## Best Subset

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```
library(RSQLite)
## Warning: package 'RSQLite' was built under R version 3.4.4
library(sqldf)
## Warning: package 'sqldf' was built under R version 3.4.4
## Loading required package: gsubfn
## Warning: package 'gsubfn' was built under R version 3.4.4
## Loading required package: proto
library(RODBC)
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
##
library(ggplot2)
library(stringr)
library(lubridate)
## Attaching package: 'lubridate'
## The following object is masked from 'package:base':
##
##
       date
library(tidyr)
library(dplyr)
library(tidyr)
library(caret)
## Warning: package 'caret' was built under R version 3.4.4
## Loading required package: lattice
library(DMwR)
## Warning: package 'DMwR' was built under R version 3.4.4
## Loading required package: grid
```

```
library(ROCR)
## Warning: package 'ROCR' was built under R version 3.4.4
## Loading required package: gplots
## Warning: package 'gplots' was built under R version 3.4.4
##
## Attaching package: 'gplots'
## The following object is masked from 'package:stats':
##
##
       lowess
require(caTools)
## Loading required package: caTools
library(ISLR)
library(ggplot2)
library(MASS)
##
## Attaching package: 'MASS'
## The following object is masked from 'package:dplyr':
##
##
       select
library(leaps)
## Warning: package 'leaps' was built under R version 3.4.4
library(bestglm)
library(glmnet)
## Loading required package: Matrix
## Attaching package: 'Matrix'
## The following object is masked from 'package:tidyr':
##
##
       expand
## Loading required package: foreach
## Loaded glmnet 2.0-13
library(Matrix)
#Create three names for same dataset
a <- read.csv("card transactions.csv")</pre>
a <- a %>% filter(Transtype == 'P')
```

