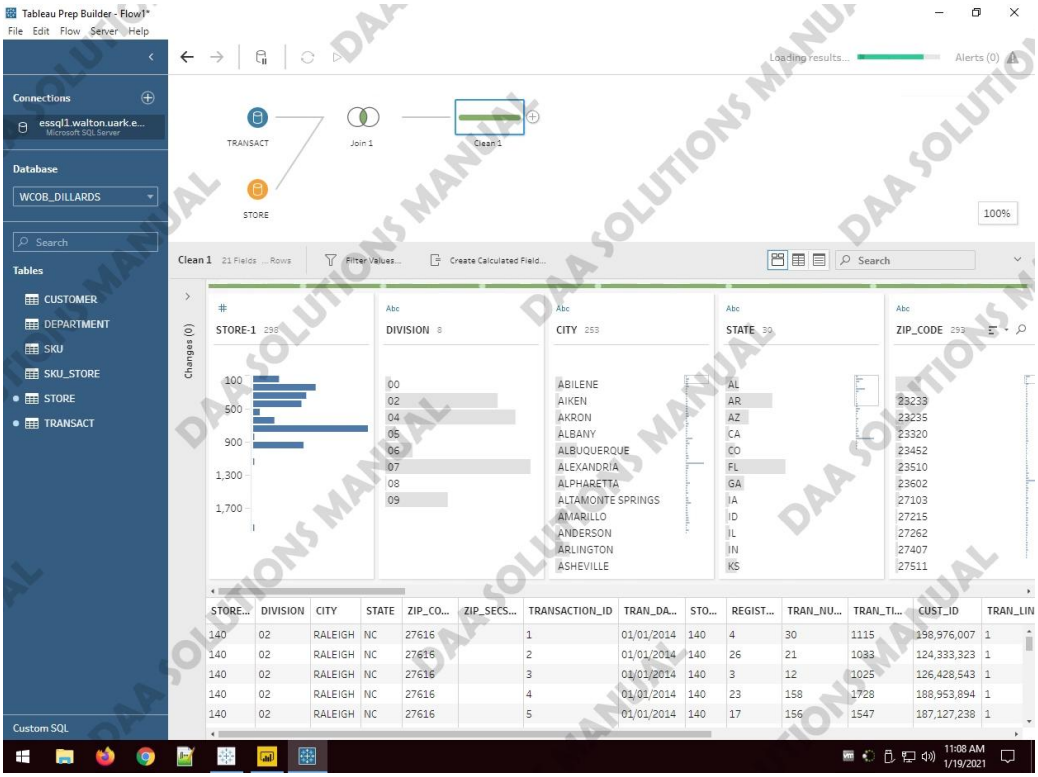
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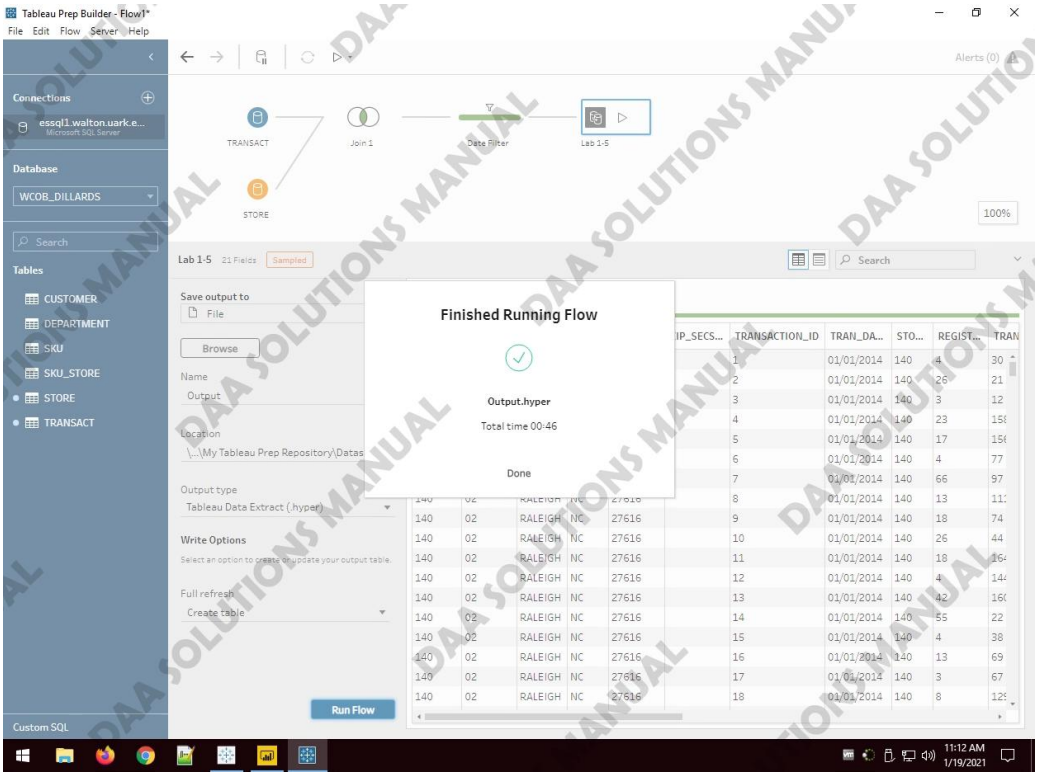
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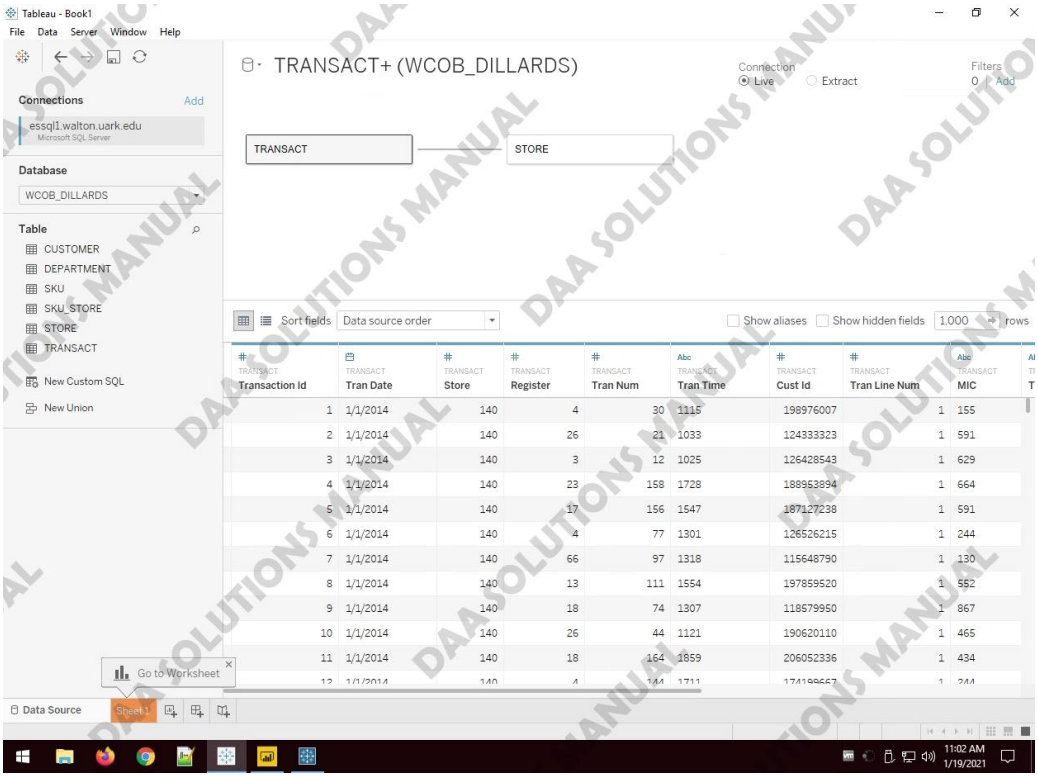
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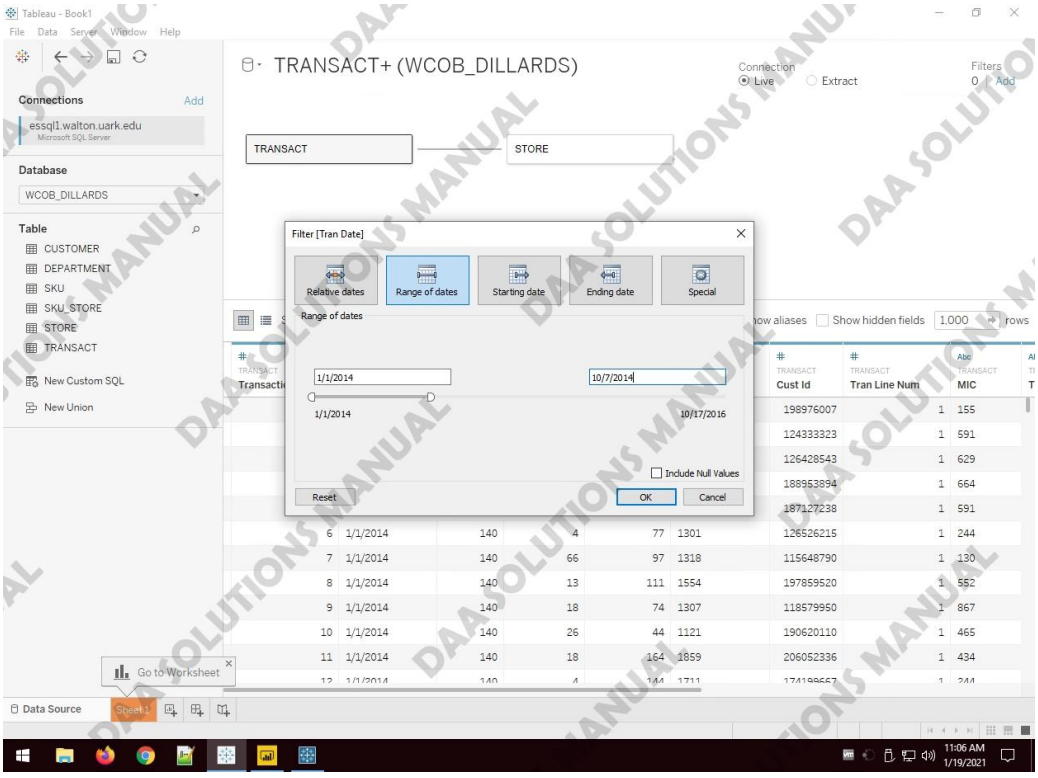
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Solutions Manual – Chapter 1

