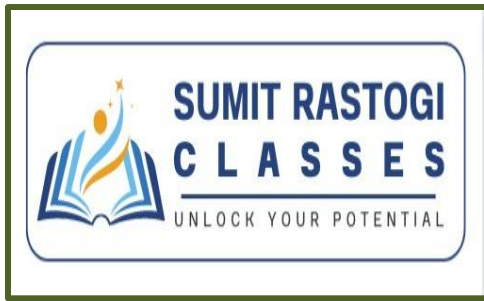




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## **BDA (TEST PAPER – 04)**

**(Chapters Covered – Introduction to Data Science, Data Processing, Data Presentation and Data Analysis & Modeling)**

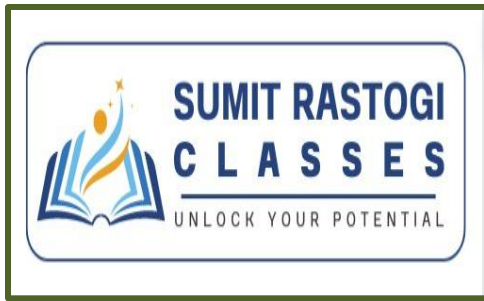
**Time Allowed: 3 Hours**

**Full Marks: 100**

**Section A contains Question Number 1. All parts of this question are compulsory.  
Working notes should form part of the relevant answer.**

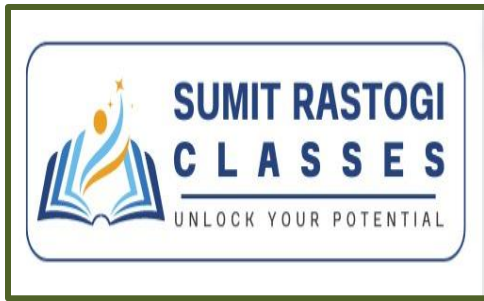
### **SECTION – A**

1. Choose the correct answer from the given alternatives (you may write only the Roman number and the alphabet of your answer. (2×15=30 Marks)
- (i) Numerical Data may be expressed as  
(A) In the form of text  
(B) In the form of numbers  
(C) In the form of images  
(D) All of the above
- (ii) Data may be classified as Restricted \_\_\_\_\_ or Public by an entity.  
(A) Sensitive  
(B) Classified  
(C) Private  
(D) Confidential
- (iii) The Probability Density function describes:  
(A) The characteristics of a Random Variable  
(B) The characteristics of a Non-Random Variable.  
(C) The characteristics of a Non-Random Constant.  
(D) The characteristics of a Random Constant.
- (iv) The Descriptive Data may be deciphered as  
(A) May be deciphered in the form of qualitative information  
(B) May be deciphered in the form of quantitative information  
(C) May be deciphered in the form of information from informal sources  
(D) All of the above



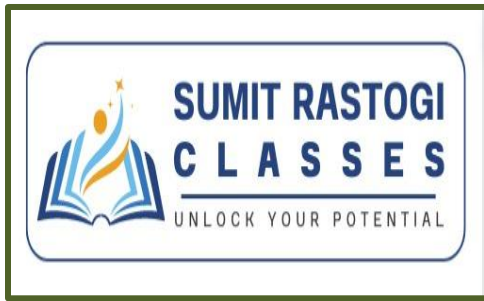
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- (v) Which of the following is not a Data Validation Technique?
- (A) Consistency check
  - (B) Length check
  - (C) Range check
  - (D) Code check
- (vi) Binominal Distribution applies to attributes that are categorized into:
- (A) Two manually exclusive classes
  - (B) Three mutually exclusive classes
  - (C) Four mutually exclusive classes
  - (D) Five mutually exclusive classes
- (vii) Normal distribution has a symmetric \_\_\_\_\_ representation.
- (A) Linear
  - (B) Graphical
  - (C) Statistical
  - (D) Bell-Shaped
- (viii) A Scatter Plot displays several unique data points:
- (A) On a single graph
  - (B) On two different graphs
  - (C) On three different graphs
  - (D) On four different graphs
- (ix) To make the data turn into user friendly information, it should go one/more of following core steps
- (A) Collection of data
  - (B) Organising the data
  - (C) Data processing
  - (D) All of the above
- (x) Following are the Techniques of Data Mining
- (A) Association rules
  - (B) Neural network
  - (C) Decision tree
  - (D) All of the above



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- (xi) Which of the following is a widely used graphs for Data Visualization?
- (A) Histogram
  - (B) Pie chart
  - (C) Bar chart
  - (D) All of the above
- (xii) XML is the abbreviated form of
- (A) Extensible Mark-Up Language
  - (B) Extended Mark-Up Language
  - (C) Extendable Mark-Up Language
  - (D) Extensive Mark-Up Language
- (xiii) Data \_\_\_\_\_ techniques are utilized to develop descriptions and hypothesis on a specific data set.
- (A) Analysis
  - (B) Mining
  - (C) Visualization
  - (D) Interpretation
- (xiv) XBRL is the abbreviated form of
- (A) Extensible Business Reporting Language
  - (B) Extensive Business Reporting Language
  - (C) Extended Business Reporting Language
  - (D) Extendable Business Reporting Language
- (xv) Which of the following is a type of Cloud Computing?
- (A) Hybrid cloud
  - (B) Private cloud
  - (C) Public cloud
  - (D) All of the above



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### **SECTION – B**

Answer any five questions from question number 2 to 8.

