### SC-MD\_Sept\_26-1

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#### Working with NYC Flights Data

```
library(ggplot2)
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(tidyverse)
## -- Attaching packages ------ tidyverse 1.3.2 --
## v tibble 3.1.8
                      v purrr
                               0.3.4
## v tidyr
            1.2.0
                      v stringr 1.4.1
## v readr
            2.1.2
                      v forcats 0.5.2
## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()
                    masks stats::lag()
library(nycflights13)
data("flights")
dim(flights)
## [1] 336776
                 19
head(flights)
## # A tibble: 6 x 19
##
                  day dep_time sched_dep~1 dep_d~2 arr_t~3 sched~4 arr_d~5 carrier
     year month
    <int> <int> <int>
                         <int>
                                    <int>
                                            <dbl>
                                                    <int>
                                                            <int>
                                                                    <dbl> <chr>
                                                                      11 UA
## 1 2013
                           517
                                      515
                                                2
                                                      830
                                                              819
              1
                    1
## 2 2013
              1
                    1
                           533
                                      529
                                                      850
                                                             830
                                                                      20 UA
## 3
     2013
              1
                           542
                                      540
                                                2
                                                      923
                                                             850
                                                                      33 AA
                    1
## 4
     2013
              1
                           544
                                      545
                                               -1
                                                     1004
                                                             1022
                                                                      -18 B6
                    1
## 5 2013
                           554
                                      600
                                               -6
                                                      812
                                                             837
                                                                     -25 DL
              1
                    1
## 6 2013
                           554
                                      558
                                                      740
                                                             728
                                                                      12 UA
```

```
## # ... with 9 more variables: flight <int>, tailnum <chr>, origin <chr>,
## # dest <chr>, air_time <dbl>, distance <dbl>, hour <dbl>, minute <dbl>,
## time_hour <dttm>, and abbreviated variable names 1: sched_dep_time,
## # 2: dep_delay, 3: arr_time, 4: sched_arr_time, 5: arr_delay
```

### Question 1: Give us all flights departed on 1<sup>st</sup> January.

```
filter(flights, flights$month == 1, flights$day == 1)
## # A tibble: 842 x 19
##
                     day dep_time sched_de~1 dep_d~2 arr_t~3 sched~4 arr_d~5 carrier
       year month
##
      <int> <int> <int>
                            <int>
                                        <int>
                                                 <dbl>
                                                         <int>
                                                                  <int>
                                                                           <dbl> <chr>
       2013
                               517
                                           515
                                                     2
                                                            830
                                                                    819
                                                                              11 UA
##
    1
                 1
                       1
##
    2 2013
                               533
                                           529
                                                     4
                                                            850
                                                                    830
                                                                              20 UA
                 1
                       1
   3 2013
                                                     2
##
                 1
                       1
                               542
                                           540
                                                            923
                                                                    850
                                                                              33 AA
   4 2013
                               544
                                           545
                                                           1004
                                                                   1022
                                                                             -18 B6
##
                 1
                       1
                                                    -1
       2013
                                                                             -25 DL
##
    5
                 1
                       1
                               554
                                           600
                                                    -6
                                                            812
                                                                    837
##
    6 2013
                               554
                                           558
                                                    -4
                                                            740
                                                                    728
                                                                              12 UA
                 1
                       1
       2013
##
   7
                       1
                               555
                                           600
                                                    -5
                                                            913
                                                                    854
                                                                              19 B6
                 1
                                                                    723
       2013
                               557
                                           600
                                                    -3
                                                            709
                                                                             -14 EV
##
    8
                 1
                       1
##
    9
       2013
                 1
                       1
                               557
                                           600
                                                    -3
                                                            838
                                                                    846
                                                                              -8 B6
## 10 2013
                               558
                                           600
                                                    -2
                                                            753
                       1
                                                                    745
                                                                               8 AA
## # ... with 832 more rows, 9 more variables: flight <int>, tailnum <chr>,
       origin <chr>, dest <chr>, air_time <dbl>, distance <dbl>, hour <dbl>,
## #
       minute <dbl>, time_hour <dttm>, and abbreviated variable names
## #
       1: sched_dep_time, 2: dep_delay, 3: arr_time, 4: sched_arr_time,
## #
       5: arr_delay
```

