CDS HomeWork 6

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load packages

```
pacman::p_load(gapminder, tidyverse)
```

Loading data

```
dat <- gapminder
```

Question 1:

Define a defensive function that calculates the Gross Domestic Product of a nation from the data available in the gapminder dataset. Using that function, calculate the GDP of Denmark in the following years: 1967, 1977, 1987, 1997, 2007, and 2017.

Defensive function means that we should make sure the data input is numeric

```
calculate_gdp <- function(population, gdpPercapita) {
  stopifnot(is.numeric(population) & is.numeric(gdpPercapita))
  return(population * gdpPercapita)
}

dat %>%
  filter(year %in% c(1967, 1977, 1987, 1997, 2007, 2017), country == "Denmark") %>%
  mutate(total_gdp = calculate_gdp(pop, gdpPercap)) %>%
  select(year, total_gdp)
```

```
## # A tibble: 5 x 2
##    year     total_gdp
##   <int>         <dbl>
## 1  1967  77116977700.
## 2  1977 103920280028.
## 3  1987 128771236166.
## 4  1997 157476118456.
## 5  2007 192906627081.
```

Question 2

Write a script that loops over each country in the gapminder dataset, tests whether the country starts with a 'B' , and print out whether the life expectancy is smaller than 50, between 50 and 70, or greater than 70. (Hint: use the Control Flow tutorial as a guide here) In general, looping in R is slow and generally not recommended as R is a vectorized language. However, here is how to do it. I look at life expectancy in 2017

```
countries <- unique(dat$country)
dat2017 <- filter(dat, year == max(year))

for (land in countries) {
  life_expectancy <- dat2017 %>%
    filter(country == land) %>%
    pull(lifeExp)

  if (life_expectancy < 50) {
    print(paste0(land, "'s life expectancy is less than 50!"))
  }

  else if (between(life_expectancy, 50, 70)) {
    print(paste0(land, "'s life expectancy is between 50 and 70"))
  }

  else if (life_expectancy > 70) {
    print(paste0(land, "'s life expectancy is more than 70!"))
  }
}
```

```
## [1] "Afghanistan's life expectancy is less than 50!"
## [1] "Albania's life expectancy is more than 70!"
## [1] "Algeria's life expectancy is more than 70!"
## [1] "Angola's life expectancy is less than 50!"
## [1] "Argentina's life expectancy is more than 70!"
## [1] "Australia's life expectancy is more than 70!"
## [1] "Austria's life expectancy is more than 70!"
## [1] "Bahrain's life expectancy is more than 70!"
## [1] "Bangladesh's life expectancy is between 50 and 70"
## [1] "Belgium's life expectancy is more than 70!"
## [1] "Benin's life expectancy is between 50 and 70"
## [1] "Bolivia's life expectancy is between 50 and 70"
## [1] "Bosnia and Herzegovina's life expectancy is more than 70!"
## [1] "Botswana's life expectancy is between 50 and 70"
## [1] "Brazil's life expectancy is more than 70!"
## [1] "Bulgaria's life expectancy is more than 70!"
## [1] "Burkina Faso's life expectancy is between 50 and 70"
## [1] "Burundi's life expectancy is less than 50!"
## [1] "Cambodia's life expectancy is between 50 and 70"
## [1] "Cameroon's life expectancy is between 50 and 70"
## [1] "Canada's life expectancy is more than 70!"
## [1] "Central African Republic's life expectancy is less than 50!"
## [1] "Chad's life expectancy is between 50 and 70"
## [1] "Chile's life expectancy is more than 70!"
## [1] "China's life expectancy is more than 70!"
## [1] "Colombia's life expectancy is more than 70!"
```

```
## [1] "Comoros's life expectancy is between 50 and 70"
## [1] "Congo, Dem. Rep.'s life expectancy is less than 50!"
## [1] "Congo, Rep.'s life expectancy is between 50 and 70"
## [1] "Costa Rica's life expectancy is more than 70!"
## [1] "Cote d'Ivoire's life expectancy is less than 50!"
## [1] "Croatia's life expectancy is more than 70!"
## [1] "Cuba's life expectancy is more than 70!"
## [1] "Czech Republic's life expectancy is more than 70!"
## [1] "Denmark's life expectancy is more than 70!"
## [1] "Djibouti's life expectancy is between 50 and 70"
## [1] "Dominican Republic's life expectancy is more than 70!"
## [1] "Ecuador's life expectancy is more than 70!"
## [1] "Egypt's life expectancy is more than 70!"
## [1] "El Salvador's life expectancy is more than 70!"
## [1] "Equatorial Guinea's life expectancy is between 50 and 70"
## [1] "Eritrea's life expectancy is between 50 and 70"
## [1] "Ethiopia's life expectancy is between 50 and 70"
## [1] "Finland's life expectancy is more than 70!"
## [1] "France's life expectancy is more than 70!"
## [1] "Gabon's life expectancy is between 50 and 70"
## [1] "Gambia's life expectancy is between 50 and 70"
## [1] "Germany's life expectancy is more than 70!"
## [1] "Ghana's life expectancy is between 50 and 70"
## [1] "Greece's life expectancy is more than 70!"
## [1] "Guatemala's life expectancy is more than 70!"
## [1] "Guinea's life expectancy is between 50 and 70"
## [1] "Guinea-Bissau's life expectancy is less than 50!"