Solutions to Multiple Choice Questions

1. (LO 1-1) Big data is often described by the four Vs, or

   a. volume, velocity, veracity, and variability.
   b. volume, velocity, veracity, and variety.
   c. volume, volatility, veracity, and variability.
   d. variability, velocity, veracity, and variety.

Answer: b

2. (LO 1-4) Which data approach attempts to assign each unit in a population into a small set of classes (or groups) where the unit best fits?

   a. Regression
   b. Similarity matching
   c. Co-occurrence grouping
   d. Classification

Answer: d

3. (LO 1-4) Which data approach attempts to identify similar individuals based on data known about them?

   a. Classification
   b. Regression
   c. Similarity matching
   d. Data reduction

Answer: c

4. (LO 1-4) Which data approach attempts to predict connections between two data items?

   a. Profiling
   b. Classification
   c. Link prediction
   d. Regression

Answer: c

5. (LO 1-6) Which of these terms is defined as being a central repository of descriptions for all of the data attributes of the dataset?

   a. Big data

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b. Data warehouse
c. Data dictionary
d. Data analytics

Answer: c

6. (LO 1-5) Which of these skills for the analytic-minded accountant would involve comprehending the process needed to clean and prepare the data before analysis?

a. Data analysis through data manipulation
b. Descriptive data analysis
c. Data scrubbing and data preparation
d. Data visualization and data reporting

Answer: c

7. (LO 1-5) In which areas were skills *not* emphasized for analytic-minded accountants?

a. Data quality
b. Descriptive data analysis
c. Data visualization and data reporting
d. Data and systems analysis and design

Answer: d

8. (LO 1-4) The IMPACT cycle includes all of the following steps *except*:

a. perform test plan.
b. visualize the data.
c. master the data.
d. track outcomes.

Answer: b

9. (LO 1-4) The IMPACT cycle specifically includes all of the following steps *except*:

a. data preparation.
b. communicate insights.
c. address and refine results.
d. perform test plan.

Answer: a

10. (LO 1-1) According to predictions, by the year 2027, the volume of data created, captured, copied, and consumed worldwide will be how much?

