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#import dataset

retail<-read.csv("C:/Users/prath/Downloads/Online\_Retail.csv")

#1. Show the breakdown of the number of transactions by countries i.e., how many transactions are in the dataset for each country (consider all records including cancelled transactions). Show this in total number and also in percentage. Show only countries accounting for more than 1% of the total transactions.

summary(retail)

## InvoiceNo StockCode Description Quantity   
## Length:541909 Length:541909 Length:541909 Min. :-80995.00   
## Class :character Class :character Class :character 1st Qu.: 1.00   
## Mode :character Mode :character Mode :character Median : 3.00   
## Mean : 9.55   
## 3rd Qu.: 10.00   
## Max. : 80995.00   
##   
## InvoiceDate UnitPrice CustomerID Country   
## Length:541909 Min. :-11062.06 Min. :12346 Length:541909   
## Class :character 1st Qu.: 1.25 1st Qu.:13953 Class :character   
## Mode :character Median : 2.08 Median :15152 Mode :character   
## Mean : 4.61 Mean :15288   
## 3rd Qu.: 4.13 3rd Qu.:16791   
## Max. : 38970.00 Max. :18287   
## NA's :135080

summary(retail$Country)

## Length Class Mode   
## 541909 character character

country\_totalnumber<-table(retail$Country)  
transaction\_percent<-round(100\*prop.table(country\_totalnumber),digits = 2)  
percentage<-cbind(country\_totalnumber,transaction\_percent)  
total<-subset(percentage,transaction\_percent>1)  
total

## country\_totalnumber transaction\_percent  
## EIRE 8196 1.51  
## France 8557 1.58  
## Germany 9495 1.75  
## United Kingdom 495478 91.43

#2. Create a new variable ‘TransactionValue’ that is the product of the exising ‘Quantity’ and ‘UnitPrice’ variables. Add this variable to the dataframe.

library(dplyr)

##   
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':  
##   
## filter, lag

## The following objects are masked from 'package:base':  
##   
## intersect, setdiff, setequal, union

retail <- retail %>% mutate(TransactionValue= Quantity \* UnitPrice)  
summary(retail$TransactionValue)

## Min. 1st Qu. Median Mean 3rd Qu. Max.   
## -168469.60 3.40 9.75 17.99 17.40 168469.60

#3.Using the newly created variable, TransactionValue, show the breakdown of transaction values by countries i.e. how much money in total has been spent each country. Show this in total sum of transaction values. Show only countries with total transaction exceeding 130,000 British Pound

data <- summarise(group\_by(retail,Country),sum\_1= sum(TransactionValue))  
Transaction <- filter(data,sum\_1 >130000)  
Transaction

## # A tibble: 6 × 2  
## Country sum\_1  
## <chr> <dbl>  
## 1 Australia 137077.  
## 2 EIRE 263277.  
## 3 France 197404.  
## 4 Germany 221698.  
## 5 Netherlands 284662.  
## 6 United Kingdom 8187806.

#4.he variable is read as a categorical when you read data from the file. Now we need to explicitly instruct R to interpret this as a Date variable.”POSIXlt” and “POSIXct” are two powerful object classes in R to deal with date and time. irst let’s convert ‘InvoiceDate’ into a POSIXlt object:

Temp=strptime(retail$InvoiceDate,format='%m/%d/%Y %H:%M',tz='GMT')   
head(Temp)

## [1] "2010-12-01 08:26:00 GMT" "2010-12-01 08:26:00 GMT"  
## [3] "2010-12-01 08:26:00 GMT" "2010-12-01 08:26:00 GMT"  
## [5] "2010-12-01 08:26:00 GMT" "2010-12-01 08:26:00 GMT"

#Now, let’s split the dataframe’s components for the date, day of the week, and hour under the labels New Invoice Date, Invoice Day Week, and New Invoice Hour:

retail$New\_Invoice\_Date <- as.Date(Temp)

#There are many versatile functions available for Date objects. For instance, if you are aware of two date values, the object enables you to determine how many days separate the dates.

