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```
library(readr)
library(RSQLite)
library(tibble)
library(dplyr)
library(lubridate)
library(DBI)
library(assertthat)
library(purrr)
library(ggplot2)
library(RSQLite)
library(DBI)
```

1 Part 1 - Database Design and Implementation

1.1 Task 1.1: E-R Diagram Design

#Part 1.2 - SQL Database Schema Creation

1.2 Task 1.2: SQL Database Schema Creation

```
#setwd("/cloud/project/")
print(getwd())

#connect to the SQLite database
my_connection <- RSQLite::dbConnect(RSQLite::SQLite(),
                                    "../database/ecommerce_database_v1.db")


dbExecute(my_connection,
                "CREATE TABLE IF NOT EXISTS CUSTOMERS
                (
                    customer_id VARCHAR(255) NOT NULL PRIMARY KEY,
                    first_name VARCHAR(255) NOT NULL,
                    last_name VARCHAR(255),
                    username VARCHAR(255),
                    gender TEXT,
                    date_of_birth DATE NOT NULL,
                    email VARCHAR(255) UNIQUE,
                    phone VARCHAR(20) UNIQUE,
                    street_name VARCHAR(255),
                    city VARCHAR(255),
                    country VARCHAR(255),
                    zip_code VARCHAR(20),
                    account_created_date TIMESTAMP,
                    premium_subscription INTEGER
                );"
          )

dbExecute(my_connection,
                "CREATE TABLE IF NOT EXISTS PRODUCT_CATEGORY
                (
                    category_id VARCHAR(255) NOT NULL PRIMARY KEY,
                    cat_name VARCHAR(255)
                );"
          )

dbExecute(my_connection,
                "CREATE TABLE IF NOT EXISTS SUPPLIERS
                (
                    supplier_id VARCHAR(255) NOT NULL PRIMARY KEY,
```

```
                    supplier_name VARCHAR(255),
                    supplier_address VARCHAR(500),
                    supplier_phone VARCHAR(20),
                    supplier_email VARCHAR(255) UNIQUE
                );"
          )

dbExecute(my_connection,
                "CREATE TABLE IF NOT EXISTS PRODUCTS
                (
                    product_id VARCHAR(255) NOT NULL PRIMARY KEY,
                    product_name VARCHAR(255),
                    price REAL,
                    stock_quantity INTEGER NOT NULL,
                    category_id VARCHAR(255) NOT NULL,
                    supplier_id VARCHAR(255) NOT NULL,
                    FOREIGN KEY(category_id) REFERENCES
                          PRODUCT_CATEGORY(category_id),
                    FOREIGN KEY(supplier_id) REFERENCES SUPPLIERS(supplier_id)
                );"
          )

dbExecute(my_connection,
                "CREATE TABLE IF NOT EXISTS GIFT_CARD
                (
                gift_card_id VARCHAR(50) NOT NULL PRIMARY KEY,
                gift_card_code VARCHAR(50),
                detail INTEGER,
                status VARCHAR(50)
                );"
          )
dbExecute(my_connection,
                "CREATE TABLE IF NOT EXISTS ORDERS
                (
                    order_id VARCHAR(255) NOT NULL PRIMARY KEY,
                    customer_id VARCHAR(255),
                    product_id VARCHAR(255),
                    gift_card_id VARCHAR(255),
                    payment_method TEXT,
                    quantity INTEGER,
                    order_timestamp TIMESTAMP,
                    payment_timestamp TIMESTAMP,
```

```
                    order_status VARCHAR(50) NOT NULL,
                    shipment_id VARCHAR(255),
                    FOREIGN KEY(customer_id) REFERENCES CUSTOMERS(customer_id),
                    FOREIGN KEY(product_id) REFERENCES PRODUCTS(product_id),
                    FOREIGN KEY(shipment_id) REFERENCES SHIPMENT(shipment_id),
                    FOREIGN KEY(gift_card_id) REFERENCES GIFT_CARD(gift_card_id)
                );"
          )
dbExecute(my_connection,
                "CREATE TABLE IF NOT EXISTS SHIPMENT
                (
                shipment_id VARCHAR(255) NOT NULL PRIMARY KEY,
                dispatch_timestamp DATETIME,
                delivered_timestamp DATETIME,
                status VARCHAR(50) NOT NULL
                );"
          )

#Check if the tables are created

dbGetQuery(my_connection,
    sprintf("SELECT name FROM sqlite_master WHERE type='table';")
  )


# dbDisconnect(my_connection)
```

2 Part 2: Data Generation and Management

2.1 Task 2.1: Synthetic Data Generation

```
## Find all files matching the pattern
customer_files <- list.files(path = "../datasets"
                             ,pattern = "CUSTOMERS.*\\.csv$",full.names = TRUE)
category_files <- list.files(path = "../datasets"
                             ,pattern = "CATEGORY.*\\.csv$",full.names = TRUE)
gift_card_files <- list.files(path = "../datasets"
                             ,pattern = "GIFT_CARDS.*\\.csv$",full.names = TRUE)
suppliers_files <- list.files(path = "../datasets"
```

```
                              ,pattern = "SUPPLIERS.*\\.csv$",full.names = TRUE)
products_files <- list.files(path = "../datasets"
                              ,pattern = "PRODUCTS.*\\.csv$",full.names = TRUE)

customers_df <- readr::read_csv(customer_files[1])
gift_card_df <- readr::read_csv(gift_card_files[1])
suppliers_df <- readr::read_csv(suppliers_files[1])
category_df <- readr::read_csv(category_files[1])
products_df <- readr::read_csv(products_files[1])



#Sample Customers

sample_size <- floor(0.2 * nrow(products_df))
sampled_product_ids <- sample(products_df$product_id,
                              size = sample_size, replace = FALSE)
sampled_products_df <- products_df[products_df$product_id %in%
                                     sampled_product_ids, ]


#Sample Products

sample_size <- floor(0.2 * nrow(customers_df))
sampled_customer_ids <- sample(customers_df$customer_id,
                               size = sample_size, replace = FALSE)
sampled_customers_df <- customers_df[customers_df$customer_id %in%
                                       sampled_customer_ids, ]


generate_orders_data <- function(n = 1000) {
  set.seed(123)

  orders_df <- tibble(
    order_id = sprintf("%s-%04d", "ORD", 1:n),
    customer_id = sample(sampled_customers_df$customer_id, n, replace = TRUE),
    product_id = sample(sampled_products_df$product_id, n, replace = TRUE),
    gift_card_id = sample(c(NA, gift_card_df$gift_card_id), n, replace = TRUE),
    payment_method = sample(c("Credit Card", "Debit Card", "PayPal",
                              "Gift Card"),n, replace = TRUE),
    quantity = sample(1:5, n, replace = TRUE),
    order_timestamp = sample(seq(as.POSIXct('2024/02/01')
```

```
                        ,as.POSIXct('2024/02/29'), by="day"), n, replace = TRUE),
    payment_timestamp = order_timestamp + hours(sample(1:72, n, replace = TRUE)),
    order_status = sample(c("Processing", "Shipped", "Delivered",
                            "Cancelled","Pending Payment","Out for Delivery")
                          , n, replace = TRUE),
  )

  # Augment the orders data frame with supplier_id using left_join
  orders_df <- orders_df %>%
    left_join(sampled_products_df %>% select(product_id, supplier_id)
              , by = "product_id") %>%
    select(order_id, customer_id, product_id, gift_card_id
           , payment_method, quantity, order_timestamp, payment_timestamp
           , order_status, supplier_id)

  return(orders_df)
}

# Generate orders data
orders_df <- generate_orders_data(n = 1000)

generate_shipment_ids <- function(df) {
  # Create a unique identifier for each group
  df <- df %>%
    mutate(date_only = as.Date(order_timestamp)) %>%
    group_by(customer_id, supplier_id, date_only) %>%
    mutate(shipment_group_id = cur_group_id()) %>%
    ungroup() %>%
    mutate(shipment_id = sprintf("SHIP%05d", shipment_group_id)) %>%
    select(-shipment_group_id, -date_only) # Clean up the extra columns

  df
}

# Apply the function to your data frame
orders_df <- generate_shipment_ids(orders_df)

  orders_df <- orders_df %>%
    mutate(shipment_id = if_else(order_status %in%
                                 c("Cancelled","Pending Payment"), NA_character_,
                                   as.character(shipment_id)),
           payment_method = if_else(order_status == "Pending Payment"
```