```
a[is.na(a)] \leftarrow 0
a$zip = a$Merchant.Zip
a$Description=a$Merch.Description
a$State=a$Merchant.State
summary(a)
##
      Recordnum
                       Cardnum
                                               Date
##
   Min. :
                1
                    Min.
                           :5.142e+09
                                        2/28/2010: 684
   1st Qu.:24143
                    1st Qu.:5.142e+09
                                        8/10/2010:
                                        3/15/2010:
   Median :48344
                    Median :5.142e+09
                                                     593
##
   Mean
         :48343
                    Mean
                           :5.142e+09
                                        9/13/2010:
                                                     564
##
   3rd Qu.:72544
                    3rd Qu.:5.142e+09
                                        8/9/2010 :
                                                     534
##
           :96708
                    Max.
                           :5.142e+09
                                        9/14/2010:
                                                     531
##
                                         (Other) :92841
##
           Merchantnum
                                    Merch.Description Merchant.State
##
   930090121224 : 9310
                          GSA-FSS-ADV
                                              : 1688
                                                       TN
                                                              :11990
##
                 : 3199
                          SIGMA-ALDRICH
                                              : 1635
                                                       VA
                                                              : 7872
                          STAPLES #941
##
   5509006296254: 2131
                                              : 1174
                                                       CA
                                                              : 6817
##
   9900020006406: 1714
                          FISHER SCI ATL
                                             : 1093
                                                       IL
                                                              : 6508
## 602608969534 : 1092
                          MWI*MICRO WAREHOUSE: 958
                                                       MD
                                                              : 5398
  4353000719908: 1020
                          CDW*GOVERNMENT INC: 872
                                                              : 5025
                                                       GA
                          (Other)
                                              :88933
##
   (Other)
                 :77887
                                                       (Other):52743
##
                                                                        Х
    Merchant.Zip
                    Transtype
                                   Amount
                                                    Fraud
##
                          0
                               $3.62 : 4283
                                                       :0.00000
                                                                          :0
                                               \mathtt{Min}.
                                                                  Min.
   1st Qu.:20639
                               $3.67 : 1620
                                               1st Qu.:0.00000
                                                                  1st Qu.:0
##
                    D:
                          0
##
   Median :38118
                    P:96353
                               $3.74 : 913
                                               Median :0.00000
                                                                  Median:0
##
         :42714
                               $3.80 : 827
                                                       :0.01052
                                                                        :0
   Mean
                    Υ:
                          0
                                               Mean
                                                                  Mean
##
   3rd Qu.:63103
                               $4.37 : 378
                                               3rd Qu.:0.00000
                                                                  3rd Qu.:0
##
  Max.
           :99999
                               $30.00 : 315
                                               {\tt Max.}
                                                       :1.00000
                                                                  Max.
                                                                         :0
##
                               (Other) :88017
##
                                 Description
                                                     State
         zip
                    GSA-FSS-ADV
   Min.
                                       : 1688
                                                 TN
                                                        :11990
##
   1st Qu.:20639
                    SIGMA-ALDRICH
                                        : 1635
                                                        : 7872
                                                 VA
  Median :38118
                                       : 1174
                                                        : 6817
##
                    STAPLES #941
                                                 CA
##
  Mean
         :42714
                    FISHER SCI ATL
                                       : 1093
                                                 IL
                                                        : 6508
   3rd Qu.:63103
                    MWI*MICRO WAREHOUSE: 958
                                                 MD
                                                        : 5398
##
   Max. :99999
                    CDW*GOVERNMENT INC: 872
                                                 GA
                                                        : 5025
##
                    (Other)
                                        :88933
                                                 (Other):52743
b <- a
df < -a
#Create expert variables with SQL
Merchantnumstate = sqldf("SELECT a.Recordnum,
                    COUNT(CASE WHEN a.Date = b.Date THEN a.Recordnum ELSE NULL END) AS same_Merchantnum
                    COUNT(CASE WHEN a.Date - b.Date BETWEEN 0 AND 2 AND a.Recordnum > b.Recordnum THEN a
                    COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 4 AND a.Recordnum> b.Recordn
                    COUNT(CASE WHEN a.Date - b.Date BETWEEN 0 AND 6 AND a.Recordnum > b.Recordnum THEN a
```

COUNT(CASE WHEN a.Date - b.Date BETWEEN 0 AND 13 AND a.Recordnum > b.Recordnum THEN COUNT(CASE WHEN a.Date - b.Date BETWEEN 0 AND 29 AND a.Recordnum > b.Recordnum THEN COUNT(DISTINCT CASE WHEN a.Date = b.Date AND a.Recordnum > b.Recordnum THEN b.Zip EL COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 2 AND a.Recordnum> b.Recordn COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 4 AND a.Recordnum> b.Recordn COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 6 AND a.Recordnum> b.Recordn COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 13 AND a.Recordnum> b.Record COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 29 AND a.Recordnum> b.Record. COUNT(DISTINCT CASE WHEN a.Date = b.Date AND a.Recordnum > b.Recordnum THEN b.Amount COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 2 AND a.Recordnum> b.Recordn COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 4 AND a.Recordnum> b.Recordn COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 6 AND a.Recordnum> b.Recordn COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 13 AND a.Recordnum> b.Record. COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 29 AND a.Recordnum> b.Record COUNT(DISTINCT CASE WHEN a.Date = b.Date AND a.Recordnum > b.Recordnum THEN b.Cardnum COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 2 AND a.Recordnum> b.Recordn COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 6 AND a.Recordnum> b.Recordn COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 4 AND a.Recordnum> b.Recordn COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 13 AND a.Recordnum> b.Record COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 29 AND a.Recordnum> b.Record.

from a, b
WHERE a.Merchantnum=b.Merchantnum
AND a.State=b.State
GROUP BY 1")

## Merchantnum = sqldf("SELECT a.Recordnum,

COUNT(CASE WHEN a.Date = b.Date THEN a.Recordnum ELSE NULL END) AS same Merchantnu COUNT(CASE WHEN a.Date - b.Date BETWEEN 0 AND 2 AND a.Recordnum > b.Recordnum THEN a COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 4 AND a.Recordnum> b.Recordn COUNT(CASE WHEN a.Date - b.Date BETWEEN 0 AND 6 AND a.Recordnum > b.Recordnum THEN a COUNT(CASE WHEN a.Date - b.Date BETWEEN 0 AND 13 AND a.Recordnum > b.Recordnum THEN COUNT(CASE WHEN a.Date - b.Date BETWEEN 0 AND 29 AND a.Recordnum > b.Recordnum THEN COUNT(DISTINCT CASE WHEN a.Date = b.Date AND a.Recordnum > b.Recordnum THEN b.Zip EL COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 2 AND a.Recordnum> b.Recordn COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 4 AND a.Recordnum> b.Recordn COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 6 AND a.Recordnum> b.Recordn COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 13 AND a.Recordnum> b.Record. COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 29 AND a.Recordnum> b.Record. COUNT(DISTINCT CASE WHEN a.Date = b.Date AND a.Recordnum > b.Recordnum THEN b.Amount COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 2 AND a.Recordnum> b.Recordn COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 4 AND a.Recordnum> b.Recordn COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 6 AND a.Recordnum> b.Recordn COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 13 AND a.Recordnum> b.Record COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 29 AND a.Recordnum> b.Record. COUNT(DISTINCT CASE WHEN a.Date = b.Date AND a.Recordnum > b.Recordnum THEN b.Cardnum COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 2 AND a.Recordnum> b.Recordn COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 6 AND a.Recordnum> b.Recordn COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 4 AND a.Recordnum> b.Recordn COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 13 AND a.Recordnum> b.Record

COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 29 AND a.Recordnum> b.Record

from a, b

