

```

> # Assignment: ASSIGNMENT 5

> # Name: Mukherjee, Chitramoy

> # Date: 2023-01-11

>

> #Assignment 5.1

> #Using the dplyr package, use the 6 different operations to analyze/transform the data -
GroupBy, Summarize, Mutate, Filter, Select, and Arrange

> library(readxl)

> ## Set the working directory to the root of your DSC 520 directory

> setwd("C:/Users/chitro/Desktop/dsc520-fork-chitro")

> housing_df <- read_excel("data/week-7-housing.xlsx")

> head (housing_df)

# A tibble: 6 × 24

`Sale Date`      Sale P...1 sale_...2 sale_...3 sale_...4 sitet...5 addr_...6 zip5 ctyname posta...7 lon
lat build...8 squar...9 bedro...* bath_...* bath_...* bath_...* year_...* year_...*

<dtm>          <dbl> <dbl> <dbl> <chr> <chr> <chr> <dbl> <chr> <chr> <dbl> <dbl>
<dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>

1 2006-01-03 00:00:00 698000    1    3 NA    R1    17021 ... 98052 REDMOND
REDMOND -122. 47.7    9 2810    4    2    1    0 2003    0

2 2006-01-03 00:00:00 649990    1    3 NA    R1    11927 ... 98052 REDMOND
REDMOND -122. 47.7    9 2880    4    2    0    1 2006    0

3 2006-01-03 00:00:00 572500    1    3 NA    R1    13315 ... 98052 NA    REDMOND -122.
47.7    8 2770    4    1    1    1 1987    0

4 2006-01-03 00:00:00 420000    1    3 NA    R1    3303 1... 98052 REDMOND
REDMOND -122. 47.6    8 1620    3    1    0    1 1968    0

5 2006-01-03 00:00:00 369900    1    3 15    R1    16126 ... 98052 REDMOND
REDMOND -122. 47.7    7 1440    3    1    0    1 1980    0

6 2006-01-03 00:00:00 184667    1    15 18 51 R1    8101 2... 98053 NA    REDMOND -122.

```

```
47.7    7  4160    4    2    1    1  2005    0
```

```
# ... with 4 more variables: current_zoning <chr>, sq_ft_lot <dbl>, prop_type <chr>, present_use  
<dbl>, and abbreviated variable names 1`Sale Price`, 2sale_reason,
```

```
# 3sale_instrument, 4sale_warning, 5sitetype, 6addr_full, 7postalctyn, 8building_grade, 9  
square_feet_total_living, *bedrooms, *bath_full_count, *bath_half_count,
```

```
# *bath_3qtr_count, *year_built, *year_renovated
```

```
# i Use `colnames()` to see all variable names
```

```
> colnames(housing_df)
```

```
[1] "Sale Date"      "Sale Price"      "sale_reason"      "sale_instrument"  
"sale_warning"    "sitetype"
```

```
[7] "addr_full"      "zip5"            "ctyname"          "postalctyn"      "lon"  
"lat"
```

```
[13] "building_grade"  "square_feet_total_living" "bedrooms"          "bath_full_count"  
"bath_half_count"  "bath_3qtr_count"
```

```
[19] "year_built"      "year_renovated"    "current_zoning"    "sq_ft_lot"  
"prop_type"        "present_use"
```

```
> class(housing_df)
```

```
[1] "tbl_df"      "tbl"        "data.frame"
```

```
>
```

```
>
```

```
> install.packages("dplyr")
```

WARNING: Rtools is required to build R packages but is not currently installed. Please download and install the appropriate version of Rtools before proceeding:

<https://cran.rstudio.com/bin/windows/Rtools/>

Installing package into 'C:/Users/chitro/AppData/Local/R/win-library/4.2'

(as 'lib' is unspecified)

trying URL 'https://cran.rstudio.com/bin/windows/contrib/4.2/dplyr_1.0.10.zip'

Content type 'application/zip' length 1301172 bytes (1.2 MB)

downloaded 1.2 MB

package 'dplyr' successfully unpacked and MD5 sums checked

The downloaded binary packages are in

C:\Users\chitro\AppData\Local\Temp\RtmpKqsQlf\downloaded_packages

> 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

```
> housing_df %>% select (`Sale Price`, `Sale Date`) %>% filter(`Sale Price` > 1000000) %>%  
+ mutate(year=format(as.Date(`Sale Date`, format="%m/%d/%Y"), "%Y")) %>%  
+ group_by(year) %>%  
+ summarize(average_sale_price=mean(`Sale Price`), sdev_sale_price=sd(`Sale Price`)) %>%
```

```
+ arrange(desc(year))
```

```
# A tibble: 11 × 3
```

| | year | average_sale_price | sdev_sale_price |
|----|-------|--------------------|-----------------|
| | <chr> | <dbl> | <dbl> |
| 1 | 2016 | 1376730. | 530913. |
| 2 | 2015 | 1244531. | 259357. |
| 3 | 2014 | 1254733. | 263183. |
| 4 | 2013 | 1353820. | 443343. |
| 5 | 2012 | 2236266. | 905252. |
| 6 | 2011 | 2841839. | 1361869. |
| 7 | 2010 | 1462957. | 645088. |
| 8 | 2009 | 1369636. | 292656. |
| 9 | 2008 | 2574278. | 866200. |
| 10 | 2007 | 1624951. | 588392. |
| 11 | 2006 | 1383097. | 369128. |

```
>
```

```
> install.packages("purrr")
```