14×5 =70

**2 (a)** Explain briefly the five basic principles of data ethics that a business organization should follow. (7 Marks)

**2 (b)** "Biggest challenges lie in creating the efficiencies needed to gather and process basic financial data and continue to deliver traditional finance outputs while at the same time redeploying their limited resources to enable higher-value business decision support activities." List of the steps to be followed to transform raw data into user friendly information. (7 Marks)

**3 (a)** How are Data Processing and Data Science related to finance? Mention the relevance in the areas of risk analytics, real time analytics and customer data management. (7 Marks)

**3 (b)** 'While Data Analytics is an important tool for decision making, managers should never take an important analysis at face value.' Analyse the underlying essence of the statement. (7 Marks)

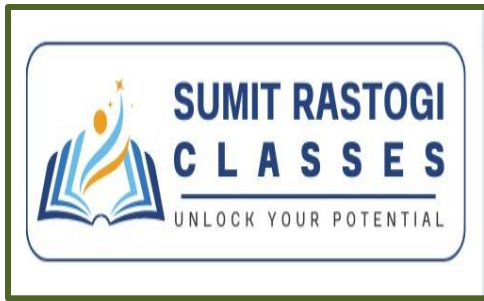
**4 (a)** What is Data Cleaning? What are the Benefits of Data Cleaning? (7 Marks)

**4 (b)** Summarise the Benefits of Data Analytics. (7 Marks)

**5 (a)** List the following:

- Steps involved in using Data Visualisation in report design.
- Objectives of Data Visualisation.
- Important four issues which the presenter should keep in mind for effective Data Visualisation.
- List any four Tools for visualising and presenting the data. (7 Marks)

**5 (b)** State the Meaning, Objectives and Scope of Data Presentation Architecture (DPA). (7 Marks)



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**6 (a)** Ram Kumar is the head data scientist of Anjana Ltd. For the last few weeks, he is working along with his team for extracting information from a huge pile of data collected over time. His team members are working day and night for collecting and cleaning the data. He has to make a presentation before the senior management of the company to explain the findings.

Discuss the important steps, he needs to take care of to transform raw data into useful knowledge.

**(7 Marks)**

**6 (b)** Discuss the Objectives of Data Visualization.

**(7 Marks)**

**7 (a)** Arjun is a Data Analyst working with Akansha Limited. The company deals in retailing of FMCG products. The company follows both online mode as well as the offline mode for delivering the services. Over the years, the company accumulated a huge amount of data.

The management is little puzzled about the ways in which this data may be brought into usable format. Arjun is entrusted with the responsibility of bringing the data into usable format. Make your suggestions, how this is to be done.

**(7 Marks)**

**7 (b)** How to use Data Visualization in Report Design?

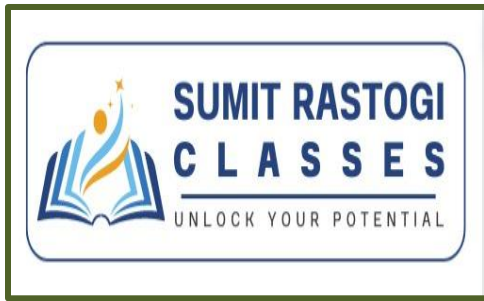
**(7 Marks)**

**8 (a)** Describe Quantitative Financial Data and Qualitative Financial Data. Explain Nominal Scale and Ratio Scale in the context of types of data.

**(7 Marks)**

**8 (b)** Discuss the ways in which the finance professionals may be helped by data visualization in analysing and reporting information.