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a. 258 zettabytes
b. 258 petabytes
c. 258 exabytes
d. 258 yottabytes

Answer: a

11. (LO 1-7) Prompt engineering in a generative AI model, can most appropriately be compared to which step of the IMPACT model?

a. Identify the question
b. Master the data
c. Track outcomes
d. Communicate insights

Answer: a

12. (LO 1-7) What relies on algorithms to create new content, such as text, images, audio, and video?

a. Data analytics
b. Machine learning
c. Prompt engineering
d. Generative artificial intelligence

Answer: d

Solutions to Discussion and Analysis Questions

1. The accounting function is one of being an information provider to the extent that data is available to address accounting questions, be they tax, managerial, audit or financial questions. With such rich available data, and software tools to prepare and analyze the data, data analytics will continue to be an important tool for accountants to use.

2. Data analytics is defined as the process of evaluating data with the purpose of drawing conclusions to address business questions. Indeed, effective Data Analytics provides a way to search through large structured and unstructured data to identify unknown patterns or relationships.

   A university might learn from analyzing the demographics of its current set of students in order to attract its future student recruits. Did they come from cities or high schools that were close by? Were their parents alumni of the university? Did they score high on certain parts of the ACT? Were those offered a scholarship more likely to attend, etc.? Was social media effective in attracting new, potentially stronger students? By analyzing this type of data, previously unknown patterns will emerge that will make recruiting students more effective.

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3. There are many potential answers. For example, Monsanto may use mathematical and statistical models to plot out the best times to plant both male and female plants and where to plant them to maximize yield. The article, 5 Data Analytics Success Stories: An Inside Look gives examples of how analytics are used to achieve business goals. (https://www.cio.com/article/3221621/analytics/6-data-analytics-success-stories-an-inside-look.html#tk.cio_rs)

4. There are many potential answers. Data analytics gives both internal and external auditors additional tools to examine every accounting transaction and assess for compliance with GAAP. The audit process is changing from a traditional process toward a more automated one, which will allow audit professionals to focus more on the logic and rationale behind data queries and less on the gathering of the actual data. No longer will they be simply checking for errors, material misstatements, fraud, and risk in financial statements or merely be reporting their findings at the end of the engagement. Instead, audit professionals will now be collecting and analyzing the company's data similar to the way a business analyst would help management make better business decisions. In this way, data analytics offers value to the audit function.

5. There are many potential answers. For example, data analytics associated with financial reporting may help accountants determine if any of their inventory obsolete. It may also help the company benchmark on the financial statements and financial reporting of other similar companies and understand their accounting practices to help infer their own. Analytics may be used in tax planning to forecast income subject to tax and the tax rates to work to minimize the present value of income tax payments over the life.

6. Management accountants address the information needs of management. They will often see what questions management has, find applicable data to address those questions, conduct analysis of the data, and report the results to management to help them make data-driven decisions. This is consistent with the data analytics process and the IMPACT model.

7. The IMPACT cycle suggests an order of 1) Identifying the Questions; 2) Mastering the Data; 3) Performing the test plan; 4) Addressing and refining results; 5) Communicating insights and 6) Tracking outcomes. The cycle starts with a question and then identifying data and test plan that might address that question. The results of the data analysis are communicated and tracked which may lead to additional, possibly more refined questions that then restart the cycle.

8. Data analysis is most effective when a question is identified that needs to be addressed. That will focus the analysis on which data and which test method might be most effective in addressing or answering the question.

9. Mastering the data requires one to know what data is available and whether it might be able to help address the business problem. We need to know everything about the data, including how to access it, its availability, how reliable it is (if there are errors), and what time periods it covers to make sure it coincides with the timing of our business problem, etc.

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10. Facebook uses link prediction to predict a relationship between two people when it suggests people that one likely knows due to similar other friends, extended family, high schools, college or work locations, etc.

11. While sampling is useful, it is still just that, sampling. By looking at all of the transactions and testing them in a way that will highlight the ones that are the biggest dollar items, or are most unusual, that will allow auditors to focus on specific items that might be of material significance.

12. There are several correct answers. One data approach might be regression analysis where, given a balance of total accounts receivable held by a firm, how long it has been outstanding, if they have paid debts in the past all will help predict the appropriate level of allowance for doubtful accounts for bad debts.

13. The Debt-to-Income ratio might suggest to **LendingClub** that the person asking for the loan was simply asking for too big of a loan and they would have little ability to repay it. The lower the credit score, the less likely the potential borrower would be able to repay the loan.

14. There are many other potential predictors of whether the **LendingClub** would pay a loan. Here are a few possibilities: What other debt do they have? How much is their disposable income? Do they have a clean criminal record? Have they had a loan with **LendingClub** before and did they repay it? Do they rent or own their house?

15. If analysts use Mac computers, they may not be able to get full functionality out of Power BI and Alteryx that work primarily on Windows computers. All other things equal, you would like for analysts to have full functionality to complete the full IMPACT model.

16. The better the prompt, the more relevant is the input when using generative AI. In the same way, the more precise an analyst is in "Identifying the Question", the better the data will perform in addressing the business or accounting questions.

Solutions to Problems

Note: Some problems and solutions may be altered in Connect for auto grading purposes.

1. (LO 1-4) Match each specific Data Analytics test to a specific test approach, as part of performing test plan:
    - Classification
    - Regression
    - Similarity Matching
    - Clustering
    - Co-occurrence Grouping
    - Profiling
    - Link Prediction
    - Data Reduction

Specific Data Analytics Test	Test Approach
1. Predict which firms will go bankrupt and which firms will not go bankrupt.	Classification

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2. Use stratified sampling to focus audit effort on transactions with greatest risk.	Data Reduction
3. Work to understand normal behavior, to then be able identify abnormal behavior (such as fraud).	Profiling
4. Look for relationships between related parties that are not otherwise disclosed.	Link Prediction
5. Predict which new customers resemble the company's best customers.	Similarity Matching
6. Predict the relationship between an investment in advertising expenditures and subsequent operating income.	Regression
7. Segment all of the company's customers into groups that will allow further specific analysis.	Clustering
8. The customers who buy product X will be most likely to be also interested in product Y.	Co-occurrence Grouping

2. (LO 1-4) Match each of the specific Data Analytics tasks to the stage of the IMPACT cycle:
   - Identify the Question
   - Master the Data
   - Perform Test Plan
   - Address and Refine Results
   - Communicate Insights
   - Track Outcomes

Specific Data Analytics Task	**Stage of IMPACT Cycle**
1. Should we use company-specific data or macro-economic data to address the accounting question?	Master the Data
2. What are appropriate cost drivers for activity-based costing purposes?	Identify the Question
3. Should we consider using regression analysis or clustering analysis to evaluate the data?	Perform the Test Plan
4. Should we use tables or graphs to show management what we've found?	Communicate Insights
5. Now that we've evaluated the data one way, should we perform another analysis to gain additional insights?	Address and Refine Results
6. What type of dashboard should we use to get the latest, up-to-date results?	Track Outcomes