```
WHERE a.Merchantnum=b.Merchantnum
                    GROUP BY 1")
Cardnum = sqldf("SELECT a.Recordnum,
COUNT(CASE WHEN a.Date = b.Date THEN a.Recordnum ELSE NULL END) AS same Cardnum 1,
                COUNT(CASE WHEN a.Date - b.Date BETWEEN 0 AND 2 AND a.Recordnum > b.Recordnum THEN a.Rec
                COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 4 AND a.Recordnum > b.Recordnum T.
                COUNT(CASE WHEN a.Date - b.Date BETWEEN 0 AND 6 AND a.Recordnum > b.Recordnum THEN a.Rec
                COUNT(CASE WHEN a.Date - b.Date BETWEEN 0 AND 13 AND a.Recordnum > b.Recordnum THEN a.Re
                COUNT(CASE WHEN a.Date - b.Date BETWEEN 0 AND 29 AND a.Recordnum > b.Recordnum THEN a.Re
                COUNT(DISTINCT CASE WHEN a.Date = b.Date AND a.Recordnum> b.Recordnum THEN b.Zip ELSE N
                COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 2 AND a.Recordnum > b.Recordnum T.
                COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 4 AND a.Recordnum > b.Recordnum T.
                COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 6 AND a.Recordnum > b.Recordnum T.
                COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 13 AND a.Recordnum> b.Recordnum
                COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 29 AND a.Recordnum> b.Recordnum
                COUNT(DISTINCT CASE WHEN a.Date = b.Date AND a.Recordnum > b.Recordnum THEN b.Amount ELS
                COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 2 AND a.Recordnum > b.Recordnum T.
                COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 4 AND a.Recordnum > b.Recordnum T.
                COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 6 AND a.Recordnum > b.Recordnum T.
                COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 13 AND a.Recordnum b.Recordnum '
                COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 29 AND a.Recordnum> b.Recordnum
                COUNT(DISTINCT CASE WHEN a.Date = b.Date AND a.Recordnum > b.Recordnum THEN b.Cardnum EL
                COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 2 AND a.Recordnum > b.Recordnum T.
                COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 6 AND a.Recordnum > b.Recordnum T.
                COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 4 AND a.Recordnum > b.Recordnum T.
                COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 13 AND a.Recordnum> b.Recordnum
                COUNT(DISTINCT CASE WHEN a.Date - b.Date BETWEEN 0 AND 29 AND a.Recordnum b.Recordnum '
                from a, b
                WHERE a.Cardnum=b.Cardnum
                GROUP BY 1")
#join datasets
df = inner join(df, Cardnum, by="Recordnum")
df = inner_join(a, Merchantnum, by="Recordnum")
df = inner_join(df, Merchantnumstate, by="Recordnum")
#feature selection
library(bestglm)
subset = regsubsets(x = df[60:30000,15:62], a[60:30000,10], nvmax=20)
```

```
## Warning in leaps.setup(x, y, wt = weights, nbest = nbest, nvmax = nvmax, :
## 22 linear dependencies found
## Reordering variables and trying again:
summary(subset)
## Subset selection object
  48 Variables (and intercept)
                                       Forced in Forced out
## same_Merchantnum_1.x
                                           FALSE
                                                       FALSE
## same Merchantnum 3.x
                                           FALSE
                                                       FALSE
## same_Merchantnum_5.x
                                           FALSE
                                                       FALSE
## same_Merchantnum_7.x
                                           FALSE
                                                       FALSE
## same_Merchantnum_diff_Zip_1.x
                                           FALSE
                                                       FALSE
## same_Merchantnum_diff_Zip_3.x
                                           FALSE
                                                       FALSE
## same_Merchantnum_diff_Zip_5.x
                                           FALSE
                                                       FALSE
                                                       FALSE
## same_Merchantnum_diff_amount_1.x
                                           FALSE
## same_Merchantnum_diff_amount_3.x
                                           FALSE
                                                       FALSE
## same_Merchantnum_diff_amount_5.x
                                           FALSE
                                                       FALSE
## same_Merchantnum_diff_Cardnum_1.x
                                           FALSE
                                                       FALSE
                                                       FALSE
## same_Merchantnum_diff_Cardnum_3.x
                                           FALSE
## same Merchantnum diff Cardnum 7.x
                                           FALSE
                                                       FALSE
## same_Merchantnum_1.y
                                           FALSE
                                                       FALSE
## same Merchantnum 3.y
                                                       FALSE
                                           FALSE
## same_Merchantnum_5.y
                                           FALSE
                                                       FALSE
## same_Merchantnum_7.y
                                           FALSE
                                                       FALSE
## same Merchantnum diff Zip 1.y
                                           FALSE
                                                       FALSE
## same_Merchantnum_diff_Zip_3.y
                                           FALSE
                                                       FALSE
## same_Merchantnum_diff_Zip_5.y
                                           FALSE
                                                       FALSE
## same_Merchantnum_diff_amount_1.y
                                           FALSE
                                                       FALSE
## same_Merchantnum_diff_amount_3.y
                                           FALSE
                                                       FALSE
## same_Merchantnum_diff_amount_5.y
                                           FALSE
                                                       FALSE
## same_Merchantnum_diff_Cardnum_1.y
                                           FALSE
                                                       FALSE
## same_Merchantnum_diff_Cardnum_3.y
                                           FALSE
                                                       FALSE
## same_Merchantnum_diff_Cardnum_7.y
                                           FALSE
                                                       FALSE
## same_Merchantnum_14.x
                                           FALSE
                                                       FALSE
  same_Merchantnum_30.x
                                           FALSE
                                                       FALSE
                                                       FALSE
## same_Merchantnum_diff_Zip_7.x
                                           FALSE
## same Merchantnum diff Zip 14.x
                                           FALSE
                                                       FALSE
## same_Merchantnum_diff_Zip_30.x
                                           FALSE
                                                       FALSE
## same_Merchantnum_diff_amount_7.x
                                           FALSE
                                                       FALSE
## same_Merchantnum_diff_amount_14.x
                                           FALSE
                                                       FALSE
## same_Merchantnum_diff_amount_30.x
                                           FALSE
                                                       FALSE
## same Cardnum diff Cardnum 5.x
                                           FALSE
                                                       FALSE
## same Merchantnum diff Cardnum 14.x
                                           FALSE
                                                       FALSE
## same Merchantnum diff Cardnum 30.x
                                           FALSE
                                                       FALSE
## same_Merchantnum_14.y
                                           FALSE
                                                       FALSE
## same_Merchantnum_30.y
                                           FALSE
                                                       FALSE
## same_Merchantnum_diff_Zip_7.y
                                           FALSE
                                                       FALSE
## same_Merchantnum_diff_Zip_14.y
                                           FALSE
                                                       FALSE
## same_Merchantnum_diff_Zip_30.y
                                           FALSE
                                                       FALSE
## same_Merchantnum_diff_amount_7.y
                                           FALSE
                                                       FALSE
```

**FALSE** 

**FALSE** 

**FALSE** 

**FALSE** 

## same\_Merchantnum\_diff\_amount\_14.y

## same\_Merchantnum\_diff\_amount\_30.y