#### Question 2: Obtain all flights departed in November or December.

```
filter(flights, flights$month == 11 | flights$month == 12)
## # A tibble: 55,403 x 19
##
       year month
                     day dep_time sched_de~1 dep_d~2 arr_t~3 sched~4 arr_d~5 carrier
##
      <int> <int> <int>
                            <int>
                                        <int>
                                                 <dbl>
                                                         <int>
                                                                  <int>
                                                                           <dbl> <chr>
##
    1 2013
                                5
                                         2359
                                                            352
                                                                    345
                                                                               7 B6
                11
                       1
                                                     6
                                35
##
    2 2013
                                         2250
                                                   105
                                                           123
                                                                   2356
                                                                              87 B6
                11
                       1
   3 2013
                                                                             -10 US
##
                11
                       1
                               455
                                          500
                                                    -5
                                                           641
                                                                    651
    4 2013
##
                11
                       1
                               539
                                          545
                                                    -6
                                                           856
                                                                    827
                                                                              29 UA
##
    5 2013
                11
                       1
                               542
                                          545
                                                    -3
                                                           831
                                                                    855
                                                                             -24 AA
##
   6 2013
                                                           912
                                                                             -11 UA
                11
                       1
                              549
                                          600
                                                   -11
                                                                    923
##
    7 2013
                              550
                                          600
                                                   -10
                                                           705
                                                                    659
                                                                               6 US
                11
                       1
       2013
                               554
                                          600
                                                            659
                                                                    701
                                                                              -2 US
##
    8
                11
                       1
                                                    -6
                                                                              -1 DL
##
    9
       2013
                11
                       1
                               554
                                          600
                                                    -6
                                                           826
                                                                    827
## 10 2013
                11
                       1
                              554
                                          600
                                                    -6
                                                           749
                                                                    751
                                                                              -2 DL
## # ... with 55,393 more rows, 9 more variables: flight <int>, tailnum <chr>,
       origin <chr>, dest <chr>, air_time <dbl>, distance <dbl>, hour <dbl>,
## #
       minute <dbl>, time_hour <dttm>, and abbreviated variable names
## #
       1: sched_dep_time, 2: dep_delay, 3: arr_time, 4: sched_arr_time,
       5: arr_delay
filter(flights, month %in% c(11, 12))
```

```
## # A tibble: 55,403 x 19
##
                     day dep_time sched_de~1 dep_d~2 arr_t~3 sched~4 arr_d~5 carrier
       year month
                                                                  <int>
##
      <int> <int> <int>
                             <int>
                                        <int>
                                                 <dbl>
                                                         <int>
                                                                           <dbl> <chr>
   1 2013
                                         2359
                                                                               7 B6
##
                11
                                 5
                                                     6
                                                            352
                                                                    345
                       1
##
    2
       2013
                11
                       1
                                35
                                         2250
                                                   105
                                                            123
                                                                   2356
                                                                              87 B6
##
    3 2013
                               455
                                          500
                                                    -5
                                                            641
                                                                             -10 US
                11
                       1
                                                                    651
##
   4 2013
                               539
                                                    -6
                                                            856
                                                                              29 UA
                11
                       1
                                           545
                                                                    827
    5 2013
##
                11
                       1
                               542
                                           545
                                                    -3
                                                           831
                                                                    855
                                                                             -24 AA
##
    6 2013
                11
                       1
                               549
                                           600
                                                   -11
                                                           912
                                                                    923
                                                                             -11 UA
##
   7 2013
                                                           705
                                                                               6 US
                11
                       1
                               550
                                           600
                                                   -10
                                                                    659
##
   8 2013
                11
                       1
                               554
                                           600
                                                    -6
                                                            659
                                                                    701
                                                                              -2 US
       2013
                                           600
                                                            826
                                                                    827
                                                                              -1 DL
##
    9
                               554
                                                    -6
                11
                       1
                                           600
## 10 2013
                11
                       1
                               554
                                                    -6
                                                            749
                                                                    751
                                                                              -2 DL
## # ... with 55,393 more rows, 9 more variables: flight <int>, tailnum <chr>,
       origin <chr>, dest <chr>, air_time <dbl>, distance <dbl>, hour <dbl>,
## #
       minute <dbl>, time_hour <dttm>, and abbreviated variable names
## #
       1: sched_dep_time, 2: dep_delay, 3: arr_time, 4: sched_arr_time,
## #
       5: arr delay
```