**(7 Marks)**

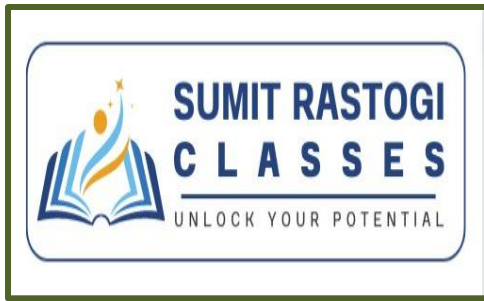


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## **BDA**

### **SECTION - A**

- (i) (B) In the form of numbers
- (ii) (C) Private
- (iii) (A) The Characteristics of a Random Variable
- (iv) (A) May be deciphered in the form of qualitative information
- (v) (B) Length check
- (vi) (A) Two manually exclusively classes
- (vii) (D) Bell-shaped
- (viii) (A) On a Single Graph
- (ix) (D) All of the above
- (x) (A) All of the above
- (xi) (D) All of the above
- (xii) (A) Extensible Mark-Up Language
- (xiii) (B) Mining
- (xiv) (A) Extensible Business Reporting Language
- (xv) (D) All of the above

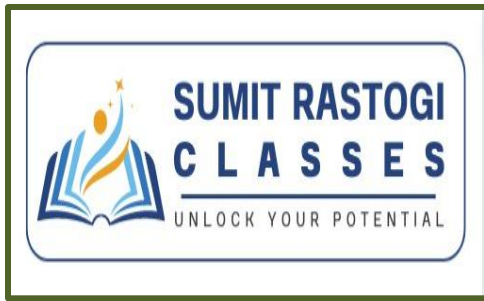


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## **SECTION – B**

**Ans. 2 (a) The five Basic Principles of Data Ethics that a Business Organization should follow are:**

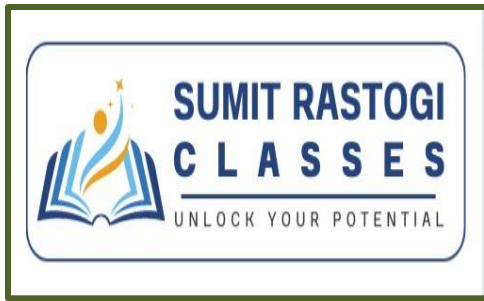
- (i) **Regarding ownership:** The first principle is that ownership of any information belongs to the person. It is unlawful and unethical to collect someone's personal data without their consent. The consent may be obtained through digital privacy policies or signed agreements or by asking the users to agree with terms and conditions. It is always advisable to ask for permission beforehand to avoid future legal and ethical complications. In case of financial data, some data may be sensitive in nature. Prior permission must be obtained before using the financial data for further analysis.
- (ii) **Regarding transparency:** Maintaining transparency is important while gathering data. The objective with which the company is collecting user's data should be known to the user. For example, if the company is using cookies to track the online behavior of the user, it should be mentioned to the user through a written policy that cookies would be used for tracking user's online behavior and the collected data will be stored in a secure database to train an algorithm to enhance user experience. After reading the policy, the user may decide to accept or not to accept the policy. Similarly, while collecting the financial data from clients, it should be clearly mentioned that for which purpose the data should be used.
- (iii) **Regarding privacy:** As the user may allow collecting, store and analyze the Personally Identifiable (PII) that does not imply it should be made publicly available. For companies, it is mandatory to publish some financial information to public e.g. through annual reports. However, there may be many confidential information, which if falls on a wrong hand may create problems and financial loss. To protect privacy of data, a data security process should be in place. This may include file encryption and dual authentication password etc. The possibility of breach of data privacy may also be done through de-identifying a dataset.
- (iv) **Regarding intention:** The intention of data analysis should never be making profits of others weaknesses or for hurting others. Collecting data which is unnecessary for analysis should be avoided and it's unethical.
- (v) **Regarding outcomes:** In some cases, even if the intentions are good, the result of data analysis may inadvertently hurt the clients and data providers. This is disparate which is unethical.



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**Ans. 2 (b) To make the data turn into user friendly information, it should go through Six Core Steps:**

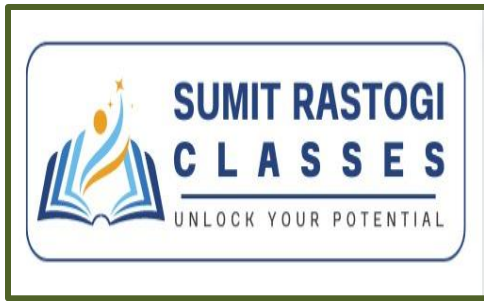
- (i) **Collection of data:** The collection of data may be done with standardized systems in place. Appropriate software and hardware may be used for this purpose. Appointment of trained staff also plays an important role in collecting accurate and relevant data.
- (ii) **Organising the data:** The raw data needs to be organized in an appropriate manner to generate relevant information. The data may be grouped, arranged in a manner that creates useful information for the target user groups.
- (iii) **Data processing:** At this step, data needs to be cleaned to remove the unnecessary elements. If any data point is missing or not available, that also needs to be addressed. The options available for presentation format for the data also need to be decided.
- (iv) **Integration of data:** Data integration is the process of combining data from various sources into a single, unified form. This step includes creation of data network sources, a master server and users accessing the data from master server. Data integration eventually enables the analytics tools to produce effective, actionable business intelligence.
- (v) **Data reporting:** Data reporting stage involves translating the data into a consumable format to make it accessible by the users. For example, for a business firm, they should be able to provide summarized financial information e.g. revenue, net profit etc. The objective is, a user, who wants to understand the financial position of the company should get the relevant and accurate information.
- (vi) **Data utilization:** At this ultimate step, data is being utilized to back corporate activities and enhance operational efficiencies and productivity for the growth of business. This makes the corporate decision making really 'data driven'.



