Gas That Will Make You Gasp!

Environmental Study of Air - MATHEMATICS

Essential Question	*How can we use carbon monoxide emissions data from various countries to suggest improvement on environmental air quality?*
Outcomes	• Students will be able to use data from charts and graphs to suggest improvement on air quality worldwide. • Students will be able to examine variables and percentage rate increase represented from charts and graphs. • Students will create, examine, analyze and develop equations to determine suggestions on improving air quality.
Standards Benchmarks identified in RED are priority benchmarks.	**Science Assessment Targets** **P.a.4** Sources of energy (e.g. sun, fossil fuels, nuclear) and the relationships between different sources (e.g. levels of pollution, amount of energy produced) **L.c.5** Disruption of ecosystems (e.g. invasive species, flooding, habitat destruction, decertification) and extinction (e.g. causes [human and natural] and effects. **Math Content Standards** **A.3.16** Use variables to represent two quantities in a real-world problem that changes in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. *For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation* d = 65t *to represent the relationship between distance and time.* (6.EE.9) **N.4.12** Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error. (7.RP.3) [Also see 7.G.1 and G.MG.2]

STEM Focus	□ Science □ Technology □ Engineering X Mathematics

TEACHERS: this content was designed for ABE/ASE students. Instructional scaffolding used in this lesson can be beneficial for multilingual students.

Because adult classrooms are multi-level, teachers will want to differentiate this HyperDoc by accommodating the different ways that students learn by using scaffolding strategies and appropriate leveled materials. Teachers will want to vary the instructional activities based on their student's needed skills.

For more information about collaborating and sharing on Google Drive, check out videos 36-45: Google Junior Training series - YouTube.

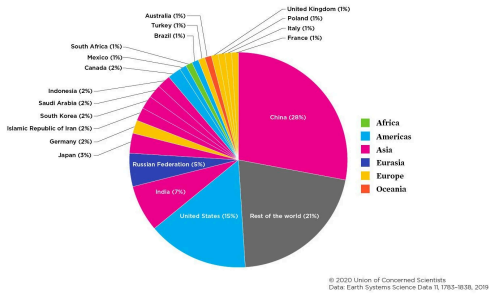
STUDENTS: Before you begin this lesson

- Go to File > Make a copy
- Change the name to: <your name> Air Math
- Begin working in your document
- When completing an activity, make a copy of the document and save with your name and the title of the activity

Be sure to read carefully. The green text is a prompt for reflection or activity.

Engage

Click on the image below to view the graph (image size will increase when you go to the website):



Read:

The world's countries emit vastly different amounts of heat-trapping gases into the atmosphere. The chart above shows data compiled by the International Energy Agency, which estimates carbon dioxide (CO2) emissions from the combustion of coal, natural gas, oil, and other fuels, including industrial waste and non-renewable municipal waste.

Source: Union of Concerned Scientists.

After studying the graph, which country emits the most carbon dioxide? Why?

Type your response in the box:

Explore

Click the image to watch the video: "*Climate Science: Too much Carbon Dioxide*". **Watch the video closely. You will need to answer questions based on what you have learned.**

Choose a graph in the video to answer the questions below:

1. **What data did the graph show at the bottom (x axis)? What does the y axis represent (along the side)?**

2. **What is the relationship between the x axis and y axis?**

Climate Science: Too much Carbon Dioxide (2:44)

Vocabulary

Write the definitions to the following words:

ATMOSPHERE

CARBON DIOXIDE

EMISSIONS

GREEN HOUSE EFFECT

3. **What would that look like as an equation?**

Click below for the answer key:

Answer Key

Explain

Before we continue….

Follow these steps:

1. To get more practice with reading, analyzing and creating graphs, go to this lesson on Khan Academy and complete the practice sections.
2. Next, examine this lesson on Khan Academy that explains using variables in graphs and equations 📊.
3. You may then continue on to the assignment below once you have completed steps one and two.

