mbruner3_Assign1

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```
rm(list = ls())
```

```
library(tidyverse)
```

```
## -- Attaching packages ---------------------------------------------------- tidyverse 1.3.0 --
```

```
## v ggplot2 3.3.2     v purrr   0.3.4
## v tibble  3.0.3     v dplyr   1.0.2
## v tidyr   1.1.2     v stringr 1.4.0
## v readr   1.3.1     v forcats 0.5.0
```

```
## -- Conflicts ------------------------------------------------------- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
Online_Retail <- read_csv("Online_Retail.csv", col_types = c("ccci?dcc"))
head(Online_Retail)
```

```
## # A tibble: 6 x 8
##   InvoiceNo StockCode Description Quantity InvoiceDate UnitPrice CustomerID
##   <chr>     <chr>     <chr>          <int> <chr>           <dbl> <chr>
## 1 536365    85123A    WHITE HANG~        6 12/1/2010 ~      2.55 17850
## 2 536365    71053     WHITE META~        6 12/1/2010 ~      3.39 17850
## 3 536365    84406B    CREAM CUPI~        8 12/1/2010 ~      2.75 17850
## 4 536365    84029G    KNITTED UN~        6 12/1/2010 ~      3.39 17850
## 5 536365    84029E    RED WOOLLY~        6 12/1/2010 ~      3.39 17850
## 6 536365    22752     SET 7 BABU~        2 12/1/2010 ~      7.65 17850
## # ... with 1 more variable: Country <chr>
```

NUMBER 1

```
Online_Retail %>%
group_by(Country)  %>%
  tally(sort = TRUE) %>% summarise(Country, Counts = n, Percent = n/sum(n)*100) %>% filter(Percent > 1)
```

```
## # A tibble: 4 x 3
##   Country        Counts Percent
##   <chr>           <int>   <dbl>
## 1 United Kingdom 495478   91.4
## 2 Germany          9495    1.75
## 3 France           8557    1.58
## 4 EIRE             8196    1.51
```

UK, Germany, France, and EIRE account for more than 1% of the total transactions in this dataset.

NUMBER 2

```
Online_Retail <- mutate(Online_Retail, TransactionValue = Quantity * UnitPrice)
head(Online_Retail[, 9])
```

```
## # A tibble: 6 x 1
##   TransactionValue
##              <dbl>
## 1             15.3
## 2             20.3
## 3             22
## 4             20.3
## 5             20.3
## 6             15.3
```

NUMBER 3

```
Online_Retail %>%
group_by(Country) %>%
  summarise(TransValueSum = sum(TransactionValue)) %>% filter(TransValueSum > 130000) %>% arrange(desc(
```

```
## `summarise()` ungrouping output (override with `.groups` argument)
```

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

UK, Netherlands, EIRE, Germany, France, and Australia are the countries where their sum is greater than 130,000 British Pound.

Number 4 Intro

```
Temp <- strptime(Online_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"
```

```
head(Online_Retail)
```

```
## # A tibble: 6 x 9
##   InvoiceNo StockCode Description Quantity InvoiceDate UnitPrice CustomerID
##   <chr>     <chr>     <chr>          <int> <chr>           <dbl> <chr>
## 1 536365    85123A    WHITE HANG~        6 12/1/2010 ~      2.55 17850
## 2 536365    71053     WHITE META~        6 12/1/2010 ~      3.39 17850
## 3 536365    84406B    CREAM CUPI~        8 12/1/2010 ~      2.75 17850
## 4 536365    84029G    KNITTED UN~        6 12/1/2010 ~      3.39 17850
## 5 536365    84029E    RED WOOLLY~        6 12/1/2010 ~      3.39 17850
## 6 536365    22752     SET 7 BABU~        2 12/1/2010 ~      7.65 17850
## # ... with 2 more variables: Country <chr>, TransactionValue <dbl>
```

```
Online_Retail$New_Invoice_Date <- as.Date(Temp)
Online_Retail$Invoice_Day_Week <- weekdays(Online_Retail$New_Invoice_Date)
Online_Retail$New_Invoice_Hour <- as.numeric(format(Temp, "%H"))
Online_Retail$New_Invoice_Month <- as.numeric(format(Temp, "%m"))
head(Online_Retail)
```

