Homework 5

Setup

```
library(tidyverse)
```

```
## -- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
## v dplyr     1.1.4     v readr     2.1.5
## v forcats   1.0.0     v stringr   1.5.1
## v ggplot2   3.5.1     v tibble    3.2.1
## v lubridate 1.9.3     v tidyr     1.3.1
## v purrr     1.0.2
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```
library(datasets)
library(scales)
```

```
##
## Attaching package: 'scales'
##
## The following object is masked from 'package:purrr':
##
##     discard
##
## The following object is masked from 'package:readr':
##
##     col_factor
```

```
library(ggrepel)
```

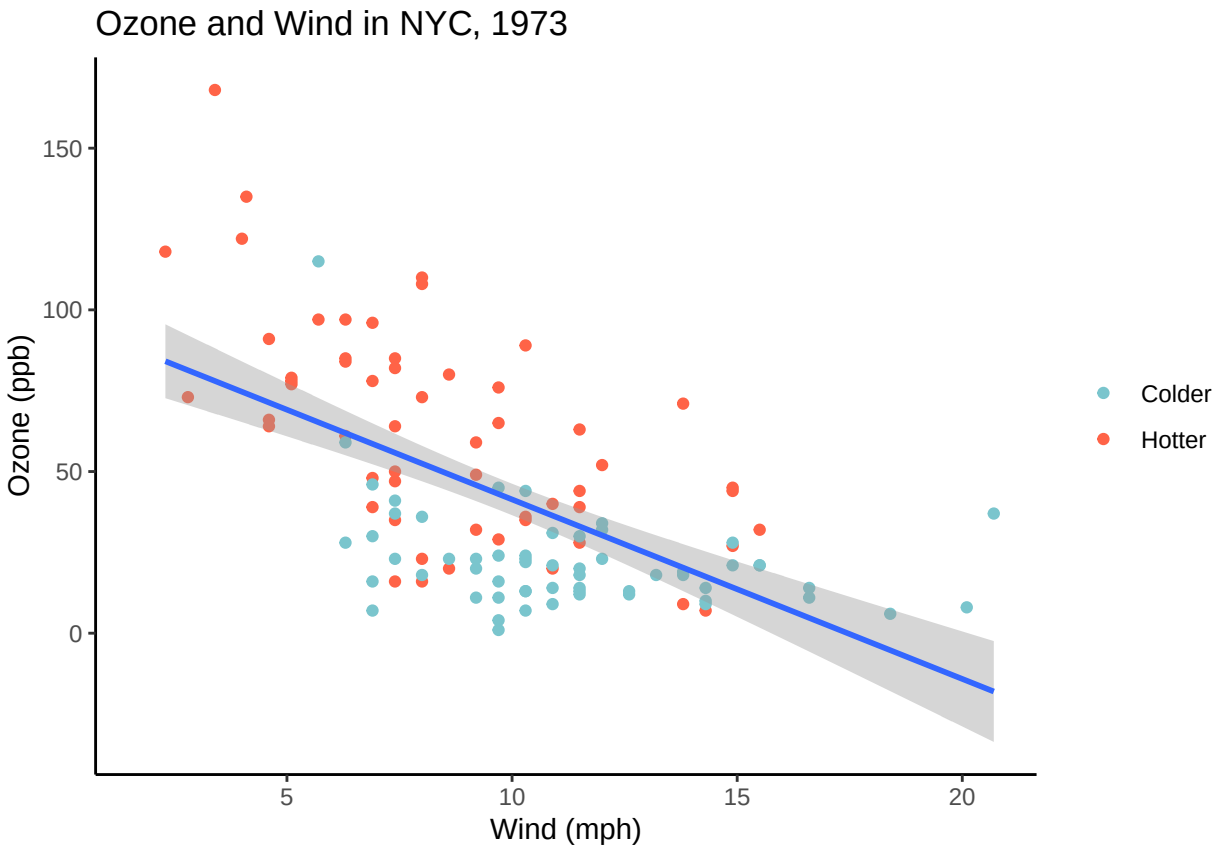
Problem 1

```
aqdata <- as_tibble(airquality)
tempData1 <- aqdata |> filter(Temp >= 80) |> mutate(Feels = 'Hotter')
tempData2 <- aqdata |> filter(Temp < 80) |> mutate(Feels = 'Colder')
aqdata <- rbind(tempData1, tempData2)
plot <- ggplot(aqdata, mapping = aes(x = Wind, y = Ozone, color=Feels))
plot + geom_point(aes()) +
       geom_smooth(method='lm', se = TRUE, col='#3366ff') +
       scale_color_manual(values = c("Colder" = "cadetblue3", "Hotter" = "tomato"), name=NULL) +
       labs(x = 'Wind (mph)', y = 'Ozone (ppb)', title='Ozone and Wind in NYC, 1973') +
       guides(fill=guide_legend(title='test')) +
       theme_classic()
```

```
## `geom_smooth()` using formula = 'y ~ x'
```

```
## Warning: Removed 37 rows containing non-finite outside the scale range
## (`stat_smooth()`).
```

```
## Warning: Removed 37 rows containing missing values or values outside the scale range
## (`geom_point()`).
```