```
                                    ,NA_character_,payment_method)) %>%
    mutate(supplier_id = NULL)
```

```
#Shipment Table

  shipment_df <- orders_df %>%
    mutate(
      # Dispatch date could be the same as the order date or a day after
      dispatch_timestamp = order_timestamp + days(sample(0:1, n()
                                                         , replace = TRUE)),

      # Delivered date should be after the dispatch date;
      #here I assume delivery takes between 2 to 5 days
      delivered_timestamp = dispatch_timestamp + days(sample(2:14, n()
                                                             , replace = TRUE)),

      # Randomly assign a delivery status
      status = if_else(order_status == "Processing","Ready for Dispatch"
                       ,if_else(order_status == "Shipped","In Transit"
                      ,if_else(order_status == "Out for Delivery",order_status
                     ,if_else(order_status == "Delivered",order_status,"NA"))))
    ) %>%
    # Select only the relevant columns for the shipment table
    select(shipment_id, dispatch_timestamp, delivered_timestamp, status) %>%
    # Remove duplicate rows to ensure unique shipments
    distinct()

  shipment_df <- na.omit(shipment_df)


  shipment_df <- shipment_df %>%
    mutate(
      # Assign NA to dispatch_timestamp if status is 'Ready for Dispatch'
      dispatch_timestamp = if_else(status == "Ready for Dispatch"
                                   , NA_Date_, dispatch_timestamp),
      delivered_timestamp = if_else(status == "Ready for Dispatch"
                                    , NA_Date_, delivered_timestamp),

      # 'In Transit' status should have a dispatch date but no delivery date
      dispatch_timestamp = if_else(status == "In Transit"
                          , Sys.Date() - days(sample(1:5, 1)), dispatch_timestamp),
      delivered_timestamp = if_else(status == "In Transit"
```

```
                        , NA_Date_, delivered_timestamp),

      # 'In Transit' status should have a dispatch date but no delivery date
      dispatch_timestamp = if_else(status == "Out for Delivery"
                      , Sys.Date() - days(sample(1:5, 1)), dispatch_timestamp),
      delivered_timestamp = if_else(status == "Out for Delivery"
                      , NA_Date_, delivered_timestamp),

      # If status is 'Delivered', both dates should be in the past,
      #with delivered after dispatched
      dispatch_timestamp = if_else(status == "Delivered" &
                                     is.na(dispatch_timestamp)
                      , Sys.Date() - days(sample(6:10, 1)), dispatch_timestamp),
      delivered_timestamp = if_else(status == "Delivered"
              , dispatch_timestamp + days(sample(1:5, 1)), delivered_timestamp)
    )

write_csv(orders_df,"../datasets/ORDERS.csv")

write_csv(shipment_df,"../datasets/SHIPMENTS.csv")
```

2.2 Task 2.2: Data Import and Quality Assurance

1.CUSTOMERS

```
ingest_customer_data <- function(df) {

  my_connection <- RSQLite::dbConnect(RSQLite::SQLite()
                                      , "../database/ecommerce_database_v1.db")
  # Data validation

  #email check
  valid_email <- grepl("^[a-zA-Z0-9._%+-]+@[a-zA-Z0-9.-]+\\.[a-zA-Z]{2,}$"
                       , df$email)
  df <- df[valid_email, ]

  #gender check
  valid_genders <- c("Male", "Female", "Other")
  df <- df[df$gender %in% valid_genders, ]
```

```r
# Data type checks (adjust according to your data frame)
df$date_of_birth <- as.Date(df$date_of_birth,format = "%d/%m/%y")
df$account_created_date <- as.Date(df$account_created_date
                                   ,format = "%d/%m/%y")
df$premium_subscription <- as.integer(df$premium_subscription)

# Check for null values in NOT NULL columns
required_columns <- c("customer_id", "first_name", "date_of_birth")
df <- df[!rowSums(is.na(df[required_columns])) > 0, ]

# Insert validated data into the database
for(i in 1:nrow(df)){

    #Check for duplicate records based on the primary key
 existing_ids <- dbGetQuery(my_connection
        , sprintf("SELECT customer_id FROM CUSTOMERS WHERE customer_id = '%s'"
                              ,   df$customer_id[i]))
  if(nrow(existing_ids) > 0) {
    cat(sprintf("Skipping duplicate entry for customer_id: %s\n"
                , df$customer_id[i]))
    next
  }

  insert_query <- sprintf("INSERT INTO CUSTOMERS (customer_id, first_name
  , last_name, username, gender, date_of_birth, email, phone, street_name
  , city, country, zip_code, account_created_date, premium_subscription)
  VALUES ('%s', '%s', '%s', '%s', '%s', '%s', '%s', '%s'
  , '%s', '%s', '%s', '%s', '%s', %d)",
  df$customer_id[i], df$first_name[i], df$last_name[i], df$username[i]
  , df$gender[i], df$date_of_birth[i],df$email[i], df$phone[i]
  , df$street_name[i], df$city[i], df$country[i], df$zip_code[i]
  , df$account_created_date[i], df$premium_subscription[i])
  tryCatch({
  dbExecute(my_connection, insert_query)
    cat(sprintf("Successfully inserted row: %d\n", i))
  }, error = function(e) {
    cat(sprintf("Error in inserting row: %d, Error: %s\n", i, e$message))
  })
    }

    # Close the database connection
    dbDisconnect(my_connection)
```

```
    }

for(file in customer_files) {
  df <- readr::read_csv(file)
  ingest_customer_data(df)

}
```

```
my_connection <- RSQLite::dbConnect(RSQLite::SQLite()
                                    , "../database/ecommerce_database_v1.db")
dbGetQuery(my_connection,"SELECT * FROM CUSTOMERS LIMIT 10;")
```

```
                 customer_id first_name last_name     username gender
1  01HQZS38KRC38NFNQR9QF1MTBZ       Poul  Jellings  pjellingsdv   Male
2  01HQZS38KT99V41AM8FFX4GZH7       Rolf   Crocket   rcrocketdw   Male
3  01HQZS38KW6A30TWWP40YR785F     Rockey   Lapwood   rlapwooddx   Male
4  01HQZS38KY9JB7X0RFWGEQESF5      Junia    Bayles    jbaylesdy Female
5  01HQZS38M0RSRWM1K83TZFG06K     Sydney Gillhespy sgillhespydz   Male
6  01HQZS38M3KZFS9R4CYZ8F2QNY     Johnny   Tidbold   jtidbolde0   Male
7  01HQZS38M5ZTYQRT6KQW75RQTS     Edward Strethill estrethille1  Other
8  01HQZS38M7XNA31ACXPJBC78ME       Walt Goulborne wgoulbornee2   Male
9  01HQZS38M9XY7AN2TSG9KTAARY     Bertie    Ratter    brattere3   Male
10 01HQZS38MC1ZX8SFB5WR3V2H66   Gerianne Meininger gmeiningere4 Female
   date_of_birth                         email        phone
1     1992-12-11 pjellingsdv@reverbnation.com 277-129-0314
2     1990-04-21        rcrocketdw@uol.com.br 755-108-4849
3     1992-09-20       rlapwooddx@latimes.com 563-846-2198
4     1999-02-13          jbaylesdy@hc360.com 809-987-6451
5     1990-05-15      sgillhespydz@cdbaby.com 881-340-2239
6     1990-08-04      jtidbolde0@china.com.cn 634-193-3056
7     1998-03-14       estrethille1@goo.ne.jp 716-684-1496
8     1997-02-01         wgoulbornee2@ihg.com 285-539-0816
9     1990-11-13      brattere3@bloomberg.com 455-678-8574
10    1992-10-18       gmeiningere4@amazon.de 302-279-5654
                  street_name       city        country zip_code
1       3 Stone Corner Street   Aberdeen United Kingdom     AB39
2           547 Fordem Avenue    Glasgow United Kingdom       G4
3               97 4th Avenue  Edinburgh United Kingdom      EH9
4             3922 Vahlen Way Birmingham United Kingdom      B12
5          60256 Russell Park  Liverpool United Kingdom      L74
6             5 Huxley Center      Upton United Kingdom     DN21
7              24 Ramsey Road    Kirkton United Kingdom     KW10
```