```
## same_Cardnum_diff_Cardnum_5.y
                                          FALSE
                                                     FALSE
## same_Merchantnum_diff_Cardnum_14.y
                                          FALSE
                                                     FALSE
## same_Merchantnum_diff_Cardnum_30.y
                                          FALSE
                                                     FALSE
## 1 subsets of each size up to 21
## Selection Algorithm: exhaustive
##
             same_Merchantnum_1.x same_Merchantnum_3.x same_Merchantnum_5.x
                                  11 11
     (1)
            11 11
## 2
     (1)
                                                       .. ..
                                  11 11
## 3
      (1)
## 4
     (1)
            11 11
                                  11 11
     (1)
## 6
     (1)
## 7
      (1)
             11 11
                                  11 11
             11 11
                                  "*"
## 8
     (1)
## 9
      (1)
                                  11 11
       (1)""
## 10
## 11
       (1)""
       (1)""
## 12
       (1)""
## 13
       (1)""
## 14
## 15
       (1)""
## 16
       (1)""
                                  11 11
       (1)""
## 17
                                  11 11
## 18
       (1)""
       (1)""
## 19
## 20
       (1)""
       (1)""
                                  11 11
                                                       "*"
## 21
##
             same_Merchantnum_7.x same_Merchantnum_14.x same_Merchantnum_30.x
## 1
     (1)
                                  .. ..
                                                        .. ..
             11 11
     (1)
## 2
## 3
      (1)
## 4
     (1)
             11 11
                                  11 11
                                                        11 11
            11 11
## 5
     (1)
             11 11
                                  11 11
## 6
     (1)
             11 11
## 7
                                  "*"
      (1)
                                  11 11
## 8
     (1)
                                  11 11
## 9
     (1)
## 10
       (1)"*"
       (1)"*"
## 11
## 12
       (1)""
## 13
       (1)""
                                                        "*"
       (1)""
                                                        "*"
## 14
## 15
       (1)""
                                                        "*"
## 16
      (1)"*"
## 17
       (1)""
                                                        11 🕌 11
       (1)""
                                                        "*"
## 18
                                  11 11
## 19
       (1)""
                                                        "*"
      (1)""
                                                        "*"
## 20
       (1)""
                                                        "*"
## 21
##
             same_Merchantnum_diff_Zip_1.x same_Merchantnum_diff_Zip_3.x
                                           ......
## 1
     (1)
                                           11 11
            11 11
## 2 (1)
             11 11
                                           11 11
## 3
     (1)
                                           11 11
            11 11
## 4 (1)
```

```
11 11
## 5 (1) ""
     (1)
           "*"
                                        11 11
## 6
           11 11
                                        11 11
## 7
     (1)
## 8
    (1)
## 9
     (1)
           "*"
     (1)""
## 10
                                        11 11
## 11
      (1)""
      (1)""
## 12
## 13
      (1)""
      (1)""
## 14
      (1)""
## 15
      (1)""
## 16
## 17
      (1)""
      (1)"*"
## 18
      (1)"*"
                                        11 11
## 19
      (1)"*"
                                        "*"
## 20
      (1)"*"
## 21
                                        "*"
##
            {\tt same\_Merchantnum\_diff\_Zip\_5.x same\_Merchantnum\_diff\_Zip\_7.x}
## 1 (1)
                                        11 11
           11 11
     (1)
## 2
                                        11 11
           11 11
## 3 (1)
                                        11 11
## 4 (1)
           11 11
## 5
     (1)
## 6
     (1)
           11 11
## 7
     (1)
## 8
     (1)
           "*"
## 9
     (1)
## 10
      (1)""
      (1)""
## 11
## 12
      (1)""
      (1)""
## 13
## 14
      (1)""
      (1)""
## 15
      (1)""
## 16
      (1)""
## 17
      (1)""
## 18
      (1)""
                                        "*"
## 19
      (1)"*"
## 20
                                        11 11
      (1)""
                                        11 11
## 21
##
            same_Merchantnum_diff_Zip_14.x same_Merchantnum_diff_Zip_30.x
           11 11
## 1 ( 1 )
## 2 (1)
                                         11 11
## 3
     (1)
## 4
    (1)
                                         "*"
            11 11
## 5
     (1)
                                         "*"
                                         "*"
## 6
     (1)
## 7
     (1)
           11 11
## 8
     (1)
                                         "*"
     (1)
           11 11
## 9
      (1)""
## 10
      (1)""
                                         11 11
## 11
      (1)""
## 12
## 13 (1)""
                                         11 11
## 14 ( 1 ) " "
                                         11 11
```