3. (LO 1-5) Match the specific analysis need/characteristic to the appropriate Microsoft Track tool:
   - Excel
   - Power Query
   - Power BI
   - Power Automate

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Specific Analysis Need/Characteristic	Microsoft Track Tool
1. Basic Visualization	Excel
2. Robotics Process Automation	Power Automate
3. Data joining	Power Query
4. Advanced visualization	Power BI
5. Works on Windows/Mac/Online platforms	Excel
6. Dashboards	Power BI
7. Collect data from multiple sources	Power Automate
8. Data cleaning	Power Query

4. (LO 1-5) Match the specific analysis need/characteristic to the appropriate Tableau Track tool:
   - Tableau Prep Builder
   - Tableau Desktop
   - Tableau Public

Specific Analysis Need/Characteristic	Tableau Track Tool
1. Advanced visualization	Tableau Desktop
2. Analyze and share public datasets	Tableau Public
3. Data joining	Tableau Prep Builder
4. Presentations	Tableau Desktop
5. Data transformation	Tableau Prep Builder
6. Dashboards	Tableau Desktop
7. Data cleaning	Tableau Prep Builder

5. (LO 1-6) Here are the predictive attributes and whether they would be applicable to predicting which loans would be delinquent and which loans will ultimately be fully repaid.

Predictive Attributes	Predictive? (Yes/No)
1. date (Date when the borrower accepted the offer)	No
2. desc (Loan description provided by borrower)	No
3. dti (A ratio of debt owed to income earned)	Yes
4. grade (LC assigned loan grade)	Yes
5. home_ownership (Values include Rent, Own, Mortgage, Other)	Yes
6. loanAmnt (Amount of the loan)	Yes
7. next_pymnt_d (Next scheduled payment date)	No
8. term (Number of payments on the loan)	No
9. tot_cur_bal (Total current balance of all accounts)	Yes

6. (LO 1-6) Navigate to the Connect Additional Student Resources page. Under Chapter 1 Data Files, download and consider the rejected loans dataset of **LendingClub** data titled "DAA Chapter 1-1 Data". Choose among these attributes in the data dictionary, and indicate which are likely to be predictive of loan rejection, and which are not.

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Predictive Attributes	Predictive? (Yes/No)
1. Amount Requested	Yes
2. Zip Code	Yes
3. Loan Title	No
4. Debt-To-Income Ratio	Yes
5. Application Date	No
6. Risk_Score	Yes
7. Employment Length	Yes

7.

7A) **Multiple Choice:** What is the percentage of total loans rejected in the United States that came from Arkansas?

a. Less than 1%.
b. Between 1% and 2%.
c. More than 2%.

Answer: b

Percentage of total loans rejected that live in Arkansas = 1.219%

7B) **Multiple Choice:** Is this loan rejection percentage greater than the percent of the U.S. population that lives in Arkansas (per 2010 census)?

a. Loan rejection percentage is greater than the population.
b. Loan rejection percentage is less than the population.

Answer: a

2,915,918 population in Arkansas divided by USA population of 308,745,538 = 0.9444%

The loan rejection percentage is greater than the percent of the USA population that lives in Arkansas (per 2010 census), but is reasonably close.

8. (LO 1-6) Download the rejected loans dataset of LendingClub data titled "DAA Chapter 1-1 Data" from Connect Additional Student Resources and do an Excel PivotTable by state; then figure out the number of rejected applications for each state.

8A) Put the following states in order of their loan rejection percentage based on the count of rejected loans (from high [1] to low [11]) of the total rejected loans.

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State	Loan Rejection Rate		Rank 1 (High) to 11 (Low)
1. Arkansas (AR)	1.22	%	2
2. Hawaii (HI)	0.58	%	9
3. Kansas (KS)	0.86	%	5
4. New Hampshire (NH)	0.55	%	10
5. New Mexico (NM)	0.59	%	8
6. Nevada (NV)	1.27	%	1
7. Oklahoma (OK)	1.10	%	3
8. Oregon (OR)	0.95	%	4
9. Rhode Island (RI)	0.50	%	11
10. Utah (UT)	0.69	%	6
11. West Virginia (WV)	0.64	%	7

8B) What is the state with the highest percentage of rejected loans?

Answer: CA

8C) What is the state with the lowest percentage of rejected loans?

Answer: ND

State	Loan Rejection %
CA	0.13292708
TX	0.08344411
NY	0.0797736
FL	0.07688089
PA	0.04401981
IL	0.04246422
OH	0.03779744
NJ	0.03708008
GA	0.03683527
VA	0.03131478
MI	0.02718255
NC	0.02672393
MA	0.02547822
MD	0.02340048
AZ	0.02142811
MO	0.01954559
WA	0.0187585
CO	0.01812325
AL	0.0169798
CT	0.01640652
SC	0.01569535