```
## # A tibble: 6 x 13
##   InvoiceNo StockCode Description Quantity InvoiceDate UnitPrice CustomerID
##   <chr>     <chr>     <chr>          <int> <chr>           <dbl> <chr>
## 1 536365    85123A    WHITE HANG~        6 12/1/2010 ~      2.55 17850
## 2 536365    71053     WHITE META~        6 12/1/2010 ~      3.39 17850
## 3 536365    84406B    CREAM CUPI~        8 12/1/2010 ~      2.75 17850
## 4 536365    84029G    KNITTED UN~        6 12/1/2010 ~      3.39 17850
## 5 536365    84029E    RED WOOLLY~        6 12/1/2010 ~      3.39 17850
## 6 536365    22752     SET 7 BABU~        2 12/1/2010 ~      7.65 17850
## # ... with 6 more variables: Country <chr>, TransactionValue <dbl>,
## #   New_Invoice_Date <date>, Invoice_Day_Week <chr>, New_Invoice_Hour <dbl>,
## #   New_Invoice_Month <dbl>
```

Part a

```
Online_Retail %>%
  group_by(Invoice_Day_Week) %>%
  tally(sort = TRUE) %>%
  summarise(Invoice_Day_Week, TransactionCounts = n, Percent = n/sum(n)*100) %>%
  arrange(desc(TransactionCounts))
```

```
## # A tibble: 6 x 3
##   Invoice_Day_Week TransactionCounts Percent
##   <chr>                        <int>   <dbl>
## 1 Thursday                    103857    19.2
## 2 Tuesday                     101808    18.8
## 3 Monday                       95111    17.6
## 4 Wednesday                    94565    17.5
## 5 Friday                       82193    15.2
## 6 Sunday                       64375    11.9
```

Part b

```
Online_Retail %>%
  group_by(Invoice_Day_Week) %>%
  summarise(TransValueSum = sum(TransactionValue)) %>%
  mutate(TransValuePercent = TransValueSum/sum(TransValueSum)) %>%
  arrange(desc(TransValueSum))
```

```
## ‘summarise()‘ ungrouping output (override with ‘.groups‘ argument)
```

```
## # A tibble: 6 x 3
##   Invoice_Day_Week TransValueSum TransValuePercent
##   <chr>                    <dbl>             <dbl>
## 1 Thursday              2112519             0.217 
## 2 Tuesday               1966183.            0.202 
## 3 Wednesday             1734147.            0.178 
## 4 Monday                1588609.            0.163 
## 5 Friday                1540611.            0.158 
## 6 Sunday                 805679.            0.0827
```

Part c

```
Online_Retail %>%
  group_by(New_Invoice_Month) %>%
  summarise(TransValueSum = sum(TransactionValue)) %>%
  mutate(TransValuePercent = TransValueSum/sum(TransValueSum)) %>%
  arrange(desc(TransValuePercent))
```

```
## ‘summarise()‘ ungrouping output (override with ‘.groups‘ argument)
```

```
## # A tibble: 12 x 3
##    New_Invoice_Month TransValueSum TransValuePercent
##                <dbl>         <dbl>             <dbl>
##  1                11      1461756.            0.150 
##  2                12      1182625.            0.121 
##  3                10      1070705.            0.110 
##  4                 9      1019688.            0.105 
##  5                 5       723334.            0.0742
##  6                 6       691123.            0.0709
## 7                 3       683267.          0.0701
## 8                 8       682681.          0.0700
## 9                 7       681300.          0.0699
## 10                1       560000.          0.0574
## 11                2       498063.          0.0511
## 12                4       493207.          0.0506
```

Part d

```
Online_Retail %>%
  filter(Country == "Australia") %>%
  group_by(InvoiceDate) %>%
  tally(sort = TRUE) %>%
  filter(n == max(n))
```

```
## # A tibble: 1 x 2
##   InvoiceDate         n
##   <chr>           <int>
## 1 6/15/2011 13:37   139
```

Part e

```
Online_Retail %>%
  group_by(New_Invoice_Hour) %>%
  tally(sort = TRUE) %>%
  filter(New_Invoice_Hour>= 7 & New_Invoice_Hour<=20) %>%
  arrange(n) %>%
  head(5)
```