Vocabulary

Write the definitions to the following words:

VARIABLE

EQUATION

CHARTS

GRAPHS

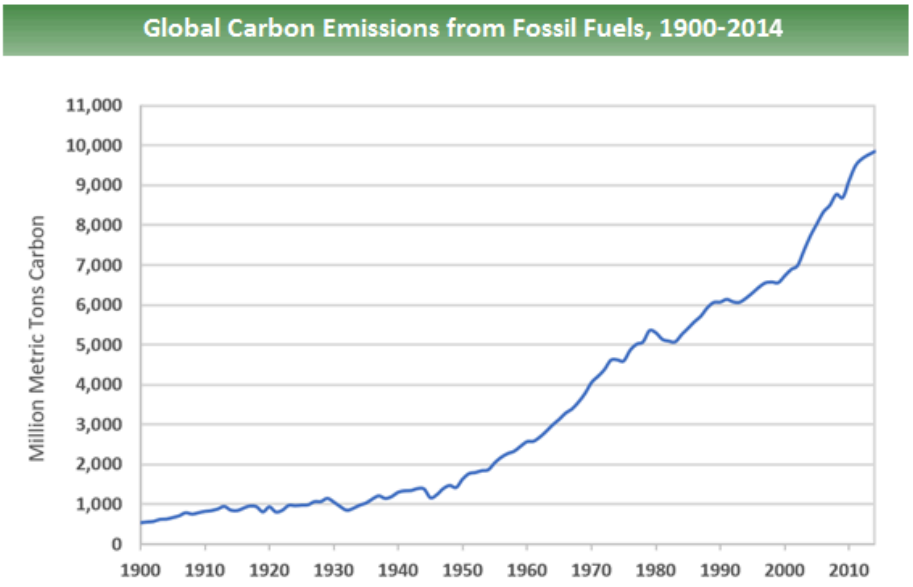
DATA

Global carbon emissions from fossil fuels have significantly increased since 1900.

Click on the image below and scroll down to the "Trends in Global Emissions" section. Be on the lookout for "Emissions".

(Click to see a larger image)

Trends in Global Emissions



Source: Boden, T.A., Marland, G., and Andres, R.J. (2017). Global, Regional, and National Fossil-Fuel CO2Emissions. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tenn., U.S.A. doi 10.3334/CDIAC/00001_V2017.

Watch a video by clicking here for additional support in order to determine percentage increase.

This is a short video (1:50) explaining how to calculate percentage increase. Super easy to follow!

To calculate the percentage increase:

1. First: work out the difference (**increase**) between the two numbers you are comparing.
2. **Increase** = New Number - Original Number.
3. Then: divide the **increase** by the original number and multiply the answer by 100.
4. % **increase** = **Increase** ÷ Original Number × 100.

Source: https://www.skillsyouneed.com/num/percent-change.html
(click link for more support)

Use the "Trends in Global Emissions" chart and the steps above to determine carbon emission percentage % increase in the following years (years are in bold print):

1900(600 tons of carbon)-**1920** (1000):

1. 1000-600=
2. 400/1000=
3. .4 x 100=

1920 (900)-**1940** (1100):

1. 1100-900=
2. 200/1100=
3. .18 x 100=

1960 (2500)-**1980** (5500):

1. 5500-2500=
2. 3000/5500=
3. .54 x 100=

1990 (6000)-**2010** (9900):

1. 9900-6000=
2. 3900/9900=
3. .39 x 100=

Click the link in the box below for the Answer Key:

Answer Key

Explain the data:

Which time frame from above had the largest increase in carbon emissions? Why do you suppose that is? Use text evidence from the United States Environmental Protection Agency to support your response.

Elaborate

We now know that carbon emissions have grown tremendously since the early 1900s. Let's examine data on how global deforestation has impacted our

Elaborate on the data:

We have learned that data is relevant to numbers. After reading the article, list 3 data facts that relate to global deforestation. Elaborate on the data by

	environment. **Examine the data:** Click the image below to examine data in the article “By the Numbers: The Value of Tropical Forests in the Climate Change Equation”. Source: World Resources Institute **Move on to the next column.**	giving specific details on the 3 facts. Fact 1 Fact 2 Fact 3 What variables are examined in this data? Is there an equation that can be used to represent the data?

Collaborate

Research: Collect Data

1. Find charts or graphs online that demonstrate the amount of carbon emissions per country for at least five countries. Example China, United States, France, Turkey, South Africa.
2. You will also need to know the population.
3. Determine how much carbon emissions is being used per person (per capita).