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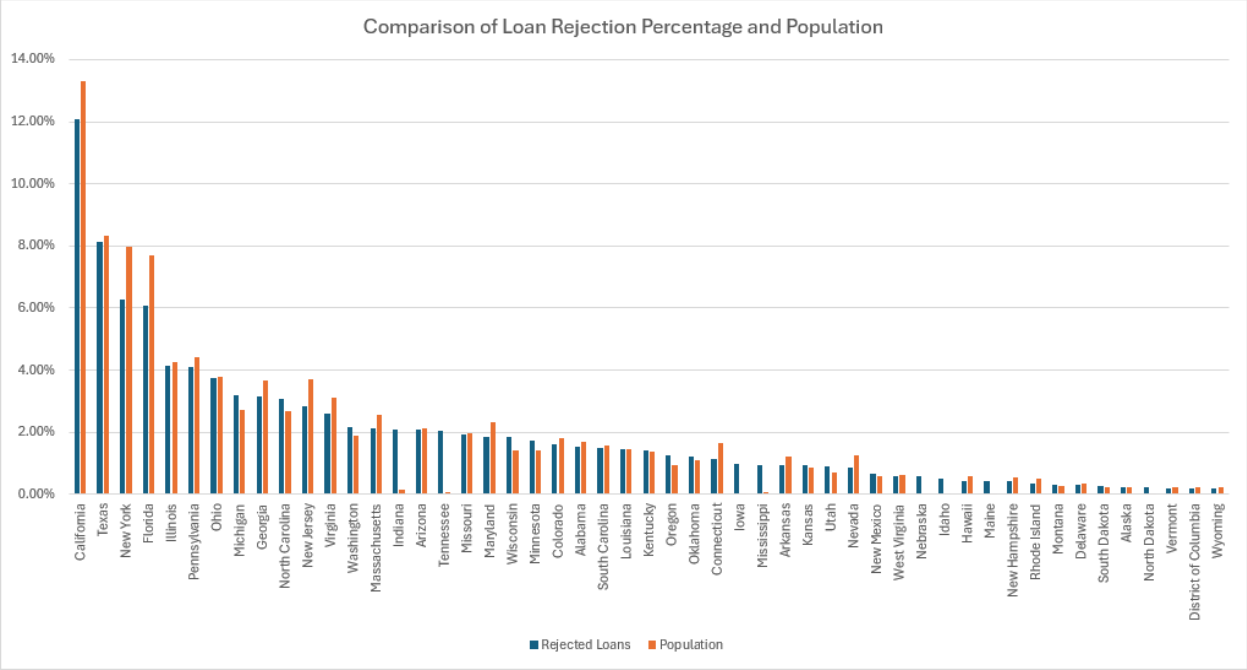
LA	0.01450077
WI	0.01430865
MN	0.01407314
KY	0.01367649
NV (1)	0.01275305
AR (2)	0.01219062
OK (3)	0.01103943
OR (4)	0.00954581
KS (5)	0.00862547
UT (6)	0.00692579
WV (7)	0.00643153
NM (8)	0.00590939
HI (9)	0.005756
NH (10)	0.00551739
RI (11)	0.00498905
DE	0.00354346
MT	0.00284933
VT	0.00250537
AK	0.00249142
DC	0.00236128
SD	0.00223887
WY	0.00220479
IN	0.00149516
MS	0.00059962
TN	0.00055003
NE	0.00022311
IA	0.00017043
ME	0.0001379
ID	8.0568E-05
ND	4.6482E-05

8D) **Analysis:** Does each state's loan rejection percentage roughly correspond to their relative proportion of the U.S. population (by 2010 U.S. census at https://en.wikipedia.org/wiki/2010_United_States_census)?

The loan rejection percentage roughly corresponds with the population of each state. However, there is still substantial variation between the rejection percentage of each state.

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For Problems 9, 10, and 11, we will be cleaning a data file in preparation for subsequent analysis.

9. Here is the pivot table by risk score grouping:

Row Labels	Count of Loan Title
Excellent	2931
Fair	236669
Good	83543
Poor	189621
Very Bad	145322
Very Good	11907
Grand Total	**669993**

Question	Group
Which group had the most observations?	Fair
Which group had the least observations?	Excellent

The Excellent category had the smallest group, whereas the Fair group had the biggest group. Arguably there is a greater population of Fair, even though Very Bad has a smaller count, it is clearly the worst of the group.

The results from the 2013 data are similar to the data from 2007 to 2012.

10. Here is the pivot table by Debt-to-Income (DTI) grouping:

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Row Labels	Count of Amount Requested
High	340615
Low	159464
Medium	169914
Grand Total	**669993**

Question	Group
Which group had the most observations?	High
Which group had the least observations?	Low

Low DTI is the smallest grouping whereas High DTI has the largest grouping.

The higher the debt as compared to income, the less likely the potential borrower would be able to pay back the loan from Lending Club. Since this dataset is for rejected loans, the higher the DTI ratio, the more likely to be rejected for a loan.

11. Here is the pivot table for the loans with excellent risks but high debt-to-income, by years of employment:

Row Labels	Count of Amount Requested
Excellent	**2931**
High	**1190**
0	942
1	12
2	14
3	11
4	12
5	92
6	9
7	15
8	9
9	6
10	68

Question	Level	
Which employment year group had the most observations to go along with excellent risk scores but high debt-to-income?	0	employment years
Which employment year group had the fewest observations to go along with excellent risk scores but high debt-to-income?	9	employment years

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Perhaps those with excellent credit just asked for too big of a loan given their existing debt and that is why they are rejected. This PivotTable analysis suggests those with excellent credit asked for a larger loan given the debt they already had as compared to any of the others, suggesting a reason why even those potential borrowers with excellent credit were rejected. There weren't a lot of them, but there were certainly some!

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Instructor's Resource Manual

Data Analytics for Accounting 2025 Release

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TO THE INSTRUCTOR

This guide includes suggested assignment schedules, topical outlines, chapter comments and observations, and suggested team exercises based on the authors experience teaching data analytics.

Assignment Suggestions. This textbook is not designed to be a survey of data analytics in accounting. Instead, it is intended to develop student skills to support accountant's roles as data analysts. Consequently, we recommend that the assignments include the problems and labs that will develop these skills and require critical thinking. Different instructors will teach this course differently, some choosing to only use the labs or only include the text. Others hoping to cover this textbook in eight weeks, instead of a full fifteen-week period. The assignment suggestions assume that this material will be covered over fifteen-week period.

Brief Topical Outlines. These outlines are designed to assist instructors in coordinating classroom discussions with material covered in the textbook and the PowerPoints. The Brief Topical Outlines identify topics that we believe are important enough to merit some classroom discussion. The outlines also include references to illustrations in the textbook, PowerPoints, questions, problems, and cases that may serve as useful supplements to your class presentations.

Comments and Observations. You will probably find that our comments and observations suggest coverage of more topics than your time will allow. This is because our comments are drawn from the experiences of three instructors over many semesters. Therefore, we suggest that you borrow from our comments that which appeals to you and discard that which does not.

Course Description and Objectives.

For information only, we use the following course description and objectives:

Course Description

Data Analytics is changing the business world - data simply surrounds us! With so much data available about each of us (i.e., how we shop, what we read, what we've bought, what music we listen to, where we travel, who we trust, etc.), arguably, there is the potential for analyzing that data in a way that can answer fundamental business and accounting questions and create value.

According to the results of 18th Annual Global CEO Survey conducted by PwC, many CEOs put a high value on Data Analytics, and 80% of them place data mining and analysis as the second-most important strategic technology for CEOs. In fact, per PwC's 6th Annual Digital IQ survey of more than 1,400 leaders from digital businesses, the area of investment that tops CEOs' list of priorities is business analytics.[1]

This textbook addresses what we believe will be a similar impact of data analytics on accounting and auditing. For example, we argue that data analytics will play an increasingly critical role in the future of audit. In a recent Forbes Insights/KPMG report "Audit 2020: A Focus on Change", the vast majority of survey respondents believe both that:

1. auditors must better embrace technology and

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2. technology will enhance the quality, transparency and accuracy of the audit.

