Assignment 1

44

```
rm(list=ls())
library(tidyverse)
```

```
Warning: package 'tidyverse' was built under R version 4.2.2
```

```
-- Attaching packages --------------------------------------- tidyverse 1.3.2 --
v ggplot2 3.4.0     v purrr   0.3.4
v tibble  3.1.8     v dplyr   1.0.9
v tidyr   1.2.0     v stringr 1.4.0
v readr   2.1.2     v forcats 0.5.1
```

```
Warning: package 'ggplot2' was built under R version 4.2.2
```

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

```
library(zoo)
```

```
Warning: package 'zoo' was built under R version 4.2.2
```

```

Attaching package: 'zoo'

The following objects are masked from 'package:base':

    as.Date, as.Date.numeric
```

```
#importing data, tyding up and converting the necesary varible.

lower_troposphere <- read_table("http://vortex.nsstc.uah.edu/data/msu/v6.0/tlt/uahncdc_lt_
```

```
Warning: Duplicated column names deduplicated: 'Land' => 'Land_1' [7], 'Ocean'
=> 'Ocean_1' [8], 'Land' => 'Land_2' [10], 'Ocean' => 'Ocean_2' [11], 'Land' =>
'Land_3' [13], 'Ocean' => 'Ocean_3' [14], 'Land' => 'Land_4' [16], 'Ocean' =>
'Ocean_4' [17], 'Land' => 'Land_5' [19], 'Ocean' => 'Ocean_5' [20], 'Land' =>
'Land_6' [22], 'Ocean' => 'Ocean_6' [23], 'Land' => 'Land_7' [25], 'Ocean' =>
'Ocean_7' [26]
```

```
-- Column specification --------------------------------------------------------
cols(
  .default = col_character()
)
i Use `spec()` for the full column specifications.
```

```
Warning: 11 parsing failures.
row col   expected     actual                                                    
532  -- 29 columns 1 columns  'http://vortex.nsstc.uah.edu/data/msu/v6.0/tlt/uahncdc_lt_6.0.t
533  -- 29 columns 28 columns 'http://vortex.nsstc.uah.edu/data/msu/v6.0/tlt/uahncdc_lt_6.0.t
534  -- 29 columns 1 columns  'http://vortex.nsstc.uah.edu/data/msu/v6.0/tlt/uahncdc_lt_6.0.t
535  -- 29 columns 7 columns  'http://vortex.nsstc.uah.edu/data/msu/v6.0/tlt/uahncdc_lt_6.0.t
536  -- 29 columns 7 columns  'http://vortex.nsstc.uah.edu/data/msu/v6.0/tlt/uahncdc_lt_6.0.t
... ... ......... ......... ...........................................................
See problems(...) for more details.
```

```
lower_troposphere <- lower_troposphere[1:which(lower_troposphere$Year %in% "Year")-1, ] %>
  mutate_at(vars(Globe), ~as.numeric(.))

mid_troposphere <- read_table("http://vortex.nsstc.uah.edu/data/msu/v6.0/tmt/uahncdc_mt_6.
```

```
Warning: Duplicated column names deduplicated: 'Land' => 'Land_1' [7], 'Ocean'
=> 'Ocean_1' [8], 'Land' => 'Land_2' [10], 'Ocean' => 'Ocean_2' [11], 'Land' =>
'Land_3' [13], 'Ocean' => 'Ocean_3' [14], 'Land' => 'Land_4' [16], 'Ocean' =>
'Ocean_4' [17], 'Land' => 'Land_5' [19], 'Ocean' => 'Ocean_5' [20], 'Land' =>
'Land_6' [22], 'Ocean' => 'Ocean_6' [23], 'Land' => 'Land_7' [25], 'Ocean' =>
'Ocean_7' [26]
```

```
-- Column specification --------------------------------------------------------
cols(
  .default = col_character()
)
i Use `spec()` for the full column specifications.

Warning: 11 parsing failures.
row col   expected     actual                                                                 
532  -- 29 columns 1 columns  'http://vortex.nsstc.uah.edu/data/msu/v6.0/tmt/uahncdc_mt_6.0.t
533  -- 29 columns 28 columns 'http://vortex.nsstc.uah.edu/data/msu/v6.0/tmt/uahncdc_mt_6.0.t
534  -- 29 columns 1 columns  'http://vortex.nsstc.uah.edu/data/msu/v6.0/tmt/uahncdc_mt_6.0.t
535  -- 29 columns 7 columns  'http://vortex.nsstc.uah.edu/data/msu/v6.0/tmt/uahncdc_mt_6.0.t
536  -- 29 columns 7 columns  'http://vortex.nsstc.uah.edu/data/msu/v6.0/tmt/uahncdc_mt_6.0.t
... ... .......... .......... ..........................................................