# Question 3: Flights that were not delayed by more than 2 hours both for arrival or departure.

```
filter(flights, flights$dep_delay <= 120 & flights$arr_delay <= 120)
## # A tibble: 316,050 x 19
                     day dep_time sched_de~1 dep_d~2 arr_t~3 sched~4 arr_d~5 carrier
       year month
##
      <int> <int> <int>
                                                 <dbl>
                                                         <int>
                                                                  <int>
                                                                          <dbl> <chr>
                            <int>
                                        <int>
##
    1 2013
                       1
                              517
                                          515
                                                     2
                                                           830
                                                                    819
                                                                             11 UA
                 1
                                                                             20 UA
##
   2 2013
                              533
                                          529
                                                     4
                                                           850
                                                                    830
                 1
                       1
   3 2013
##
                       1
                              542
                                          540
                                                     2
                                                           923
                                                                    850
                                                                             33 AA
                 1
   4 2013
##
                 1
                       1
                              544
                                          545
                                                    -1
                                                          1004
                                                                   1022
                                                                            -18 B6
##
   5 2013
                       1
                                          600
                                                    -6
                                                                            -25 DL
                 1
                              554
                                                           812
                                                                    837
##
   6 2013
                 1
                       1
                              554
                                          558
                                                    -4
                                                           740
                                                                    728
                                                                             12 UA
##
    7 2013
                              555
                                          600
                                                    -5
                                                           913
                                                                             19 B6
                       1
                                                                    854
                 1
    8 2013
                                                    -3
##
                 1
                       1
                              557
                                          600
                                                           709
                                                                    723
                                                                            -14 EV
##
   9
       2013
                       1
                              557
                                          600
                                                    -3
                                                           838
                                                                    846
                                                                             -8 B6
                 1
## 10 2013
                       1
                              558
                                          600
                                                    -2
                                                           753
                                                                    745
## # ... with 316,040 more rows, 9 more variables: flight <int>, tailnum <chr>,
       origin <chr>, dest <chr>, air_time <dbl>, distance <dbl>, hour <dbl>,
## #
       minute <dbl>, time_hour <dttm>, and abbreviated variable names
       1: sched_dep_time, 2: dep_delay, 3: arr_time, 4: sched_arr_time,
## #
       5: arr_delay
filter(flights, !(flights$dep_delay > 120 | flights$arr_delay > 120))
## # A tibble: 316,050 x 19
##
       year month
                     day dep_time sched_de~1 dep_d~2 arr_t~3 sched~4 arr_d~5 carrier
##
      <int> <int> <int>
                            <int>
                                        <int>
                                                 <dbl>
                                                         <int>
                                                                  <int>
                                                                          <dbl> <chr>
    1 2013
                       1
                              517
                                          515
                                                     2
                                                           830
                                                                    819
                                                                             11 UA
##
                 1
##
    2 2013
                              533
                                          529
                                                     4
                                                           850
                                                                    830
                                                                             20 UA
                 1
                       1
   3 2013
                              542
                                          540
                                                     2
                                                           923
                                                                    850
                                                                             33 AA
                 1
                       1
   4 2013
##
                 1
                       1
                              544
                                          545
                                                    -1
                                                          1004
                                                                   1022
                                                                            -18 B6
```

-6

812

837

-25 DL

600

5 2013

1

1

554

```
6 2013
                              554
                                                                   728
##
                 1
                       1
                                          558
                                                    -4
                                                           740
                                                                             12 UA
##
    7
       2013
                       1
                              555
                                          600
                                                    -5
                                                           913
                                                                   854
                                                                             19 B6
                 1
       2013
##
                       1
                              557
                                          600
                                                    -3
                                                           709
                                                                   723
                                                                            -14 EV
       2013
                                          600
                                                    -3
                                                           838
                                                                             -8 B6
##
   9
                       1
                              557
                                                                   846
                 1
## 10
       2013
                              558
                                          600
                                                    -2
                                                           753
                                                                   745
                                                                              8 AA
## # ... with 316,040 more rows, 9 more variables: flight <int>, tailnum <chr>,
       origin <chr>, dest <chr>, air time <dbl>, distance <dbl>, hour <dbl>,
       minute <dbl>, time_hour <dttm>, and abbreviated variable names
## #
       1: sched_dep_time, 2: dep_delay, 3: arr_time, 4: sched_arr_time,
## #
       5: arr_delay
```