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**Ans. 3 (a) The relevance of data processing and data science in the area of finance is increasing every day. The three significant areas where data science play important role are:**

- (i) Risk analytics:** Business inevitably involves risk, particularly in the financial industry. It is crucial to determine the risk factor before making any decisions, For example, a better method for defending the business against potential cyber security risks is risk analytics, which is determined through data science, Given that a large portion of a company's risk-related data is "unstructured," its analysis without data science methods can be challenging and prone to human mistake.
- (ii) Real time analytics:** With technological advancement and improved hard- ware, analytics are now available, as Data Engineering, Data Science, Machine Learning, and Business Intelligence work together to provide the optimal user experience. Thanks to dynamic data pipelines, data streams, and a speedier data transmission between source and analyser, businesses can now respond quickly to consumer interactions. With real-time analysis, there are no delays in establishing a customer's worth to an organisation, and credit ratings and transactions are far more precise.
- (iii) Customer data management:** Using methods such as text analytics, data mining, and natural language processing, data science is well-equipped to deal with massive volumes of unstructured new data. Consequently, despite the fact that data availability has been enhanced, data science implies that a company's analytical capabilities may also be upgraded, leading to a greater understanding of market patterns and client behaviour.

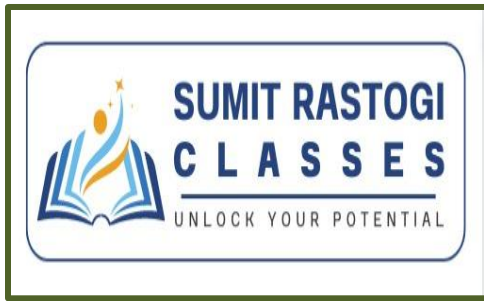


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**Ans. 3 (b)**

- While data analytics is an important tool for decision making, managers should never take an important analysis at face value.
- A deeper understanding of hidden insights that lie underneath the surface of the data set need to be explored, and what appears on the surface should be looked with some scepticism.
- The emergence of new data analytics tools and techniques in financial environment allows the accounting and finance professionals to gain unique insights into the data, but at the same time creating very unique challenges while exercising scepticism.
- As the availability of data is bigger now, analysts and auditors not only getting more information, but also is facing challenges about managing and investigating red flags.
- One major concern about the use of data analytics is the likelihood of false positives, i.e. the data may identify few potential anomalies that could be later identified as reasonable and explained variation of data.
- Studies show that the frequency of false positives increase proportionately with the size and complexity of data.
- Few studies also show that analysts face problems while determining outliers using data analytics tools.
- Professional scepticism is an important focus area for practitioners, researchers, regulators and standard setters.
- At the same time, professional scepticism may result into additional costs e.g. strained client relationships, and budget coverages. Under such circumstances, it is important to identify and understand conditions in which the finance and audit professionals should apply professional scepticism.
- There is a requirement to keep a fine balance costly scepticism and underutilizing data analytics to keep the cost under control.



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**Ans. 4 (a)**

**DATA CLEANING:**

Data cleaning is the process of correcting or deleting inaccurate, corrupted, improperly, formatted, duplicate, or insufficient data from a dataset. When several data sources are combined, there are numerous chances for data duplication and mislabeling. Incorrect data renders outcomes and algorithms untrustworthy, despite their apparent accuracy.

**BENEFITS OF DATA CLEANING:**

- 1) Error correction when numerous data sources are involved.
- 2) Fewer result in happier customers and less irritated workers.
- 3) Capability to map the many functions and planned uses of your data.
- 4) Monitoring mistakes and improving reporting to determine where errors are originating can make it easier to repair inaccurate or damaged data in future applications.
- 5) Using data cleaning technologies will result in more effective corporate procedures and speedier decision-making.

**ANS. 4 (B) FOLLOWING ARE THE BENEFITS OF DATA ANALYTICS:**

**(i) Improves Decision Making Process**

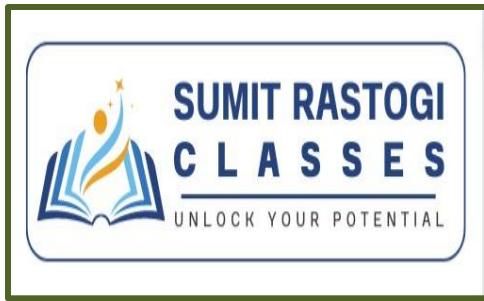
Companies can use the information gained from data analytics to base their decisions, resulting in enhanced outcomes. Using data analytics significantly reduces the amount of guesswork involved in preparing marketing plans, deciding what materials to produce, and more. Using advanced data analytics technologies, you can continuously collect and analyse new data to gain a deeper understanding of changing circumstances.