WARNING: Rtools is required to build R packages but is not currently installed. Please download and install the appropriate version of Rtools before proceeding:

<https://cran.rstudio.com/bin/windows/Rtools/>

Installing package into 'C:/Users/chitro/AppData/Local/R/win-library/4.2'

(as 'lib' is unspecified)

trying URL 'https://cran.rstudio.com/bin/windows/contrib/4.2/purrr_1.0.1.zip'

Content type 'application/zip' length 498686 bytes (486 KB)

downloaded 486 KB

package 'purrr' successfully unpacked and MD5 sums checked

The downloaded binary packages are in

```
C:\Users\chitro\AppData\Local\Temp\RtmpKqsQIf\downloaded_packages
```

```
> library(purrr)
```

```
>
```

```
> #Using the purrr package – perform 2 functions on your dataset. You could use zip_n, keep,
discard, compact, etc
```

```
> bedrooms_count <- keep(housing_df$bedrooms, ~ .x >= 8)
```

```
> head(bedrooms_count)
```

```
[1] 9 8 10 11 9 8
```

```
> sale_price_1500000 <- discard(housing_df$`Sale Price`, ~ .x <= 1500000)
```

```
> head(sale_price_1500000)
```

```
[1] 1900000 1520000 1588359 2500000 2169000 1534000
```

```
>
```

```
> #Use the cbind and rbind function on your dataset
```

```
> housing_df1 <- data.frame(housing_df %>% select (square_feet_total_living, bedrooms, `Sale
Price`) %>% filter(`Sale Price` > 600000))
```

```
> head(housing_df1)
```

| | square_feet_total_living | bedrooms | Sale.Price |
|---|--------------------------|----------|------------|
| 1 | 2810 | 4 | 698000 |
| 2 | 2880 | 4 | 649990 |
| 3 | 3960 | 5 | 1050000 |

| | | | |
|---|------|---|--------|
| 4 | 3720 | 4 | 875000 |
| 5 | 4160 | 4 | 660000 |
| 6 | 2760 | 4 | 650000 |

```
> housing_df2 <- data.frame(housing_df %>% select (square_feet_total_living, bedrooms, `Sale Price`) %>% filter(`Sale Price` > 600000))
```

```
> head(housing_df2)
```

| | square_feet_total_living | bedrooms | Sale.Price |
|---|--------------------------|----------|------------|
| 1 | 2810 | 4 | 698000 |
| 2 | 2880 | 4 | 649990 |
| 3 | 3960 | 5 | 1050000 |
| 4 | 3720 | 4 | 875000 |
| 5 | 4160 | 4 | 660000 |
| 6 | 2760 | 4 | 650000 |

```
>
```

```
> housisng_df_cbind <- cbind(housing_df1, housing_df2)
```

```
> housisng_df_cbind
```

| | square_feet_total_living | bedrooms | Sale.Price | square_feet_total_living | bedrooms | Sale.Price |
|---|--------------------------|----------|------------|--------------------------|----------|------------|
| 1 | 2810 | 4 | 698000 | 2810 | 4 | 698000 |
| 2 | 2880 | 4 | 649990 | 2880 | 4 | 649990 |
| 3 | 3960 | 5 | 1050000 | 3960 | 5 | 1050000 |
| 4 | 3720 | 4 | 875000 | 3720 | 4 | 875000 |
| 5 | 4160 | 4 | 660000 | 4160 | 4 | 660000 |
| 6 | 2760 | 4 | 650000 | 2760 | 4 | 650000 |
| 7 | 3180 | 3 | 803000 | 3180 | 3 | 803000 |
| 8 | 4000 | 4 | 765000 | 4000 | 4 | 765000 |

| | | | | | | |
|----|------|---|---------|------|---|---------|
| 9 | 3520 | 4 | 765000 | 3520 | 4 | 765000 |
| 10 | 3740 | 4 | 1392000 | 3740 | 4 | 1392000 |
| 11 | 3090 | 3 | 717390 | 3090 | 3 | 717390 |
| 12 | 3840 | 5 | 949950 | 3840 | 5 | 949950 |
| 13 | 3520 | 4 | 905000 | 3520 | 4 | 905000 |
| 14 | 2300 | 3 | 750073 | 2300 | 3 | 750073 |
| 15 | 2305 | 3 | 690749 | 2305 | 3 | 690749 |
| 16 | 3010 | 4 | 640000 | 3010 | 4 | 640000 |
| 17 | 5440 | 4 | 1445000 | 5440 | 4 | 1445000 |
| 18 | 3400 | 3 | 729000 | 3400 | 3 | 729000 |
| 19 | 3150 | 4 | 754500 | 3150 | 4 | 754500 |
| 20 | 2520 | 3 | 640900 | 2520 | 3 | 640900 |
| 21 | 2680 | 2 | 1053649 | 2680 | 2 | 1053649 |
| 22 | 4100 | 4 | 870000 | 4100 | 4 | 870000 |
| 23 | 3160 | 3 | 844148 | 3160 | 3 | 844148 |
| 24 | 3290 | 5 | 765719 | 3290 | 5 | 765719 |
| 25 | 2680 | 4 | 689000 | 2680 | 4 | 689000 |
| 26 | 3990 | 5 | 849990 | 3990 | 5 | 849990 |
| 27 | 3020 | 4 | 798000 | 3020 | 4 | 798000 |
| 28 | 6610 | 4 | 1900000 | 6610 | 4 | 1900000 |
| 29 | 2700 | 3 | 1080135 | 2700 | 3 | 1080135 |
| 30 | 4340 | 4 | 1075000 | 4340 | 4 | 1075000 |
| 31 | 2520 | 3 | 691321 | 2520 | 3 | 691321 |
| 32 | 2170 | 2 | 657953 | 2170 | 2 | 657953 |