```
8             474 Lunder Lane    Wootton United Kingdom      NN4
9  4691 Weeping Birch Parkway     London United Kingdom     SW1E
10         15 Hanover Terrace   Brampton United Kingdom     NR34
   account_created_date premium_subscription
1            2023-04-01                    0
2            2023-12-15                    0
3            2023-11-30                    0
4            2023-07-09                    0
5            2023-06-08                    1
6            2024-02-26                    1
7            2023-04-12                    0
8            2024-03-03                    1
9            2023-09-12                    1
10           2024-01-26                    1
```

2. PRODUCT_CATEGORY

```r
ingest_product_category <- function(df) {

  my_connection <- RSQLite::dbConnect(RSQLite::SQLite(), "../database/ecommerce_database_v1.d

  # Check for null values in NOT NULL columns
  required_columns <- c("category_id", "cat_name")
  df <- df[!rowSums(is.na(df[required_columns])) > 0, ]

  # Insert validated data into the database
  for(i in 1:nrow(df)){
    # Check for duplicate records based on the primary key
    existing_ids <- dbGetQuery(my_connection, sprintf("SELECT category_id FROM PRODUCT_CATEGO
    if(nrow(existing_ids) > 0) {
      cat(sprintf("Skipping duplicate entry for category_id: %s\n", df$category_id[i]))
      next
    }

    insert_query <- sprintf("INSERT INTO PRODUCT_CATEGORY (category_id, cat_name) VALUES ('%s
                            df$category_id[i], df$cat_name[i])
    tryCatch({
      dbExecute(my_connection, insert_query)
      cat(sprintf("Successfully inserted row: %d\n", i))
    }, error = function(e) {
      cat(sprintf("Error in inserting row: %d, Error: %s\n", i, e$message))
    })
  }
```

```
    dbDisconnect(my_connection)

}

for(file in category_files) {

  df <- readr::read_csv(file)
  ingest_product_category(df)
}
```

```
my_connection <- RSQLite::dbConnect(RSQLite::SQLite(), "../database/ecommerce_database_v1.db
dbGetQuery(my_connection,"SELECT * FROM PRODUCT_CATEGORY;")
```

```
                  category_id    cat_name
1  01HQZSYXN5D9YD5YEVE62CZY5T     Jewelry
2  01HQZSYXN2NFNR8NP0JDJJ4EGE       Music
3  01HQZSYXN3Y1HWZHXWRT8QBN1F    Clothing
4  01HQZSYXN8GVDME3KSR2V3CWSY        Home
5  01HQZSYXN9NDEKZ0KDTXG7GWAR        Baby
6  01HQZSYXN8HS73RN25WQHFRVS9      Garden
7  01HQZSYXN69EZ5NYSTKN55ABQ6    Outdoors
8  01HQZSYXN577K9HSBRRVY2QSMT        Kids
9  01HQZSYXN7EQ2BMKM5RZH0274J  Automotive
10 01HQZSYXN28M6P8R3N3Y74SSF1       Books
11 01HQZSYXN6Y7B8FZAJHW0AM6PC Electronics
12 01HQZSYXN4ED4TEE0YBDZT4KX9  Industrial
13 01HQZSYXN6CG9CR3D0B1XV5PG4      Sports
14 01HQZSYXN72AVRM73YCJRXDX41      Beauty
15 01HQZSYXN5AE7QD7WTD963ZWED        Toys
16 01HQZSYXN7W4J5MDCRENEHYDFZ      Health
17 01HQZSYXN6YFDBEX24RWT2KJ9R       Games
18 01HQZSYXN8BNNSDXSQJNTGA8W1       Tools
19 01HQZSYXN4V6QHMP8859N4NF9F       Shoes
20 01HQZSYXN1A7S9BPG7EH95906T   Computers
21 01HQZSYXMXFJ85AVVPHYH23XFB     Grocery
```

```
my_connection <- RSQLite::dbConnect(RSQLite::SQLite(),
                                    "../database/ecommerce_database_v1.db")
dbGetQuery(my_connection,"SELECT * FROM PRODUCT_CATEGORY LIMIT 10;")
```

```
                  category_id   cat_name
```

```
1  01HQZSYXN5D9YD5YEVE62CZY5T    Jewelry
2  01HQZSYXN2NFNR8NP0JDJJ4EGE      Music
3  01HQZSYXN3Y1HWZHXWRT8QBN1F   Clothing
4  01HQZSYXN8GVDME3KSR2V3CWSY       Home
5  01HQZSYXN9NDEKZ0KDTXG7GWAR       Baby
6  01HQZSYXN8HS73RN25WQHFRVS9     Garden
7  01HQZSYXN69EZ5NYSTKN55ABQ6   Outdoors
8  01HQZSYXN577K9HSBRRVY2QSMT       Kids
9  01HQZSYXN7EQ2BMKM5RZH0274J Automotive
10 01HQZSYXN28M6P8R3N3Y74SSF1      Books
```

SUPPLIERS

```
ingest_suppliers <- function(df) {

  my_connection <- RSQLite::dbConnect(RSQLite::SQLite()
                                      , "../database/ecommerce_database_v1.db")

  # Email format validation
  valid_email <- grepl("^[a-zA-Z0-9._%+-]+@[a-zA-Z0-9.-]+\\.[a-zA-Z]{2,}$",
                       df$supplier_email)
  df <- df[valid_email, ]

  # Check for null values in NOT NULL columns
  required_columns <- c("supplier_id", "supplier_name")
  df <- df[!rowSums(is.na(df[required_columns])) > 0, ]

  for(i in 1:nrow(df)){
    # Check for duplicate records based on the primary key
    existing_supplier_ids <- dbGetQuery(my_connection, sprintf("SELECT supplier_id FROM SUPPL
    if(nrow(existing_supplier_ids) > 0) {
      cat(sprintf("Skipping duplicate entry for supplier_id: %s\n", df$supplier_id[i]))
      next
    }

    insert_query <- sprintf("INSERT INTO SUPPLIERS (supplier_id, supplier_name, supplier_addr
                            df$supplier_id[i], df$supplier_name[i], df$supplier_address[i], c
    existing_supplier_ids <- dbGetQuery(my_connection
              , sprintf("SELECT supplier_id FROM SUPPLIERS
                        WHERE supplier_id = '%s'", df$supplier_id[i]))
    if(nrow(existing_supplier_ids) > 0) {
      cat(sprintf("Skipping duplicate entry for supplier_id: %s\n"
```

```
                  , df$supplier_id[i]))
      next
    }

    insert_query <- sprintf("INSERT INTO SUPPLIERS (supplier_id, supplier_name,
                            supplier_address, supplier_phone, supplier_email)
                            VALUES ('%s', '%s', '%s', '%s', '%s')",
                            df$supplier_id[i], df$supplier_name[i],
                            df$supplier_address[i], df$supplier_phone[i],
                            df$supplier_email[i])
    tryCatch({
      dbExecute(my_connection, insert_query)
      cat(sprintf("Successfully inserted row: %d\n", i))
    }, error = function(e) {
      cat(sprintf("Error in inserting row: %d, Error: %s\n", i, e$message))
    })

  }
    dbDisconnect(my_connection)

}

for(file in suppliers_files) {

  df <- readr::read_csv(file)
  ingest_suppliers(df)

}
```

GIFT CARDS

```
ingest_gift_card_data <- function(df) {

  my_connection <- RSQLite::dbConnect(RSQLite::SQLite(),
                                      "../database/ecommerce_database_v1.db")

  # Validate 'gift_card_id' and 'gift_card_code' for null values
  required_columns <- c("gift_card_id", "gift_card_code", "status")
  df <- df[!rowSums(is.na(df[required_columns])) > 0, ]