## [1] "Haiti's life expectancy is between 50 and 70"
## [1] "Honduras's life expectancy is more than 70!"
## [1] "Hong Kong, China's life expectancy is more than 70!"
## [1] "Hungary's life expectancy is more than 70!"
## [1] "Iceland's life expectancy is more than 70!"
## [1] "India's life expectancy is between 50 and 70"
## [1] "Indonesia's life expectancy is more than 70!"
## [1] "Iran's life expectancy is more than 70!"
## [1] "Iraq's life expectancy is between 50 and 70"
## [1] "Ireland's life expectancy is more than 70!"
## [1] "Israel's life expectancy is more than 70!"
## [1] "Italy's life expectancy is more than 70!"
## [1] "Jamaica's life expectancy is more than 70!"
## [1] "Japan's life expectancy is more than 70!"
## [1] "Jordan's life expectancy is more than 70!"
## [1] "Kenya's life expectancy is between 50 and 70"
## [1] "Korea, Dem. Rep.'s life expectancy is between 50 and 70"
## [1] "Korea, Rep.'s life expectancy is more than 70!"
## [1] "Kuwait's life expectancy is more than 70!"
## [1] "Lebanon's life expectancy is more than 70!"
## [1] "Lesotho's life expectancy is less than 50!"
## [1] "Liberia's life expectancy is less than 50!"
## [1] "Libya's life expectancy is more than 70!"
## [1] "Madagascar's life expectancy is between 50 and 70"
## [1] "Malawi's life expectancy is less than 50!"
## [1] "Malaysia's life expectancy is more than 70!"
## [1] "Mali's life expectancy is between 50 and 70"
```

```
## [1] "Mauritania's life expectancy is between 50 and 70"
## [1] "Mauritius's life expectancy is more than 70!"
## [1] "Mexico's life expectancy is more than 70!"
## [1] "Mongolia's life expectancy is between 50 and 70"
## [1] "Montenegro's life expectancy is more than 70!"
## [1] "Morocco's life expectancy is more than 70!"
## [1] "Mozambique's life expectancy is less than 50!"
## [1] "Myanmar's life expectancy is between 50 and 70"
## [1] "Namibia's life expectancy is between 50 and 70"
## [1] "Nepal's life expectancy is between 50 and 70"
## [1] "Netherlands's life expectancy is more than 70!"
## [1] "New Zealand's life expectancy is more than 70!"
## [1] "Nicaragua's life expectancy is more than 70!"
## [1] "Niger's life expectancy is between 50 and 70"
## [1] "Nigeria's life expectancy is less than 50!"
## [1] "Norway's life expectancy is more than 70!"
## [1] "Oman's life expectancy is more than 70!"
## [1] "Pakistan's life expectancy is between 50 and 70"
## [1] "Panama's life expectancy is more than 70!"
## [1] "Paraguay's life expectancy is more than 70!"
## [1] "Peru's life expectancy is more than 70!"
## [1] "Philippines's life expectancy is more than 70!"
## [1] "Poland's life expectancy is more than 70!"
## [1] "Portugal's life expectancy is more than 70!"
## [1] "Puerto Rico's life expectancy is more than 70!"
## [1] "Reunion's life expectancy is more than 70!"
## [1] "Romania's life expectancy is more than 70!"
## [1] "Rwanda's life expectancy is less than 50!"
## [1] "Sao Tome and Principe's life expectancy is between 50 and 70"
## [1] "Saudi Arabia's life expectancy is more than 70!"
## [1] "Senegal's life expectancy is between 50 and 70"
## [1] "Serbia's life expectancy is more than 70!"
## [1] "Sierra Leone's life expectancy is less than 50!"
## [1] "Singapore's life expectancy is more than 70!"
## [1] "Slovak Republic's life expectancy is more than 70!"
## [1] "Slovenia's life expectancy is more than 70!"
## [1] "Somalia's life expectancy is less than 50!"
## [1] "South Africa's life expectancy is less than 50!"
## [1] "Spain's life expectancy is more than 70!"
## [1] "Sri Lanka's life expectancy is more than 70!"
## [1] "Sudan's life expectancy is between 50 and 70"
## [1] "Swaziland's life expectancy is less than 50!"
## [1] "Sweden's life expectancy is more than 70!"
## [1] "Switzerland's life expectancy is more than 70!"
## [1] "Syria's life expectancy is more than 70!"
## [1] "Taiwan's life expectancy is more than 70!"
## [1] "Tanzania's life expectancy is between 50 and 70"
## [1] "Thailand's life expectancy is more than 70!"
## [1] "Togo's life expectancy is between 50 and 70"
## [1] "Trinidad and Tobago's life expectancy is between 50 and 70"
## [1] "Tunisia's life expectancy is more than 70!"
## [1] "Turkey's life expectancy is more than 70!"
## [1] "Uganda's life expectancy is between 50 and 70"
## [1] "United Kingdom's life expectancy is more than 70!"
```

```
## [1] "United States's life expectancy is more than 70!"
## [1] "Uruguay's life expectancy is more than 70!"
## [1] "Venezuela's life expectancy is more than 70!"
## [1] "Vietnam's life expectancy is more than 70!"
## [1] "West Bank and Gaza's life expectancy is more than 70!"
## [1] "Yemen, Rep.'s life expectancy is between 50 and 70"
## [1] "Zambia's life expectancy is less than 50!"
## [1] "Zimbabwe's life expectancy is less than 50!"
```

