Homework 3

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Problem 1

```
data1 <- read.csv("Homework 3 Data 1.csv", header = TRUE)
data2 <- read.csv("Homework 3 Data 2.csv", header = TRUE)
data3 <- read.csv("Homework 3 Data 3.csv", header = TRUE)
data4 <- read.csv("Homework 3 Data 4.csv", header = TRUE)
data5 <- read.csv("Homework 3 Data 5.csv", header = TRUE)
data6 <- read.csv("Homework 3 Data 6.csv", header = TRUE)
data7 <- read.csv("Homework 3 Data 7.csv", header = TRUE)
data8 <- read.csv("Homework 3 Data 8.csv", header = TRUE)
```

Problem 2

Part (A)

```
int_rev <- rbind(data1, data3)

int_rev
```

```
##    Year Quarter Revenue
## 1  2010      Q4    3617
## 2  2011      Q1   12279
## 3  2011      Q2   18896
## 4  2011      Q3   22687
## 5  2011      Q4   28988
## 6  2012      Q1   43425
## 7  2012      Q2   64973
## 8  2012      Q3   77744
## 9  2012      Q4  101400
## 10 2013      Q1  142019
## 11 2013      Q2  165902
## 12 2013      Q3  183051
## 13 2013      Q4  221418
## 14 2014      Q1  267118
## 15 2014      Q2  307461
## 16 2014      Q3  345685
## 17 2014      Q4  387797
## 18 2015      Q1  415397
## 19 2015      Q2  454763
## 20 2015      Q3  516870
## 21 2015      Q4  566405
## 22 2016      Q1  651748
## 23 2016      Q2  758201
## 24 2016      Q3  853480
## 25 2016      Q4  947666
```

```
## 26 2017      Q1 1046199
## 27 2017      Q2 1165228
## 28 2017      Q3 1327435
## 29 2017      Q4 1550329
```

Part (B)

```
names(data2) <- names(data4)
us_rev <- rbind(data2, data4)

us_rev

##    Year Quarter Revenue
## 1  2011      Q4  476334
## 2  2012      Q1  506665
## 3  2012      Q2  532705
## 4  2012      Q3  556027
## 5  2012      Q4  589471
## 6  2013      Q1  638649
## 7  2013      Q2  671089
## 8  2013      Q3  701083
## 9  2013      Q4  740554
## 10 2014      Q1  798617
## 11 2014      Q2  838225
## 12 2014      Q3  877150
## 13 2014      Q4  917442
## 14 2015      Q1  984532
## 15 2015      Q2 1025913
## 16 2015      Q3 1063961
## 17 2015      Q4 1105933
## 18 2016      Q1 1161241
## 19 2016      Q2 1208271
## 20 2016      Q3 1304333
## 21 2016      Q4 1403462
## 22 2017      Q1 1470042
## 23 2017      Q2 1505499
## 24 2017      Q3 1547210
## 25 2017      Q4 1630274
```

Part (C)

```
names(data7) <- names(data5)
int_mem <- rbind(data5, data7)

int_mem

##    Year Quarter Membership
## 1  2010      Q3        133
## 2  2010      Q4        509
## 3  2011      Q1        803
## 4  2011      Q2        967
## 5  2011      Q3       1480
```

```
## 6  2011      Q4       1858
## 7  2012      Q1       3065
## 8  2012      Q2       3624
## 9  2012      Q3       4311
## 10 2012      Q4       6121
## 11 2013      Q1       7142
## 12 2013      Q2       7747
## 13 2013      Q3       9188
## 14 2013      Q4      10930
## 15 2014      Q1      12683
## 16 2014      Q2      13801
## 17 2014      Q3      15843
## 18 2014      Q4      18277
## 19 2015      Q1      20877
## 20 2015      Q2      23251
## 21 2015      Q3      25987
## 22 2015      Q4      30024
## 23 2016      Q1      34533
## 24 2016      Q2      36048
## 25 2016      Q3      39246
## 26 2016      Q4      44365
## 27 2017      Q1      47894
## 28 2017      Q2      52031
## 29 2017      Q3      56476
## 30 2017      Q4      62832
```