**(ii) Increase in Efficiency of Operations**

Data analytics assists firms in streamlining their processes, conserving resources, and increasing their profitability. When firms have a better understanding of their audience's demands, they spend less time creating advertising that do not fulfil those needs.

**(iii) Improved Service to Stakeholders**

Data analytics gives organisations with a more in-depth understanding of their customers, employees and other stake holders. This enables the company to tailor stakeholders' experiences to their needs, provide more personalization, and build stronger relationships with them



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**Ans. 5 (a)**

**(i) Steps involved in using Data Visualisation in report design:**

1. Find a story in the data
2. Create a narrative
3. Choose the most suitable data Visualisation
4. Follow the visual language
5. Publicize the report

**(ii) Objectives of Data Visualisation:**

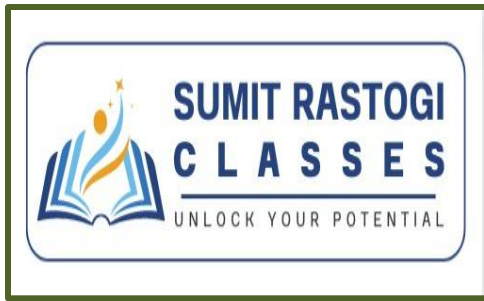
1. Making a better data analysis
2. Faster decision making
3. Analysing complicated data.

**(iii) Important four issues which the presenter should keep in mind for effective Data Visualisation:**

1. Know the objective
2. Always keep the audience in mind
3. Invest in the best technology
4. Improve the team's ability to visualise data.

**(iv) List any four for visualising and presenting the data:**

1. Dashboards
2. Bar Charts
3. Gantt Chart
4. Density Maps.



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**Ans. 5 (b)**

### **MEANING OF DPA:**

Data Presentation Architecture (DPA) is a set of skills that aims to identify, find, modify, format, and present data in a manner that ideally conveys meaning and provides insight.

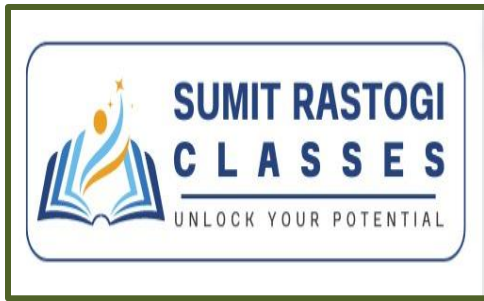
According to Kelly Latt, "Data Presentation Architecture (DPA) is a rarely applied skill set critical for the success and value of Business Intelligence.

### **OBJECTIVES OF DPA:**

- (i) Utilize data to impart information in the most efficient method feasible (provide pertinent, timely and comprehensive data to each audience participant in a clear and reasonable manner that conveys important meaning, is actionable and can affect understanding, behaviour and decisions).
- (ii) To utilise data to deliver information as effectively as feasible (minimise noise, complexity, and unneeded data or detail based on the demands and tasks of each audience)

### **SCOPE OF DPA:**

- (i) Defining significant meaning (relevant information) required by each audience member in every scenario.
- (ii) Obtaining the proper data (focus area, historic reach, extensiveness, level of detail, etc.).
- (iii) Determining the needed frequency of data refreshes (the currency of the data).
- (iv) Determining the optimal presentation moment (the frequency of the user needs to view the data).
- (v) Using suitable analysis, categorization, visualisation, and other display styles.
- (vi) Developing appropriate delivery techniques for each audience member based on their job, duties, and technological access.



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**Ans. 6 (a)** Transforming raw data into useful knowledge is a multi-step process that involves several critical stages. Here's a detailed outline of the steps Ram Kumar and his team should take to ensure they derive meaningful insights from their data:

### **1. Data Collection**

- **Identify Data Sources:** Determine all relevant data sources, such as databases, APIs, external files, or any other repositories where the data might reside.
- **Gather Data:** Extract data from these sources, ensuring that all necessary data points are collected. This might involve automated scripts or manual collection methods.
- **Ensure Data Integrity:** Verify that the data collected is complete and accurate.

