

## Analysis of Graphical Data in Science

Questions and tasks that you must complete are written in blue.

### Part 1: Why graph?

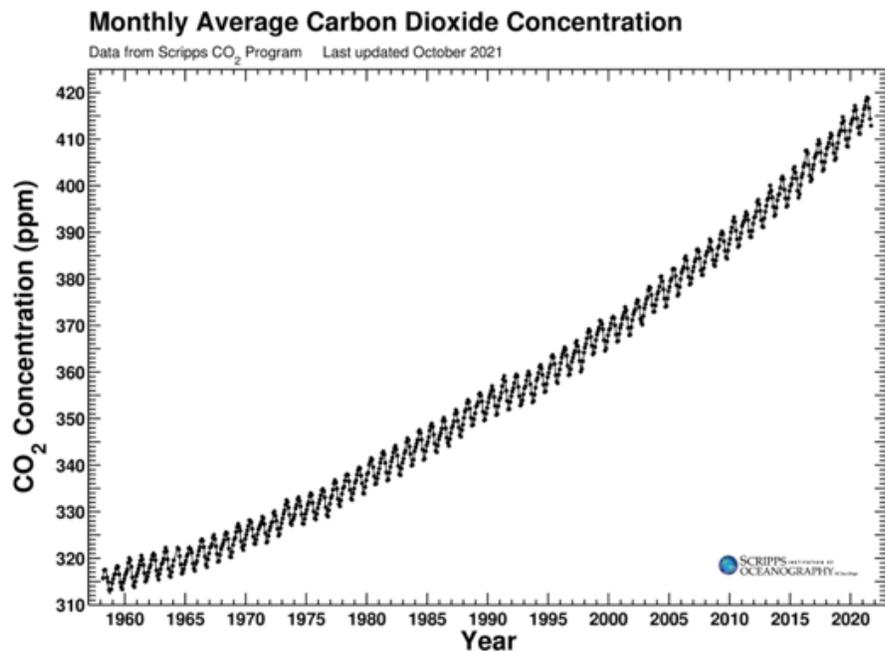
Scientists use graphs to show their data in a form that makes it easier to spot trends and relationships. For example, the following chart shows atmospheric carbon dioxide levels taken atop Mauna Kea. This is the same data you saw in the video of the Earth breathing.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1965	319.44	320.44	320.89	322.13	322.16	321.87	321.39	318.80	317.81	317.30	318.87	319.42
1966	320.62	321.59	322.39	323.87	324.01	323.75	322.39	320.37	318.64	318.10	319.79	321.08
1967	322.06	322.50	323.04	324.42	325.00	324.09	322.55	320.92	319.31	319.31	320.72	321.96
1968	322.57	323.15	323.89	325.02	325.57	325.36	324.14	322.03	320.41	320.25	321.31	322.84
1969	324.00	324.42	325.64	326.66	327.34	326.76	325.88	323.67	322.38	321.78	322.85	324.12
1970	325.03	325.99	326.87	328.14	328.07	327.66	326.35	324.69	323.10	323.16	323.98	325.13
1971	326.17	326.68	327.18	327.78	328.92	328.57	327.34	325.46	323.36	323.57	324.80	326.01

Source CDIAC

If you really look carefully above, you might be able to start to figure out some trends in this data.

However, it becomes much more clear when you graph it, as seen on the right.



1. Describe this graph in your own words.

## Part 2: Review- Types of Graphs

There are several types of graphs for presenting data. Bar graphs are great for comparing different data sets (for example, control group vs experimental group). Line graphs can be used to show incremental changes or continuous data. Other common forms of graphs are pie charts which show parts of a whole, scattergram which plots a large group of individual points, and Venn diagrams which can show relationships between concept. This [BrainPop video](https://www.brainpop.com/math/dataanalysis/graphs/) shows a good introduction to types of graphs. <https://www.brainpop.com/math/dataanalysis/graphs/>

For each of the following data sets below, choose the graph type that would best display the data.

2. In this class, people wearing slippers, athletic shoes, or other shoes.

Type of graph: \_\_\_\_\_

3. Growth of a tomato plant that is exposed to only blue light over a 20 day period.

Measurements are taken once a day.