  # Ensure 'detail' is an integer
  df$detail <- as.numeric(df$detail)
```

```
  # Insert validated data into the database
  for(i in 1:nrow(df)){
    # Check for duplicate records based on the primary key
    existing_ids <- dbGetQuery(my_connection, sprintf("SELECT gift_card_id FROM GIFT_CARD WHE
    if(nrow(existing_ids) > 0) {
      cat(sprintf("Skipping duplicate entry for gift_card_id: %s\n", df$gift_card_id[i]))
      next
    }

    insert_query <- sprintf("INSERT INTO GIFT_CARD (gift_card_id, gift_card_code, detail, sta
                            df$gift_card_id[i], df$gift_card_code[i], df$detail[i], df$status
    existing_ids <- dbGetQuery(my_connection, sprintf("SELECT gift_card_id FROM
                    GIFT_CARD WHERE gift_card_id = '%s'", df$gift_card_id[i]))
    if(nrow(existing_ids) > 0) {
      cat(sprintf("Skipping duplicate entry for gift_card_id: %s\n",
                  df$gift_card_id[i]))
      next
    }

    insert_query <- sprintf("INSERT INTO GIFT_CARD (gift_card_id,
              gift_card_code, detail, status) VALUES ('%s', '%s', %f, '%s')",
          df$gift_card_id[i], df$gift_card_code[i], df$detail[i], df$status[i])
    tryCatch({
      dbExecute(my_connection, insert_query)
      cat(sprintf("Successfully inserted row: %d\n", i))
    }, error = function(e) {
      cat(sprintf("Error in inserting row: %d, Error: %s\n", i, e$message))
    })
  }
    dbDisconnect(my_connection)

}

for(file in gift_card_files) {

  df <- readr::read_csv(file)
  ingest_gift_card_data(df)

}
```

```
my_connection <- RSQLite::dbConnect(RSQLite::SQLite()
                                    , "../database/ecommerce_database_v1.db")
dbGetQuery(my_connection,"SELECT * FROM GIFT_CARD;")
```

PRODUCTS

```
ingest_products <- function(df) {

  my_connection <- RSQLite::dbConnect(RSQLite::SQLite()
                                      , "../database/ecommerce_database_v1.db")
  # Data type checks
  df$stock_quantity <- as.integer(df$stock_quantity)

  # Check for null values in NOT NULL columns
  required_columns <- c("product_id", "stock_quantity", "category_id", "supplier_id")
  df <- df[!rowSums(is.na(df[required_columns])) > 0, ]

  for(i in 1:nrow(df)){
    # Check for duplicate records based on the primary key and
    #foreign key constraints
    existing_product_ids <- dbGetQuery(my_connection
    , sprintf("SELECT product_id FROM PRODUCTS WHERE product_id = '%s'"
              , df$product_id[i]))
    if(nrow(existing_product_ids) > 0) {
      cat(sprintf("Skipping duplicate entry for product_id: %s\n"
                  , df$product_id[i]))
      next
    }

    # Construct and execute the insertion query

    insert_query <- sprintf("INSERT INTO PRODUCTS (product_id, product_name,
                            price, stock_quantity, category_id, supplier_id)
                            VALUES ('%s', '%s', %f, %d, '%s', '%s')",
                            df$product_id[i], df$product_name[i], df$price[i]
                  , df$stock_quantity[i], df$category_id[i], df$supplier_id[i])
    tryCatch({
      dbExecute(my_connection, insert_query)
      cat(sprintf("Successfully inserted row: %d\n", i))
    }, error = function(e) {
      cat(sprintf("Error in inserting row: %d, Error: %s\n", i, e$message))
    })
```

```
  }
    dbDisconnect(my_connection)

}

for(file in products_files) {

  df <- readr::read_csv(file)
  ingest_products(df)

}
```

```
my_connection <- RSQLite::dbConnect(RSQLite::SQLite()
                                    , "../database/ecommerce_database_v1.db")
dbGetQuery(my_connection,"SELECT * FROM PRODUCTS LIMIT 10;")
```

```
      product_id                          product_name price stock_quantity
1  5116-vjq-2956             Pampers Swaddlers Diapers    25            222
2  6718-hlo-4759       Huggies Natural Care Baby Wipes    10            424
3  2985-wrf-5782    Similac Pro-Advance Infant Formula    30            229
4  4625-mrp-9938       Philips Avent Soothie Pacifiers     5            216
5  4163-cos-4183           Bumkins Waterproof SuperBib     8            419
6  6949-zmb-6593 Aden + Anais Muslin Swaddle Blankets    20            215
7  8600-uzy-9324                     Gerber Baby Socks     5            431
8  1345-epw-6525  Nuby Mittens with Teething Surfaces     7            162
9  4488-xnr-2917             Hudson Baby Hooded Towels    12            122
10 7706-sdc-6511         Spasilk Soft Terry Washcloths     8            140
                  category_id                supplier_id
1  01HQZSYXN9NDEKZ0KDTXG7GWAR 01HQZS3CHR3Z0C3RDD0QYFT566
2  01HQZSYXN9NDEKZ0KDTXG7GWAR 01HQZS3CHZ74ZQCSDXCS7CBVAC
3  01HQZSYXN9NDEKZ0KDTXG7GWAR 01HQZS3CHX81N7E24DA6H2H5DW
4  01HQZSYXN9NDEKZ0KDTXG7GWAR 01HQZS3CHF5YHQ7PBD8T11XRG1
5  01HQZSYXN9NDEKZ0KDTXG7GWAR 01HQZS3CHWKK9ACW7KQ58MHMZ1
6  01HQZSYXN9NDEKZ0KDTXG7GWAR 01HQZS3CHWKK9ACW7KQ58MHMZ1
7  01HQZSYXN9NDEKZ0KDTXG7GWAR 01HQZS3CHZ74ZQCSDXCS7CBVAC
8  01HQZSYXN9NDEKZ0KDTXG7GWAR 01HQZS3CHR3Z0C3RDD0QYFT566
9  01HQZSYXN9NDEKZ0KDTXG7GWAR 01HQZS3CJ0MY496XC7CYHNBGTJ
10 01HQZSYXN9NDEKZ0KDTXG7GWAR 01HQZS3CHSG3EB7GENNYD7YQ2K
```

ORDER

```r
ingest_orders <- function(df) {

  my_connection <- RSQLite::dbConnect(RSQLite::SQLite()
                                      , "../database/ecommerce_database_v1.db")

  # Essential columns for validation
  required_columns <- c("order_id", "order_status", "quantity")
  df <- df[!rowSums(is.na(df[required_columns])) > 0, ]

  for(i in 1:nrow(df)) {
    # Check for duplicate order_id
    existing_ids <- dbGetQuery(my_connection, sprintf("SELECT order_id FROM ORDERS WHERE orde
    if(nrow(existing_ids) > 0) {
      cat(sprintf("Skipping duplicate entry for order_id: %s\n", df$order_id[i]))
    existing_ids <- dbGetQuery(my_connection
                  , sprintf("SELECT order_id FROM ORDERS WHERE order_id = '%s'"
                            , df$order_id[i]))
    if(nrow(existing_ids) > 0) {
      cat(sprintf("Skipping duplicate entry for order_id: %s\n"
                  , df$order_id[i]))
      next
    }

    # Data validation for quantity
    if(!is.numeric(df$quantity[i]) || df$quantity[i] <= 0) {
      cat(sprintf("Skipping entry due to invalid quantity for order_id: %s\n", df$order_id[i

      cat(sprintf("Skipping entry due to invalid quantity for order_id: %s\n"
                  , df$order_id[i]))
      next
    }

    # Insert validated data into the database
    insert_query <- sprintf("INSERT INTO ORDERS (order_id, customer_id,
                            product_id, shipment_id, gift_card_id, payment_method,
                            quantity, order_timestamp, payment_timestamp,
                            order_status) VALUES ('%s', '%s', '%s', '%s', '%s',
                            '%s', %d, '%s', '%s', '%s')",
                            df$order_id[i], df$customer_id[i], df$product_id[i],
                            df$shipment_id[i], df$gift_card_id[i],
                            df$payment_method[i], df$quantity[i],
                            df$order_timestamp[i],
```