### **2. Data Cleaning**

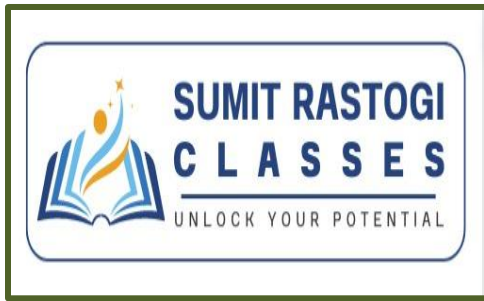
- **Remove Duplicates:** Identify and remove any duplicate records that might skew the results.
- **Handle Missing Values:** Decide how to handle missing data—either by filling them with appropriate values (imputation) or by removing records with too many missing fields.
- **Correct Errors:** Identify and correct inaccuracies or inconsistencies in the data. This includes fixing typos, incorrect entries, and other errors.
- **Standardize Data:** Ensure that data is in a consistent format (e.g., dates, units of measurement).

### **3. Data Transformation**

- **Normalize Data:** Adjust data to a standard range, often necessary for numerical fields.
- **Aggregate Data:** Combine data from various sources or records to provide more comprehensive insights.
- **Feature Engineering:** Create new features or variables that could be more predictive or useful for analysis based on existing data.
- **Data Encoding:** Convert categorical variables into numerical values if necessary for analysis (e.g., one-hot encoding).

### **4. Data Analysis**

- **Exploratory Data Analysis (EDA):** Use statistical and visualization techniques to understand the data's structure, relationships, and patterns.
- **Hypothesis Testing:** Formulate and test hypotheses to understand relationships and causations within the data.



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- **Data Modelling:** Develop models to predict outcomes, find correlations, or classify data. This could involve machine learning techniques, regression analysis, clustering, etc.

#### 5. Data Validation

- **Cross-Validation:** Validate the models using techniques like k-fold cross-validation to ensure they generalize well to unseen data.
- **Performance Metrics:** Use appropriate metrics (e.g., accuracy, precision, recall, F1 score) to evaluate model performance.

#### 6. Interpretation and Insights

- **Identify Key Findings:** Highlight the most significant insights and patterns discovered during the analysis.
- **Correlate Findings to Business Goals:** Relate the insights back to the business context and objectives to ensure relevance.

#### 7. Visualization and Reporting

- **Data Visualization:** Create clear and insightful visualizations (charts, graphs, dashboards) to present the data and findings effectively.
- **Prepare the Presentation:** Organize the insights into a coherent narrative for the senior management. Focus on the implications of the findings for the business, actionable recommendations, and future steps.
- **Practice Delivery:** Ensure the presentation is clear, concise, and tailored to the audience, focusing on the most critical insights.

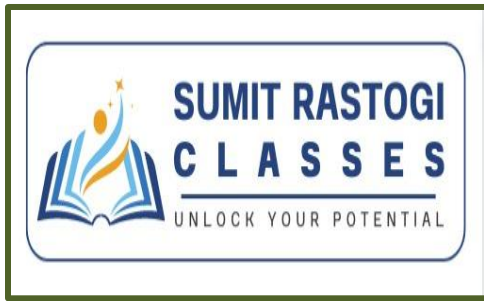
#### 8. Actionable Recommendations

- **Provide Recommendations:** Based on the findings, offer concrete actions that the company can take to leverage the insights.
- **Outline Next Steps:** Suggest further analysis or additional data collection that could refine or expand the insights.

#### 9. Feedback and Iteration

- **Gather Feedback:** After presenting, collect feedback from the senior management and other stakeholders.
- **Iterate and Improve:** Use the feedback to refine the analysis, models, or presentation approach for future projects.

**By following these steps, Ram Kumar and his team can effectively transform raw data into actionable knowledge that can drive strategic decision-making at Anjana Ltd.**



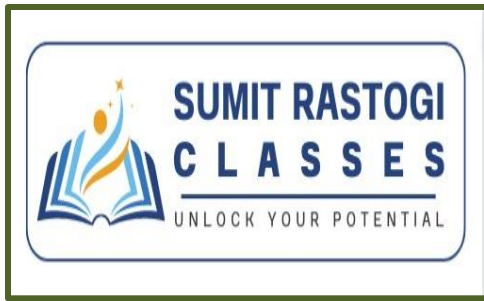
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**ANS. 6 (B) THE KEY OBJECTIVES OF DATA VISUALIZATION:**

- 1. Communicating Information Clearly:** Making complex data understandable and accessible.
- 2. Exploring Data and Generating Insights:** Uncovering patterns, trends, and relationships within data.
- 3. Presenting Findings Effectively:** Engaging audiences and telling a compelling story with data.
- 4. Supporting Data-Driven Communication:** Enabling collaboration and promoting transparency in decision-making.
- 5. Making Data Accessible to All:** Democratizing data access and improving accessibility for diverse audiences.
- 6. Monitoring Performance and KPIs:** Tracking progress and identifying anomalies in real-time.
- 7. Enhancing Data Literacy:** Educating stakeholders and fostering a culture of data-driven decision-making.