Problem 2

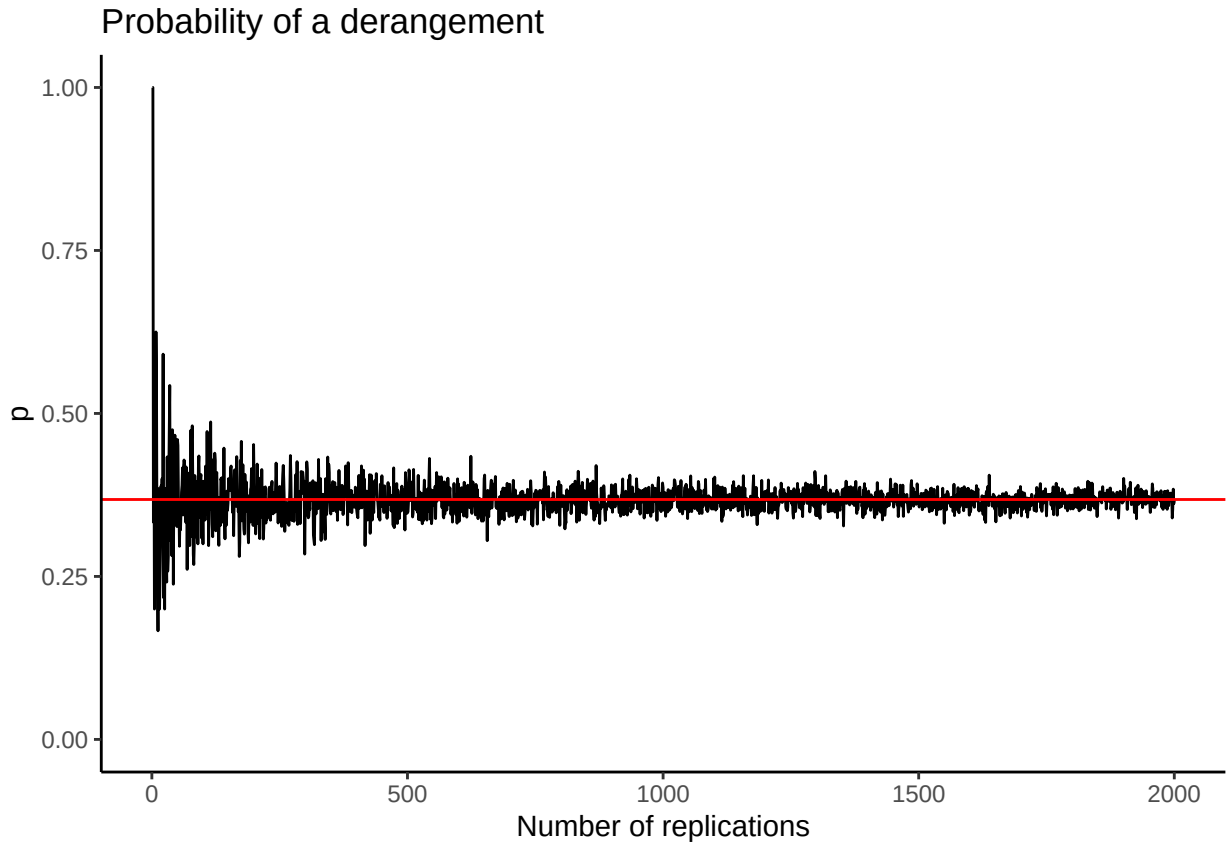
```
checkDerange <- function(sequence)
{
	for(i in 1:length(sequence))
	{
		if(i == sequence[i])
		{
			return(FALSE)
		}
	}
	return(TRUE)
}

trial <- function(numReps)
{
	values <- replicate(n=numReps, sample(1:100))
	isDerange = c()
	for(i in 1:numReps)
```

```
        {
                isDerange[i] = checkDerange(values[,i])
        }
        return(sum(isDerange)/length(isDerange))
}


plot_values = c()
for(i in 1:2000)
{
        plot_values[i] = trial(i)
}
plot_x = 1:2000
plot_2_df <- data.frame(plot_x, plot_values)

plot_2 <- ggplot(plot_2_df, mapping=aes(x = plot_x, plot_values))
plot_2 + geom_line() +
          geom_hline(yintercept=0.368, col='red') +
          labs(x = 'Number of replications', y = 'p', title = 'Probability of a derangement') +
          theme_classic() +
          coord_cartesian(ylim = c(0, 1.0))
```