### Question 4: Flights with arrival delay of 2 or more hours

```
filter(flights, flights$arr_delay >= 120)
## # A tibble: 10,200 x 19
                     day dep_time sched_de~1 dep_d~2 arr_t~3 sched~4 arr_d~5 carrier
##
       year month
##
      <int> <int> <int>
                            <int>
                                        <int>
                                                 <dbl>
                                                         <int>
                                                                 <int>
                                                                          <dbl> <chr>
   1 2013
                 1
                       1
                              811
                                          630
                                                  101
                                                          1047
                                                                   830
                                                                            137 MQ
    2 2013
                              848
                                                  853
##
                                         1835
                                                          1001
                                                                  1950
                                                                            851 MQ
                 1
                       1
##
    3 2013
                 1
                       1
                              957
                                          733
                                                  144
                                                          1056
                                                                   853
                                                                            123 UA
##
   4 2013
                       1
                             1114
                                          900
                                                  134
                                                          1447
                                                                  1222
                                                                            145 UA
##
    5 2013
                 1
                       1
                             1505
                                         1310
                                                  115
                                                          1638
                                                                  1431
                                                                            127 EV
    6 2013
##
                 1
                       1
                             1525
                                         1340
                                                  105
                                                          1831
                                                                  1626
                                                                            125 B6
                                                                            136 EV
##
   7 2013
                 1
                       1
                             1549
                                         1445
                                                    64
                                                          1912
                                                                  1656
##
    8 2013
                 1
                             1558
                                         1359
                                                  119
                                                          1718
                                                                  1515
                                                                            123 EV
                       1
##
    9 2013
                             1732
                                         1630
                                                    62
                                                          2028
                                                                  1825
                 1
                       1
                                                                            123 EV
## 10 2013
                       1
                             1803
                                         1620
                                                  103
                                                          2008
                                                                   1750
                                                                            138 MQ
## # ... with 10,190 more rows, 9 more variables: flight <int>, tailnum <chr>,
       origin <chr>, dest <chr>, air time <dbl>, distance <dbl>, hour <dbl>,
       minute <dbl>, time_hour <dttm>, and abbreviated variable names
## #
       1: sched_dep_time, 2: dep_delay, 3: arr_time, 4: sched_arr_time,
## #
## #
       5: arr delay
```

### Question 5: Flights that flew to Houston

```
filter(flights, dest %in% c('IAH', 'HOU', 'EFD'))
## # A tibble: 9,313 x 19
##
       year month
                     day dep_time sched_de~1 dep_d~2 arr_t~3 sched~4 arr_d~5 carrier
##
                             <int>
                                         <int>
                                                 <dbl>
                                                          <int>
                                                                   <int>
                                                                            <dbl> <chr>
      <int> <int> <int>
##
   1 2013
                               517
                                           515
                                                            830
                                                                     819
                                                                               11 UA
                 1
                       1
                                                      2
    2 2013
                                           529
##
                               533
                                                            850
                                                                     830
                                                                               20 UA
                 1
                       1
                                                      4
    3 2013
                                           627
##
                 1
                       1
                               623
                                                     -4
                                                            933
                                                                     932
                                                                                1 UA
##
   4 2013
                 1
                       1
                               728
                                           732
                                                     -4
                                                           1041
                                                                    1038
                                                                                3 UA
##
    5 2013
                 1
                       1
                               739
                                           739
                                                      0
                                                           1104
                                                                    1038
                                                                               26 UA
    6 2013
##
                 1
                       1
                               908
                                           908
                                                      0
                                                           1228
                                                                    1219
                                                                                9 UA
##
    7 2013
                       1
                              1028
                                          1026
                                                      2
                                                                               11 UA
                 1
                                                           1350
                                                                    1339
##
    8 2013
                 1
                       1
                              1044
                                          1045
                                                     -1
                                                           1352
                                                                    1351
                                                                                1 UA
       2013
                                           900
                                                                    1222
                                                                              145 UA
##
    9
                 1
                       1
                              1114
                                                    134
                                                           1447
## 10
       2013
                       1
                              1205
                                          1200
                                                      5
                                                           1503
                                                                    1505
                                                                               -2 UA
## # ... with 9,303 more rows, 9 more variables: flight <int>, tailnum <chr>,
```

```
## # origin <chr>, dest <chr>, air_time <dbl>, distance <dbl>, hour <dbl>,
## # minute <dbl>, time_hour <dttm>, and abbreviated variable names
## # 1: sched_dep_time, 2: dep_delay, 3: arr_time, 4: sched_arr_time,
## # 5: arr_delay
```