| | | | | | | |
|----|------|---|---------|------|---|---------|
| 33 | 2880 | 4 | 623990 | 2880 | 4 | 623990 |
| 34 | 2330 | 4 | 661500 | 2330 | 4 | 661500 |
| 35 | 2870 | 4 | 650100 | 2870 | 4 | 650100 |
| 36 | 2930 | 4 | 879950 | 2930 | 4 | 879950 |
| 37 | 3260 | 3 | 810000 | 3260 | 3 | 810000 |
| 38 | 5710 | 5 | 732500 | 5710 | 5 | 732500 |
| 39 | 2700 | 4 | 655000 | 2700 | 4 | 655000 |
| 40 | 2390 | 2 | 665906 | 2390 | 2 | 665906 |
| 41 | 2540 | 4 | 711000 | 2540 | 4 | 711000 |
| 42 | 3620 | 5 | 647500 | 3620 | 5 | 647500 |
| 43 | 4640 | 5 | 1520000 | 4640 | 5 | 1520000 |
| 44 | 2920 | 4 | 714950 | 2920 | 4 | 714950 |
| 45 | 2830 | 5 | 628241 | 2830 | 5 | 628241 |
| 46 | 660 | 0 | 1390000 | 660 | 0 | 1390000 |
| 47 | 3280 | 3 | 1390000 | 3280 | 3 | 1390000 |
| 48 | 2170 | 2 | 687088 | 2170 | 2 | 687088 |
| 49 | 3350 | 4 | 745800 | 3350 | 4 | 745800 |
| 50 | 2880 | 4 | 634990 | 2880 | 4 | 634990 |
| 51 | 3760 | 5 | 928800 | 3760 | 5 | 928800 |
| 52 | 3560 | 4 | 795000 | 3560 | 4 | 795000 |
| 53 | 3210 | 4 | 670000 | 3210 | 4 | 670000 |
| 54 | 3150 | 4 | 799950 | 3150 | 4 | 799950 |
| 55 | 3960 | 4 | 650000 | 3960 | 4 | 650000 |
| 56 | 3690 | 5 | 855000 | 3690 | 5 | 855000 |

| | | | | | | |
|----|------|---|---------|------|---|---------|
| 57 | 3680 | 4 | 855000 | 3680 | 4 | 855000 |
| 58 | 4140 | 4 | 855000 | 4140 | 4 | 855000 |
| 59 | 3150 | 4 | 720990 | 3150 | 4 | 720990 |
| 60 | 3530 | 4 | 899950 | 3530 | 4 | 899950 |
| 61 | 4100 | 4 | 870000 | 4100 | 4 | 870000 |
| 62 | 2980 | 5 | 671332 | 2980 | 5 | 671332 |
| 63 | 2560 | 3 | 614000 | 2560 | 3 | 614000 |
| 64 | 2490 | 3 | 609500 | 2490 | 3 | 609500 |
| 65 | 2810 | 3 | 693300 | 2810 | 3 | 693300 |
| 66 | 2570 | 3 | 660000 | 2570 | 3 | 660000 |
| 67 | 2570 | 4 | 650000 | 2570 | 4 | 650000 |
| 68 | 4550 | 4 | 1100000 | 4550 | 4 | 1100000 |
| 69 | 3840 | 4 | 940000 | 3840 | 4 | 940000 |
| 70 | 2630 | 4 | 602450 | 2630 | 4 | 602450 |
| 71 | 2740 | 4 | 880000 | 2740 | 4 | 880000 |
| 72 | 3220 | 5 | 704990 | 3220 | 5 | 704990 |
| 73 | 2530 | 4 | 631235 | 2530 | 4 | 631235 |
| 74 | 5350 | 4 | 1380000 | 5350 | 4 | 1380000 |
| 75 | 2910 | 4 | 789000 | 2910 | 4 | 789000 |
| 76 | 3200 | 3 | 759995 | 3200 | 3 | 759995 |
| 77 | 3520 | 4 | 729950 | 3520 | 4 | 729950 |
| 78 | 3720 | 4 | 1050000 | 3720 | 4 | 1050000 |
| 79 | 2780 | 4 | 632990 | 2780 | 4 | 632990 |
| 80 | 2400 | 4 | 608000 | 2400 | 4 | 608000 |