Problem 3

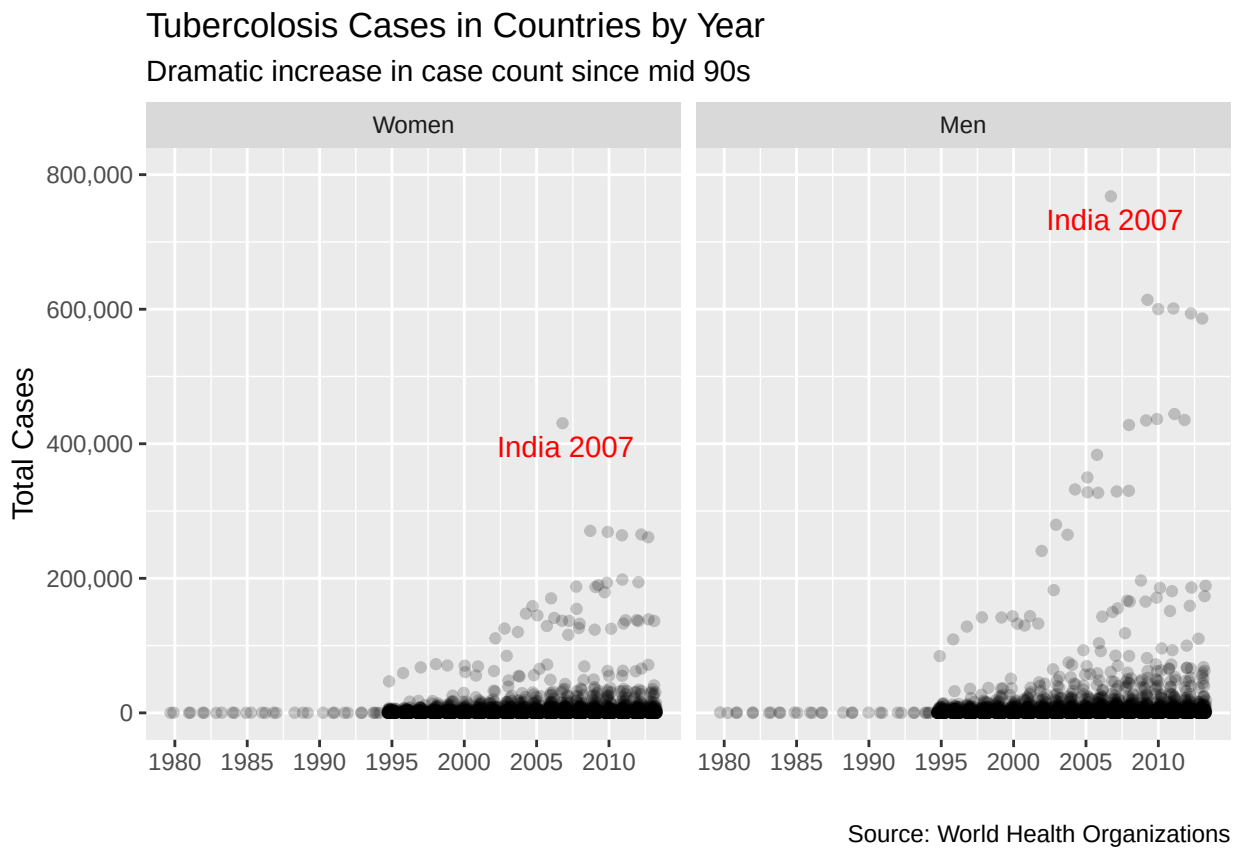
```
who_tidy <- who |>
  pivot_longer(cols = new_sp_m014:newrel_f65,
               names_to = "key",
               values_to = "cases",
               values_drop_na = TRUE) |>
  mutate(key = stringr::str_replace(key, "newrel", "new_rel")) |>
  separate(key, c("new", "type", "sexage"), sep = "_") |>
  select(-new, -iso2, -iso3) |>
  separate(sexage, c("sex", "age"), 1)
who_tidy
```

```
## # A tibble: 76,046 x 6
##    country      year type  sex   age   cases
##    <chr>       <dbl> <chr> <chr> <chr> <dbl>
##  1 Afghanistan  1997 sp    m     014       0
##  2 Afghanistan  1997 sp    m     1524     10
##  3 Afghanistan  1997 sp    m     2534      6
##  4 Afghanistan  1997 sp    m     3544      3
##  5 Afghanistan  1997 sp    m     4554      5
##  6 Afghanistan  1997 sp    m     5564      2
##  7 Afghanistan  1997 sp    m     65        0
##  8 Afghanistan  1997 sp    f     014       5
##  9 Afghanistan  1997 sp    f     1524     38
## 10 Afghanistan  1997 sp    f     2534     36
## # i 76,036 more rows
```

```
plot_3_tb <- who_tidy |> group_by(country, year, sex) |> summarise(numCases=sum(cases))
```

```
## `summarise()` has grouped output by 'country', 'year'. You can override using
## the `.groups` argument.
```

```
plot_3 <- ggplot(plot_3_tb, mapping=aes(x=year, y=numCases))
plot_3 + geom_jitter(aes(group=country), width=0.3, alpha=0.2) +
         geom_text_repel(data=filter(plot_3_tb, country=='India', year==2007), col='red', vjust=0, label
         facet_wrap(~sex, labeller=labeller(sex = c('f' = 'Women','m' = 'Men'))) +
         coord_cartesian(ylim=(c(0,800000))) +
         scale_y_continuous(labels=label_comma()) +
         scale_x_continuous(breaks = seq(1980, 2015, by = 5)) +
         labs(x='', y='Total Cases', title = 'Tubercolosis Cases in Countries by Year',
              subtitle = 'Dramatic increase in case count since mid 90s', caption = 'Source: World Healt
```