Part (D)

```
names(data8) <- names(data6)
data8[20,2] <- 'Q4'

us_mem <- rbind(data6, data8)
us_mem
```

```
##    Year Quarter Membership
## 1  2011      Q3      21448
## 2  2011      Q4      21671
## 3  2012      Q1      23410
## 4  2012      Q2      23938
## 5  2012      Q3      25101
## 6  2012      Q4      27146
## 7  2013      Q1      29174
## 8  2013      Q2      29807
## 9  2013      Q3      31092
## 10 2013      Q4      33420
## 11 2014      Q1      35674
## 12 2014      Q2      36244
## 13 2014      Q3      37219
## 14 2014      Q4      39114
## 15 2015      Q1      41397
## 16 2015      Q2      42300
```

```
## 17 2015      Q3      43181
## 18 2015      Q4      44738
## 19 2016      Q1      46967
## 20 2016      Q2      47129
## 21 2016      Q3      47497
## 22 2016      Q4      49431
## 23 2017      Q1      50854
## 24 2017      Q2      51921
## 25 2017      Q3      52772
## 26 2017      Q4      54750
```

Problem 3

Part (A)

```
rev_wide <- merge(int_rev,us_rev,by=c("Year", "Quarter"), all = TRUE)
names(rev_wide) <- c("Year", "Quarter", "Int.revenue", "US.revenue")

rev_wide
```

```
##    Year Quarter Int.revenue US.revenue
## 1  2010      Q4        3617         NA
## 2  2011      Q1       12279         NA
## 3  2011      Q2       18896         NA
## 4  2011      Q3       22687         NA
## 5  2011      Q4       28988     476334
## 6  2012      Q1       43425     506665
## 7  2012      Q2       64973     532705
## 8  2012      Q3       77744     556027
## 9  2012      Q4      101400     589471
## 10 2013      Q1      142019     638649
## 11 2013      Q2      165902     671089
## 12 2013      Q3      183051     701083
## 13 2013      Q4      221418     740554
## 14 2014      Q1      267118     798617
## 15 2014      Q2      307461     838225
## 16 2014      Q3      345685     877150
## 17 2014      Q4      387797     917442
## 18 2015      Q1      415397     984532
## 19 2015      Q2      454763    1025913
## 20 2015      Q3      516870    1063961
## 21 2015      Q4      566405    1105933
## 22 2016      Q1      651748    1161241
## 23 2016      Q2      758201    1208271
## 24 2016      Q3      853480    1304333
## 25 2016      Q4      947666    1403462
## 26 2017      Q1     1046199    1470042
## 27 2017      Q2     1165228    1505499
## 28 2017      Q3     1327435    1547210
## 29 2017      Q4     1550329    1630274
```

Part (B)

```
mem_wide <- merge(int_mem, us_mem, by=c("Year", "Quarter"), all = TRUE)
names(mem_wide) <- c("Year", "Quarter", "Int.membership", "US.membership")

mem_wide
```

```
##    Year Quarter Int.membership US.membership
## 1  2010      Q3            133            NA
## 2  2010      Q4            509            NA
## 3  2011      Q1            803            NA
## 4  2011      Q2            967            NA
## 5  2011      Q3           1480         21448
## 6  2011      Q4           1858         21671
## 7  2012      Q1           3065         23410
## 8  2012      Q2           3624         23938
## 9  2012      Q3           4311         25101
## 10 2012      Q4           6121         27146
## 11 2013      Q1           7142         29174
## 12 2013      Q2           7747         29807
## 13 2013      Q3           9188         31092
## 14 2013      Q4          10930         33420
## 15 2014      Q1          12683         35674
## 16 2014      Q2          13801         36244
## 17 2014      Q3          15843         37219
## 18 2014      Q4          18277         39114
## 19 2015      Q1          20877         41397
## 20 2015      Q2          23251         42300
## 21 2015      Q3          25987         43181
## 22 2015      Q4          30024         44738
## 23 2016      Q1          34533         46967
## 24 2016      Q2          36048         47129
## 25 2016      Q3          39246         47497
## 26 2016      Q4          44365         49431
## 27 2017      Q1          47894         50854
## 28 2017      Q2          52031         51921
## 29 2017      Q3          56476         52772
## 30 2017      Q4          62832         54750
```

