

Exercises Day 2

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Load the data

Load the `gapminder` dataset.

Answer

```
gapminder <- read.csv(here::here("data/gapminder5.csv"), stringsAsFactors=FALSE)
```

If Statement

Use an `if()` statement to print a suitable message reporting whether there are any records from 2002 in the `gapminder` dataset. Now do the same for 2012.

Hint: use the `any` function.

Answer

```
year<-2002
if(any(gapminder$year == year)){
  print(paste("Record(s) for the year",year,"found."))
} else {
  print(paste("No records for year",year))
}
```

```
## [1] "Record(s) for the year 2002 found."
```

Loop and If Statements

Write a script that finds the mean life expectancy by country for countries whose population is below the mean for the dataset

Write a script that loops through the `gapminder` data by continent and prints out whether the mean life expectancy is smaller than 50, between 50 and 70, or greater than 70.

Answer

```
overall_mean <- mean(gapminder$pop)

for (i in unique(gapminder$country)) {
  country_mean <- mean(gapminder$pop[gapminder$country==i])

  if (country_mean < overall_mean) {
    mean_le <- mean(gapminder$lifeExp[gapminder$country==i])
    print(paste("Mean Life Expectancy in", i, "is", mean_le))
  }
} # end for loop
```

```

## [1] "Mean Life Expectancy in Afghanistan is 37.4788333333333"
## [1] "Mean Life Expectancy in Albania is 68.4329166666667"
## [1] "Mean Life Expectancy in Algeria is 59.0301666666667"
## [1] "Mean Life Expectancy in Angola is 37.8835"
## [1] "Mean Life Expectancy in Argentina is 69.0604166666667"
## [1] "Mean Life Expectancy in Australia is 74.6629166666667"
## [1] "Mean Life Expectancy in Austria is 73.10325"
## [1] "Mean Life Expectancy in Bahrain is 65.6056666666667"
## [1] "Mean Life Expectancy in Belgium is 73.64175"
## [1] "Mean Life Expectancy in Benin is 48.7799166666667"
## [1] "Mean Life Expectancy in Bolivia is 52.5045833333333"
## [1] "Mean Life Expectancy in Bosnia and Herzegovina is 67.7078333333333"
## [1] "Mean Life Expectancy in Botswana is 54.5975"
## [1] "Mean Life Expectancy in Bulgaria is 69.74375"
## [1] "Mean Life Expectancy in Burkina Faso is 44.694"
## [1] "Mean Life Expectancy in Burundi is 44.8173333333333"
## [1] "Mean Life Expectancy in Cambodia is 47.90275"
## [1] "Mean Life Expectancy in Cameroon is 48.1285"
## [1] "Mean Life Expectancy in Canada is 74.90275"
## [1] "Mean Life Expectancy in Central African Republic is 43.8669166666667"
## [1] "Mean Life Expectancy in Chad is 46.7735833333333"
## [1] "Mean Life Expectancy in Chile is 67.4309166666667"
## [1] "Mean Life Expectancy in Colombia is 63.89775"
## [1] "Mean Life Expectancy in Comoros is 52.38175"
## [1] "Mean Life Expectancy in Congo Rep. is 52.5019166666667"
## [1] "Mean Life Expectancy in Costa Rica is 70.1814166666667"
## [1] "Mean Life Expectancy in Cote d'Ivoire is 48.4361666666667"
## [1] "Mean Life Expectancy in Croatia is 70.0559166666667"
## [1] "Mean Life Expectancy in Cuba is 71.0450833333333"
## [1] "Mean Life Expectancy in Czech Republic is 71.5105"
## [1] "Mean Life Expectancy in Denmark is 74.3701666666667"
## [1] "Mean Life Expectancy in Djibouti is 46.38075"
## [1] "Mean Life Expectancy in Dominican Republic is 61.5545"
## [1] "Mean Life Expectancy in Ecuador is 62.8168333333333"
## [1] "Mean Life Expectancy in El Salvador is 59.6333333333333"
## [1] "Mean Life Expectancy in Equatorial Guinea is 42.96"
## [1] "Mean Life Expectancy in Eritrea is 45.99925"
## [1] "Mean Life Expectancy in Finland is 72.9919166666667"
## [1] "Mean Life Expectancy in Gabon is 51.2205"
## [1] "Mean Life Expectancy in Gambia is 44.4005833333333"
## [1] "Mean Life Expectancy in Ghana is 52.3406666666667"
## [1] "Mean Life Expectancy in Greece is 73.7331666666667"
## [1] "Mean Life Expectancy in Guatemala is 56.7294166666667"
## [1] "Mean Life Expectancy in Guinea is 43.2398333333333"
## [1] "Mean Life Expectancy in Guinea-Bissau is 39.21025"
## [1] "Mean Life Expectancy in Haiti is 50.16525"
## [1] "Mean Life Expectancy in Honduras is 57.9208333333333"
## [1] "Mean Life Expectancy in Hong Kong China is 73.4928333333333"
## [1] "Mean Life Expectancy in Hungary is 69.3931666666667"
## [1] "Mean Life Expectancy in Iceland is 76.5114166666667"
## [1] "Mean Life Expectancy in Iraq is 56.58175"
## [1] "Mean Life Expectancy in Ireland is 73.01725"
## [1] "Mean Life Expectancy in Israel is 73.6458333333333"
## [1] "Mean Life Expectancy in Jamaica is 68.7493333333333"