#### Question 6: Flights operated by United, American or Delta.

```
filter(flights, carrier %in% c('UA', 'AA', 'DL'))
## # A tibble: 139,504 x 19
                     day dep_time sched_de~1 dep_d~2 arr_t~3 sched~4 arr_d~5 carrier
       year month
##
      <int> <int> <int>
                            <int>
                                        <int>
                                                 <dbl>
                                                         <int>
                                                                  <int>
                                                                           <dbl> <chr>
    1 2013
                               517
                                          515
                                                     2
                                                           830
                                                                    819
                                                                              11 UA
##
                 1
                       1
##
    2 2013
                               533
                                          529
                                                     4
                                                           850
                                                                    830
                                                                             20 UA
                 1
                       1
   3 2013
                                                     2
##
                 1
                       1
                               542
                                          540
                                                           923
                                                                    850
                                                                             33 AA
##
    4 2013
                       1
                              554
                                          600
                                                    -6
                                                           812
                                                                    837
                                                                             -25 DL
                 1
       2013
##
    5
                 1
                       1
                              554
                                          558
                                                    -4
                                                           740
                                                                    728
                                                                             12 UA
##
    6 2013
                       1
                              558
                                          600
                                                    -2
                                                           753
                                                                    745
                                                                               8 AA
                 1
       2013
##
   7
                 1
                       1
                               558
                                          600
                                                    -2
                                                           924
                                                                    917
                                                                               7 UA
       2013
                               558
                                          600
                                                    -2
                                                           923
                                                                    937
                                                                             -14 UA
##
    8
                 1
                       1
##
    9
       2013
                 1
                       1
                               559
                                          600
                                                    -1
                                                           941
                                                                    910
                                                                             31 AA
## 10 2013
                              559
                                          600
                                                           854
                       1
                                                    -1
                                                                    902
                                                                             -8 UA
## # ... with 139,494 more rows, 9 more variables: flight <int>, tailnum <chr>,
       origin <chr>, dest <chr>, air_time <dbl>, distance <dbl>, hour <dbl>,
## #
       minute <dbl>, time_hour <dttm>, and abbreviated variable names
## #
       1: sched_dep_time, 2: dep_delay, 3: arr_time, 4: sched_arr_time,
## #
       5: arr_delay
```

## Question 7: Flights that departed in summer (July, August, September)

```
filter(flights, month %in% c(7, 8, 9))
## # A tibble: 86,326 x 19
                     day dep_time sched_de~1 dep_d~2 arr_t~3 sched~4 arr_d~5 carrier
##
       year month
##
      <int> <int> <int>
                             <int>
                                         <int>
                                                 <dbl>
                                                         <int>
                                                                  <int>
                                                                           <dbl> <chr>
##
   1 2013
                 7
                       1
                                         2029
                                                   212
                                                            236
                                                                   2359
                                                                             157 B6
    2 2013
                 7
                                 2
                                         2359
                                                     3
                                                            344
                                                                    344
##
                       1
                                                                               0 B6
##
    3 2013
                 7
                       1
                                29
                                         2245
                                                   104
                                                            151
                                                                      1
                                                                             110 B6
##
   4 2013
                 7
                       1
                                43
                                         2130
                                                   193
                                                            322
                                                                     14
                                                                             188 B6
##
   5 2013
                 7
                       1
                                         2150
                                                   174
                                                            300
                                                                    100
                                                                             120 AA
                                44
    6 2013
                 7
                                                   235
                                                            304
##
                       1
                                46
                                         2051
                                                                   2358
                                                                             186 B6
##
    7
       2013
                 7
                       1
                                48
                                         2001
                                                   287
                                                            308
                                                                   2305
                                                                             243 VX
                 7
                                                                             172 B6
##
    8
       2013
                                58
                                                   183
                                                            335
                       1
                                         2155
                                                                     43
##
       2013
                 7
                       1
                               100
                                         2146
                                                   194
                                                            327
                                                                     30
                                                                             177 B6
       2013
                 7
                               100
                                         2245
                                                   135
                                                            337
## 10
                       1
                                                                    135
                                                                             122 B6
## # ... with 86,316 more rows, 9 more variables: flight <int>, tailnum <chr>,
       origin <chr>, dest <chr>, air_time <dbl>, distance <dbl>, hour <dbl>,
## #
       minute <dbl>, time_hour <dttm>, and abbreviated variable names
## #
       1: sched_dep_time, 2: dep_delay, 3: arr_time, 4: sched_arr_time,
## #
       5: arr_delay
```