Problem 4

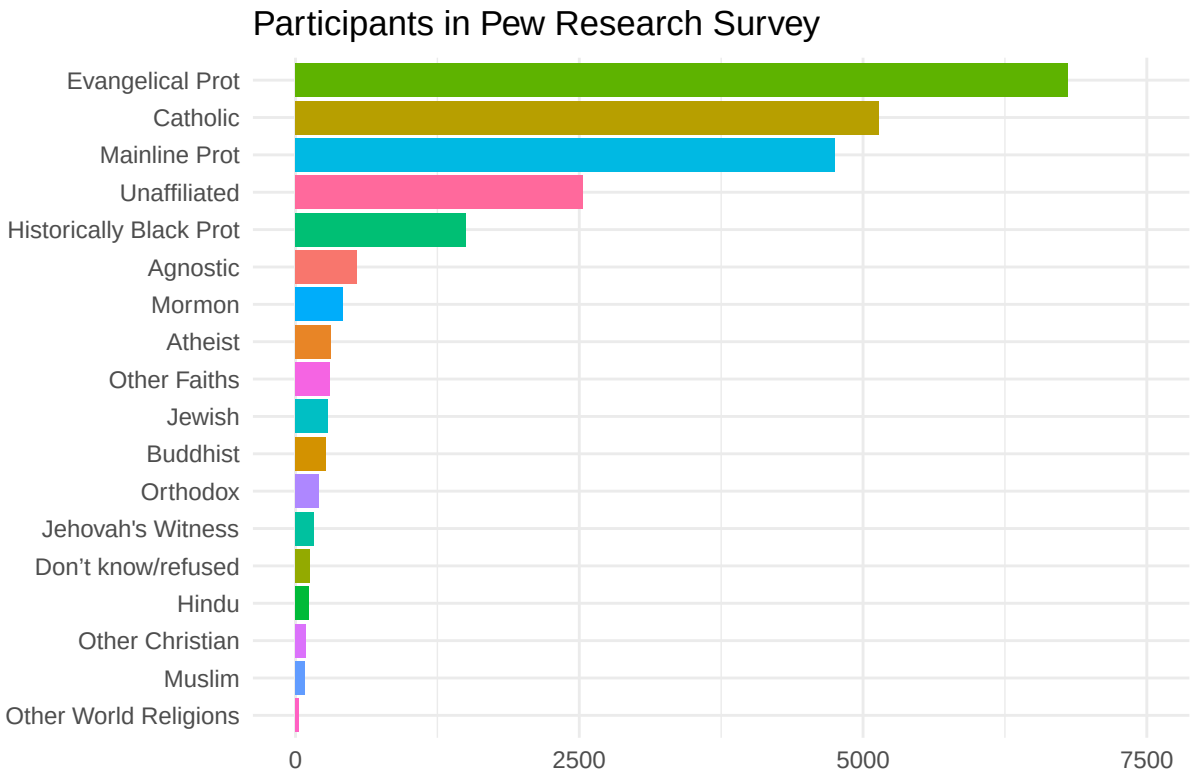
Part 1 The main issue with this dataset is that the column headers are values rather than variables. A tidy dataset would hold the values of these column headers under one variable/column.

Part 2

```
relig_income_tidy <- relig_income |> pivot_longer(cols = c('<$10k', '$10-20k', '$20-30k', '$30-40k', '$4
                                                  names_to = "income",
                                                  values_to = "frequency") |>
                                    select(religion, income, frequency)
```

Part 3

```
plot_4 <- ggplot(relig_income_tidy, mapping=aes(x=frequency, y=reorder(religion, frequency), fill=relig
plot_4  + geom_col() +
          guides(fill="none") +
          coord_cartesian(xlim=(c(0,7500))) +
          scale_x_continuous(breaks = seq(0,7500, by=2500)) +
          labs(x = '', y = '', title = 'Participants in Pew Research Survey', caption = 'Source: Pew Res
          theme_minimal()
```



Source: Pew Research Center