retail$New\_Invoice\_Date[20000]- retail$New\_Invoice\_Date[10]

## Time difference of 8 days

#Dates can also be converted to weekdays. For that, let’s create a new variable.

retail$Invoice\_Day\_Week= weekdays(retail$New\_Invoice\_Date)

# Ignoring the minute, let’s just take the hour and convert it to a regular integer value:

retail$New\_Invoice\_Hour = as.numeric(format(Temp, "%H"))

#Create a distinct numerical variable for the month as well:

retail$New\_Invoice\_Month = as.numeric(format(Temp, "%m"))

# 4.a) Show the percentage of transactions (by numbers) by days of the week.

a<-summarise(group\_by(retail,Invoice\_Day\_Week),Transaction\_Value=n\_distinct(InvoiceNo))  
a1<-mutate(a, transaction\_percent=(Transaction\_Value/sum(Transaction\_Value))\*100)  
a1

## # A tibble: 6 × 3  
## Invoice\_Day\_Week Transaction\_Value transaction\_percent  
## <chr> <int> <dbl>  
## 1 Friday 4184 16.2   
## 2 Monday 4138 16.0   
## 3 Sunday 2381 9.19  
## 4 Thursday 5660 21.9   
## 5 Tuesday 4722 18.2   
## 6 Wednesday 4815 18.6

# 4. b)Show the percentage of transactions (by transaction volume) by days of the week

b1<-summarise(group\_by(retail,Invoice\_Day\_Week),Transaction\_Volume=sum(TransactionValue))  
b2<-mutate(b1,percentage=(Transaction\_Volume/sum(Transaction\_Volume))\*100)  
b2

## # A tibble: 6 × 3  
## Invoice\_Day\_Week Transaction\_Volume percentage  
## <chr> <dbl> <dbl>  
## 1 Friday 1540611. 15.8   
## 2 Monday 1588609. 16.3   
## 3 Sunday 805679. 8.27  
## 4 Thursday 2112519 21.7   
## 5 Tuesday 1966183. 20.2   
## 6 Wednesday 1734147. 17.8

# 4. c)Show the percentage of transactions (by transaction volume) by month of the year

c1<-summarise(group\_by(retail,New\_Invoice\_Month),Transaction\_Volume=sum(TransactionValue))  
c1<-mutate(c1,percentage=(Transaction\_Volume/sum(Transaction\_Volume))\*100)  
c1

## # A tibble: 12 × 3  
## New\_Invoice\_Month Transaction\_Volume percentage  
## <dbl> <dbl> <dbl>  
## 1 1 560000. 5.74  
## 2 2 498063. 5.11  
## 3 3 683267. 7.01  
## 4 4 493207. 5.06  
## 5 5 723334. 7.42  
## 6 6 691123. 7.09  
## 7 7 681300. 6.99  
## 8 8 682681. 7.00  
## 9 9 1019688. 10.5   
## 10 10 1070705. 11.0   
## 11 11 1461756. 15.0   
## 12 12 1182625. 12.1

# 7. d)What was the date with the highest number of transactions from Australia?

retail <- retail %>% mutate(TransactionValue= Quantity \* UnitPrice)  
retail %>% filter(Country == 'Australia') %>% group\_by(New\_Invoice\_Date) %>% summarise(max=max(TransactionValue))

## # A tibble: 49 × 2  
## New\_Invoice\_Date max  
## <date> <dbl>  
## 1 2010-12-01 51   
## 2 2010-12-08 71.4   
## 3 2010-12-14 -6.25  
## 4 2010-12-17 148.   
## 5 2011-01-06 1020   
## 6 2011-01-10 81.6   
## 7 2011-01-11 35.4   
## 8 2011-01-14 142.   
## 9 2011-01-17 47.4   
## 10 2011-01-19 38.2   
## # … with 39 more rows

# 4. e)The company needs to shut down the website for two consecutive hours for maintenance. What would be the hour of the day to start this so that the distribution is at minimum for the customers? The responsible IT team is available from 7:00 to 20:00 every day.

