**Climate Change Exercises: Questions 1-7**

*This comprehensive assessment is available to verified learners only.*

**Background**

The planet's surface temperature is increasing as greenhouse gas emissions increase, and this global warming and carbon cycle disruption is wreaking havoc on natural systems. Living systems that depend on current temperature, weather, currents and carbon balance are jeopardized, and human society will be forced to contend with widespread economic, social, political and environmental damage as the temperature continues to rise. In these exercises, we examine the relationship between global temperature changes, greenhouse gases and human carbon emissions using time series of actual atmospheric and ice core measurements from the National Oceanic and Atmospheric Administration (NOAA) and Carbon Dioxide Information Analysis Center (CDIAC).

**Libraries and Data Import**

library(tidyverse)

library(dslabs)

data(temp\_carbon)

data(greenhouse\_gases)

data(historic\_co2)

*IMPORTANT:* These exercises use **dslabs** datasets that were added in a July 2019 update. Make sure your package is up to date with the command install.packages("dslabs"). You can also update all packages on your system by running update.packages() with no arguments, and you should consider doing this routinely.

You have used 1 of 2 attempts Some problems have options such as save, reset, hints, or show answer. These options follow the Submit button.

**Question 2**

3.0/3.0 points (graded)

Inspect the difference in carbon emissions in temp\_carbon from the first available year to the last available year.

What is the first year for which carbon emissions (carbon\_emissions) data are available? correct

1751 Loading

What is the last year for which carbon emissions data are available? correct

2014 Loading

How many times larger were carbon emissions in the last year relative to the first year? correct

3285 Loading

You have used 3 of 10 attempts Some problems have options such as save, reset, hints, or show answer. These options follow the Submit button.

**Question 3**

3.0/3.0 points (graded)

Inspect the difference in temperature in temp\_carbon from the first available year to the last available year.

What is the first year for which global temperature anomaly (temp\_anomaly) data are available? correct

1880 Loading

What is the last year for which global temperature anomaly data are available? correct

2018 Loading

How many degrees Celsius has temperature increased over the date range? Compare the temperatures in the most recent year versus the oldest year. correct

0.93 Loading

You have used 2 of 10 attempts Some problems have options such as save, reset, hints, or show answer. These options follow the Submit button.

**Question 4**

0/1 point (graded)

Create a time series line plot of the temperature anomaly. Only include years where temperatures are reported. Save this plot to the object p.

Which command adds a blue horizontal line indicating the 20th century mean temperature?



p <- p + geom\_vline(aes(xintercept = 0), col = "blue")



p <- p + geom\_hline(aes(y = 0), col = "blue")



p <- p + geom\_hline(aes(yintercept = 0, col = blue))



p <- p + geom\_hline(aes(yintercept = 0), col = "blue")

incorrect

Answer

Incorrect:

Try again. The color has not been specified correctly.

You have used 2 of 2 attempts Some problems have options such as save, reset, hints, or show answer. These options follow the Submit button.

**Question 5**

1/1 point (graded)

Continue working with p, the plot created in the previous question.

Change the y-axis label to be "Temperature anomaly (degrees C)". Add a title, "Temperature anomaly relative to 20th century mean, 1880-2018". Also add a text layer to the plot: the x-coordinate should be 2000, the y-coordinate should be 0.05, the text should be "20th century mean", and the text color should be blue.

Which of the following code blocks is correct?



p + ylab("Temperature anomaly (degrees C)") +

title("Temperature anomaly relative to 20th century mean, 1880-2018") +

geom\_text(aes(x = 2000, y = 0.05, label = "20th century mean", col = "blue"))



p + ylim("Temperature anomaly (degrees C)") +

ggtitle("Temperature anomaly relative to 20th century mean, 1880-2018") +

geom\_text(aes(x = 2000, y = 0.05, label = "20th century mean"), col = "blue")



p + ylab("Temperature anomaly (degrees C)") +

ggtitle("Temperature anomaly relative to 20th century mean, 1880-2018") +

geom\_text(aes(x = 2000, y = 0.05, label = "20th century mean", col = "blue"))



p + ylab("Temperature anomaly (degrees C)") +

ggtitle("Temperature anomaly relative to 20th century mean, 1880-2018") +

geom\_text(aes(x = 2000, y = 0.05, label = "20th century mean"), col = "blue")



p + ylab("Temperature anomaly (degrees C)") +

title("Temperature anomaly relative to 20th century mean, 1880-2018") +

geom\_text(aes(x = 2000, y = 0.05, label = "20th century mean"), col = "blue")

correct

You have used 1 of 2 attempts Some problems have options such as save, reset, hints, or show answer. These options follow the Submit button.

**Question 6**

1.0/3.0 points (graded)

Use the plot created in the last two exercises to answer the following questions. Answers within 5 years of the correct answer will be accepted.

When was the earliest year with a temperature above the 20th century mean? incorrect

2001 Loading

When was the last year with an average temperature below the 20th century mean? incorrect

1900 Loading

In what year did the temperature anomaly exceed 0.5 degrees Celsius for the first time? correct

1997 Loading

You have used 1 of 10 attempts Some problems have options such as save, reset, hints, or show answer. These options follow the Submit button.

**Question 7**

1.0/1.5 points (graded)

Add layers to the previous plot to include line graphs of the temperature anomaly in the ocean (ocean\_anomaly) and on land (land\_anomaly). Assign different colors to the lines. Compare the global temperature anomaly to the land temperature anomaly and ocean temperature anomaly.

Which region has the largest 2018 temperature anomaly relative to the 20th century mean?

correct

Which region has the largest change in temperature since 1880?

incorrect

Which region has a temperature anomaly pattern that more closely matches the global pattern?

correct

You have used 2 of 2 attempts Some problems have options such as save, reset, hints, or show answer. These options follow the Submit button.

The assessment continues on the following page. You will not need the temperature anomaly plot created above for future questions.