With a partner or small group, create a graph that includes data of 5 countries, their population and carbon emission use per person. Here is the equation you will use:

Total # of population/total amount of carbon emissions= Emission use per person

Search:

Here are some resources to begin your search for data:

https://ourworldindata.org/co2-and-other-greenhouse-gas-emissions

https://en.wikipedia.org/wiki/List_of_countries_by_carbon_dioxide_emissions_per_capita

https://www.ucsusa.org/resources/each-countrys-share-co2-emissions

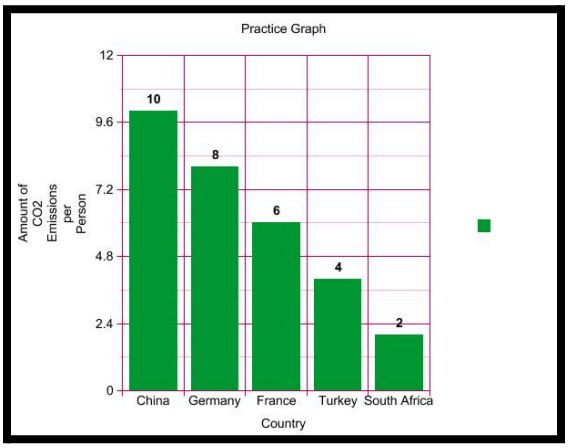
https://ourworldindata.org/per-capita-co2

Application: Create a Graph

Go to:
https://nces.ed.gov/nceskids/createagraph/

- Create a graph
- Download JPG format
- Copy and paste your graph in the box below

Example Graph:



Copy and paste your graph here:

Evaluate

Assessment 1

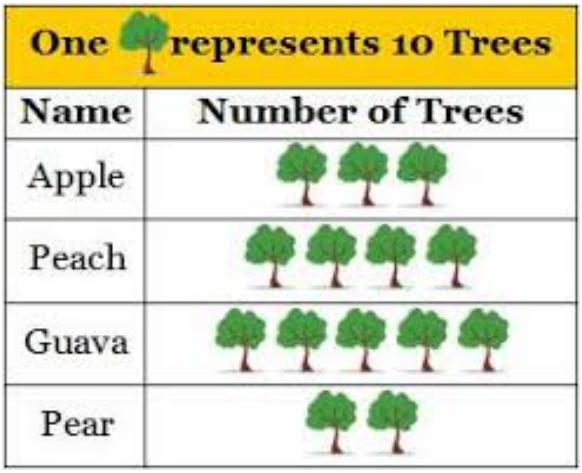
(In a separate assignment)

Read this: A pictograph is the representation of data using images. Pictographs represent the frequency of data while using symbols or images that are relevant to the data. This is one of the simplest ways to represent statistical data.

Source: https://www.toppr.com/guides/maths/data-handling/pictographs/

You will use graph, variable and equation knowledge to solve questions on this assessment.

Click on the image below to complete an assessment on using data to determine carbon emissions. **(Don't forget to "make a copy")**



One represents 10 Trees	
Name	Number of Trees
Apple	
Peach	
Guava	
Pear	

Assessment 2

Click here to review a bar graph with data on how the human population influences air quality. **Review the data** and **type your response** in the box below.

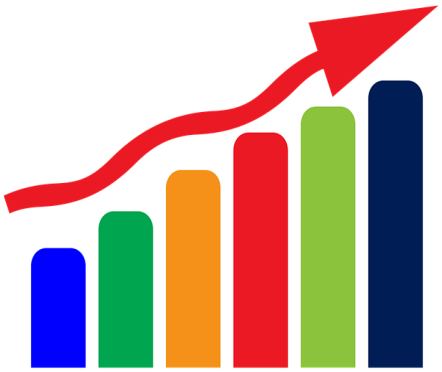
Source: nationalgeographic.org

Write your responses in the boxes:

Based on your learning from various data sources, including the population bar graph that you just reviewed, suggest improvements on environmental air quality:

How did the data from graphs and charts help you determine this?

Extend



Play: Games

Two Step Equation Practice

Read: Data

More Data with Carbon Emission Variables:
https://climate.nasa.gov/vital-signs/carbon-dioxide/

https://www.ucsusa.org/resources/each-countrys-share-co2-emissions

https://ourworldindata.org/co2-and-other-greenhouse-gas-emissions

https://en.wikipedia.org/wiki/List_of_countries_by_carbon_dioxide_emissions_per_capita

https://www.ucsusa.org/resources/each-countrys-share-co2-emissions

https://ourworldindata.org/per-capita-co2

https://www.youtube.com/watch?v=bpazvRVh4y0

Create more graphs!

https://nces.ed.gov/nceskids/createagraph/