```

```

## [1] "Mean Life Expectancy in Jordan is 59.7864166666667"
## [1] "Mean Life Expectancy in Kenya is 52.681"
## [1] "Mean Life Expectancy in Korea Dem. Rep. is 63.6073333333333"
## [1] "Mean Life Expectancy in Kuwait is 68.9223333333333"
## [1] "Mean Life Expectancy in Lebanon is 65.8656666666667"
## [1] "Mean Life Expectancy in Lesotho is 50.0070833333333"
## [1] "Mean Life Expectancy in Liberia is 42.47625"
## [1] "Mean Life Expectancy in Libya is 59.3041666666667"
## [1] "Mean Life Expectancy in Madagascar is 47.7705833333333"
## [1] "Mean Life Expectancy in Malawi is 43.3515833333333"
## [1] "Mean Life Expectancy in Malaysia is 64.2795833333333"
## [1] "Mean Life Expectancy in Mali is 43.4135"
## [1] "Mean Life Expectancy in Mauritania is 52.3020833333333"
## [1] "Mean Life Expectancy in Mauritius is 64.95325"
## [1] "Mean Life Expectancy in Mongolia is 55.8903333333333"
## [1] "Mean Life Expectancy in Montenegro is 70.2991666666667"
## [1] "Mean Life Expectancy in Morocco is 57.6088333333333"
## [1] "Mean Life Expectancy in Mozambique is 40.3795"
## [1] "Mean Life Expectancy in Namibia is 53.4913333333333"
## [1] "Mean Life Expectancy in Nepal is 48.9863333333333"
## [1] "Mean Life Expectancy in Netherlands is 75.6485"
## [1] "Mean Life Expectancy in New Zealand is 73.9895"
## [1] "Mean Life Expectancy in Nicaragua is 58.3494166666667"
## [1] "Mean Life Expectancy in Niger is 44.5586666666667"
## [1] "Mean Life Expectancy in Norway is 75.843"
## [1] "Mean Life Expectancy in Oman is 58.4426666666667"
## [1] "Mean Life Expectancy in Panama is 67.80175"
## [1] "Mean Life Expectancy in Paraguay is 66.8090833333333"
## [1] "Mean Life Expectancy in Peru is 58.8593333333333"
## [1] "Mean Life Expectancy in Portugal is 70.4198333333333"
## [1] "Mean Life Expectancy in Puerto Rico is 72.7393333333333"
## [1] "Mean Life Expectancy in Reunion is 66.64425"
## [1] "Mean Life Expectancy in Romania is 68.2906666666667"
## [1] "Mean Life Expectancy in Rwanda is 41.4815833333333"
## [1] "Mean Life Expectancy in Sao Tome and Principe is 57.8963333333333"
## [1] "Mean Life Expectancy in Saudi Arabia is 58.67875"
## [1] "Mean Life Expectancy in Senegal is 50.6259166666667"
## [1] "Mean Life Expectancy in Serbia is 68.551"
## [1] "Mean Life Expectancy in Sierra Leone is 36.7691666666667"
## [1] "Mean Life Expectancy in Singapore is 71.22025"
## [1] "Mean Life Expectancy in Slovak Republic is 70.6960833333333"
## [1] "Mean Life Expectancy in Slovenia is 71.60075"
## [1] "Mean Life Expectancy in Somalia is 40.9886666666667"
## [1] "Mean Life Expectancy in Sri Lanka is 66.5260833333333"
## [1] "Mean Life Expectancy in Sudan is 48.4005"
## [1] "Mean Life Expectancy in Swaziland is 49.0024166666667"
## [1] "Mean Life Expectancy in Sweden is 76.177"
## [1] "Mean Life Expectancy in Switzerland is 75.5650833333333"
## [1] "Mean Life Expectancy in Syria is 61.3461666666667"
## [1] "Mean Life Expectancy in Taiwan is 70.3366666666667"
## [1] "Mean Life Expectancy in Tanzania is 47.9123333333333"
## [1] "Mean Life Expectancy in Togo is 51.49875"
## [1] "Mean Life Expectancy in Trinidad and Tobago is 66.828"
## [1] "Mean Life Expectancy in Tunisia is 60.721"