| | | | | | | |
|-----|------|---|---------|------|---|---------|
| 81 | 4240 | 4 | 1300000 | 4240 | 4 | 1300000 |
| 82 | 3220 | 4 | 729990 | 3220 | 4 | 729990 |
| 83 | 2860 | 5 | 659990 | 2860 | 5 | 659990 |
| 84 | 4520 | 4 | 991550 | 4520 | 4 | 991550 |
| 85 | 2590 | 3 | 662501 | 2590 | 3 | 662501 |
| 86 | 3490 | 4 | 852000 | 3490 | 4 | 852000 |
| 87 | 3090 | 4 | 770910 | 3090 | 4 | 770910 |
| 88 | 2470 | 3 | 619950 | 2470 | 3 | 619950 |
| 89 | 2700 | 2 | 839900 | 2700 | 2 | 839900 |
| 90 | 3360 | 2 | 1588359 | 3360 | 2 | 1588359 |
| 91 | 3940 | 4 | 920000 | 3940 | 4 | 920000 |
| 92 | 3990 | 5 | 854990 | 3990 | 5 | 854990 |
| 93 | 3430 | 4 | 620000 | 3430 | 4 | 620000 |
| 94 | 3480 | 3 | 1450000 | 3480 | 3 | 1450000 |
| 95 | 900 | 2 | 1450000 | 900 | 2 | 1450000 |
| 96 | 3520 | 5 | 765626 | 3520 | 5 | 765626 |
| 97 | 3290 | 4 | 764950 | 3290 | 4 | 764950 |
| 98 | 2050 | 4 | 603000 | 2050 | 4 | 603000 |
| 99 | 5500 | 4 | 1025000 | 5500 | 4 | 1025000 |
| 100 | 3540 | 4 | 1490000 | 3540 | 4 | 1490000 |
| 101 | 4290 | 4 | 935000 | 4290 | 4 | 935000 |
| 102 | 3280 | 4 | 800000 | 3280 | 4 | 800000 |
| 103 | 3370 | 4 | 750000 | 3370 | 4 | 750000 |
| 104 | 2280 | 4 | 699950 | 2280 | 4 | 699950 |

| | | | | | | |
|-----|------|---|---------|------|---|---------|
| 105 | 2950 | 4 | 672000 | 2950 | 4 | 672000 |
| 106 | 3200 | 4 | 889000 | 3200 | 4 | 889000 |
| 107 | 2870 | 4 | 641500 | 2870 | 4 | 641500 |
| 108 | 2020 | 4 | 638000 | 2020 | 4 | 638000 |
| 109 | 2300 | 2 | 750591 | 2300 | 2 | 750591 |
| 110 | 3150 | 4 | 729900 | 3150 | 4 | 729900 |
| 111 | 2940 | 4 | 679950 | 2940 | 4 | 679950 |
| 112 | 2630 | 3 | 624500 | 2630 | 3 | 624500 |
| 113 | 4010 | 4 | 855990 | 4010 | 4 | 855990 |
| 114 | 2860 | 4 | 832950 | 2860 | 4 | 832950 |
| 115 | 2300 | 2 | 632900 | 2300 | 2 | 632900 |
| 116 | 2170 | 2 | 624900 | 2170 | 2 | 624900 |
| 117 | 3220 | 4 | 835000 | 3220 | 4 | 835000 |
| 118 | 3320 | 4 | 700000 | 3320 | 4 | 700000 |
| 119 | 4050 | 4 | 965000 | 4050 | 4 | 965000 |
| 120 | 2930 | 3 | 665500 | 2930 | 3 | 665500 |
| 121 | 2530 | 4 | 629950 | 2530 | 4 | 629950 |
| 122 | 2610 | 3 | 660000 | 2610 | 3 | 660000 |
| 123 | 6050 | 6 | 1425000 | 6050 | 6 | 1425000 |
| 124 | 3040 | 4 | 786950 | 3040 | 4 | 786950 |
| 125 | 3190 | 3 | 778000 | 3190 | 3 | 778000 |
| 126 | 3220 | 5 | 726990 | 3220 | 5 | 726990 |
| 127 | 2380 | 2 | 624900 | 2380 | 2 | 624900 |
| 128 | 3990 | 4 | 915000 | 3990 | 4 | 915000 |

| | | | | | | |
|-----|------|---|---------|------|---|---------|
| 129 | 4990 | 4 | 915000 | 4990 | 4 | 915000 |
| 130 | 4240 | 4 | 915000 | 4240 | 4 | 915000 |
| 131 | 3090 | 4 | 768950 | 3090 | 4 | 768950 |
| 132 | 2570 | 4 | 679950 | 2570 | 4 | 679950 |
| 133 | 2310 | 3 | 670676 | 2310 | 3 | 670676 |
| 134 | 2870 | 5 | 650000 | 2870 | 5 | 650000 |
| 135 | 2640 | 3 | 642470 | 2640 | 3 | 642470 |
| 136 | 3110 | 4 | 750000 | 3110 | 4 | 750000 |
| 137 | 2890 | 5 | 665000 | 2890 | 5 | 665000 |
| 138 | 2080 | 4 | 620000 | 2080 | 4 | 620000 |
| 139 | 3360 | 3 | 1032209 | 3360 | 3 | 1032209 |
| 140 | 4080 | 4 | 924950 | 4080 | 4 | 924950 |
| 141 | 3220 | 5 | 739990 | 3220 | 5 | 739990 |
| 142 | 2980 | 5 | 679990 | 2980 | 5 | 679990 |
| 143 | 6050 | 6 | 1425000 | 6050 | 6 | 1425000 |
| 144 | 2620 | 4 | 760000 | 2620 | 4 | 760000 |
| 145 | 4630 | 5 | 1369900 | 4630 | 5 | 1369900 |
| 146 | 3360 | 3 | 1000000 | 3360 | 3 | 1000000 |
| 147 | 2840 | 3 | 634000 | 2840 | 3 | 634000 |
| 148 | 6310 | 4 | 2500000 | 6310 | 4 | 2500000 |
| 149 | 4060 | 4 | 1195000 | 4060 | 4 | 1195000 |
| 150 | 3220 | 4 | 668000 | 3220 | 4 | 668000 |
| 151 | 5080 | 4 | 2169000 | 5080 | 4 | 2169000 |
| 152 | 2850 | 4 | 799950 | 2850 | 4 | 799950 |