```
11 11
## 15 (1)""
     (1)""
                                      11 11
## 16
## 17
                                      11 11
     (1)"*"
      (1)""
## 18
      (1)""
## 19
     (1)""
## 20
     (1)""
## 21
                                      "*"
##
           same_Merchantnum_diff_amount_1.x
## 1
    (1)
           11 11
           11 11
## 2 (1)
           11 11
## 3 (1)
## 4
    (1)
## 5
    (1)
           11 11
           11 11
## 6
    (1)
## 7
    (1)
           11 11
## 8
    (1)
## 9
     (1)
     (1)""
## 10
     (1)""
## 11
      (1)""
## 12
      (1)""
## 13
## 14
     (1)""
      (1)""
## 15
## 16
      (1)"*"
      (1)"*"
## 17
## 18
      (1)"*"
## 19
      (1)"*"
## 20
      (1)"*"
     (1)"*"
## 21
##
           same_Merchantnum_diff_amount_3.x
    (1)
## 1
## 2
    (1)
           11 11
## 3
    (1)
           11 11
## 4
    (1)
           11 11
## 5
    (1)
## 6
    (1)
## 7
    (1)
           11 11
## 8 (1)
           11 11
## 9
     (1)
## 10 (1)""
     (1)""
## 11
      (1)""
## 12
## 13
      (1)""
## 14
     (1)""
     (1)""
## 15
      (1)""
## 16
## 17
      (1)""
     (1)""
## 18
## 19
      (1)""
      (1)""
## 20
      (1)"*"
## 21
           same_Merchantnum_diff_amount_5.x
##
## 1 (1)
## 2 (1) ""
```

```
## 3 (1) " "
## 4 (1)
          11 11
## 5 (1)
## 6 (1)
## 7
    (1)
## 8 (1)
## 9 (1)
          "*"
## 10 (1) "*"
## 11
     (1)""
## 12
     (1)""
     (1)""
## 13
     (1)""
## 14
## 15
     (1)""
     (1)"*"
## 16
## 17
     (1)""
     (1)""
## 18
## 19
     (1)""
     (1)""
## 20
     (1)""
## 21
##
          same_Merchantnum_diff_amount_7.x
## 1 ( 1 )
          11 11
## 2 (1)
## 3 (1)
## 4
    (1)
## 5 (1)
## 6 (1)
          11 11
## 7
    (1)
## 8
    (1)
          11 11
          11 11
## 9 (1)
## 10
     (1)""
     (1)""
## 11
## 12
     (1)""
## 13
     (1)""
     (1)""
## 14
     (1)""
## 15
     (1)""
## 16
     (1)""
## 17
     (1)""
## 18
     (1)""
## 19
## 20
     (1)""
     (1)""
## 21
##
          same_Merchantnum_diff_amount_14.x
## 1 ( 1 )
          " "
## 2 (1)
          11 11
          11 11
## 3 (1)
    (1)
## 4
## 5
    (1)
## 6 (1)
## 7 (1)
## 8 (1)
## 9
    (1)
## 10 (1)""
## 11 (1)""
## 12 (1)""
```

```
## 13 (1) " "
## 14
      (1)""
      (1)""
## 15
      (1)""
## 16
## 17
      (1)"*"
## 18
      (1)""
      (1)""
## 19
      (1)""
## 20
## 21
     (1)""
##
           same_Merchantnum_diff_amount_30.x
           11 11
## 1
     (1)
           11 11
## 2
     (1)
## 3
     (1)
           11 11
## 4
    (1)
## 5
    (1)
## 6
     (1)
## 7
     (1)
           11 11
## 8
     (1)
## 9
     (1)
      (1)""
## 10
## 11
      (1)
           "*"
## 12
      (1) "*"
## 13
      (1)"*"
## 14
      (1)"*"
      (1)"*"
## 15
## 16
      (1)""
      (1)""
## 17
## 18
      (1)
      (1)"*"
## 19
## 20
      (1)"*"
      (1)"*"
## 21
##
           {\tt same\_Merchantnum\_diff\_Cardnum\_1.x}
## 1
     (1)
     (1)
           11 11
## 2
## 3
     (1)
## 4
     (1)
## 5 (1)
## 6
    (1)
## 7
     (1)
## 8
    (1)
## 9
     (1)
      (1)""
## 10
## 11
      (1)
## 12
      (1)"*"
## 13
      (1)"*"
      (1)"*"
## 14
## 15
      (1)
      (1)"*"
## 16
## 17
      (1)"*"
      (1)"*"
## 18
## 19
           "*"
      (1)
      (1)"*"
## 20
      (1)"*"
## 21
           same_Merchantnum_diff_Cardnum_3.x
##
```