```
## # A tibble: 5 x 2
##   New_Invoice_Hour     n
##              <dbl> <int>
## 1                7   383
## 2               20   871
## 3               19  3705
## 4               18  7974
## 5                8  8909
```

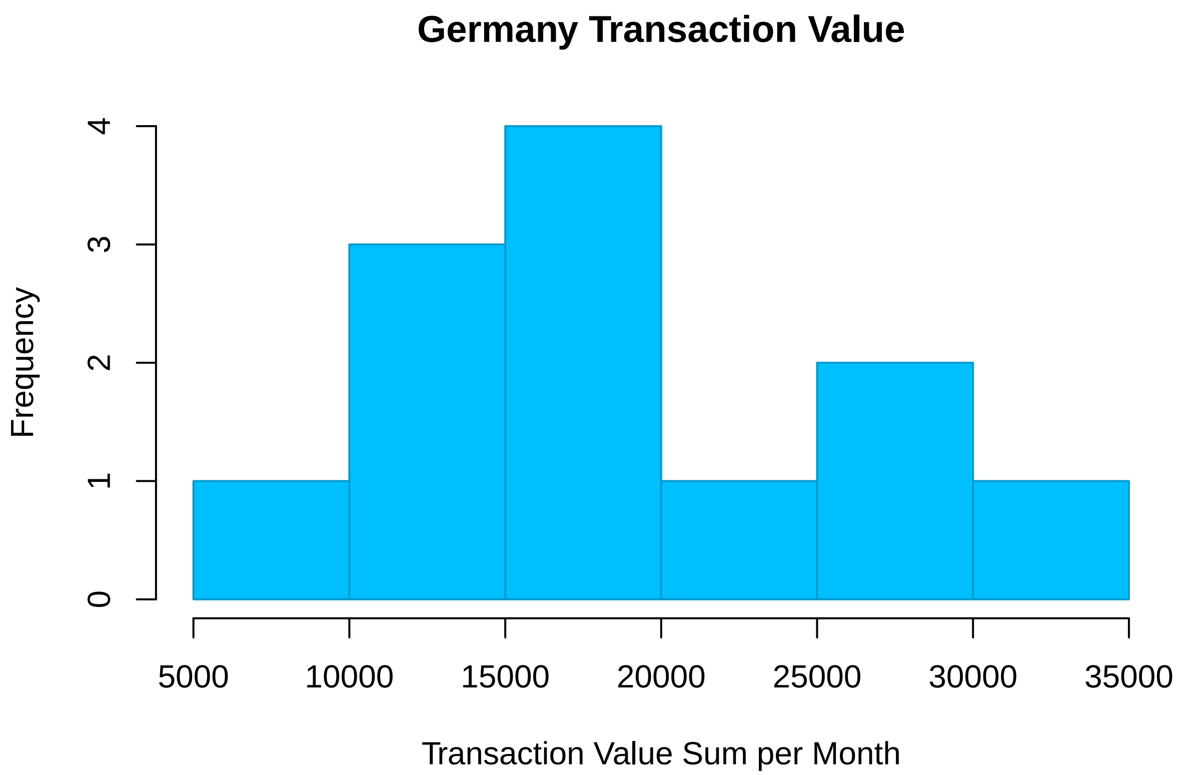
The answer is the 19th and 20th since they are the 2nd and 3rd lowest values and then combined would be the lowest sum of two consecutive hours.

Number 5

```
Online_Retail %>%
  group_by(Country) %>%
  filter(Country == "Germany") %>%
  group_by(New_Invoice_Month) %>%
  summarise(TransValueSum = sum(TransactionValue)) -> Germany
```

```
## ‘summarise()‘ ungrouping output (override with ‘.groups‘ argument)
```

```
hist(Germany$TransValueSum, border = "deepskyblue3", main = "Germany Transaction Value", xlab = "Transac
```



# Number 6

```
Online_Retail %>%
  group_by(CustomerID) %>%
  tally(sort = TRUE) %>%
  filter(!is.na(CustomerID)) %>%
  filter(n==max(n))
```

```
## # A tibble: 1 x 2
##   CustomerID     n
##   <chr>      <int>
## 1 17841       7983
```

```
Online_Retail %>%
  group_by(CustomerID) %>%
  summarise(Transvaluesum = sum(TransactionValue)) %>%
  filter(!is.na(CustomerID)) %>%
  filter(Transvaluesum == max(Transvaluesum))
```

```
## ‘summarise()‘ ungrouping output (override with ‘.groups‘ argument)
## # A tibble: 1 x 2
##   CustomerID Transvaluesum
##   <chr>              <dbl>
## 1 14646            279489.
```

Customer 17841 has the most transactions of 7,983 and customer 14646 is the most valuable spending 279,489 British Pound.

Number 7