| | | | | | | |
|-----|------|---|---------|------|---|---------|
| 153 | 2270 | 4 | 689950 | 2270 | 4 | 689950 |
| 154 | 2300 | 3 | 659900 | 2300 | 3 | 659900 |
| 155 | 2470 | 4 | 625000 | 2470 | 4 | 625000 |
| 156 | 3300 | 3 | 750000 | 3300 | 3 | 750000 |
| 157 | 2170 | 2 | 647400 | 2170 | 2 | 647400 |
| 158 | 4070 | 4 | 1175000 | 4070 | 4 | 1175000 |
| 159 | 3930 | 4 | 1092000 | 3930 | 4 | 1092000 |
| 160 | 2730 | 4 | 905000 | 2730 | 4 | 905000 |
| 161 | 3270 | 5 | 750270 | 3270 | 5 | 750270 |
| 162 | 2860 | 4 | 725000 | 2860 | 4 | 725000 |
| 163 | 2570 | 4 | 650000 | 2570 | 4 | 650000 |
| 164 | 2300 | 3 | 699950 | 2300 | 3 | 699950 |
| 165 | 3930 | 4 | 1025000 | 3930 | 4 | 1025000 |
| 166 | 2720 | 3 | 771408 | 2720 | 3 | 771408 |

[reached 'max' / getOption("max.print") -- omitted 6054 rows]

>

```
> housing_df3 <- data.frame(housing_df %>% select (square_feet_total_living, bedrooms, `Sale
Price`) %>% filter(`Sale Price` > 1100000))
```

```
> head(housing_df3)
```

| | square_feet_total_living | bedrooms | Sale.Price |
|---|--------------------------|----------|------------|
| 1 | 3740 | 4 | 1392000 |
| 2 | 5440 | 4 | 1445000 |
| 3 | 6610 | 4 | 1900000 |
| 4 | 4640 | 5 | 1520000 |
| 5 | 660 | 0 | 1390000 |

```
6          3280    3  1390000
```

```
> housing_df4 <- data.frame(housing_df %>% select (square_feet_total_living, bedrooms, `Sale  
Price`) %>% filter(bedrooms > 6))
```

```
> head(housing_df4)
```

```
square_feet_total_living bedrooms Sale.Price  
1          5200    9  413000  
2          8490    7  350000  
3          6230    8  1185000  
4          2760    7   609900  
5          6340   10   450000  
6          2260    7   225000
```

```
> housisng_df_rbind <- rbind(housing_df3, housing_df4)
```

```
> housisng_df_rbind
```

```
square_feet_total_living bedrooms Sale.Price  
1          3740    4  1392000  
2          5440    4  1445000  
3          6610    4  1900000  
4          4640    5  1520000  
5           660    0  1390000  
6          3280    3  1390000  
7          5350    4  1380000  
8          4240    4  1300000  
9          3360    2  1588359  
10         3480    3  1450000  
11          900    2  1450000
```

| | | | |
|----|------|---|---------|
| 12 | 3540 | 4 | 1490000 |
| 13 | 6050 | 6 | 1425000 |
| 14 | 6050 | 6 | 1425000 |
| 15 | 4630 | 5 | 1369900 |
| 16 | 6310 | 4 | 2500000 |
| 17 | 4060 | 4 | 1195000 |
| 18 | 5080 | 4 | 2169000 |
| 19 | 4070 | 4 | 1175000 |
| 20 | 4090 | 4 | 1130000 |
| 21 | 2800 | 3 | 1174477 |
| 22 | 3320 | 4 | 1534000 |
| 23 | 4330 | 4 | 1389900 |
| 24 | 5200 | 4 | 1455000 |
| 25 | 3280 | 4 | 1125000 |
| 26 | 5640 | 4 | 1650000 |
| 27 | 3280 | 4 | 1125000 |
| 28 | 6680 | 4 | 1968000 |
| 29 | 4160 | 4 | 1219000 |
| 30 | 5030 | 4 | 1768000 |
| 31 | 8090 | 4 | 2569000 |
| 32 | 5750 | 4 | 1879000 |
| 33 | 4710 | 4 | 2583000 |
| 34 | 4420 | 4 | 1540000 |
| 35 | 4840 | 4 | 1250000 |

| | | | |
|----|------|---|---------|
| 36 | 5270 | 4 | 1150000 |
| 37 | 4800 | 4 | 1475000 |
| 38 | 3940 | 4 | 1265000 |
| 39 | 5730 | 6 | 1772500 |
| 40 | 6010 | 4 | 1875000 |
| 41 | 4650 | 5 | 1650000 |
| 42 | 5270 | 4 | 3000000 |
| 43 | 4720 | 4 | 1295000 |
| 44 | 6360 | 4 | 1650000 |
| 45 | 3470 | 3 | 1595000 |
| 46 | 4230 | 4 | 1434000 |
| 47 | 6230 | 8 | 1185000 |
| 48 | 4250 | 4 | 1295000 |
| 49 | 6340 | 5 | 1750000 |
| 50 | 2410 | 2 | 1262500 |
| 51 | 3624 | 4 | 1165000 |
| 52 | 4640 | 4 | 1660000 |
| 53 | 2800 | 3 | 1299950 |
| 54 | 6050 | 4 | 1818026 |
| 55 | 2960 | 4 | 1315000 |
| 56 | 5340 | 6 | 1230000 |
| 57 | 3560 | 4 | 1100950 |
| 58 | 3360 | 2 | 1303636 |
| 59 | 4770 | 5 | 1180000 |