See problems(...) for more details.
```

```r
mid_troposphere <- mid_troposphere[1:which(mid_troposphere$Year %in% "Year")-1, ] %>%
  mutate_at(vars(Globe, Land, Ocean), ~as.numeric(.))

tropopause <- read_table("http://vortex.nsstc.uah.edu/data/msu/v6.0/ttp/uahncdc_tp_6.0.txt
```

```
Warning: Duplicated column names deduplicated: 'Land' => 'Land_1' [7], 'Ocean'
=> 'Ocean_1' [8], 'Land' => 'Land_2' [10], 'Ocean' => 'Ocean_2' [11], 'Land' =>
'Land_3' [13], 'Ocean' => 'Ocean_3' [14], 'Land' => 'Land_4' [16], 'Ocean' =>
'Ocean_4' [17], 'Land' => 'Land_5' [19], 'Ocean' => 'Ocean_5' [20], 'Land' =>
'Land_6' [22], 'Ocean' => 'Ocean_6' [23], 'Land' => 'Land_7' [25], 'Ocean' =>
'Ocean_7' [26]



-- Column specification --------------------------------------------------------
cols(
  .default = col_character()
)
i Use `spec()` for the full column specifications.

Warning: 11 parsing failures.
row col   expected     actual                                                                 
532  -- 29 columns 1 columns  'http://vortex.nsstc.uah.edu/data/msu/v6.0/ttp/uahncdc_tp_6.0.t
533  -- 29 columns 28 columns 'http://vortex.nsstc.uah.edu/data/msu/v6.0/ttp/uahncdc_tp_6.0.t
```

```
534  -- 29 columns 1 columns  'http://vortex.nsstc.uah.edu/data/msu/v6.0/ttp/uahncdc_tp_6.0.t
535  -- 29 columns 7 columns  'http://vortex.nsstc.uah.edu/data/msu/v6.0/ttp/uahncdc_tp_6.0.t
536  -- 29 columns 7 columns  'http://vortex.nsstc.uah.edu/data/msu/v6.0/ttp/uahncdc_tp_6.0.t
... ... ......... ......... ..........................................................
See problems(...) for more details.
```

```
tropopause <- tropopause[1:which(tropopause$Year %in% "Year")-1, ] %>%
  mutate_at(vars(Globe, Land, Ocean), ~as.numeric(.))

lower_stratosphere <- read_table("http://vortex.nsstc.uah.edu/data/msu/v6.0/tls/uahncdc_ls
```

```
Warning: Duplicated column names deduplicated: 'Land' => 'Land_1' [7], 'Ocean'
=> 'Ocean_1' [8], 'Land' => 'Land_2' [10], 'Ocean' => 'Ocean_2' [11], 'Land' =>
'Land_3' [13], 'Ocean' => 'Ocean_3' [14], 'Land' => 'Land_4' [16], 'Ocean' =>
'Ocean_4' [17], 'Land' => 'Land_5' [19], 'Ocean' => 'Ocean_5' [20], 'Land' =>
'Land_6' [22], 'Ocean' => 'Ocean_6' [23], 'Land' => 'Land_7' [25], 'Ocean' =>
'Ocean_7' [26]
```

```
-- Column specification --------------------------------------------------------
cols(
  .default = col_character()
)
i Use `spec()` for the full column specifications.
```

```
Warning: 13 parsing failures.
row col   expected     actual                                                    
504  -- 29 columns 28 columns 'http://vortex.nsstc.uah.edu/data/msu/v6.0/tls/uahncdc_ls_6.0.t
519  -- 29 columns 28 columns 'http://vortex.nsstc.uah.edu/data/msu/v6.0/tls/uahncdc_ls_6.0.t
532  -- 29 columns 1 columns  'http://vortex.nsstc.uah.edu/data/msu/v6.0/tls/uahncdc_ls_6.0.t
533  -- 29 columns 28 columns 'http://vortex.nsstc.uah.edu/data/msu/v6.0/tls/uahncdc_ls_6.0.t
534  -- 29 columns 1 columns  'http://vortex.nsstc.uah.edu/data/msu/v6.0/tls/uahncdc_ls_6.0.t
... ... ......... ......... ..........................................................
See problems(...) for more details.
```

```
lower_stratosphere <- lower_stratosphere[1:which(lower_stratosphere$Year %in% "Year")-1, ]
  mutate_at(vars(Globe, Land, Ocean), ~as.numeric(.))
```

```r
# filtring out everything before 1980, selecting the necesary
#vaiables and calculating the mean using Globe. Applying
#rollmean to Globalman to create the variable Average.