```
## 1 (1)
## 2
    (1)
## 3
    (1)
           11 11
## 4
    (1)
           "*"
## 5
     (1)
           "*"
## 6
    (1)
           "*"
## 7
    (1)
           "*"
     (1)
## 8
## 9
     (1)
     (1)"*"
## 10
## 11
      (1)"*"
## 12
      (1)""
## 13
      (1)""
      (1)""
## 14
## 15
      (1)""
      (1)"*"
## 16
## 17
      (1)""
      (1)"*"
## 18
      (1)"*"
## 19
      (1)""
## 20
      (1)"*"
## 21
##
           same_Merchantnum_diff_Cardnum_7.x same_Cardnum_diff_Cardnum_5.x
## 1 (1)
                                          11 11
## 2
     (1)
## 3
    (1)
           11 11
## 4
    (1)
           11 11
## 5
     (1)
## 6
     (1)
           11 11
           11 11
## 7
    (1)
## 8
    (1)
           11 11
           11 11
## 9
     (1)
## 10
      (1)""
## 11
      (1)""
      (1)""
## 12
      (1)""
## 13
      (1)""
## 14
      (1)""
## 15
      (1)""
## 16
      (1)""
## 17
## 18
      (1)""
      (1)""
## 19
      (1)""
## 20
## 21
      (1)""
##
           same_Merchantnum_diff_Cardnum_14.x
## 1
    (1)
## 2
     (1)
## 3
     (1)
           11 11
           11 11
## 4
    (1)
    (1)
           11 11
## 5
           11 11
## 6
    (1)
## 7
     (1)
           "*"
## 8 (1)
    (1)
## 9
## 10 (1)""
```

```
(1)""
## 11
      (1)"*"
## 12
      (1)"*"
## 13
## 14
       (1)"*"
## 15
       (1)
            "*"
## 16
      (1)
            11 11
## 17
       (1)""
       (1)"*"
## 18
## 19
       (1)
            "*"
      (1)"*"
## 20
## 21
      (1)"*"
##
            same_Merchantnum_diff_Cardnum_30.x same_Merchantnum_1.y
            11 11
## 1
     (1)
            11 11
## 2
     (1)
## 3
     (1)
            11 11
                                               11 11
            ......
## 4
      (1)
## 5
     (1)
            11 11
## 6
     (1)
            11 11
## 7
     (1)
## 8
     (1)
            11 11
## 9
      (1)
## 10
      (1)""
       (1)""
## 11
## 12
       (1)
            11 11
      (1)""
## 13
## 14
       (1)""
       (1)""
## 15
## 16
       (1)""
      (1)"*"
## 17
      (1)""
## 18
       (1)""
                                                "*"
## 19
## 20
      (1)""
                                               "*"
      (1)""
                                               "*"
## 21
##
            same_Merchantnum_3.y same_Merchantnum_5.y same_Merchantnum_7.y
                                 11 11
                                                      11 11
            11 11
## 1
     (1)
                                                      11 11
            11 11
                                 11 11
## 2
     (1)
            11 11
                                                        11
                                 11 11
## 3
     (1)
## 4
     (1)
                                 11 11
                                                        11
                                 11 11
## 5
      (1)
            11 11
## 6
     (1)
## 7
      (1)
            "*"
                                 11 11
## 8
     (1)
## 9
      (1)
                                 11 11
      (1)"*"
                                 "*"
## 10
                                                       11 11
## 11
      (1)"*"
                                 11 11
       (1)""
## 12
## 13
       (1)
            11 11
      (1)""
                                 "*"
## 14
       (1)""
                                 "*"
                                                       11 11
## 15
       (1)"*"
                                 "*"
## 16
            "*"
                                  "*"
                                                       11 11
## 17
       (1)
      (1)"*"
                                 "*"
## 18
      (1)"*"
                                 "*"
                                                      11 11
## 19
## 20
      (1)""
                                  "*"
                                                      11 11
```