**These objectives encompass the essence of why data visualization is essential in transforming data into actionable insights and fostering informed decision-making.**



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**Ans. 7 (a) Transforming the accumulated data into a usable format involves several steps. Here are some suggestions for Arjun to consider:**

### **1. Data Gathering and Integration**

- **Identify Data Sources:** Determine all sources of data, including sales records, customer data, inventory data, online transactions, etc.
- **Collect Data:** Extract data from these sources, ensuring that all relevant information is gathered.
- **Data Integration:** Integrate data from different sources to create a unified dataset. This might involve merging databases, reconciling discrepancies, and ensuring data consistency.

### **2. Data Cleaning and Pre-processing**

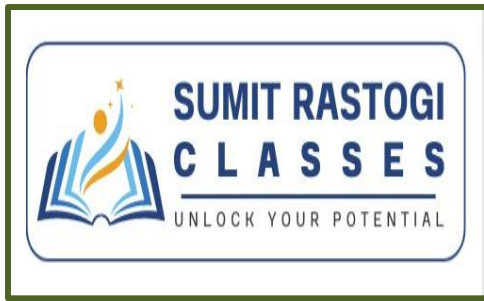
- **Remove Duplicates:** Identify and eliminate duplicate records to maintain data integrity.
- **Handle Missing Values:** Implement strategies to deal with missing data, such as imputation or removal of incomplete records.
- **Standardize Data:** Ensure consistency in data formats, units, and conventions across different datasets.
- **Address Outliers:** Identify and handle outliers that may distort analysis results.

### **3. Data Transformation**

- **Data Normalization:** Normalize numerical data to a standard scale to facilitate comparison and analysis.
- **Categorical Data Encoding:** Convert categorical variables into numerical representations using techniques like one-hot encoding.
- **Feature Engineering:** Create new features that could enhance predictive modelling or provide additional insights.

### **4. Exploratory Data Analysis (EDA)**

- **Statistical Analysis:** Conduct statistical analysis to understand the distribution, variability, and relationships within the data.
- **Data Visualization:** Create visualizations (e.g., histograms, scatter plots, box plots) to explore patterns, trends, and anomalies in the data.
- **Segmentation:** Segment the data based on relevant criteria (e.g., customer demographics, product categories) to gain deeper insights.



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#### 5. Customer Segmentation and Profiling

- **RFM Analysis:** Analyse customer behaviour based on recency, frequency, and monetary value of purchases to segment customers into different groups.
- **Demographic Analysis:** Profile customers based on demographic attributes such as age, gender, location, etc.
- **Behavioural Analysis:** Analyse customer behaviour, preferences, and buying patterns to identify distinct segments.

#### 6. Predictive Modeling and Analysis

- **Sales Forecasting:** Develop predictive models to forecast future sales based on historical data, seasonality, and other relevant factors.
- **Inventory Optimization:** Use predictive analytics to optimize inventory levels and anticipate demand fluctuations.
- **Customer Lifetime Value (CLV):** Estimate the CLV for individual customers to identify high-value segments and tailor marketing strategies accordingly.

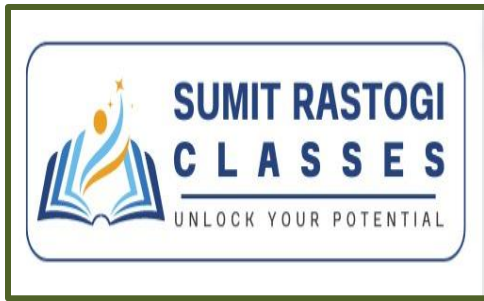
#### 7. Data Governance and Security

- **Data Governance Policies:** Establish policies and procedures for data management, access control, and privacy protection.
- **Data Security Measures:** Implement robust security measures to safeguard sensitive data from unauthorized access or breaches.

#### 8. Continuous Monitoring and Improvement

- **Monitor Data Quality:** Regularly monitor data quality metrics and address any issues promptly to maintain data accuracy and reliability.
- **Feedback and Iteration:** Gather feedback from stakeholders and incorporate suggestions for improving data quality, analysis methodologies, and decision-making processes.

By following these steps, Arjun can effectively transform the accumulated data into a usable format and derive valuable insights to support decision-making at Akansha Limited.



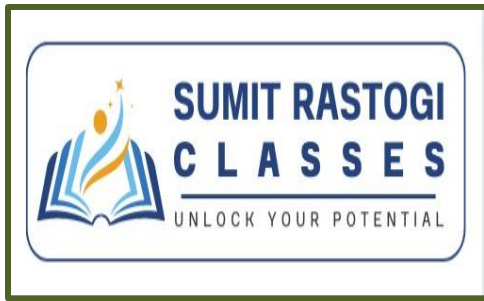
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**Ans.7 (b) Data visualization can be effectively used in report design by:**

- 1) Selecting Appropriate Charts:** Choose relevant charts, such as bar graphs for comparisons, line graphs for trends, and pie charts for proportions, to present data clearly.
- 2) Highlighting Key Insights:** Use visualizations to emphasize important findings and trends, making it easier for readers to interpret and understand the data.
- 3) Enhancing Readability:** Incorporate visuals strategically to break up text-heavy sections, improving readability and engagement.
- 4) Providing Context:** Contextualize data with annotations and labels, helping readers understand the significance of the information presented.