| | | | |
|----|------|---|---------|
| 60 | 4840 | 4 | 1350000 |
| 61 | 4330 | 4 | 1200000 |
| 62 | 4580 | 4 | 1300000 |
| 63 | 4910 | 4 | 1725000 |
| 64 | 4520 | 4 | 1188000 |
| 65 | 2800 | 3 | 1350000 |
| 66 | 6970 | 4 | 1580000 |
| 67 | 2800 | 4 | 1316000 |
| 68 | 6970 | 4 | 1580000 |
| 69 | 5020 | 4 | 1189000 |
| 70 | 6280 | 4 | 1105000 |
| 71 | 4410 | 4 | 1180000 |
| 72 | 2640 | 5 | 1340000 |
| 73 | 3530 | 4 | 1168000 |
| 74 | 4560 | 4 | 1620000 |
| 75 | 4480 | 4 | 1287500 |
| 76 | 5400 | 5 | 1600000 |
| 77 | 4260 | 4 | 1175000 |
| 78 | 3820 | 4 | 1181950 |
| 79 | 4770 | 5 | 1217000 |
| 80 | 6310 | 3 | 1450000 |
| 81 | 2680 | 2 | 1150000 |
| 82 | 5360 | 4 | 2235000 |
| 83 | 3970 | 4 | 1229302 |

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|-----|-------|---|---------|
| 84 | 4260 | 5 | 1350000 |
| 85 | 3360 | 3 | 1125000 |
| 86 | 10630 | 5 | 2988000 |
| 87 | 4240 | 4 | 1314574 |
| 88 | 4920 | 4 | 1230000 |
| 89 | 5300 | 4 | 2493000 |
| 90 | 3090 | 3 | 1600000 |
| 91 | 550 | 1 | 1600000 |
| 92 | 3830 | 5 | 2625000 |
| 93 | 3330 | 4 | 2625000 |
| 94 | 3480 | 4 | 2625000 |
| 95 | 3370 | 4 | 2625000 |
| 96 | 3350 | 4 | 2625000 |
| 97 | 4080 | 6 | 2625000 |
| 98 | 3690 | 5 | 2625000 |
| 99 | 2620 | 2 | 1250000 |
| 100 | 3760 | 4 | 1160000 |
| 101 | 3760 | 4 | 1160000 |
| 102 | 5310 | 4 | 1862000 |
| 103 | 3420 | 3 | 1384950 |
| 104 | 900 | 1 | 1384950 |
| 105 | 3300 | 5 | 1150000 |
| 106 | 4790 | 4 | 1475000 |
| 107 | 5020 | 4 | 1975000 |

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|-----|------|----|---------|
| 108 | 2590 | 5 | 1180000 |
| 109 | 2820 | 3 | 1787000 |
| 110 | 3130 | 4 | 1678000 |
| 111 | 4410 | 4 | 1220000 |
| 112 | 5100 | 4 | 1740000 |
| 113 | 5100 | 4 | 1740000 |
| 114 | 5170 | 4 | 1210000 |
| 115 | 4320 | 5 | 1200000 |
| 116 | 5290 | 3 | 1830000 |
| 117 | 1540 | 3 | 1651000 |
| 118 | 4630 | 4 | 1405000 |
| 119 | 4220 | 4 | 1274950 |
| 120 | 4630 | 4 | 1405000 |
| 121 | 4460 | 5 | 1425000 |
| 122 | 3200 | 3 | 1640000 |
| 123 | 310 | 0 | 1640000 |
| 124 | 4220 | 4 | 1280000 |
| 125 | 3970 | 5 | 1149950 |
| 126 | 4740 | 4 | 1500000 |
| 127 | 2695 | 3 | 1268000 |
| 128 | 2980 | 3 | 1710000 |
| 129 | 4340 | 4 | 1250000 |
| 130 | 3850 | 4 | 1140000 |
| 131 | 7980 | 11 | 1825000 |

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|-----|-------|---|---------|
| 132 | 3410 | 5 | 2590000 |
| 133 | 3660 | 4 | 2590000 |
| 134 | 4500 | 5 | 2590000 |
| 135 | 3480 | 4 | 2590000 |
| 136 | 3310 | 4 | 2590000 |
| 137 | 4340 | 5 | 2590000 |
| 138 | 4390 | 5 | 2590000 |
| 139 | 4710 | 5 | 2300000 |
| 140 | 5100 | 4 | 2300000 |
| 141 | 4910 | 4 | 2300000 |
| 142 | 5390 | 4 | 2598000 |
| 143 | 3740 | 4 | 1188800 |
| 144 | 6790 | 7 | 1990000 |
| 145 | 11810 | 7 | 3995000 |
| 146 | 5400 | 5 | 1850000 |
| 147 | 4310 | 4 | 1575000 |
| 148 | 4350 | 4 | 1265000 |
| 149 | 4760 | 4 | 1350000 |
| 150 | 4260 | 4 | 1130500 |
| 151 | 5520 | 4 | 1550000 |
| 152 | 6630 | 4 | 2081572 |
| 153 | 5320 | 4 | 2549000 |
| 154 | 4790 | 4 | 2080000 |
| 155 | 1290 | 2 | 1250000 |