Part (C)

```
stream_wide <- merge(rev_wide,mem_wide, all = TRUE)[,c(1,2,6,4,5,3)]
names(stream_wide) <- c("Year","Quarter", "US.membership", "US.revenue",
"Int.membership", "Int.revenue")

stream_wide
```

```
##    Year Quarter US.membership US.revenue Int.membership Int.revenue
## 1  2010      Q3            NA         NA            133          NA
## 2  2010      Q4            NA         NA            509        3617
## 3  2011      Q1            NA         NA            803       12279
## 4  2011      Q2            NA         NA            967       18896
```

```
## 5  2011      Q3         21448         NA           1480       22687
## 6  2011      Q4         21671     476334           1858       28988
## 7  2012      Q1         23410     506665           3065       43425
## 8  2012      Q2         23938     532705           3624       64973
## 9  2012      Q3         25101     556027           4311       77744
## 10 2012      Q4         27146     589471           6121      101400
## 11 2013      Q1         29174     638649           7142      142019
## 12 2013      Q2         29807     671089           7747      165902
## 13 2013      Q3         31092     701083           9188      183051
## 14 2013      Q4         33420     740554          10930      221418
## 15 2014      Q1         35674     798617          12683      267118
## 16 2014      Q2         36244     838225          13801      307461
## 17 2014      Q3         37219     877150          15843      345685
## 18 2014      Q4         39114     917442          18277      387797
## 19 2015      Q1         41397     984532          20877      415397
## 20 2015      Q2         42300    1025913          23251      454763
## 21 2015      Q3         43181    1063961          25987      516870
## 22 2015      Q4         44738    1105933          30024      566405
## 23 2016      Q1         46967    1161241          34533      651748
## 24 2016      Q2         47129    1208271          36048      758201
## 25 2016      Q3         47497    1304333          39246      853480
## 26 2016      Q4         49431    1403462          44365      947666
## 27 2017      Q1         50854    1470042          47894     1046199
## 28 2017      Q2         51921    1505499          52031     1165228
## 29 2017      Q3         52772    1547210          56476     1327435
## 30 2017      Q4         54750    1630274          62832     1550329
```

Problem 4

Part (A)

```
int_mem$Service <- rep('Int', length(int_mem[1]))
int_mem
```

```
##    Year Quarter Membership Service
## 1  2010      Q3        133     Int
## 2  2010      Q4        509     Int
## 3  2011      Q1        803     Int
## 4  2011      Q2        967     Int
## 5  2011      Q3       1480     Int
## 6  2011      Q4       1858     Int
## 7  2012      Q1       3065     Int
## 8  2012      Q2       3624     Int
## 9  2012      Q3       4311     Int
## 10 2012      Q4       6121     Int
## 11 2013      Q1       7142     Int
## 12 2013      Q2       7747     Int
## 13 2013      Q3       9188     Int
## 14 2013      Q4      10930     Int
## 15 2014      Q1      12683     Int
## 16 2014      Q2      13801     Int
```

```
## 17 2014      Q3      15843     Int
## 18 2014      Q4      18277     Int
## 19 2015      Q1      20877     Int
## 20 2015      Q2      23251     Int
## 21 2015      Q3      25987     Int
## 22 2015      Q4      30024     Int
## 23 2016      Q1      34533     Int
## 24 2016      Q2      36048     Int
## 25 2016      Q3      39246     Int
## 26 2016      Q4      44365     Int
## 27 2017      Q1      47894     Int
## 28 2017      Q2      52031     Int
## 29 2017      Q3      56476     Int
## 30 2017      Q4      62832     Int
```

```
int_rev$Service <- rep('Int', length(int_rev[1]))
int_rev
```

```
##    Year Quarter Revenue Service
## 1  2010      Q4    3617     Int
## 2  2011      Q1   12279     Int
## 3  2011      Q2   18896     Int
## 4  2011      Q3   22687     Int
## 5  2011      Q4   28988     Int
## 6  2012      Q1   43425     Int
## 7  2012      Q2   64973     Int
## 8  2012      Q3   77744     Int
## 9  2012      Q4  101400     Int
## 10 2013      Q1  142019     Int
## 11 2013      Q2  165902     Int
## 12 2013      Q3  183051     Int
## 13 2013      Q4  221418     Int
## 14 2014      Q1  267118     Int
## 15 2014      Q2  307461     Int
## 16 2014      Q3  345685     Int
## 17 2014      Q4  387797     Int
## 18 2015      Q1  415397     Int
## 19 2015      Q2  454763     Int
## 20 2015      Q3  516870     Int
## 21 2015      Q4  566405     Int
## 22 2016      Q1  651748     Int
## 23 2016      Q2  758201     Int
## 24 2016      Q3  853480     Int
## 25 2016      Q4  947666     Int
## 26 2017      Q1 1046199     Int
## 27 2017      Q2 1165228     Int
## 28 2017      Q3 1327435     Int
## 29 2017      Q4 1550329     Int
```