```
                              df$payment_timestamp[i], df$order_status[i])
    tryCatch({
      dbExecute(my_connection, insert_query)
      cat(sprintf("Successfully inserted row: %d\n", i))
    }, error = function(e) {
      cat(sprintf("Error in inserting row: %d, Error: %s\n", i, e$message))
    })
  }
    dbDisconnect(my_connection)

}}


# Assume orders_df is your DataFrame containing orders data
ingest_orders(orders_df)
```

```
my_connection <- RSQLite::dbConnect(RSQLite::SQLite()
                                    , "../database/ecommerce_database_v1.db")
dbGetQuery(my_connection,"SELECT * FROM ORDERS LIMIT 10;")
```

```
   order_id                customer_id    product_id
1  ORD-0001 01HQZS38YDTF2DBFZMBDXF6WZ6 3672-agb-8683
2  ORD-0002 01HQZS3A94XFFP2XQZ3P67369X 8612-swk-4072
3  ORD-0003 01HQZS39J8GEMSNSKB3GK13V5Z 8162-ohs-2848
4  ORD-0004 01HQZS38QJBCBRXYQCFV4SN48Q 0239-sss-2251
5  ORD-0005 01HQZS39QSCH1MS4VMMD5Y6XPP 6643-jgq-7681
6  ORD-0006 01HQZS39FG5QBNT1QE1GE1RWWP 1439-jfo-9022
7  ORD-0007 01HQZS39HKBGAEMPSZC1KEJ5MA 2985-wrf-5782
8  ORD-0008 01HQZS39FVYFWSK9DP5DE94NX0 6265-dqm-3061
9  ORD-0009 01HQZS38QJBCBRXYQCFV4SN48Q 1619-lcu-9571
10 ORD-0010 01HQZS38VF3SMDQQ3S5ZVR8865 1619-lcu-9571
                           gift_card_id payment_method quantity order_timestamp
1  3014edd1-7db0-4e6e-b19d-5bc9ff355b9c         PayPal        4      2024-02-01
2  fa8f2b6f-ffe4-4dbe-bd5e-1421b5ce15e4             NA        1      2024-02-05
3  15ab6b33-e9db-485e-b0bd-b51fb10e9ae7      Gift Card        3      2024-02-02
4  623c535f-602f-48e6-a5a7-a5802586c06b      Gift Card        1      2024-02-19
5  a8308354-588c-4f16-b299-a5b5aa589095    Credit Card        1      2024-02-20
6  b9b821ad-27f0-436c-925c-0a9156494a18    Credit Card        4      2024-02-01
7  e6940482-ce67-4558-b807-abcd736db07e     Debit Card        5      2024-02-17
8  2ae5c52e-6622-45d4-8ae0-7ea774992504             NA        3      2024-02-04
9  19fff31f-57b0-4f45-a083-c311054077ce    Credit Card        1      2024-02-22
```

```
10 98684120-6826-459f-b36a-0d42963599e4    Credit Card        5      2024-02-04
     payment_timestamp     order_status shipment_id
1  2024-02-02 18:00:00          Shipped   SHIP00295
2  2024-02-05 03:00:00  Pending Payment          NA
3  2024-02-03 04:00:00       Processing   SHIP00496
4  2024-02-19 09:00:00        Delivered   SHIP00130
5  2024-02-21 23:00:00 Out for Delivery   SHIP00643
6  2024-02-03 13:00:00          Shipped   SHIP00420
7  2024-02-19 05:00:00        Cancelled          NA
8  2024-02-05 03:00:00  Pending Payment          NA
9  2024-02-23 04:00:00        Cancelled          NA
10 2024-02-06 01:00:00        Delivered   SHIP00235
```

SHIPMENTS

```
ingest_shipment_data <- function(df) {

  my_connection <- RSQLite::dbConnect(RSQLite::SQLite()
                                      , "../database/ecommerce_database_v1.db")
  # Validate 'shipment_id' and 'status' for null values
  required_columns <- c("shipment_id", "status")
  df <- df[!rowSums(is.na(df[required_columns])) > 0, ]


  # Insert validated data into the database
  for(i in 1:nrow(df)){
    # Check for duplicate records based on the primary key
    existing_ids <- dbGetQuery(my_connection, sprintf("SELECT shipment_id FROM SHIPMENT WHERE
    if(nrow(existing_ids) > 0) {
      cat(sprintf("Skipping duplicate entry for shipment_id: %s\n", df$shipment_id[i]))
      next
    }

    insert_query <- sprintf("INSERT INTO SHIPMENT (shipment_id, dispatch_timestamp, delivered
                            df$shipment_id[i], df$dispatch_timestamp[i], df$delivered_timesta

    existing_ids <- dbGetQuery(my_connection
        , sprintf("SELECT shipment_id FROM SHIPMENT WHERE shipment_id = '%s'",
                  df$shipment_id[i]))
    if(nrow(existing_ids) > 0) {
      cat(sprintf("Skipping duplicate entry for shipment_id: %s\n"
                  , df$shipment_id[i]))
```

```
      next
    }

    insert_query <- sprintf("INSERT INTO SHIPMENT (shipment_id,
                        dispatch_timestamp, delivered_timestamp, status)
                        VALUES ('%s', '%s', '%s', '%s')",
                            df$shipment_id[i], df$dispatch_timestamp[i]
                            , df$delivered_timestamp[i], df$status[i])
    tryCatch({
      dbExecute(my_connection, insert_query)
      cat(sprintf("Successfully inserted row: %d\n", i))
    }, error = function(e) {
      cat(sprintf("Error in inserting row: %d, Error: %s\n", i, e$message))
    })
  }
    dbDisconnect(my_connection)

}

ingest_shipment_data(shipment_df)
```

```
my_connection <- RSQLite::dbConnect(RSQLite::SQLite()
                                    , "../database/ecommerce_database_v1.db")
dbGetQuery(my_connection,"SELECT * FROM SHIPMENT LIMIT 10;")
```

	shipment_id	dispatch_timestamp	delivered_timestamp	status
1	SHIP00295	2024-03-14	NA	In Transit
2	SHIP00496	NA	NA	Ready for Dispatch
3	SHIP00130	2024-02-20	2024-03-02	Delivered
4	SHIP00643	2024-03-10	NA	Out for Delivery
5	SHIP00420	2024-03-14	NA	In Transit
6	SHIP00235	2024-02-04	2024-02-16	Delivered
7	SHIP00887	2024-03-14	NA	In Transit
8	SHIP00904	2024-03-14	NA	In Transit
9	SHIP00658	2024-03-14	NA	In Transit
10	SHIP00900	2024-03-14	NA	In Transit

2.2.1 Check Referential Integrity

ORDERS customer_id check

```
dbGetQuery(my_connection,
           "SELECT
              DISTINCT o.customer_id as customer_id,
              c.customer_id as customer_id,
              first_name ||' '|| last_name as customer_name
           FROM ORDERS as o
           LEFT JOIN CUSTOMERS as c ON c.customer_id = o.customer_id
           WHERE c.customer_id is NULL
           ;")
```

```
[1] customer_id   customer_id   customer_name
<0 rows> (or 0-length row.names)
```

product_id check

```
dbGetQuery(my_connection,
           "SELECT
              DISTINCT o.product_id as product_id,
              p.product_id as product_id,
              product_name as product_name
           FROM ORDERS as o
           LEFT JOIN PRODUCTS as p ON o.product_id = p.product_id
           WHERE p.product_id is NULL
           ;")
```

```
     product_id product_id product_name
1 1727-bev-6294       <NA>         <NA>
2 4420-lwz-5789       <NA>         <NA>
3 7528-dit-1763       <NA>         <NA>
4 0986-ymb-9060       <NA>         <NA>
5 0228-vgx-5140       <NA>         <NA>
```

gift_card_id

```
dbGetQuery(my_connection,
           "SELECT
              DISTINCT o.gift_card_id as gif_card_id,
              g.gift_card_id,
              gift_card_code
           FROM ORDERS as o
```

```
            LEFT JOIN GIFT_CARD as g ON g.gift_card_id = o.gift_card_id
            WHERE o.gift_card_id is NULL
            ;")
```