```
"*"
## 21 ( 1 ) "*"
##
            same_Merchantnum_14.y same_Merchantnum_30.y
            11 11
## 1 ( 1 )
## 2 (1)
            11 11
## 3
     (1)
            11 11
                                 11 11
## 4 (1)
            11 11
## 5 (1)
## 6
     (1)
## 7
     (1)
            11 11
## 8
     (1)
           11 11
## 9
     (1)
## 10
      (1)""
## 11
      (1)""
      (1)"*"
## 12
      (1)"*"
## 13
      (1)"*"
## 14
## 15
      (1)"*"
      (1)""
## 16
      (1)""
## 17
      (1)"*"
## 18
      (1)"*"
                                 11 11
## 19
## 20
      (1)"*"
## 21
     (1)"*"
##
            same_Merchantnum_diff_Zip_1.y same_Merchantnum_diff_Zip_3.y
            "*"
## 1 (1)
                                         11 11
## 2 (1)
            "*"
            "*"
                                         "*"
## 3
     (1)
## 4
     (1)
                                         "*"
## 5 (1)
            "*"
                                         "*"
## 6 (1)
            "*"
                                         "*"
## 7
     (1)
## 8
     (1)
            "*"
                                         "*"
            "*"
## 9
     (1)
                                         "*"
      (1)"*"
## 10
                                         "*"
      (1)
            "*"
## 11
## 12
            "*"
                                         11 11
      (1)
## 13
      (1)"*"
      (1)"*"
## 14
      (1)"*"
## 15
## 16
      (1)"*"
## 17
      (1)"*"
      (1)"*"
## 18
                                         .. ..
## 19
      (1)"*"
                                         11 11
## 20
      (1)"*"
                                         11 11
## 21
      (1)"*"
##
            same_Merchantnum_diff_Zip_5.y same_Merchantnum_diff_Zip_7.y
                                         11 11
## 1
     (1)
                                         11 11
            11 11
## 2 (1)
            11 11
## 3 (1)
                                         11 11
            11 11
## 4
     (1)
## 5
     (1)
                                         ......
## 6 (1)
## 7 (1)
            11 11
                                         11 11
                                         11 11
## 8 (1)
            "*"
```

```
11 11
## 9 (1) " "
## 10 (1)""
                                        "*"
## 11
      (1)"*"
                                        11 11
      (1)""
## 12
                                        .. ..
      (1)""
## 13
## 14
      (1)""
                                        11 11
## 15
      (1)""
      (1)""
## 16
## 17
      (1)""
## 18
      (1)""
                                        .. ..
      (1)""
## 19
## 20
      (1)""
                                        11 11
## 21
      (1)""
            {\tt same\_Merchantnum\_diff\_Zip\_14.y\ same\_Merchantnum\_diff\_Zip\_30.y}
##
## 1
     (1)
            11 11
## 2
     (1)
                                         11 11
## 3
     (1)
           11 11
                                         11 11
## 4
     (1)
            11 11
                                         11 11
## 5
     (1)
           11 11
## 6
     (1)
                                         "*"
## 7
     (1)
## 8 (1)
           11 11
## 9
     (1)
                                         "*"
## 10
      (1)""
      (1)""
## 11
## 12
      (1)""
      (1)""
## 13
                                         "*"
## 14
      (1)""
      (1)""
                                         "*"
## 15
## 16
      (1)"*"
      (1)""
## 17
## 18
      (1)""
      (1)""
## 19
                                         "*"
      (1)""
                                         "*"
## 20
      (1)""
                                         "*"
## 21
##
            same_Merchantnum_diff_amount_1.y
           11 11
## 1 ( 1 )
## 2
     (1)
## 3
            11 11
     (1)
## 4
     (1)
            11 11
## 5
     (1)
     (1)
## 6
## 7
     (1)
            11 11
## 8
    (1)
            11 11
## 9
     (1)
      (1)""
## 10
## 11
      (1)"*"
      (1)"*"
## 12
## 13
      (1)"*"
      (1)"*"
## 14
           "*"
## 15
      (1)
      (1)"*"
## 16
      (1)"*"
## 17
## 18 (1)""
```

```
## 19 (1)""
## 20 (1)""
     (1)""
## 21
##
           same_Merchantnum_diff_amount_3.y
           11 11
## 1
    (1)
           11 11
## 2 (1)
           11 11
## 3
    (1)
     (1)
## 4
## 5
     (1)
## 6
    (1)
## 7
     (1)
           "*"
    (1)
## 8
## 9
     (1)
     (1)"*"
## 10
## 11
      (1)
           "*"
## 12
      (1)
## 13
      (1)
           "*"
      (1)"*"
## 14
      (1)"*"
## 15
           "*"
## 16
      (1)
      (1)"*"
## 17
## 18
      (1)"*"
      (1)"*"
## 19
## 20
      (1)"*"
     (1)"*"
## 21
           same_Merchantnum_diff_amount_5.y
## 1
    (1)
## 2
     (1)
           11 11
           11 11
## 3
    (1)
## 4
    (1)
## 5
     (1)
## 6
     (1)
           11 11
## 7
    (1)
           11 11
## 8
    (1)
           11 11
## 9
     (1)
      (1)""
## 10
## 11
      (1)""
      (1)""
## 12
      (1)""
## 13
      (1)""
## 14
## 15
      (1)"*"
      (1)""
## 16
## 17
      (1)""
## 18
      (1)""
      (1)""
## 19
      (1)""
## 20
## 21
      (1)""
##
           same_Merchantnum_diff_amount_7.y
    (1)
## 1
           11 11
## 2
     (1)
## 3
    (1)
           11 11
## 4
    (1)
    (1)
           11 11
## 5
## 6 (1)
```