Part (B)

```
us_rev$Service <- rep('US', length(us_rev[1]))
us_rev
```

```
##    Year Quarter Revenue Service
## 1  2011      Q4  476334      US
## 2  2012      Q1  506665      US
## 3  2012      Q2  532705      US
## 4  2012      Q3  556027      US
## 5  2012      Q4  589471      US
## 6  2013      Q1  638649      US
## 7  2013      Q2  671089      US
## 8  2013      Q3  701083      US
## 9  2013      Q4  740554      US
## 10 2014      Q1  798617      US
## 11 2014      Q2  838225      US
## 12 2014      Q3  877150      US
## 13 2014      Q4  917442      US
## 14 2015      Q1  984532      US
## 15 2015      Q2 1025913      US
## 16 2015      Q3 1063961      US
## 17 2015      Q4 1105933      US
## 18 2016      Q1 1161241      US
## 19 2016      Q2 1208271      US
## 20 2016      Q3 1304333      US
## 21 2016      Q4 1403462      US
## 22 2017      Q1 1470042      US
## 23 2017      Q2 1505499      US
## 24 2017      Q3 1547210      US
## 25 2017      Q4 1630274      US
```

```
us_mem$Service <- rep('US', length(us_mem[1]))
us_mem
```

```
##    Year Quarter Membership Service
## 1  2011      Q3      21448      US
## 2  2011      Q4      21671      US
## 3  2012      Q1      23410      US
## 4  2012      Q2      23938      US
## 5  2012      Q3      25101      US
## 6  2012      Q4      27146      US
## 7  2013      Q1      29174      US
## 8  2013      Q2      29807      US
## 9  2013      Q3      31092      US
## 10 2013      Q4      33420      US
## 11 2014      Q1      35674      US
## 12 2014      Q2      36244      US
## 13 2014      Q3      37219      US
## 14 2014      Q4      39114      US
## 15 2015      Q1      41397      US
```

```
## 16 2015      Q2      42300      US
## 17 2015      Q3      43181      US
## 18 2015      Q4      44738      US
## 19 2016      Q1      46967      US
## 20 2016      Q2      47129      US
## 21 2016      Q3      47497      US
## 22 2016      Q4      49431      US
## 23 2017      Q1      50854      US
## 24 2017      Q2      51921      US
## 25 2017      Q3      52772      US
## 26 2017      Q4      54750      US
```