### Question 8: Flights that arrived more than 2 hours late but did not leave late.

```
filter(flights, flights$arr_delay > 120 & flights$dep_delay <= 0)
## # A tibble: 29 x 19
##
       year month
                     day dep_time sched_de~1 dep_d~2 arr_t~3 sched~4 arr_d~5 carrier
##
      <int> <int> <int>
                                        <int>
                                                <dbl>
                                                         <int>
                                                                          <dbl> <chr>
                            <int>
                                                                 <int>
##
   1 2013
                             1419
                                         1420
                                                          1754
                                                                  1550
                                                                            124 MQ
                1
                      27
                                                   -1
##
    2
       2013
               10
                       7
                             1350
                                         1350
                                                    0
                                                          1736
                                                                  1526
                                                                            130 EV
##
    3
       2013
               10
                       7
                             1357
                                         1359
                                                    -2
                                                          1858
                                                                  1654
                                                                            124 AA
##
    4
       2013
               10
                      16
                              657
                                          700
                                                    -3
                                                          1258
                                                                  1056
                                                                            122 B6
##
   5 2013
               11
                       1
                              658
                                          700
                                                    -2
                                                          1329
                                                                  1015
                                                                            194 VX
   6 2013
                                                    -3
##
                3
                      18
                             1844
                                         1847
                                                            39
                                                                  2219
                                                                            140 UA
##
    7
       2013
                4
                      17
                             1635
                                         1640
                                                    -5
                                                          2049
                                                                  1845
                                                                            124 MQ
                                                   -2
##
   8
      2013
                4
                      18
                              558
                                          600
                                                          1149
                                                                   850
                                                                            179 AA
##
    9
      2013
                      18
                              655
                                          700
                                                    -5
                                                          1213
                                                                   950
                                                                            143 AA
## 10 2013
                             1827
                                                   -3
                5
                      22
                                         1830
                                                          2217
                                                                  2010
                                                                            127 MQ
## # ... with 19 more rows, 9 more variables: flight <int>, tailnum <chr>,
       origin <chr>, dest <chr>, air_time <dbl>, distance <dbl>, hour <dbl>,
       minute <dbl>, time_hour <dttm>, and abbreviated variable names
## #
       1: sched_dep_time, 2: dep_delay, 3: arr_time, 4: sched_arr_time,
       5: arr_delay
```

# Question 9: Flights that were delayed by at least an hour, but made up over 30 mins in flight.

```
filter(flights, dep_delay >= 60,(dep_delay-arr_delay > 30))
## # A tibble: 1,844 x 19
##
       year month
                     day dep_time sched_de~1 dep_d~2 arr_t~3 sched~4 arr_d~5 carrier
                                                         <int>
                                                                          <dbl> <chr>
##
      <int> <int> <int>
                            <int>
                                        <int>
                                                 <dbl>
                                                                 <int>
##
    1 2013
                             2205
                                         1720
                                                  285
                                                            46
                                                                  2040
                                                                            246 AA
                       1
                 1
       2013
                             2326
                                         2130
                                                  116
                                                           131
                                                                             73 B6
##
                 1
                       1
                                                                     18
    3 2013
                       3
                                         1221
                                                  162
                                                          1803
                                                                            128 UA
##
                 1
                             1503
                                                                  1555
##
   4 2013
                 1
                       3
                             1839
                                         1700
                                                   99
                                                          2056
                                                                  1950
                                                                             66 AA
##
    5 2013
                       3
                                         1745
                                                    65
                                                          2148
                                                                  2120
                                                                             28 AA
                 1
                             1850
    6 2013
                       3
##
                 1
                             1941
                                         1759
                                                  102
                                                          2246
                                                                  2139
                                                                             67 UA
##
   7 2013
                       3
                                                                              1 B6
                 1
                             1950
                                         1845
                                                    65
                                                          2228
                                                                  2227
##
   8
      2013
                       3
                             2015
                                         1915
                                                    60
                                                          2135
                                                                  2111
                                                                             24 9E
                 1
##
    9
       2013
                 1
                       3
                             2257
                                         2000
                                                  177
                                                            45
                                                                  2224
                                                                            141 9E
## 10
       2013
                 1
                       4
                             1917
                                         1700
                                                  137
                                                          2135
                                                                  1950
                                                                            105 AA
## # ... with 1,834 more rows, 9 more variables: flight <int>, tailnum <chr>,
       origin <chr>, dest <chr>, air_time <dbl>, distance <dbl>, hour <dbl>,
       minute <dbl>, time_hour <dttm>, and abbreviated variable names
## #
       1: sched_dep_time, 2: dep_delay, 3: arr_time, 4: sched_arr_time,
## #
       5: arr_delay
```