```
[1] gif_card_id    gift_card_id   gift_card_code
<0 rows> (or 0-length row.names)
```

shipment_id

```
dbGetQuery(my_connection,
            "SELECT
               DISTINCT o.shipment_id as x,
               s.shipment_id
            FROM ORDERS as o
            LEFT JOIN SHIPMENT as s ON s.shipment_id = o.shipment_id
            WHERE o.shipment_id is NULL
            ORDER BY o.shipment_id
            ;")
```

```
[1] x           shipment_id
<0 rows> (or 0-length row.names)
```

PRODUCTS supplier_id

```
dbGetQuery(my_connection,
            "SELECT
               DISTINCT p.supplier_id,
               s.supplier_id as a,
               s.supplier_name
            FROM PRODUCTS as p
            LEFT JOIN SUPPLIERS as s ON p.supplier_id = s.supplier_id
            WHERE s.supplier_id is NULL
            ORDER BY p.supplier_id
            ;")
```

```
                 supplier_id    a supplier_name
1 01HQZS3CJJMZ8VE8FSFV12394Q <NA>          <NA>
2 01HQZS3CJSA14X7CFXR9GN7HJJ <NA>          <NA>
3 01HQZS3CK7TNQY984CRWZ2YWYH <NA>          <NA>
4 01HQZS3CP6J1E2W3K754ED8TSV <NA>          <NA>
```

```
5 01HQZS3CWAANK3HMDV7OKFNRTE <NA>          <NA>
6 01HQZS3CZ808EDV2QSZ7EC6RGQ <NA>          <NA>
7 01HQZS3D2JCXJ0GKKPY6JT5RMM <NA>          <NA>
```

category_id

```
dbGetQuery(my_connection,
           "SELECT
              DISTINCT p.category_id,
              c.category_id as c,
              cat_name
           FROM PRODUCTS as p
           LEFT JOIN PRODUCT_CATEGORY as c ON c.category_id = p.category_id
           WHERE p.category_id is NULL
           ORDER BY p.category_id
           ;")
```

```
[1] category_id c           cat_name
<0 rows> (or 0-length row.names)
```

3 Part 3: Data Pipeline Generation

3.1 Task 3.1: GitHub Repository and Workflow Setup

3.2 Task 3.2: GitHub Actions for Continuous Integration

4 Part 4: Data Analysis and Reporting with Quarto in R

4.1 Task 4.1: Advanced Data Analysis in R

4.2 Task 4.2: Comprehensive Reporting with Quarto

1. Top 10 Products - Overall (Quantity)
2. Top 5 Categories (Quantity)
3. Top 3 Products across categories (Total Amount)

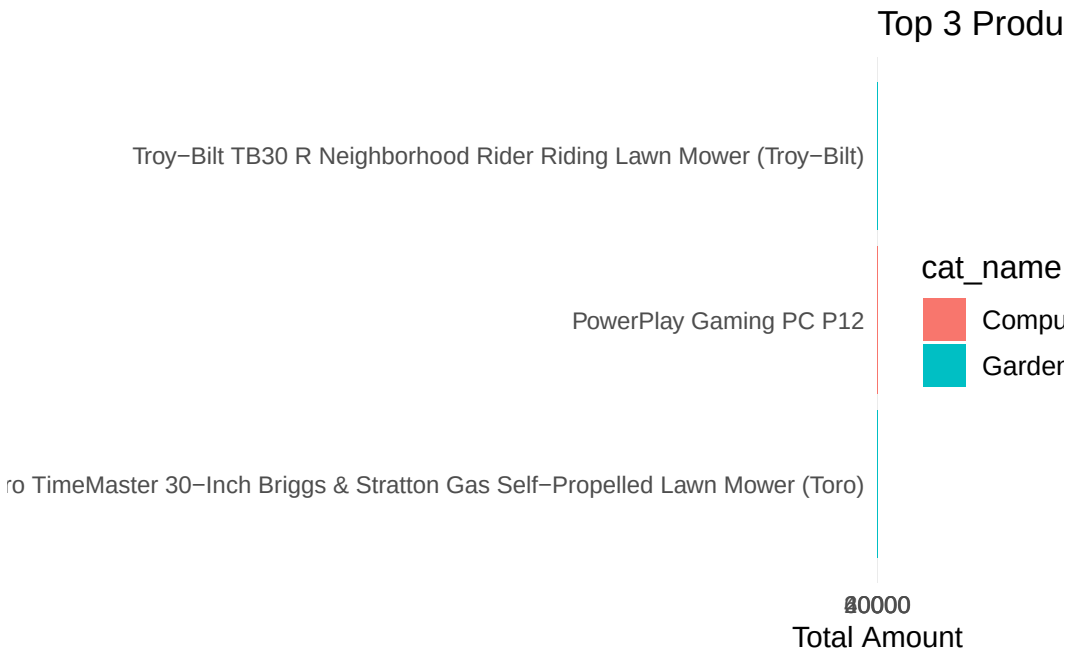
```r
# Join orders with products to get category information
orders_with_category <- orders_df %>%
  inner_join(products_df, by = "product_id")

# Calculate total amount for each product
product_amounts <- orders_with_category %>%
  group_by(category_id, product_id, product_name) %>%
  summarise(total_amount = sum(quantity * price, na.rm = TRUE)) %>%
  ungroup()

# Join with category_df to get category names
product_amounts_with_category_name <- product_amounts %>%
  inner_join(category_df, by = "category_id")

# Get overall top 3 products
top_3_products <- product_amounts_with_category_name %>%
  arrange(desc(total_amount)) %>%
  slice_max(total_amount, n = 3) %>%
  ungroup()

# Plot using ggplot2
ggplot(top_3_products, aes(x = reorder(product_name, total_amount)
                           , y = total_amount, fill = cat_name)) +
  geom_bar(stat = "identity", position = position_dodge()) +
  coord_flip() +
  labs(title = "Top 3 Products by Total Amount",
       x = "Product Name",
       y = "Total Amount") +
  theme_minimal() +
  theme(legend.title = element_text(size = 12),
        legend.text = element_text(size = 10))
```



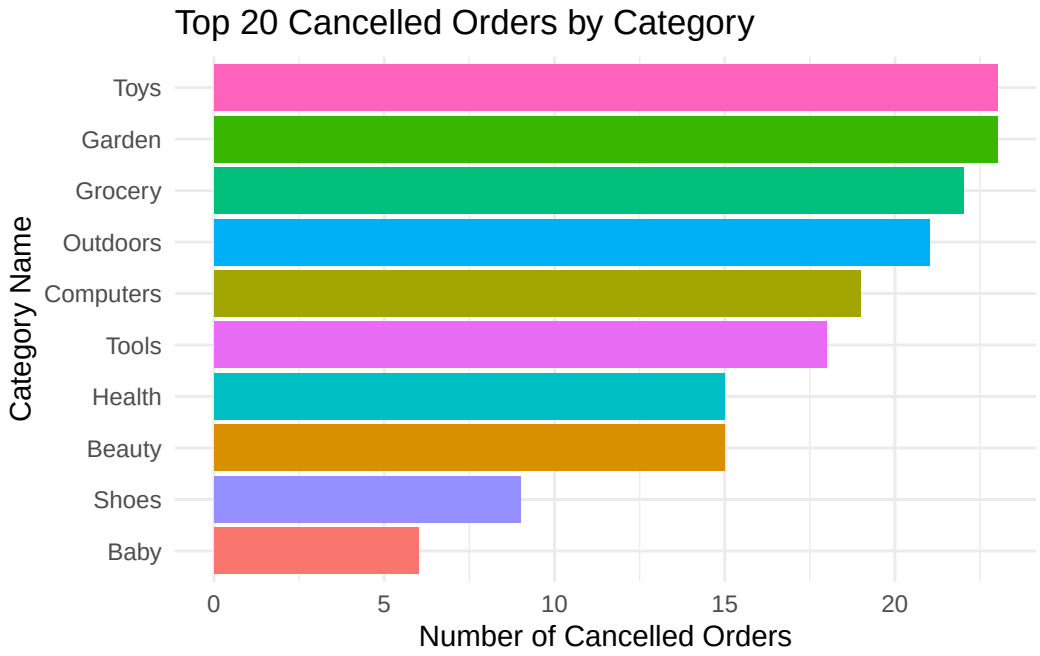
4. Average delivery time for orders across top 5 delivery suppliers
5. Top 20 Average Spending across customers
6. Top 20 cancelled orders for which category