No longer will auditors be simply checking for errors, misstated accounts, fraud, and risk in the financial statements, or merely report their findings at the end of the audit. Through the use of data analytics, audit professionals will be collecting and analyzing the company's data, similar to the way a business analyst would, to help management make better business decisions. In our textbook, we emphasize audit data analytics and all the testing that can be done to perform audit testing.

Data analytics also potentially has an impact on financial reporting. With the use of so many estimates and valuations in Financial Accounting, some believe that employing Data Analytics may substantially improve the quality of the estimates and valuations. Likewise, the use of XBRL data gives accountants access to more timely and more extensive accounting data for financial analysis.

This textbook recognizes that accountants don't need to become data scientists – they may never need to build a data repository or do the real hardcore data analytics or machine learning – however, we do emphasize seven skills that we believe analytic-minded accountants should have, including the following:

1. Developing an Analytics Mindset - recognize when and how data analytics can address business questions

2. Data Scrubbing and Data Preparation – comprehend the process needed to clean and prepare the data before analysis

3. Data Quality – recognize what is meant by data quality, be it completeness, reliability or validity

4. Descriptive Data Analysis – perform basic analysis to understand the quality of the underlying data and its ability to address the business question

5. Data Analysis through Data Manipulation – demonstrate ability to sort, rearrange, merge and reconfigure data in a manner that allows enhanced analysis.

6. Defining and Addressing Problems through Statistical Data Analysis – identify and implement an approach that will use statistical data analysis to draw conclusions and make recommendations on a timely basis

7. Data Visualization and Data Reporting – report results of analysis in an accessible way to each varied decision maker and their specific needs

Consistent with these skills we desire in all accountants, we recognize that Data Analytics is a process. The process begins by identifying business questions that can be addressed with data, and then test the data, refine our testing and finally, communicate those findings to management. We describe our data analytics process by using an established data analytics model called the IMPACT Cycle, by Isson and Harriott:

1. Identify the Question

2. Master the Data

3. Perform Test Plan

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4. Address and Refine Results
5. Communicate Insights
6. Track Outcomes

Course Objectives

After completing this course, students should be able to:

1. Describe in detail the purpose of data analytics and how it can create value for accountants.
2. Describe the IMPACT model and how it can be used to address most accounting issues that can be addressed by accountants.
3. Demonstrate proficiency in multiple software tools to manage data, perform test analyses, communicate findings through text, tables and visualizations.
4. Explain how data analytics can be used in accounting, auditing, managerial accounting and financial accounting to find patterns, errors, and anomalies and find insights useful to decision making.
5. Describe and demonstrate different types of test approaches that can be used to gather insights in decision making.

LABS

Each chapter has a collection of labs at the end that allow the students to apply specific steps of the IMPACT model to a variety of data problems with different datasets. There are a variety of paths that can be taken with assigning the labs. Each lab can be done independent of the labs that precede it, although there are some labs that provide a richer student experience if they are done in sequence. We will describe those sequences in each chapter section, as well as provide information on discussion points and methods for taking the students' learning deeper with each lab.

Each lab has two tracks, a Microsoft track or a Tableau track. The Microsoft track uses a combination of Microsoft tools, including Excel, Power Query, Power BI, and Power Pivot. The Tableau track uses Tableau Prep and Tableau Desktop. We have also added a third track for **Alteryx Designer Desktop**, available through Connect only assignment. And for our latest development we have optional **GenAI Lab versions for Beta release** provided on the Instructor Library for those interested in exploring and integrating GenAI into their classes.

Each of these tools are available on the University of Arkansas' remote desktop, so you do not have to require your students to download the tools directly to their computers (particularly because **many of these tools that are not compatible with Mac computers!**).

However, if you would like to download the tools, here are some relevant links:

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- Tableau Desktop Public Edition (previously Tableau Desktop): https://www.tableau.com/academic/students
- and Tableau Prep: www.tableau.com/academic-prep
    - Ensure that your students register using their .edu email address, this is the best way to ensure that they can gain access to the free academic license.
    - The link will download Tableau to your students' computers (regardless of whether they have a PC or a Mac).
    - Tableau Desktop Public Edition is a free version of Tableau Desktop that primarily creates visualizations and performs high-level data analysis.
    - In contrast, Tableau Prep focusses on preparing data for analysis. It specializes in extracting data (using SQL and other tools) and transforming and cleaning data into usable datasets that then can be analyzed in Tableau Desktop or other software tools.
- Microsoft products:
    - Excel works on a Mac, although the menu paths will occasionally be slightly different and some functionality is entirely missing from Macs (particularly the Internal Data Model, which is embedded into Excel for PCs via Power Pivot.
    - Power BI and the related tools (Power Query and Power Pivot) are only available on PC. If you would like your students who have PC laptops to download Power BI, they can do so for free through the following link: https://powerbi.microsoft.com/en-us/desktop/
    - In this textbook, we use the desktop version of Power BI (not the web app). The menu paths are different on the web app and some of the advanced analytics are not possible via the web app.
- Alteryx products:
    - Alteryx Designer Desktop is only available on PC. If you would like your students who have PC laptops to download Alteryx Designer Desktop, they can do so for free through the following link: https://www.alteryx.com/sparked/learning-programs/students Ensure your students use their .edu email address, this is the best way to ensure that they can gain access to the free academic license.
    - Alteryx also provides a cloud offering, Alteryx Designer Cloud. Our labs are not built specifically using the cloud version, so some of the menu paths vary. Designer Cloud does not have all of the functionality as Designer Desktop, but it is a great workaround for Mac users. If you wish to use the Designer Cloud, you as the educator can request access to Alteryx Analytics Cloud for one year and receive a a free academic workspace for yourself and your students. You can request a 30-day free trial for yourself and then request a workspace to which you can add your students to give them access to Alteryx

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Designer Cloud. You can find more information by signing up for Alteryx's free SparkED program for educators: https://www.alteryx.com/sparked

Each chapter has at least three end-of-chapter labs, and chapters 1 – 7, 9, and 11 have Comprehensive Case labs that are based on a real-life large dataset from Dillard's department store. The end-of-chapter labs can each be completed on the students' local computers or on the local computer in your computer lab. **The Comprehensive Case labs require the student to remote into a virtual environment. Detailed instructions are provided on the instructor's website.**

Instructional videos

We have put together a variety of videos to help you gain confidence with the tools and resources available in the textbook:

- **Remote Desktop tutorial: this video walks you through how to request access to the University of Arkansas remote desktop for yourself and your students (it is free to do so, just takes about 48 hours for requests to be fulfilled), as well as how to navigate the remote desktop.**