## Question 10: Flights that departed between midnight and 6:00 am, both inclusive.

```
filter(flights, dep_time >= 0000 & dep_time <= 0600)
## # A tibble: 9,344 x 19
##
       year month
                     day dep_time sched_de~1 dep_d~2 arr_t~3 sched~4 arr_d~5 carrier
##
                                        <int>
                                                 <dbl>
                                                         <int>
                                                                           <dbl> <chr>
      <int> <int> <int>
                            <int>
                                                                  <int>
   1 2013
                              517
                                          515
                                                     2
                                                           830
                                                                    819
                                                                             11 UA
##
                 1
                       1
##
    2
       2013
                       1
                              533
                                          529
                                                     4
                                                           850
                                                                    830
                                                                             20 UA
                 1
##
    3
       2013
                 1
                       1
                              542
                                          540
                                                     2
                                                           923
                                                                    850
                                                                             33 AA
##
    4 2013
                       1
                              544
                                          545
                                                    -1
                                                          1004
                                                                   1022
                                                                             -18 B6
                 1
##
    5 2013
                 1
                       1
                              554
                                          600
                                                    -6
                                                           812
                                                                    837
                                                                             -25 DL
    6 2013
                                          558
                                                                    728
##
                       1
                              554
                                                    -4
                                                           740
                                                                             12 UA
                 1
##
    7
       2013
                       1
                              555
                                          600
                                                    -5
                                                           913
                                                                    854
                                                                             19 B6
                 1
##
    8
      2013
                 1
                       1
                              557
                                          600
                                                    -3
                                                           709
                                                                    723
                                                                             -14 EV
##
    9
       2013
                 1
                       1
                              557
                                          600
                                                    -3
                                                           838
                                                                    846
                                                                             -8 B6
                                          600
                                                    -2
## 10 2013
                              558
                                                           753
                                                                    745
                                                                               8 AA
                 1
                       1
## # ... with 9,334 more rows, 9 more variables: flight <int>, tailnum <chr>,
       origin <chr>, dest <chr>, air_time <dbl>, distance <dbl>, hour <dbl>,
       minute <dbl>, time_hour <dttm>, and abbreviated variable names
## #
       1: sched_dep_time, 2: dep_delay, 3: arr_time, 4: sched_arr_time,
       5: arr_delay
filter(flights, between(dep_time, 0000, 600))
## # A tibble: 9,344 x 19
##
       year month
                     day dep_time sched_de~1 dep_d~2 arr_t~3 sched~4 arr_d~5 carrier
##
      <int> <int> <int>
                            <int>
                                        <int>
                                                 <dbl>
                                                         <int>
                                                                  <int>
                                                                           <dbl> <chr>
##
   1 2013
                              517
                                          515
                                                     2
                                                           830
                                                                    819
                                                                             11 UA
                 1
                       1
    2
       2013
                 1
                       1
                              533
                                          529
                                                     4
                                                           850
                                                                    830
                                                                             20 UA
##
       2013
                                          540
                                                     2
                                                           923
                                                                             33 AA
##
    3
                       1
                              542
                                                                    850
                 1
       2013
                       1
                                          545
                                                          1004
                                                                   1022
                                                                             -18 B6
##
    4
                 1
                              544
                                                    -1
##
   5 2013
                 1
                       1
                              554
                                          600
                                                    -6
                                                           812
                                                                    837
                                                                             -25 DL
##
    6 2013
                       1
                              554
                                          558
                                                    -4
                                                           740
                                                                    728
                                                                             12 UA
                 1
       2013
                              555
                                          600
                                                                             19 B6
##
    7
                 1
                       1
                                                    -5
                                                           913
                                                                    854
##
    8
       2013
                       1
                              557
                                          600
                                                    -3
                                                           709
                                                                    723
                                                                             -14 EV
                 1
##
   9
       2013
                              557
                                          600
                                                    -3
                                                           838
                                                                             -8 B6
                 1
                       1
                                                                    846
## 10 2013
                 1
                       1
                              558
                                          600
                                                    -2
                                                           753
                                                                    745
                                                                               8 AA
## # ... with 9,334 more rows, 9 more variables: flight <int>, tailnum <chr>,
       origin <chr>, dest <chr>, air_time <dbl>, distance <dbl>, hour <dbl>,
       minute <dbl>, time_hour <dttm>, and abbreviated variable names
       1: sched_dep_time, 2: dep_delay, 3: arr_time, 4: sched_arr_time,
## #
       5: arr_delay
filter(flights, !between(dep_time, 0601, 2359))
## # A tibble: 9,373 x 19
##
                     day dep_time sched_de~1 dep_d~2 arr_t~3 sched~4 arr_d~5 carrier
       year month
##
      <int> <int> <int>
                            <int>
                                        <int>
                                                 <dbl>
                                                         <int>
                                                                  <int>
                                                                           <dbl> <chr>
##
   1 2013
                       1
                              517
                                          515
                                                     2
                                                           830
                                                                    819
                                                                             11 UA
                 1
##
   2 2013
                 1
                       1
                              533
                                          529
                                                     4
                                                           850
                                                                    830
                                                                             20 UA
    3 2013
                              542
                                          540
                                                     2
                                                           923
                                                                    850
                                                                             33 AA
##
                       1
                 1
##
    4
       2013
                 1
                       1
                              544
                                          545
                                                    -1
                                                          1004
                                                                   1022
                                                                             -18 B6
##
    5 2013
                 1
                       1
                              554
                                          600
                                                    -6
                                                           812
                                                                    837
                                                                             -25 DL
```

```
6 2013
                1
                      1
                             554
                                         558
                                                         740
                                                                 728
                                                                           12 UA
##
   7 2013
                      1
                             555
                                         600
                                                  -5
                                                                 854
                                                                           19 B6
                1
                                                         913
##
   8 2013
                             557
                                         600
                                                  -3
                                                         709
                                                                 723
                                                                          -14 EV
  9 2013
                                         600
                                                  -3
                                                         838
##
                      1
                             557
                                                                 846
                                                                           -8 B6
                1
## 10 2013
                             558
                                         600
                                                  -2
                                                         753
                                                                 745
## # ... with 9,363 more rows, 9 more variables: flight <int>, tailnum <chr>,
       origin <chr>, dest <chr>, air time <dbl>, distance <dbl>, hour <dbl>,
       minute <dbl>, time_hour <dttm>, and abbreviated variable names
## #
       1: sched_dep_time, 2: dep_delay, 3: arr_time, 4: sched_arr_time,
       5: arr_delay
```