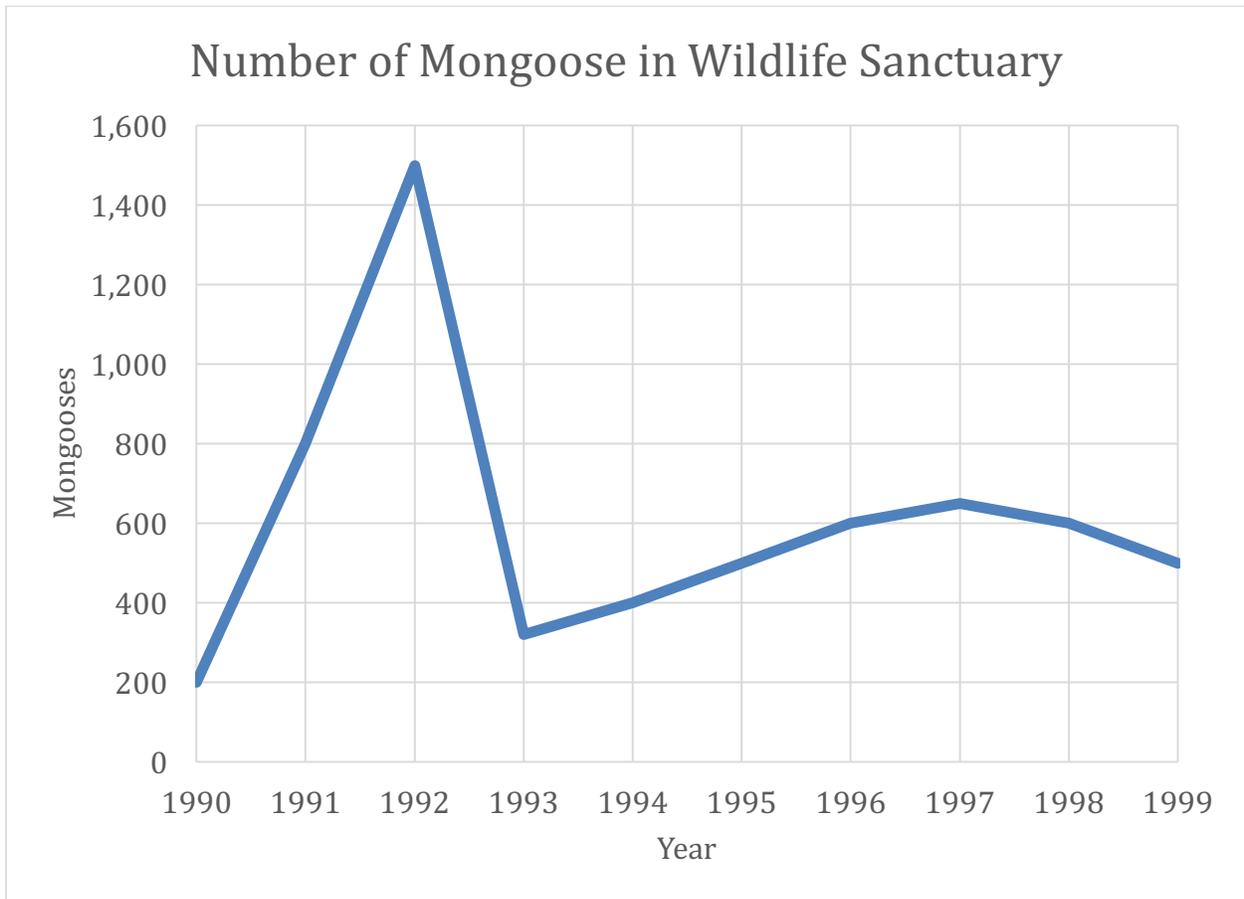
Type of graph: \_\_\_\_\_

## Part 3: Slope

The vocabulary of slope:

Peak	The verbs in the box can be used to describe changes commonly seen on graphs.  <ol style="list-style-type: none"><li>1. Highlight in yellow the verbs that mean to go up.</li><li>2. Underline the verbs that mean to go down.</li><li>3. Bold the verb that means to go up and down.</li><li>4. Use italics to indicate the word that means to reach its highest level.</li><li>5. Highlight in red the word that means to stay the same for a period of time</li></ol>
Rise	
Soar	
Fluctuate	
Decline	
Drop	
Climb	
Increase	
Stabilize	

Hamakua Marsh Wildlife Sanctuary is home to endangered native birds. When invasive mongooses were introduced to the area, they preyed on the eggs and chicks of the endangered birds. A predator control program was initiated to control the population of the mongooses. The mongoose population was tracked for 10 years. (Data is not real.)