```
## 7 (1) ""
## 8 (1)
          11 11
## 9 (1)
          11 11
## 10 (1)""
     (1)""
## 11
## 12
     (1)""
## 13
     (1)""
     (1)""
## 14
## 15
     (1)""
     (1)""
## 16
     (1)""
## 17
     (1)"*"
## 18
## 19
     (1)"*"
     (1)""
## 20
## 21
     (1)"*"
##
          same_Merchantnum_diff_amount_14.y
## 1 (1)
          11 11
## 2 (1)
## 3 (1)
          11 11
## 4 (1)
## 5 (1)
## 6 (1)
          11 11
## 7 (1)
## 8
    (1)
## 9 (1)
## 10
     (1)""
     (1)""
## 11
## 12
     (1)""
     (1)""
## 13
## 14
     (1)""
     (1)""
## 15
## 16
     (1)""
## 17
     (1)""
     (1)""
## 18
     (1)""
## 19
## 20
     (1)""
     (1)""
## 21
##
          same_Merchantnum_diff_amount_30.y
## 1 (1)
          11 11
          11 11
## 2 (1)
## 3 (1)
    (1)
## 4
## 5
    (1)
## 6 (1)
          11 11
## 7 (1)
## 8 (1)
## 9
     (1)
## 10 (1)""
     (1)""
## 11
     (1)""
## 12
## 13
     (1)""
     (1)""
## 14
     (1)""
## 15
## 16 (1) " "
```

```
## 17 (1)""
      (1)""
## 18
      (1)""
## 19
## 20
      (1)"*"
      (1)""
## 21
##
           same_Merchantnum_diff_Cardnum_1.y
## 1 ( 1 )
           " "
## 2
    (1)
## 3
     (1)
## 4
    (1)
           11 11
           11 11
## 5
    (1)
## 6
    (1)
## 7
     (1)
           11 11
           11 11
## 8 (1)
## 9
    (1)
           11 11
      (1)""
## 10
## 11
      (1)""
      (1)""
## 12
      (1)""
## 13
      (1)""
## 14
      (1)""
## 15
## 16
      (1)"*"
      (1)"*"
## 17
## 18
      (1)""
      (1)""
## 19
## 20
      (1)""
      (1)""
## 21
##
           same_Merchantnum_diff_Cardnum_3.y
## 1 ( 1 )
## 2 (1)
           "*"
     (1)
           "*"
## 3
## 4
     (1)
           11 11
## 5
    (1)
           11 11
           11 11
## 6
    (1)
           11 11
## 7
     (1)
           11 11
## 8
    (1)
## 9
    (1)
           11 11
      (1)"*"
## 10
## 11
      (1)"*"
      (1)""
## 12
      (1)""
## 13
      (1)""
## 14
## 15
      (1)""
## 16
      (1)"*"
## 17
      (1)"*"
      (1)""
## 18
## 19
      (1)""
     (1)"*"
## 20
      (1)""
## 21
##
           same_Merchantnum_diff_Cardnum_7.y same_Cardnum_diff_Cardnum_5.y
## 1 (1)
           11 11
## 2 (1)
           11 11
                                          11 11
## 3 (1)
                                          11 11
## 4 (1) ""
```

```
11 11
## 5 (1) ""
     (1)
           11 11
                                          11
## 6
           11 11
     (1)
## 7
## 8
     (1)
           11 11
## 9
     (1)
      (1)""
## 10
## 11
      (1)""
      (1)""
## 12
## 13
      (1)""
      (1)""
## 14
      (1)""
## 15
      (1)"*"
## 16
## 17
      (1)""
      (1)""
                                          "*"
## 18
## 19
      (1)""
      (1)""
                                          "*"
## 20
      (1)""
## 21
##
           same_Merchantnum_diff_Cardnum_14.y
## 1
     (1)
           11 11
## 2
     (1)
           11 11
## 3
     (1)
## 4
    (1)
           11 11
## 5
     (1)
## 6
     (1)
           11 11
## 7
     (1)
## 8
     (1)
           11 11
## 9
     (1)
## 10
      (1)""
      (1)""
## 11
## 12
      (1)"*"
      (1)"*"
## 13
## 14
      (1)"*"
## 15
      (1)"*"
      (1)""
## 16
           11 11
## 17
      (1)
      (1)"*"
## 18
## 19
      (1)"*"
      (1)"*"
## 20
      (1)"*"
## 21
##
           same_Merchantnum_diff_Cardnum_30.y
           11 11
## 1
    (1)
    (1)
           11 11
## 2
## 3
     (1)
## 4
    (1)
           11 11
## 5
     (1)
## 6
     (1)
## 7
     (1)
           11 11
## 8
     (1)
     (1)
           11 11
## 9
      (1)""
## 10
      (1)
## 11
      (1)""
## 12
      (1)""
## 13
## 14 (1)""
```

```
## 15 ( 1 ) " "
## 16 ( 1 ) " "
## 17 ( 1 ) " "
## 18 ( 1 ) " "
## 19 ( 1 ) " "
## 20 ( 1 ) " "
## 21 ( 1 ) " "
```