Part (C)

```
rev_long <- rbind(int_rev, us_rev)[,c(1,2,4,3)]
names(rev_long)<- c("Year", "Quarter", "Service", "Revenue")

rev_long
```

```
##    Year Quarter Service Revenue
## 1  2010      Q4     Int    3617
## 2  2011      Q1     Int   12279
## 3  2011      Q2     Int   18896
## 4  2011      Q3     Int   22687
## 5  2011      Q4     Int   28988
## 6  2012      Q1     Int   43425
## 7  2012      Q2     Int   64973
## 8  2012      Q3     Int   77744
## 9  2012      Q4     Int  101400
## 10 2013      Q1     Int  142019
## 11 2013      Q2     Int  165902
## 12 2013      Q3     Int  183051
## 13 2013      Q4     Int  221418
## 14 2014      Q1     Int  267118
## 15 2014      Q2     Int  307461
## 16 2014      Q3     Int  345685
## 17 2014      Q4     Int  387797
## 18 2015      Q1     Int  415397
## 19 2015      Q2     Int  454763
## 20 2015      Q3     Int  516870
## 21 2015      Q4     Int  566405
## 22 2016      Q1     Int  651748
## 23 2016      Q2     Int  758201
## 24 2016      Q3     Int  853480
## 25 2016      Q4     Int  947666
## 26 2017      Q1     Int 1046199
## 27 2017      Q2     Int 1165228
## 28 2017      Q3     Int 1327435
## 29 2017      Q4     Int 1550329
## 30 2011      Q4      US  476334
## 31 2012      Q1      US  506665
```

```
## 32 2012      Q2      US  532705
## 33 2012      Q3      US  556027
## 34 2012      Q4      US  589471
## 35 2013      Q1      US  638649
## 36 2013      Q2      US  671089
## 37 2013      Q3      US  701083
## 38 2013      Q4      US  740554
## 39 2014      Q1      US  798617
## 40 2014      Q2      US  838225
## 41 2014      Q3      US  877150
## 42 2014      Q4      US  917442
## 43 2015      Q1      US  984532
## 44 2015      Q2      US 1025913
## 45 2015      Q3      US 1063961
## 46 2015      Q4      US 1105933
## 47 2016      Q1      US 1161241
## 48 2016      Q2      US 1208271
## 49 2016      Q3      US 1304333
## 50 2016      Q4      US 1403462
## 51 2017      Q1      US 1470042
## 52 2017      Q2      US 1505499
## 53 2017      Q3      US 1547210
## 54 2017      Q4      US 1630274
```

Part (D)

```
mem_long <- rbind(int_mem, us_mem)[,c(1,2,4,3)]
names(rev_long) <- c("Year", "Quarter", "Service", "Membership")

mem_long

##    Year Quarter Service Membership
## 1  2010      Q3     Int        133
## 2  2010      Q4     Int        509
## 3  2011      Q1     Int        803
## 4  2011      Q2     Int        967
## 5  2011      Q3     Int       1480
## 6  2011      Q4     Int       1858
## 7  2012      Q1     Int       3065
## 8  2012      Q2     Int       3624
## 9  2012      Q3     Int       4311
## 10 2012      Q4     Int       6121
## 11 2013      Q1     Int       7142
## 12 2013      Q2     Int       7747
## 13 2013      Q3     Int       9188
## 14 2013      Q4     Int      10930
## 15 2014      Q1     Int      12683
## 16 2014      Q2     Int      13801
## 17 2014      Q3     Int      15843
## 18 2014      Q4     Int      18277
## 19 2015      Q1     Int      20877
```

```
## 20 2015      Q2     Int      23251
## 21 2015      Q3     Int      25987
## 22 2015      Q4     Int      30024
## 23 2016      Q1     Int      34533
## 24 2016      Q2     Int      36048
## 25 2016      Q3     Int      39246
## 26 2016      Q4     Int      44365
## 27 2017      Q1     Int      47894
## 28 2017      Q2     Int      52031
## 29 2017      Q3     Int      56476
## 30 2017      Q4     Int      62832
## 31 2011      Q3      US      21448
## 32 2011      Q4      US      21671
## 33 2012      Q1      US      23410
## 34 2012      Q2      US      23938
## 35 2012      Q3      US      25101
## 36 2012      Q4      US      27146
## 37 2013      Q1      US      29174
## 38 2013      Q2      US      29807
## 39 2013      Q3      US      31092
## 40 2013      Q4      US      33420
## 41 2014      Q1      US      35674
## 42 2014      Q2      US      36244
## 43 2014      Q3      US      37219
## 44 2014      Q4      US      39114
## 45 2015      Q1      US      41397
## 46 2015      Q2      US      42300
## 47 2015      Q3      US      43181
## 48 2015      Q4      US      44738
## 49 2016      Q1      US      46967
## 50 2016      Q2      US      47129
## 51 2016      Q3      US      47497
## 52 2016      Q4      US      49431
## 53 2017      Q1      US      50854
## 54 2017      Q2      US      51921
## 55 2017      Q3      US      52772
## 56 2017      Q4      US      54750
```