```
# Join orders with products and then with categories to get category information
orders_with_categories <- orders_df %>%
  inner_join(products_df, by = "product_id") %>%
  inner_join(category_df, by = "category_id")

# Filter for cancelled orders and count by category
cancelled_orders_by_category <- orders_with_categories %>%
  filter(order_status == "Cancelled") %>%
  count(cat_name) %>%
  arrange(desc(n)) %>%
  top_n(20, n)

# Visualization
ggplot(cancelled_orders_by_category,
       aes(x = reorder(cat_name, n), y = n, fill = cat_name)) +
  geom_bar(stat = "identity") +
  coord_flip() +
  labs(title = "Top 20 Cancelled Orders by Category",
       x = "Category Name",
```

```
       y = "Number of Cancelled Orders") +
  theme_minimal() +
  theme(legend.position = "none")
```



7. Average number of orders across time
8. Scatter plot for revenue across quantity; color by category

SQL version 1. Top 10 Products - Overall (Quantity)

```
dbGetQuery(my_connection,
           "SELECT
              ORDERS.product_id,
              product_name,
              count(quantity) as total_purchase
            FROM ORDERS
            JOIN PRODUCTS ON ORDERS.product_id = PRODUCTS.product_id
            WHERE lower(order_status) in ('shipped','delivered')
            GROUP BY ORDERS.product_id,product_name
            ORDER BY total_purchase desc
            LIMIT 10
            ;")
```

```
      product_id                                product_name total_purchase
```

```
1  1332-xzt-9401     Garmin inReach Mini Satellite Communicator             8
2  3044-bpk-9266                    ProEdit Graphic Tablet 10x6             8
3  4202-vwa-5608        SweetSensation Stevia Natural Sweetener             7
4  0642-hvp-7060                        Sally Hansen Miracle Gel            6
5  1619-lcu-9571                   PaceSetter Marathon Shoes P2             6
6  1698-rbf-6951                                    Air Purifier            6
7  2030-xxz-9133             Heroic Optimus Prime Action Figure             6
8  2179-kqi-1903    The Art of Shaving Sandalwood Shaving Cream              6
9  2901-cyy-6826 Jack Black Double-Duty Face Moisturizer SPF 20             6
10 5317-rjn-1652   Corona Extendable Handle Cultivator (Corona)             6
```

2. Top 5 Categories (Quantity)

```
dbGetQuery(my_connection,
           "SELECT
              cat_name as category,
              count(quantity) as total_purchase
           FROM ORDERS
           JOIN PRODUCTS ON ORDERS.product_id = PRODUCTS.product_id
           JOIN PRODUCT_CATEGORY ON PRODUCTS.category_id = PRODUCT_CATEGORY.category_id
           WHERE lower(order_status) in ('shipped','delivered')
           GROUP BY cat_name
           ORDER by total_purchase desc
           LIMIT 5
           ;")
```

```
   category total_purchase
1    Beauty             52
2      Toys             51
3    Garden             42
4     Tools             38
5 Computers             34
```

3. Top 3 Products across categories (Total Amount)

```
dbGetQuery(my_connection,
           "WITH product AS (
              SELECT
                p.product_id,
                pc.cat_name,
                p.product_name
              FROM PRODUCTS as p
```

```
              JOIN PRODUCT_CATEGORY as pc ON pc.category_id = p.category_id
            ),
            order_amount AS (
              SELECT
                o.product_id AS product_id,
                SUM(o.quantity * p.price) AS total_amount
              FROM ORDERS as o
              JOIN PRODUCTS as p ON o.product_id = p.product_id
              WHERE LOWER(o.order_status) IN ('shipped', 'delivered')
              GROUP BY o.product_id
            ),
            rnk AS (
              SELECT
                pr.cat_name,
                pr.product_name,
                oa.total_amount,
                ROW_NUMBER() OVER (PARTITION BY pr.cat_name ORDER BY oa.total_amount DESC) AS
              FROM order_amount as oa
              JOIN product as pr ON oa.product_id = pr.product_id
            )
            SELECT
              cat_name,
              product_name,
              total_amount
            FROM rnk
            WHERE rnk IN (1,2,3);")
```

```
    cat_name
1       Baby
2       Baby
3       Baby
4     Beauty
5     Beauty
6     Beauty
7  Computers
8  Computers
9  Computers
10    Garden
11    Garden
12    Garden
13   Grocery
14   Grocery
```

15	Grocery	
16	Health	
17	Health	
18	Health	
19	Outdoors	
20	Outdoors	
21	Outdoors	
22	Shoes	
23	Shoes	
24	Shoes	
25	Tools	
26	Tools	
27	Tools	
28	Toys	
29	Toys	
30	Toys	

	product_name
1	Nanit Plus Smart Baby Monitor and Wall Mount
2	Similac Pro-Advance Infant Formula
3	Summer Infant Pacifier Thermometer
4	Clarisonic Mia Smart 3-in-1 Connected Sonic Beauty Device
5	Sol de Janeiro Brazilian Bum Bum Cream
6	Anastasia Beverly Hills Modern Renaissance Eyeshadow Palette
7	InfinityPad Tablet 12.9" Pro
8	CodeMaster Development Laptop C9
9	QuantumLeap Desktop Q7 Pro
10	Traeger Pro 575 Wood Pellet Grill (Traeger)
11	Greenworks Pro 80V Cordless Backpack Leaf Blower (Greenworks)
12	John Deere D105 17.5-HP Automatic 42-in Riding Lawn Mower (John Deere)
13	SweetSensation Stevia Natural Sweetener
14	SmoothSerenity Almond Butter
15	PureDelight Chocolate Ice Cream
16	Air Purifier
17	Nicotine Gum for Smoking Cessation
18	Blood Glucose Monitoring Kit
19	Garmin inReach Mini Satellite Communicator
20	Kelty Discovery 4 Tent
21	Garmin GPSMAP 64st Handheld GPS
22	PaceSetter Marathon Shoes P2
23	BreezeBlock Breathable Loafers B4
24	SilentStep Ballet Flats Silence
25	SmartSaw Table Saw T6
26	DiamondCut Tile Cutter D700

```
27                                        HammerHead Demolition Hammer H900
28                                             Rival Prometheus MXVIII-20K
29                                               Cozy Cottage Starter Home
30                                  Mini App-Enabled Programmable Robot Ball
   total_amount
1          2000
2           210
3           120
4          1500
5           480
6           440
7         11200
8          5600
9          5400
10         7000
11         3500
12         3000
13           84
14           60
15           48
16         1200
17          320
18          300
19         5500
20         3400
21         3300
22         1250
23          660
24          650
25         5500
26         4500
27         2400
28         1330
29          770
30          560
```

4. Average delivery time for orders across top 5 delivery suppliers

```
dbGetQuery(my_connection,
           "SELECT
               sup.supplier_id,
               sup.supplier_name AS supplier_name,
               AVG(julianday(s.delivered_timestamp) - julianday(s.dispatch_timestamp)) AS del
```

```
            FROM SHIPMENT AS s
            JOIN ORDERS AS o ON o.shipment_id = s.shipment_id
            JOIN PRODUCTS AS p ON p.product_id = o.product_id
            JOIN SUPPLIERS AS sup ON sup.supplier_id = p.supplier_id
            WHERE LOWER(s.status) = 'delivered'
            GROUP BY sup.supplier_id, sup.supplier_name
            ORDER BY delivery_time DESC, supplier_name
            LIMIT 5;")
```

	supplier_id	supplier_name	delivery_time
1	01HQZS3CJY4RW5H1ZH25Q61R02	Denesik and Sons	14
2	01HQZS3CYJHCZX4E4PBXJ5BK60	Prohaska Inc	14
3	01HQZS3CJNFSXMG8NJMDPX406D	Lindgren, Corkery and Brekke	13
4	01HQZS3CYHRVE31WXCT9E3XRXN	Pollich-Gulgowski	12
5	01HQZS3CYE3EZPVB9W9YFE3072	Rippin Inc	12

5. Top 20 Average Spending across customers