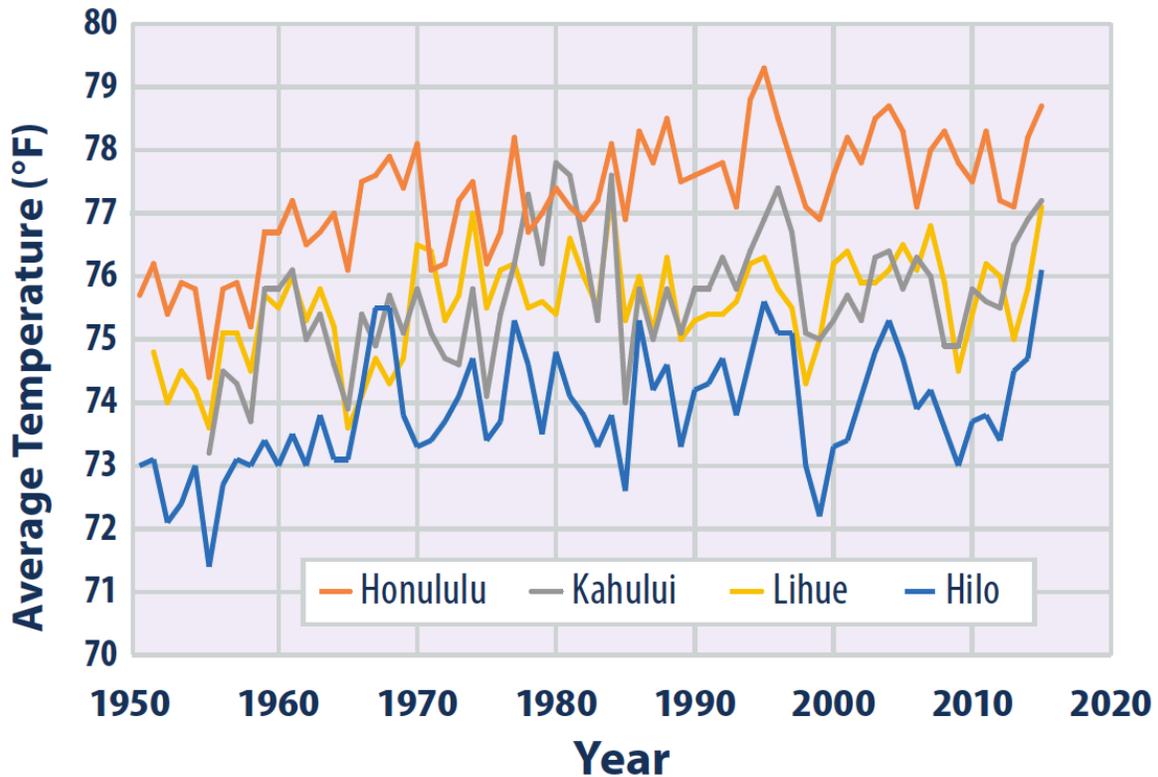
adapted from: [https://www.biologycorner.com/worksheets/graph\\_tadpoles.html](https://www.biologycorner.com/worksheets/graph_tadpoles.html)

Use the words in the box to complete the sentences. There may be more than one correct answer.

1. In the year 1990, mongoose populations began to \_\_\_\_\_ rapidly.
2. Mongoose populations reached a \_\_\_\_\_ in 1992.
3. Between 1992 and 1993, populations of mongoose \_\_\_\_\_
4. Mongoose populations \_\_\_\_\_ after 1993.
5. Between 1995 and 1999, populations \_\_\_\_\_
6. How many mongoose were in the wildlife sanctuary at its highest point? \_\_\_\_\_
7. How many mongoose were present in the wildlife sanctuary in 1998? \_\_\_\_\_
8. Between 1998 and 1999, mongoose populations \_\_\_\_\_ somewhat.

#### Part 4: Analysis of line graphs

How does all of this come into play for a scientific graph? Let's break down the analysis into 3 different sections.



*Average annual temperatures have increased across Hawaii since 1950. Source: NOAA*

Under each set of directions, answer in bullet points or outlines.

Part 1: read the graph

- identify the independent and dependent variables. The independent variable is almost always shown on the x axis.
- Identify the units of measurement of each variable
- State what each data point represents

Part 2: describe the data and trends

- What are the long term trends in the data? Describe the slope- is it constant, increasing, decreasing, showing a peak or plateau?
- What are the short term trends in the data? Are there cycles or patterns that repeat? Are there outliers in the data?
- What is the minimum, maximum, range?

Part 3: make interpretations

- What is the data telling you? For example, calculate the slope and analyze what it means.
- What is the significance of the range, slope, outliers, trends, etc.?
- How does this data interact with other things you know about science, the world, etc.?
- Do the patterns you identified correlate with other information you know or can gather?

#### **Part 4: Global Climate Change Graphs**

Now we are ready to take these skills and apply them to other graphs. The class will divide up into groups. Each group is responsible for analyzing one of the graphs provided by your teacher and then reporting their findings back to the full group. Use the skills we learned today to analyze the graphs, all of which are related to global climate change.