Part (E)

```
stream_long <- merge(rev_long, mem_long, by=c("Year", "Quarter", "Service"),
all = TRUE)
names(stream_long) <- c("Year", "Quarter", "Service", "Membership",
"Revenue")

stream_long
```

```
##    Year Quarter Service Membership Revenue
## 1  2010      Q3     Int         NA     133
## 2  2010      Q4     Int       3617     509
## 3  2011      Q1     Int      12279     803
```

```
## 4  2011      Q2     Int      18896     967
## 5  2011      Q3     Int      22687    1480
## 6  2011      Q3      US         NA   21448
## 7  2011      Q4     Int      28988    1858
## 8  2011      Q4      US     476334   21671
## 9  2012      Q1     Int      43425    3065
## 10 2012      Q1      US     506665   23410
## 11 2012      Q2     Int      64973    3624
## 12 2012      Q2      US     532705   23938
## 13 2012      Q3     Int      77744    4311
## 14 2012      Q3      US     556027   25101
## 15 2012      Q4     Int     101400    6121
## 16 2012      Q4      US     589471   27146
## 17 2013      Q1     Int     142019    7142
## 18 2013      Q1      US     638649   29174
## 19 2013      Q2     Int     165902    7747
## 20 2013      Q2      US     671089   29807
## 21 2013      Q3     Int     183051    9188
## 22 2013      Q3      US     701083   31092
## 23 2013      Q4     Int     221418   10930
## 24 2013      Q4      US     740554   33420
## 25 2014      Q1     Int     267118   12683
## 26 2014      Q1      US     798617   35674
## 27 2014      Q2     Int     307461   13801
## 28 2014      Q2      US     838225   36244
## 29 2014      Q3     Int     345685   15843
## 30 2014      Q3      US     877150   37219
## 31 2014      Q4     Int     387797   18277
## 32 2014      Q4      US     917442   39114
## 33 2015      Q1     Int     415397   20877
## 34 2015      Q1      US     984532   41397
## 35 2015      Q2     Int     454763   23251
## 36 2015      Q2      US    1025913   42300
## 37 2015      Q3     Int     516870   25987
## 38 2015      Q3      US    1063961   43181
## 39 2015      Q4     Int     566405   30024
## 40 2015      Q4      US    1105933   44738
## 41 2016      Q1     Int     651748   34533
## 42 2016      Q1      US    1161241   46967
## 43 2016      Q2     Int     758201   36048
## 44 2016      Q2      US    1208271   47129
## 45 2016      Q3     Int     853480   39246
## 46 2016      Q3      US    1304333   47497
## 47 2016      Q4     Int     947666   44365
## 48 2016      Q4      US    1403462   49431
## 49 2017      Q1     Int    1046199   47894
## 50 2017      Q1      US    1470042   50854
## 51 2017      Q2     Int    1165228   52031
## 52 2017      Q2      US    1505499   51921
## 53 2017      Q3     Int    1327435   56476
```

```
## 54 2017      Q3      US    1547210   52772
## 55 2017      Q4     Int    1550329   62832
## 56 2017      Q4      US    1630274   54750
```

Problem 5

In my opinion the wide format is easier to work with and read simply because it is easier to find information and understand what the data means. The main difference between the two is the number of columns and rows. The wide format has more columns however the rows on the long format are more than the ones on the wide format.