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|-----|------|---|---------|
| 156 | 1920 | 5 | 1250000 |
| 157 | 2690 | 3 | 1250000 |
| 158 | 7360 | 6 | 2189000 |
| 159 | 1290 | 2 | 3175000 |
| 160 | 1290 | 2 | 3175000 |
| 161 | 1600 | 3 | 3175000 |
| 162 | 1740 | 3 | 3175000 |
| 163 | 1710 | 3 | 3175000 |
| 164 | 1740 | 3 | 3175000 |
| 165 | 1710 | 3 | 3175000 |
| 166 | 1460 | 3 | 3175000 |
| 167 | 1820 | 3 | 3175000 |
| 168 | 1840 | 3 | 3175000 |
| 169 | 1840 | 3 | 3175000 |
| 170 | 1600 | 3 | 3175000 |
| 171 | 1840 | 3 | 3175000 |
| 172 | 1600 | 3 | 3175000 |
| 173 | 1290 | 2 | 3175000 |
| 174 | 1290 | 2 | 3175000 |
| 175 | 1290 | 2 | 3175000 |
| 176 | 1290 | 2 | 3175000 |
| 177 | 1290 | 2 | 3175000 |
| 178 | 1290 | 2 | 3175000 |
| 179 | 1290 | 2 | 3175000 |

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|-----|------|---|---------|
| 180 | 1460 | 3 | 3175000 |
| 181 | 1710 | 3 | 3175000 |
| 182 | 1460 | 3 | 3175000 |
| 183 | 1740 | 3 | 3175000 |
| 184 | 1710 | 3 | 3175000 |
| 185 | 1710 | 3 | 3175000 |
| 186 | 1840 | 3 | 3175000 |
| 187 | 1840 | 3 | 3175000 |
| 188 | 1820 | 3 | 3175000 |
| 189 | 1290 | 2 | 3175000 |
| 190 | 1290 | 2 | 3175000 |
| 191 | 1290 | 2 | 3175000 |
| 192 | 1290 | 2 | 3175000 |
| 193 | 1290 | 2 | 3175000 |
| 194 | 4604 | 5 | 1750000 |
| 195 | 3805 | 4 | 1155000 |
| 196 | 4540 | 4 | 1300000 |
| 197 | 4800 | 4 | 1420000 |
| 198 | 4990 | 4 | 1580000 |
| 199 | 2280 | 3 | 1160000 |
| 200 | 3360 | 3 | 1177616 |
| 201 | 6200 | 4 | 1599000 |
| 202 | 1460 | 3 | 3150000 |
| 203 | 1600 | 3 | 3150000 |

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|-----|------|---|---------|
| 204 | 1840 | 3 | 3150000 |
| 205 | 1840 | 3 | 3150000 |
| 206 | 1460 | 3 | 3150000 |
| 207 | 1600 | 3 | 3150000 |
| 208 | 1840 | 3 | 3150000 |
| 209 | 1600 | 3 | 3150000 |
| 210 | 1740 | 3 | 3150000 |
| 211 | 1710 | 3 | 3150000 |
| 212 | 1460 | 3 | 3150000 |
| 213 | 1740 | 3 | 3150000 |
| 214 | 1830 | 3 | 3150000 |
| 215 | 1740 | 3 | 3150000 |
| 216 | 1290 | 2 | 3150000 |
| 217 | 1290 | 2 | 3150000 |
| 218 | 1290 | 2 | 3150000 |
| 219 | 1290 | 2 | 3150000 |
| 220 | 1290 | 2 | 3150000 |
| 221 | 1290 | 2 | 3150000 |
| 222 | 1290 | 2 | 3150000 |
| 223 | 1840 | 3 | 3150000 |
| 224 | 1600 | 3 | 3150000 |
| 225 | 1840 | 3 | 3150000 |
| 226 | 1710 | 3 | 3150000 |
| 227 | 1740 | 3 | 3150000 |

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|-----|------|---|---------|
| 228 | 1710 | 3 | 3150000 |
| 229 | 1840 | 4 | 3150000 |
| 230 | 1600 | 3 | 3150000 |
| 231 | 1840 | 3 | 3150000 |
| 232 | 1460 | 3 | 3150000 |
| 233 | 1290 | 2 | 3150000 |
| 234 | 1290 | 2 | 3150000 |
| 235 | 1290 | 2 | 3150000 |
| 236 | 3990 | 4 | 1175000 |
| 237 | 3980 | 4 | 2000000 |
| 238 | 5450 | 4 | 1340000 |
| 239 | 6380 | 6 | 2033000 |
| 240 | 3540 | 3 | 1200000 |
| 241 | 4640 | 4 | 1465000 |
| 242 | 3360 | 2 | 1174872 |
| 243 | 6610 | 4 | 1400000 |
| 244 | 4760 | 4 | 1510000 |
| 245 | 5390 | 4 | 1480000 |
| 246 | 4250 | 4 | 1202301 |
| 247 | 4930 | 4 | 1150000 |
| 248 | 4640 | 4 | 1119000 |
| 249 | 6690 | 5 | 1585000 |
| 250 | 4110 | 4 | 2000000 |
| 251 | 900 | 1 | 2000000 |