library(zoo)

##   
## Attaching package: 'zoo'

## The following objects are masked from 'package:base':  
##   
## as.Date, as.Date.numeric

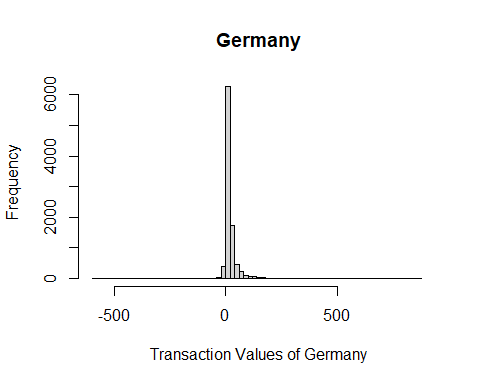
e1<-summarise(group\_by(retail,New\_Invoice\_Hour),Transaction\_min=n\_distinct(InvoiceNo))  
e1<-filter(e1,New\_Invoice\_Hour>=7&New\_Invoice\_Hour<=20)  
e12<-rollapply(e1$Transaction\_min,3,sum)  
e123<-which.min(e12)  
e123

## [1] 12

starting the work at 12noon is correct for maintenance.

#5. Plot the histogram of transaction values from Germany. Use the hist() function to plot.

Germany\_data <- subset(retail$TransactionValue, retail$Country == "Germany")  
hist(Germany\_data, xlim = c (-600, 900), breaks = 100 , xlab = "Transaction Values of Germany", main = "Germany")



#6. Which customer had the highest number of transactions? Which customer is most valuable (i.e. highest total sum of transactions)?

retail1 <- na.omit(retail)  
result1 <- summarise(group\_by(retail1,CustomerID), sum2= sum(TransactionValue))  
result1[which.max(result1$sum2),]

## # A tibble: 1 × 2  
## CustomerID sum2  
## <int> <dbl>  
## 1 14646 279489.

data2 <- table(retail$CustomerID)  
data2 <- as.data.frame(data2)  
result2 <- data2[which.max(data2$Freq),]  
result2

## Var1 Freq  
## 4043 17841 7983

#7. Calculate the percentage of missing values for each variable in the dataset

missing\_values <- colMeans(is.na(retail)\*100)  
missing\_values

## InvoiceNo StockCode Description Quantity   
## 0.00000 0.00000 0.00000 0.00000   
## InvoiceDate UnitPrice CustomerID Country   
## 0.00000 0.00000 24.92669 0.00000   
## TransactionValue New\_Invoice\_Date Invoice\_Day\_Week New\_Invoice\_Hour   
## 0.00000 0.00000 0.00000 0.00000   
## New\_Invoice\_Month   
## 0.00000

#8. What are the number of transactions with missing CustomerID records by countries?

retail\_2 <- retail %>% filter(is.na(CustomerID)) %>% group\_by(Country)  
summary(retail\_2$Country)

## Length Class Mode   
## 135080 character character

#10.the retail sector, it is very important to understand the return rate of the goods purchased by customers. In this example, we can define this quantity, simply, as the ratio of the number of transactions cancelled (regardless of the transaction value) over the total number of transaction with this definition, what is the return rate for the French customers?

retail\_table <- filter(retail,Country=="France")  
totalrow <- nrow(retail\_table)  
cancel <- nrow(subset(retail\_table,TransactionValue<0))  
cancel

## [1] 149

notcancel <- totalrow-cancel   
notcancel

## [1] 8408

TEST2=(cancel/8556)  
TEST2

## [1] 0.01741468

#11.What is the product that has generated the highest revenue for the retailer? (i.e. item with the highest total sum of TransactionValue’).

Transaction\_Value <- tapply(retail$TransactionValue, retail$StockCode , sum)  
Transaction\_Value[which.max(Transaction\_Value)]

## DOT   
## 206245.5

#12.How many unique customers are represented in the dataset? You can use unique() and length() functions.

unique\_customers <- unique(retail$CustomerID)  
length(unique\_customers)

## [1] 4373