- **Intro Excel, Power BI, and Tableau tutorials: we have a variety of 3rd party videos that will help set the base level knowledge for working with the main tools we use in this textbook that you can access for yourself and/or share with your students.**

- **Lecture videos: Every chapter has a dedicated lecture video and accompanying PowerPoint slide deck.**

- **Lab videos: Every lab has a set of dedicated lab videos and accompanying PowerPoint slide decks. The lab videos are split to follow the segmentation of parts in each lab, as well as split for each track.**

Tips on Enhancing the Integrity of Assignments in Lab Screenshots

Throughout the labs, we emphasize the process and analysis of the lab results. As such, we expect students to show their progress through the labs by taking screenshots at various checkpoints throughout the lab. To minimize the possibility of reuse of student work, we require our students to include personally identifiable data in each screenshot, such as a text or sticky note with their name and university e-mail address, to verify the work is theirs. The students will not receive credit for the work without this information. Most Web-based tools, such as Microsoft 365, show the student's name in the corner of the screen when they are logged in, so that is also sufficient. On Windows, students can search for "Sticky Notes" or "Notepad". On a Mac, students should search for "Stickies" or "TextEdit".

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[1] "Data Driven: What students need to succeed in a rapidly changing business world," by PwC, http://www.pwc.com/us/en/faculty-resource/assets/PwC-Data-driven-paper-Feb2015.pdf, posted February 2015, extracted January 9, 2016.

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CHAPTER 1

1. Data Analytics for Accounting and Identifying the Question

Brief Topical Outline

A. Introduction
   1. What is Data Analytics? (PowerPoints 1-3 – 1-5)
   2. Why does Data Analytics Matter to Business? (PowerPoints 1-6 – 1-8)
   3. Why does Data Analytics Matter to Accounting? (PowerPoints 1-9 – 1-14)
   4. How does Data Analytics Affect Auditing? (PowerPoints 1-10)
   5. How does Data Analytics Affect Management Accounting (Powerpoints 1-11)
   6. How does Data Analytics Affect Financial Reporting? (PowerPoint 1-12)
   7. How does Data Analytics Affect Tax? (PowerPoint 1-13)

B. Introduction to the IMPACT Model (PowerPoint 1-15 – 1-23)
   1. Identify the Questions (PowerPoint 1-17)
   2. Master the Data (PowerPoint 1-18)
   3. Perform the Test Plan (PowerPoint 1-19)
   4. Address and Refine Results (PowerPoint 1-20)
   5. Communicate Insights (PowerPoint 1-21)
   6. Track Outcomes (PowerPoint 1-22)

C. Data Analytics Skills Needed by Accountants (PowerPoints 1-24 – 1-30)

D. Hands-on Example of the IMPACT Model (PowerPoint 1-31 – 1-46)
   1. Identify the Questions (PowerPoint 1-32)
   2. Master the Data (PowerPoints 1-33 – 1-36)
   3. Perform the Test Plan (PowerPoints 1-38 – 1-40)
   4. Address and Refine Results (PowerPoints 1-41 – 1-43)
   5. Communicate Insights (PowerPoint 1-44)
   6. Track Outcomes (PowerPoint 1-45)

E. Artificial Intelligence and Data Analytics (PowerPoint 1-47 – 1-50)

F. Summary – (PowerPoint 1-51)

G. Chapter 1 Lab Walk-throughs – (Separate Lab PowerPoint decks)

Comments and Observations

In our first class meeting, we discuss not only about the role of accountants as information provider, but also how that role is steadily changing to become an interpreter of data. That is, to actively look to data and the interpretation of that data to help answer business problems by deciding what questions need answering, what information needs to be collected to address the question, and what the analysis will entail.

We then start defining data analytics and how it creates value in business and then more specifically what data analytics has done and has the potential of doing in auditing, managerial accounting, financial

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reporting, and taxes. We emphasize the types of accounting questions that exist and how data and data analysis can address them.

We next introduce the IMPACT model. The IMPACT model serves as a foundation for this chapter, and for each remaining chapter. We also use it as a foundation for each of the labs throughout the text. We discuss each of these steps, one by one and talk about what each step entails and why it is important. I like emphasizing the iterative nature of the IMPACT model to reinforce that the data analysis efforts continue as new questions are asked and new data and analyses are available.

We spend some time naming the skills needed by accountants and what we will do in the textbook to help get them there.

We spend substantial time in this chapter chapter illustrating the IMPACT model with the real-world Lending Club data. We go through each step of the IMPACT model one by one, asking what types of questions Lending Club would likely want answered and focus in on the loan decision of whether to extend a loan or not. The discussion continues by asking what data could be used to answer these questions if we could get any data we wanted, etc. I then jump into the data with them to show them what is there. We talk about data cleaning, data transformation and what assumptions we would need to make to do that. We also do some pivot tables analysis and answer the question of why loans were rejected and inversely why loans are accepted.

If you are teaching in a hybrid environment or otherwise prefer a flipped classroom, you can consider starting with illustrating the IMPACT model and the Lending Club data instead of starting with the conceptual introduction of the topics.

We wrap up the chapter with a discussion on artificial intelligence, establishing the basic vocabulary surrounding working with generative AI and prompt engineering and its place in accounting.

One of the goals of chapter 1 is for the students to open their minds and really learn what data analytics can do for accountants. This chapter provides a good introduction and foundation for what will be included in the textbook and start to address the skills needed.

The presentation ends by introducing the labs that we will cover. I point out why they fit and what they are trying to teach the students.

Suggested Team Exercise

Just as the discussion of the questions that could be answered with data analytics concludes, I have them think of auditing data and think what auditing issues/questions auditors have with sales and how they could be addressed with data, for example, a complete sales journal. I think it is helpful for the students to meet in small groups and see if they can address that topic and then report their findings ready for a full class discussion.

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Chapter 1 Labs

If you are going to complete any labs throughout the semester, we strongly recommend beginning with Lab 1-0 to help the student become familiar with the way labs are set up in the textbook. The remaining labs in chapter 1 can be used to help the student begin applying an analytic mindset to a variety of accounting problems. Additionally, each chapter 1 lab precedes future labs in the textbook well. The future labs could be completed without having first completed the chapter 1 labs, but a student's experience with the later labs may be richer if they can recall what they first applied in chapter 1.

Additionally, if you are planning to use the comprehensive labs that rely on Dillard's data throughout the semester, it is strongly encouraged to work through Lab 1-4 and 1-5 as an introduction to the Dillard's data and how to access it.