#### Question 11: How many flights have a missing dep\_time?

## Question 12: From the flight dataset, only consider the data on arrival delay, departure delay, distance and air time.

```
select(flights, arr_delay, dep_delay, distance, air_time)
## # A tibble: 336,776 x 4
##
      arr_delay dep_delay distance air_time
##
          <dbl>
                    <dbl>
                              <dbl>
                                       <dbl>
                                         227
##
             11
                        2
                               1400
  1
             20
                        4
                               1416
                                         227
##
             33
                        2
                               1089
                                         160
##
  4
            -18
                               1576
                                         183
                       -1
## 5
            -25
                       -6
                               762
                                         116
##
  6
             12
                       -4
                               719
                                         150
## 7
                                         158
             19
                       -5
                               1065
##
  8
            -14
                       -3
                                229
                                          53
             -8
##
  9
                       -3
                                944
                                         140
              8
                       -2
                                733
                                         138
## 10
## # ... with 336,766 more rows
flights = flights %>% mutate(gain = arr_delay - dep_delay)
flights = flights %>% mutate(speed = distance/arr_time*60)
```

# Question 13: How can you compute hours and minutes from departure time using transmute?

```
transmute(flights,
  dep_time,
  hour = dep_time %/% 100,
  minute = dep_time %% 100
```

```
)
```

```
## # A tibble: 336,776 x 3
##
     dep_time hour minute
##
         <int> <dbl> <dbl>
##
   1
           517
                  5
                        17
   2
           533
                  5
                        33
##
##
   3
           542
                  5
                        42
##
   4
           544
                  5
                        44
##
   5
           554
                  5
                        54
                  5
## 6
           554
                        54
##
  7
           555
                  5
                        55
## 8
                  5
           557
                        57
## 9
           557
                  5
                        57
## 10
           558
                  5
## # ... with 336,766 more rows
```

Click for reference