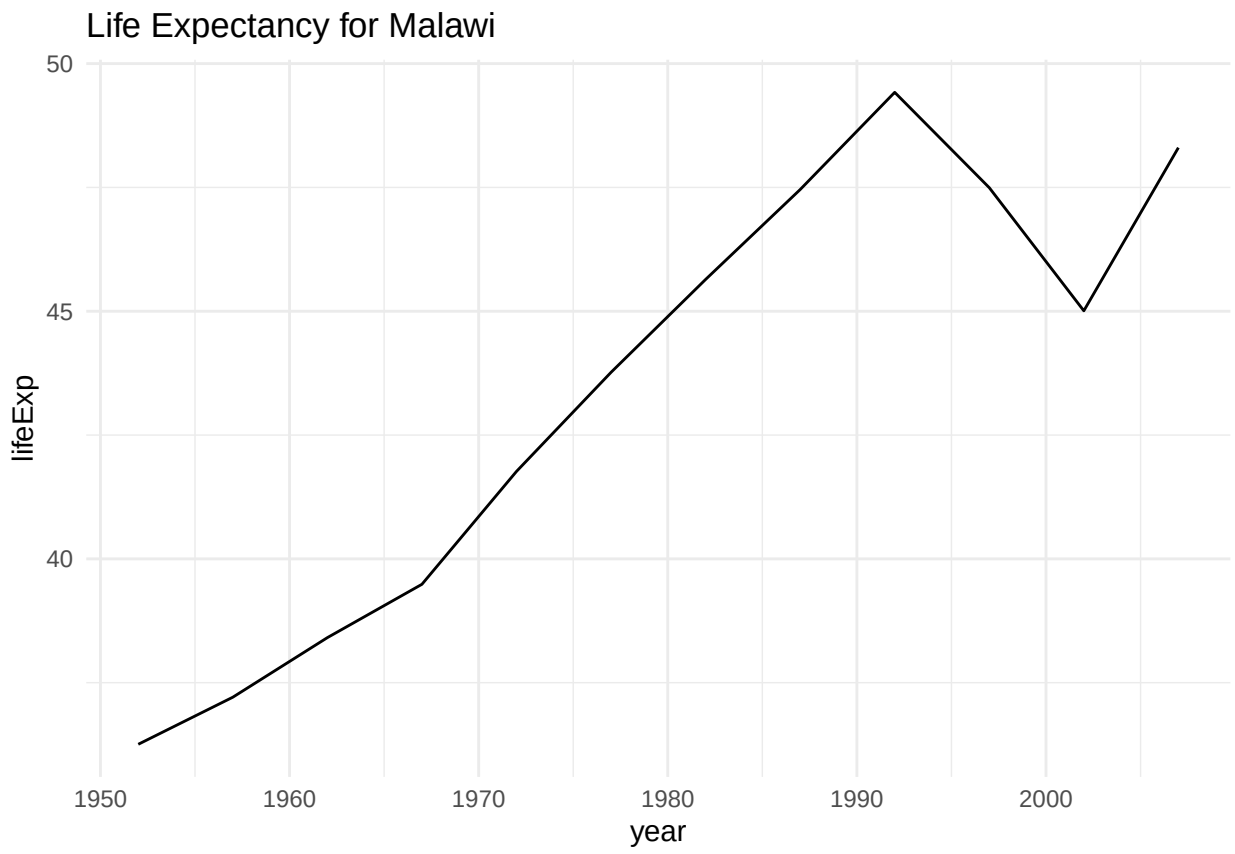
Question 3

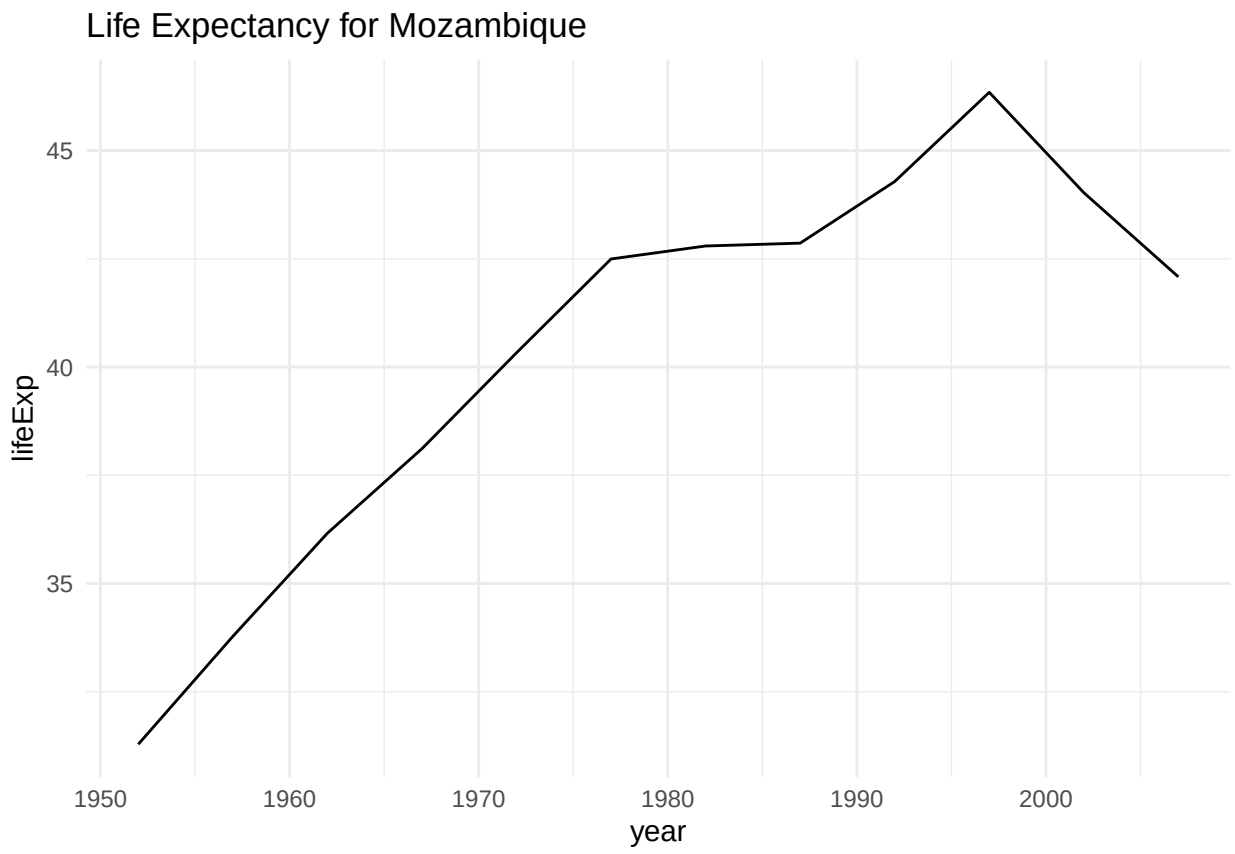
Challenge/Optional: Write a script that loops over each country in the gapminder dataset, tests whether the country starts with a 'M' and graphs life expectancy against time (using plot() function) as a line graph if the mean life expectancy is under 50 years.

```
for (land in countries) {
  # Find only rows with that country
  country_dat <- dat %>%
    filter(country == land)

  # Get the latest life expectancy
  life_expectancy <- country_dat %>%
    filter(year == max(year)) %>%
    pull(lifeExp)

  # Checks starts with M and low life expectancy
  if (str_detect(land, "^M") & (life_expectancy < 50)) {
    country_plot <- country_dat %>%
      ggplot(aes(x=year, y=lifeExp)) +
      geom_line() +
      labs(title = paste0("Life Expectancy for ", land)) +
      theme_minimal()
    plot(country_plot)
  }
}
```


Life Expectancy for Malawi
50
45
40
lifeExp
1950
1960
1970
1980
1990
2000
year


Life Expectancy for Mozambique
lifeExp
45
40
35
1950
1960
1970
1980
1990
2000
year