```
dbGetQuery(my_connection,
            "SELECT
               o.customer_id as customer_id,
               c.first_name ||' '|| c.last_name as customer_name,
               AVG(p.price*o.quantity) as avg_amount,
               SUM(p.price*o.quantity) as total_amount
             FROM ORDERS as o
             JOIN CUSTOMERS as c ON o.customer_id = c.customer_id
             JOIN PRODUCTS as p ON p.product_id = o.product_id
             WHERE LOWER(o.order_status) IN ('shipped', 'delivered')
             GROUP BY o.customer_id,customer_name
             ORDER BY avg_amount DESC
             limit 20
            ;")
```

	customer_id	customer_name	avg_amount	total_amount
1	01HQZS3A9FDVME30PNFFYH6R8C	Gabi Boate	2050.0000	4100
2	01HQZS38Z1611MHPEVXD917JDG	Irving Andress	1400.0000	1400
3	01HQZS39EB5YNBV1PD9967KY2A	Hanny Bauldrey	1215.3333	3646
4	01HQZS38QMTJM3XDR1PFVMVP7E	Godart Dineen	1209.0000	2418
5	01HQZS39GBJFTQR2QXVZS9XRBA	Bailey Pittman	1206.6667	3620
6	01HQZS39M3H7N6N722B2BBSRQK	Demetrius Boich	1094.0000	2188
7	01HQZS38QBHKKG8ZDHQ9QRVGF6	Hilary Iffe	1075.0000	2150

```
8  01HQZS38X6AS3MVQ7D55XBCRWH      Odetta Dollard  1001.3333         3004
9  01HQZS39FVYFWSK9DP5DE94NX0       Godiva Jerams   980.0000         2940
10 01HQZS39J8GEMSNSKB3GK13V5Z      Cleon Chisnell   866.6667         2600
11 01HQZS38YPVZX3J6Z86F4NAVX1      Karine Gemmell   857.5000         3430
12 01HQZS39GM9C0QGNDK9SHT99JV    Tiffani Trenaman   800.0000         1600
13 01HQZS38WEDQXH6AW7MBAW6TFZ    Lloyd Veschambes   706.6667         2120
14 01HQZS39E2TD51HG6C9GR61971 Danella Littlechild   674.4000         3372
15 01HQZS38WXVF9XHHTQG073DC8B   Carmelle Bendelow   630.0000         1260
16 01HQZS38M7XNA31ACXPJBC78ME      Walt Goulborne   553.3333         1660
17 01HQZS3AEMVA4ZZ1KB41AH6K9V       Valene Syphas   546.6667         1640
18 01HQZS39FG5QBNT1QE1GE1RWWP   Batholomew Barday   513.7500         4110
19 01HQZS38NZVWXGQADGH4ZHC5SW        Karie Feaver   458.0000         2290
20 01HQZS3A9VKRFVQ5TAGRPWPPNW       Tiff Mainland   438.8000         2194
```

6. Top 20 cancelled orders for which category

```
dbGetQuery(my_connection,
           "SELECT
              cat_name,
              COUNT(o.quantity) as total_cancelled
            FROM ORDERS as o
            JOIN PRODUCTS as p ON p.product_id = o.product_id
            JOIN PRODUCT_CATEGORY as pc on pc.category_id = p.category_id
            WHERE LOWER(order_status) = 'cancelled'
            GROUP BY cat_name
            ORDER BY total_cancelled DESC
           ;")
```

```
    cat_name total_cancelled
1       Toys              27
2     Beauty              24
3      Tools              22
4     Garden              22
5   Outdoors              21
6    Grocery              16
7  Computers              12
8     Health              11
9      Shoes               8
10      Baby               3
```

7. Average number of orders across time

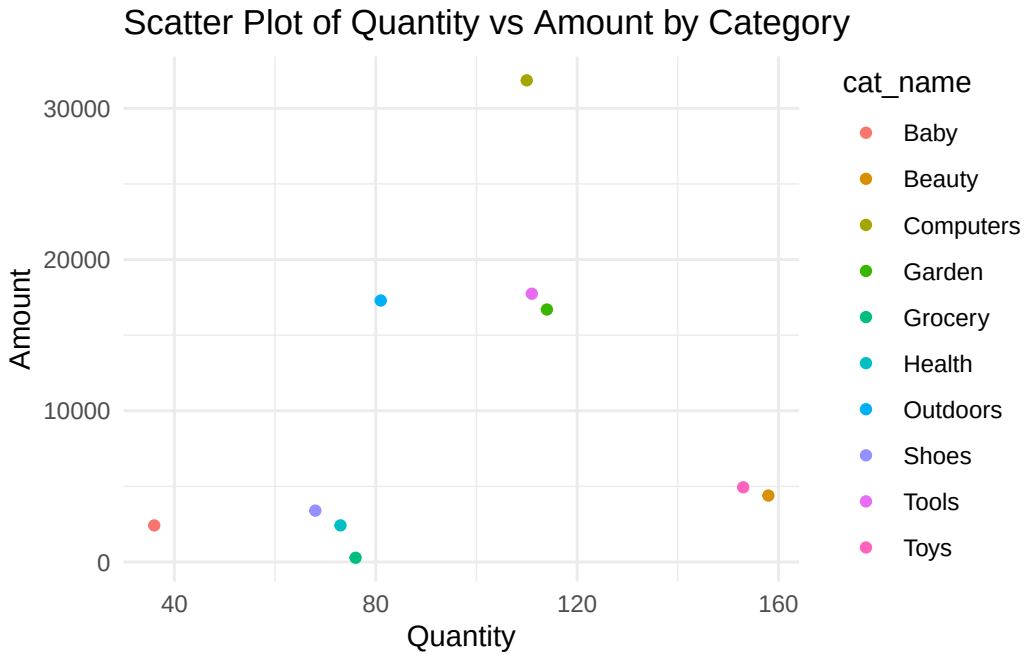
```
dbGetQuery(my_connection,
           "SELECT
              order_timestamp as date,
              SUM(o.quantity) as total_order
            FROM ORDERS as o
            WHERE LOWER(order_status) IN ('shipped', 'delivered')
            GROUP BY order_timestamp
            ORDER BY date
           ;")
```

```
         date total_order
1  2024-02-01          58
2  2024-02-02          24
3  2024-02-03          24
4  2024-02-04          50
5  2024-02-05          27
6  2024-02-06          46
7  2024-02-07          46
8  2024-02-08          31
9  2024-02-09          35
10 2024-02-10          19
11 2024-02-11          28
12 2024-02-12          40
13 2024-02-13          28
14 2024-02-14          52
15 2024-02-15          17
16 2024-02-16          34
17 2024-02-17          47
18 2024-02-18          29
19 2024-02-19          29
20 2024-02-20          23
21 2024-02-21          11
22 2024-02-22          34
23 2024-02-23          41
24 2024-02-24          48
25 2024-02-25          32
26 2024-02-26          29
27 2024-02-27          41
28 2024-02-28          62
29 2024-02-29          24
```

8. Scatter plot for revenue across quantity; color by category

```r
revenue_quantity <- dbGetQuery(my_connection,
           "SELECT
              cat_name,
              SUM(o.quantity) as quantity,
              SUM(p.price * o.quantity) as amount
             FROM ORDERS as o
             JOIN PRODUCTS as p ON p.product_id = o.product_id
             JOIN PRODUCT_CATEGORY as pc on pc.category_id = p.category_id
             WHERE LOWER(order_status) IN ('shipped', 'delivered')
             GROUP BY cat_name
           ;")

ggplot(revenue_quantity, aes(x = quantity, y = amount, color = cat_name)) +
  geom_point() +
  theme_minimal() +
  labs(title = "Scatter Plot of Quantity vs Amount by Category",
       x = "Quantity",
       y = "Amount") +
  theme(legend.position = "right")
```




```r
dbDisconnect(my_connection)
```