lower_stratosphere_mean <- lower_stratosphere %>%
  filter(Year > 1979) %>%
  select(Year, Mo, Globe) %>%
  group_by(Year) %>%
  summarize(Globalmean = mean(Globe)) %>%
  mutate(Average = rollmean(Globalmean, 1 : 44, allign = right))
```

```
Warning in k > n || anyNA(coredata(x)): 'length(x) = 44 > 1' in coercion to
'logical(1)'
```

```
Warning in floor((1 + k)/2):ceiling(n - k/2): numerical expression has 44
elements: only the first used
```

```
Warning in floor((1 + k)/2):ceiling(n - k/2): numerical expression has 44
elements: only the first used
```

```
Warning in k:n: numerical expression has 44 elements: only the first used
```

```
Warning in seq_len(n - k): first element used of 'length.out' argument
```

```
Warning in 1:k: numerical expression has 44 elements: only the first used
```

```r
lower_troposphere_mean <- lower_troposphere %>%
  filter(Year > 1979) %>%
  select(Year, Mo, Globe) %>%
  group_by(Year) %>%
  summarize(Globalmean = mean(Globe)) %>%
  mutate(Average = rollmean(Globalmean, 1 : 44, allign = right))
```

```
Warning in k > n || anyNA(coredata(x)): 'length(x) = 44 > 1' in coercion to
'logical(1)'
```

```
Warning in floor((1 + k)/2):ceiling(n - k/2): numerical expression has 44
elements: only the first used

Warning in floor((1 + k)/2):ceiling(n - k/2): numerical expression has 44
elements: only the first used

Warning in k:n: numerical expression has 44 elements: only the first used

Warning in seq_len(n - k): first element used of 'length.out' argument

Warning in 1:k: numerical expression has 44 elements: only the first used
```

```
mid_troposphere_mean <- mid_troposphere %>%
  filter(Year > 1979) %>%
  select(Year, Mo, Globe) %>%
  group_by(Year) %>%
  summarize(Globalmean = mean(Globe)) %>%
    mutate(Average = rollmean(Globalmean, 1 :  44, allign = right))
```

```
Warning in k > n || anyNA(coredata(x)): 'length(x) = 44 > 1' in coercion to
'logical(1)'

Warning in floor((1 + k)/2):ceiling(n - k/2): numerical expression has 44
elements: only the first used

Warning in floor((1 + k)/2):ceiling(n - k/2): numerical expression has 44
elements: only the first used

Warning in k:n: numerical expression has 44 elements: only the first used

Warning in seq_len(n - k): first element used of 'length.out' argument

Warning in 1:k: numerical expression has 44 elements: only the first used
```

```
tropopause_mean <- tropopause %>%
  filter(Year > 1979) %>%
  select (Year, Mo, Globe) %>%
  group_by(Year) %>%
```

```
  summarize(Globalmean = mean(Globe)) %>%
    mutate(Average = rollmean(Globalmean, 1  : 44, allign = right))
```

```
Warning in k > n || anyNA(coredata(x)): 'length(x) = 44 > 1' in coercion to
'logical(1)'
```

```
Warning in floor((1 + k)/2):ceiling(n - k/2): numerical expression has 44
elements: only the first used
```

```
Warning in floor((1 + k)/2):ceiling(n - k/2): numerical expression has 44
elements: only the first used
```

```
Warning in k:n: numerical expression has 44 elements: only the first used
```

```
Warning in seq_len(n - k): first element used of 'length.out' argument
```

```
Warning in 1:k: numerical expression has 44 elements: only the first used
```

```
#creating a new dataframe, cbinding the results from mean
#and roll mean, there after changing the names as to make
#the graph more tidy. Also making the datafram longer,
#making the graphing procsess easier.

df_tidy = lower_stratosphere_mean %>%
  cbind(lower_troposphere_mean$Globalmean) %>%
  cbind(lower_troposphere_mean$Average) %>%
  cbind(mid_troposphere_mean$Globalmean) %>%
  cbind(mid_troposphere_mean$Average) %>%
  cbind(tropopause_mean$Globalmean) %>%
  cbind(tropopause_mean$Average)

names(df_tidy) <- c("Year", "LSGM", "LSA", "LTGM", "LTA", "MTGA", "MTA", "TGM", "TA")

df_tall <- df_tidy%>%
  pivot_longer(- Year, names_to = "Var", values_to = "Temprature")
```

```
df_tall%>%
  ggplot(aes(x=Year, y= Temprature , color = Var)) +
  geom_line(col="lightblue") + geom_point(col="lightblue") +
```

```
    geom_hline(yintercept = mean(df_tall$Temprature), color="blue") +
     theme(axis.text.x = element_text(angle=90, vjust = 0.6)) +
    labs(title = "Atmospheric temprature changes the last 4-5 decades") +
    geom_smooth() +
    geom_point()
```

```
`geom_smooth()` using method = 'loess' and formula = 'y ~ x'
```