```
colMeans(is.na(Online_Retail))
```

```
##         InvoiceNo         StockCode       Description          Quantity
##       0.000000000       0.000000000       0.002683107       0.000000000
##       InvoiceDate         UnitPrice        CustomerID           Country
##       0.000000000       0.000000000       0.249266943       0.000000000
##  TransactionValue  New_Invoice_Date  Invoice_Day_Week  New_Invoice_Hour
##       0.000000000       0.000000000       0.000000000       0.000000000
## New_Invoice_Month
##       0.000000000
```

Only columns “Description” (.2% missing values) and “CustomerID” (24.9% missing values) have missing values.

Number 8

```
Online_Retail %>%
  group_by(Country) %>%
  summarise(CustomerID) %>%
  filter(is.na(CustomerID)) %>%
  tally(sort = TRUE) # Total "NA" by country.
```

```
## ‘summarise()‘ regrouping output by ’Country’ (override with ‘.groups‘ argument)
```

```
## # A tibble: 9 x 2
##   Country             n
##   <chr>           <int>
## 1 United Kingdom 133600
## 2 EIRE              711
## 3 Hong Kong         288
## 4 Unspecified       202
## 5 Switzerland       125
## 6 France             66
## 7 Israel             47
## 8 Portugal           39
## 9 Bahrain             2
```

Number 9

```
Online_Retail %>% # Creating a variable for the number of days between visits.
  select(CustomerID, New_Invoice_Date) %>%
  group_by(CustomerID) %>%
  distinct(New_Invoice_Date) %>%
  arrange(desc(CustomerID)) %>%
  mutate(DaysBetween = New_Invoice_Date - lag(New_Invoice_Date))-> CustDaysBtwVisit #Combined DaysBetwe

CustDaysBtwVisit %>%
   filter(!is.na(DaysBetween)) -> RetCustDaysBtwVisits # Filtered "NA" from dataset.

mean(RetCustDaysBtwVisits$DaysBetween)
```

```
## Time difference of 38.4875 days
```

The customers who did return had an average of 38.5 days between visits.

Number 10

```
Online_Retail %>% # Found the returns from France.
  group_by(Country) %>%
  filter(Country == "France") %>%
  select(Country, Quantity) %>%
  filter(Quantity < 0) -> FrenchReturns

  Online_Retail %>%  # Found the purchases from France.
  group_by(Country) %>%
  filter(Country == "France") %>%
  select(Quantity, Country) %>%
  filter(Quantity > 0) -> FrenchPurchases

FRReturns <- sum(FrenchReturns$Quantity) # calculated the quantity of returns from France.
FRTransactions <- sum(FrenchPurchases$Quantity) # calculated the quanity of purchased from France.

FRReturns/FRTransactions *100 # Using the above two numbers, I then calculated the return rate.
```

```
## [1] -1.448655
```

France has a 1.45% return rate.

Number 11

```
Online_Retail %>%
  group_by(StockCode) %>%
  summarise(TransactionValueTot = sum(TransactionValue)) %>%
  arrange(desc(TransactionValueTot)) %>%
  filter(StockCode != "DOT") %>%  # Looks like this is postage for delivering products.
  filter(TransactionValueTot == max(TransactionValueTot))
```

```
## `summarise()` ungrouping output (override with `.groups` argument)
```

```
## # A tibble: 1 x 2
##   StockCode TransactionValueTot
##   <chr>                   <dbl>
## 1 22423                 164762.
```

```
Online_Retail %>%
  group_by(StockCode) %>%
  filter(StockCode == "22423") %>%
  select(StockCode, Description) %>%
  distinct(StockCode, Description) %>%
  filter(Description == "REGENCY CAKESTAND 3 TIER")
```

```
## # A tibble: 1 x 2
## # Groups:   StockCode [1]
##   StockCode Description
##   <chr>     <chr>
## 1 22423     REGENCY CAKESTAND 3 TIER
```

Regency 3 tiered cakestand had the highest revenue.

Number 12

```
Online_Retail %>%
  group_by(CustomerID) %>%
  distinct(CustomerID) -> UniqueCustomers

  length(UniqueCustomers$CustomerID)
```

```
## [1] 4373
```

There are 4373 unique customers in this dataset.