```

```
## [1] "Mean Life Expectancy in Uganda is 47.6188333333333"
## [1] "Mean Life Expectancy in Uruguay is 70.7815833333333"
## [1] "Mean Life Expectancy in Venezuela is 66.5806666666667"
## [1] "Mean Life Expectancy in West Bank and Gaza is 60.3286666666667"
## [1] "Mean Life Expectancy in Yemen Rep. is 46.7804166666667"
## [1] "Mean Life Expectancy in Zambia is 45.9963333333333"
## [1] "Mean Life Expectancy in Zimbabwe is 52.6631666666667"

lower_threshold <- 50
upper_threshold <- 70

for (i in unique(gapminder$continent)){
  tmp <- mean(gapminder$lifeExp[gapminder$continent==i])

  if (tmp < lower_threshold){
    print(paste("Average Life Expectancy in", i, "is less than", lower_threshold))
  }
  else if (tmp > lower_threshold & tmp < upper_threshold){
    print(paste("Average Life Expectancy in", i, "is between", lower_threshold, "and", upper_threshold))
  }
  else {
    print(paste("Average Life Expectancy in", i, "is greater than", upper_threshold))
  }
}

## [1] "Average Life Expectancy in Asia is between 50 and 70"
## [1] "Average Life Expectancy in Europe is greater than 70"
## [1] "Average Life Expectancy in Africa is less than 50"
## [1] "Average Life Expectancy in Americas is between 50 and 70"
## [1] "Average Life Expectancy in Oceania is greater than 70"
```

Writing Functions

Create a function that given a data frame will print the name of each column and the class of data it contains. Use the gapminder dataset. Hint: Use `mode()` or `class()` to get the class of the data in each column. Remember that `names()` or `colnames()` returns the name of the columns in a dataset.

Answer

Note: Some of these were taken or modified from <https://www.r-bloggers.com/functions-exercises/>

```
data_frame_info <- function(df) {
  cols <- names(df)
  for (i in cols) {
    print(paste0(i, ": ", mode(df[, i])))
  }
}

data_frame_info(gapminder)

## [1] "country: character"
## [1] "year: numeric"
## [1] "pop: numeric"
## [1] "continent: character"
## [1] "lifeExp: numeric"
## [1] "gdpPercap: numeric"
```

Create a function that given a vector will print the mean and the standard deviation of a **vector**, it will optionally also print the median. Hint: include an argument that takes a boolean (TRUE/FALSE) operator and then include an if statement.

Answer

```
vector_info <- function(x, include_median=FALSE) {  
  print(paste("Mean:", mean(x)))  
  print(paste("Standard Deviation:", sd(x)))  
  if (include_median) {  
    print(paste("Median:", median(x)))  
  }  
}
```

```
le <- gapminder$lifeExp  
vector_info(le, include_median = F)
```

```
## [1] "Mean: 59.4744393661972"  
## [1] "Standard Deviation: 12.9171074152412"
```

```
vector_info(le, include_median = T)
```

```
## [1] "Mean: 59.4744393661972"  
## [1] "Standard Deviation: 12.9171074152412"  
## [1] "Median: 60.7125"
```

Analyzing the relationship between GDP per capita and life expectancy

Use what you've learned so far to answer the following questions using the **gapminder** dataset. Be sure to include some visualizations!

1. What is the relationship between GDP per capita and life expectancy? Does this relationship change over time? (Hint: Use the natural log of both variables.)
2. Does the relationship between GDP per capita and life expectancy vary by continent? Make sure you divide the Americas into North and South America.