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|-----|------|---|---------|
| 252 | 5300 | 4 | 1518050 |
| 253 | 5300 | 4 | 1518050 |
| 254 | 5150 | 4 | 1250000 |
| 255 | 5470 | 4 | 1250000 |
| 256 | 5050 | 4 | 1600000 |
| 257 | 2690 | 3 | 1149542 |
| 258 | 5790 | 3 | 4400000 |
| 259 | 2410 | 3 | 4400000 |
| 260 | 5780 | 4 | 1675000 |
| 261 | 5850 | 4 | 1620000 |
| 262 | 1430 | 2 | 2300000 |
| 263 | 5330 | 4 | 2300000 |
| 264 | 5060 | 5 | 1260000 |
| 265 | 6310 | 4 | 1637500 |
| 266 | 5270 | 4 | 1160000 |
| 267 | 2900 | 3 | 1448000 |
| 268 | 2800 | 4 | 1169000 |
| 269 | 7640 | 5 | 2300000 |
| 270 | 5640 | 4 | 1715000 |
| 271 | 6980 | 5 | 1600000 |
| 272 | 890 | 1 | 1430000 |
| 273 | 4766 | 4 | 1430000 |
| 274 | 3420 | 3 | 1300000 |
| 275 | 900 | 1 | 1300000 |

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|-----|------|---|---------|
| 276 | 6010 | 4 | 1300000 |
| 277 | 6340 | 5 | 1295000 |
| 278 | 4210 | 4 | 1780000 |
| 279 | 3320 | 4 | 1407000 |
| 280 | 5830 | 4 | 1400000 |
| 281 | 4060 | 4 | 1400000 |
| 282 | 6310 | 4 | 1600000 |
| 283 | 3720 | 4 | 1395000 |
| 284 | 4870 | 5 | 1340000 |
| 285 | 5720 | 4 | 1250000 |
| 286 | 4330 | 4 | 1125000 |
| 287 | 6990 | 5 | 1715000 |
| 288 | 2960 | 4 | 1550000 |
| 289 | 3890 | 5 | 1550000 |
| 290 | 3830 | 5 | 1550000 |
| 291 | 3010 | 4 | 1550000 |
| 292 | 2960 | 4 | 1550000 |
| 293 | 2960 | 4 | 1550000 |
| 294 | 2950 | 5 | 1550000 |
| 295 | 3480 | 4 | 1550000 |
| 296 | 4950 | 5 | 1300000 |
| 297 | 5550 | 4 | 1870000 |
| 298 | 2880 | 3 | 1280000 |
| 299 | 5100 | 4 | 1230000 |

| | | | |
|-----|------|---|---------|
| 300 | 7120 | 4 | 1500000 |
| 301 | 4670 | 4 | 1220000 |
| 302 | 6280 | 4 | 1310000 |
| 303 | 5390 | 4 | 1450000 |
| 304 | 5190 | 4 | 1339400 |
| 305 | 5390 | 4 | 1450000 |
| 306 | 6280 | 5 | 1960000 |
| 307 | 3240 | 3 | 1200000 |
| 308 | 5200 | 4 | 1425000 |
| 309 | 5200 | 4 | 1425000 |
| 310 | 3560 | 5 | 1120000 |
| 311 | 5260 | 4 | 1500000 |
| 312 | 4910 | 4 | 1215700 |
| 313 | 4490 | 4 | 1150000 |
| 314 | 3320 | 4 | 2885000 |
| 315 | 3530 | 4 | 2885000 |
| 316 | 3720 | 4 | 2885000 |
| 317 | 3150 | 4 | 2885000 |
| 318 | 3340 | 5 | 2885000 |
| 319 | 3320 | 5 | 2885000 |
| 320 | 3340 | 5 | 2885000 |
| 321 | 3320 | 5 | 2885000 |
| 322 | 3060 | 4 | 2885000 |
| 323 | 3530 | 4 | 2885000 |

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|-----|------|---|---------|
| 324 | 5390 | 4 | 1355000 |
| 325 | 6340 | 4 | 1370000 |
| 326 | 6380 | 6 | 1230000 |
| 327 | 3290 | 4 | 4380542 |
| 328 | 2450 | 4 | 4380542 |
| 329 | 2750 | 4 | 4380542 |
| 330 | 3010 | 4 | 4380542 |
| 331 | 3200 | 5 | 4380542 |
| 332 | 3200 | 5 | 4380542 |
| 333 | 3620 | 5 | 4380542 |

[reached 'max' / getOption("max.print") -- omitted 392 rows]

>

>

> #Split a string, then concatenate the results back together

> library(stringr)

> midwest <- c(

+ "Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri",

+ "Nebraska, North Dakota, Ohio, South Dakota, Wisconsin"

+)

> midwest

[1] "Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri" "Nebraska, North Dakota, Ohio, South Dakota, Wisconsin"

> midwest_list <- strsplit(midwest,split=",")[[1]]

> midwest_list

[1] "Illinois" " Indiana" " Iowa" " Kansas" " Michigan" " Minnesota" " Missouri"

```
> paste(midwest_list,collapse=",")  
[1] "Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri"  
>
```