- Labs 1-1 through 1-3 continue introducing the student to the IMPACT model, and they also each set the stage for later material.
    - Lab 1-1 has the student practice thinking analytically about financial accounting data, so it precedes work the student will complete in chapter 8. This lab precedes Lab 8-1 very well.
    - Lab 1-2 has the student practice thinking analytically about managerial accounting data. This lab also introduces the student to the Lending Club dataset, which is used in future labs, so Lab 1-2 precedes Labs 2-3 (cleaning data), Lab 2-4 (generating summary statistics) and Lab 3-2 (Identify Data Clusters) very well.
    - Lab 1-3 has the student practice thinking analytically about audit data and it introduces the Audit Data Standards which the student revisits in chapter 5.
- Labs 1-4 and 1-5 are the Comprehensive Cases for chapter 1
    - Lab 1-4 introduces the student to the way the data is organized in the Dillard's database. The case also has the students identify questions they may be able to ask and answer with the Dillard's data, which sets the stage for future Comprehensive Case labs.
    - Lab 1-5 introduces students to how to access Dillard's data using the University of Arkansas Remote Desktop and Microsoft Excel, Microsoft Power BI, Tableau Prep, and Tableau Desktop.

Chapter 2

2. Master the Data

Brief Topical Outline

A. Chapter Introduction (PowerPoints 2-1 – 2-2)
B. How are Data Used and Stored in the Accounting Cycle (PowerPoints 2-3 – 2-5)
C. The Use of Relational Databases (PowerPoints 2-6 and 2-11)
    1. How are Data Stored in Relational Databases (PowerPoints 2-6 – 2-9)
    2. The Use of a Data Dictionary (PowerPoint 2-10)

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D. Extract, Transform and Load (PowerPoints 2-12 – 2-24)
    1. Step 1: Determine the purpose and scope of the data request (PowerPoint 2-14)
    2. Step 2: Obtain the Data (PowerPoints 2-15 – 2-19)
    3. Step 3: Validate the Data for Completeness (PowerPoint 2-20)
    4. Step 4: Clean the Data (PowerPoint 2-21 – 2-22)
    5. Step 5: Load the Data for Data Analysis (PowerPoint 2-23)
E. Ethical Considerations of Data Collection and Use (PowerPoint 2-25 – 2-27)
F. Summary (PowerPoint 2-28)
G. Chapter 2 Lab Walk-throughs – (Separate Lab PowerPoint decks)

Comments and Observations

As we journey through the IMPACT model, after identifying the question, we start looking at the data. So, the discussion might begin by saying, if we had all available data to answer this question, what data would we use. We ask questions like:

1. What data is available to address the key question? Is there a system that already captures that data?

2. What is the quality of the data? Is it reliable? Is it biased? Why does that matter?

3. Where did it come from (internal vs. external sources), etc.? Why does that matter?

I like going through the basics of relational databases again. They will not admit to remembering it from their AIS course, if they were fortunate to have taken one before this course. This will help them understand how data might originate in their datasets and prepare them for some of the labs where joining different tables using the primary and foreign keys might be required. I also point out the data dictionary for a dataset like Lending Club or Dillard's (particularly if you have already covered these in class in Chapter 1).

It is important to know what data you need, and then be able to ask for that data in a complete way. You certainly do not want to keep going back to the data source to ask for additional data. And you cannot just ask for all the data because it is often just too big to use it all! Once you have the data you need to validate that you got what you asked for, assess the data quality, and then clean the data to get it ready for its intended use. As noted in Chapter 1, data analysts spend between 50 and 90% of their time cleaning and preparing the data as part of ETL (Extract, Transform, and Load). This is a good time to reintroduce prompt engineering and how generative artificial intelligence can help provide clarification and guidance on various data preparation steps.

The last step is to load the data in some type of analysis program, which often depends on the test approach used, your own familiarity with the software packages and whether you want to use more of an analysis package (such as Excel) or a visualization program (such as Tableau or Power BI).

The chapter ends with a discussion on ethical considerations of data collection and use. As the amount of data that companies gather on individuals, it is important to consider how the company will use the data and what safeguards the company has in place to mitigate data misuse.

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Suggested Team Exercise

Given access to the LendingClub data, I like to start the team exercise by highlighting a loan acceptance/rejection decision that a bank must make. And say something like, as a team, "write down all of the data you'd like to know about an individual before deciding whether to extend a loan and if you do extend a loan, the interest rate that you would likely give them." Allow the team a full 8-15 minutes to put together the data needs. Students then present their findings and get feedback from other students.

I then take over the class discussion After that, we look at the data dictionary. I let them see what data is available and what characteristics they have – are they numeric, are they ranked, are they machine readable, etc.? We then open the dataset of loan rejections – I use 2013 as it will fit in Excel and see what issues there are in cleaning the data. For example, how do you do analysis if the loan data says years of work experience "10+" instead of "10"? How do you build that into your analysis? What do you do with missing data? These are all important questions that they will need to start addressing as they become data analysts!

After discussing data cleaning, you can continue to team exercise to have your students consider the ethical risks associated with the data in the Lending Club dataset. What safeguards should Lending Club have in place to avoid data misuse? What should they communicate with their customers before gathering their data?

Chapter 2 Labs

If you only have time to complete two labs in chapter 2, we recommend focusing on Lab 2-2 and 2-3. 2-2 provides the students experience with PivotTables, Excel's Internal Data Model, and SQL queries in Access, which the student will continue to be exposed to in future labs throughout the textbook. Lab 2-3 provides the students experience cleaning messy data.

If you are assigning comprehensive labs throughout this text, we recommend that you complete Comprehensive Lab 2-8 at a minimum, so that the students can learn how to connect an Excel workbook to the Dillard's dataset that is stored in SQL Server.

- Lab 2-1 Request Data from IT – Slainte: Lab 2-1 is a conceptual lab. The student will not work with any data but are instead provided a scenario in which they need to request data to solve a problem, and then see if the data they were provided aligns with the data they requested. The students will need to identify data that seemed likely to have been held back when their data request was fulfilled to answer the questions in part 2 of the lab. This lab works with the Slainte dataset, a fictional sales database for a brewery.

  The remaining labs do not depend on the knowledge the student gains from this lab, although this does give the student experience in thinking through the importance of identifying the necessary data a data request, as well as being thorough when comparing the data that was received to that which was requested.

- Lab 2-2 Prepare Data for Analysis – Slainte: Lab 2-2 is an applied lab which provides the students an opportunity to work with data stored across multiple tables in Excel or in Tableau. This lab works with the Slainte dataset, a fictional sales database for a brewery.

  Part 1 has the students prepare a data model:

  - Microsoft track: use Power Query in Excel to transform the data then load it to the Excel

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