**By integrating data visualizations thoughtfully into report design, one can enhance comprehension, engagement, and the overall effectiveness of the communication.**



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**ANS. 8 (A)**

- **QUANTITATIVE FINANCIAL DATA vs QUALITATIVE FINANCIAL DATA**

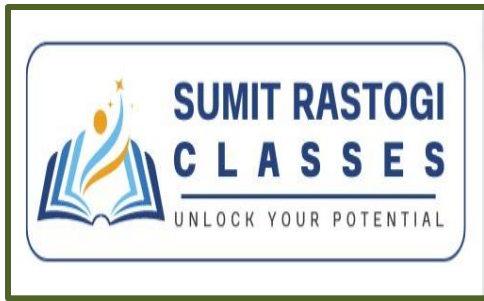
**Quantitative Financial Data:** By the term 'quantitative data', we mean the data expressed in numbers. The quantitative data availability in finance is significant. The stock price data, financial statements etc. are examples of quantitative data. As most of the financial records are maintained in the form of organised numerical data.

**Qualitative Financial Data:** However, some data in financial studies may appear in a qualitative format e.g. text, videos, audio etc. These types of data may be very useful for financial analysis. For example, the 'management discussion and analyses presented as part of annual report of a company is mostly presented in the form of text. This information is useful for getting an insight into the performance of the business. Similarly, key executives often appear for an interview in business channels. These interactions are often goldmines for data and information.

- **NOMINAL SCALE vs RATIO SCALE**

**Nominal Scale:** Nominal scale is being used for categorising data. Under this scale, observations are classified based on certain characteristics. The category labels may contain numbers but have no numerical value. Examples could be, classifying equities into small-cap, mid-cap, and large-cap categories or classifying funds as equity funds, debt funds, and balanced funds etc.

**Ratio Scale:** The ratio scale possesses all characteristics of the nominal, ordinal, and interval scales. The acquired data can not only be classified and rated on a ratio scale, but also have equal intervals. A ratio scale has a true zero, meaning that zero has a significant value. The genuine zero value on a ratio scale allows for the magnitude to be described. For example, length, time, mass, money, age, etc. are typical examples of ratio scales. For data analysis, a ratio scale may be utilised to measure sales, pricing, market share, and client count.

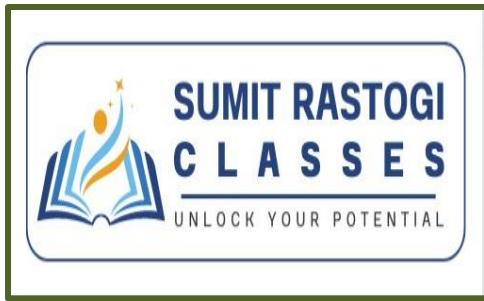


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**Ans. 8 (b) Data visualization plays a crucial role in assisting finance professionals in analysing and reporting information effectively. Here are several ways in which data visualization can aid finance professionals:**

- **Spotting Trends and Patterns:** Finance professionals can use visualizations like line charts and trend graphs to identify trends and patterns in financial data over time. This helps in understanding the direction of financial indicators such as revenue, expenses, and profitability, enabling informed decision-making.
- **Comparative Analysis:** Visualizations like bar charts and scatter plots allow finance professionals to compare financial performance across different time periods, departments, products, or regions. This comparative analysis helps in identifying areas of strength and weakness, as well as opportunities for improvement or investment.
- **Identifying Relationships and Correlations:** Visualization techniques such as heatmaps and correlation matrices enable finance professionals to uncover relationships and correlations between financial variables. This helps in understanding the impact of one financial metric on another and identifying potential cause-and-effect relationships.
- **Forecasting and Predictive Analytics:** Finance professionals can use visualizations such as line charts and regression plots to visualize historical data and forecast future trends. By applying predictive analytics techniques, they can make informed predictions about future financial performance, helping in budgeting, planning, and risk management.
- **Storytelling and Communication:** Visualizations serve as powerful storytelling tools, allowing finance professionals to communicate complex financial information in a clear and compelling manner. By presenting data visually through charts, graphs, and dashboards, they can convey key insights and findings to stakeholders, facilitating decision-making and driving action.

**Overall, data visualization empowers finance professionals to analyse complex financial data more efficiently, derive actionable insights, and communicate findings effectively to stakeholders. By leveraging visualizations in their analysis and reporting processes, finance professionals can enhance decision-making, improve financial performance, and drive business success.**



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