

ANT PICNIC DATA ANALYSIS ACTIVITY

ABOUT THIS ACTIVITY

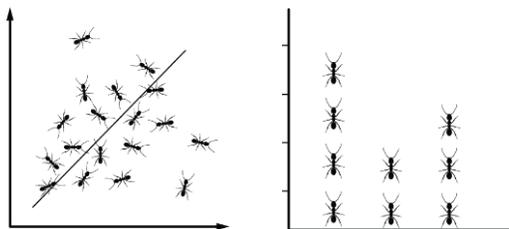
When someone conducts an experiment they always collect and record data. For instance, when they count how many drops it takes for a solution to change color, how many nuts a squirrel hides in a day, or how many ants come to a certain food type then they are doing an experiment. The data alone is not quite enough to answer the research question but rather the data needs to be analyzed. For instance, if the question was whether squirrels hide more nuts on a cold day or a warm day, then you need to add up the nuts hidden per day, calculate an average of the nuts per day and compare the average number of nuts collected on a cold day to the average on a warm day.

In this activity students can try their hand at analyzing data using an interactive online platform called CODAP (Common Online Data Analysis Platform). The activity is directly related to the [Ant Picnic](#) lesson. Students can explore an existing data set collected by scientists around the world or they can add their own Ant Picnic data and use this online tool to compare it to the existing global data set. CODAP allows students to create and analyze tables and graphs and draw conclusions to answer their own research questions.

North Carolina Standards Alignment (Science)

6.1.2.3 Summarize how the abiotic factors (such as temperature, water, sunlight, and soil quality) of biomes (freshwater, marine, forest, grasslands, desert, Tundra) affect the ability of organisms to grow, survive and/or create their own food through photosynthesis.

See additional possible standards in other subject areas (e.g., math) on next page



HERE'S WHAT YOU'LL NEED

- ["Using CODAP" tutorial](#) video
- Computer with reasonably fast internet access
- CODAP links specific to respective student assignment (see directions)
- "Ants Around the World" student worksheet with Biome Fact Sheet, see below
- "Getting to know CODAP" student worksheet + answer key, see below
- "Comparing your Ant Picnic results to global data in CODAP" guide, see below – only applies if [Ant Picnic](#) lesson has been completed
- "Ants Around the World Presentation Guide" + rubric, see below
- ["Ants and Citizen Science"](#) video – optional but helpful if [Ant Picnic](#) lesson wasn't done prior to this activity

DIRECTIONS

1. Show ["Using CODAP" tutorial](#) video to class.
2. Distribute student worksheet - choose the worksheet that works best for your classroom and share the respective CODAP link with your students:
 - "Ants Around the World" (aligns with standard above) – [Ants Around the World CODAP LINK](#)
 - "Getting to know CODAP" will give students an overview of how to navigate CODAP – [Getting to know CODAP LINK](#)
 - "Comparing your Ant Picnic results to global data in CODAP" is a guide for how to analyze Ant Picnic data if the [Ant Picnic](#) lesson has been completed. – [ANT PICNIC data entry CODAP LINK](#)
5. Allow time for students to complete the student worksheet (~45 min). Every student will need access to CODAP during this step.
6. Go over worksheet with students to ensure that they understand how to manipulate data in CODAP.
7. Put students in pairs for the presentation activity (see "Ants Around the World Presentation Guide").

cont. on next page

DIRECTIONS CONT.

8. Distribute “Ants Around the World Presentation Guide” and rubric to students.
9. Allow time for students to develop and answer their own research questions using CODAP (~45 min).
10. Have students present their slide shows to the class.
11. Wrap up the activity with a class discussion. Possible questions:
 - a) What was challenging about finding a solution to your question?
 - b) If you were going to do this research again, what would you do differently?
 - c) Were you surprised by your findings? Why or why not?
 - d) What did you learn about data analysis through this process?

HELPFUL HINTS

- Computers with large screens will work better – will eliminate excessive scrolling!
- This activity works best when combined with the [Ant Picnic](#) lesson. It will also allow students to compare their ant picnic results to global data in CODAP (see “Comparing your Ant Picnic results to global data in CODAP” guide).
- Steps 7-11 are optional if the presentation section does not suit your needs.
- Please note that the CODAP website may load slowly depending on the speed of your computer and internet connection. If any section of the main interface appears blank, reload or reopen the page.
- CODAP allows the sorting of columns (ascending/descending) by double clicking on the column title. Please, **DO NOT USE THIS FUNCTION!** It does not work properly and corrupts the data beyond repair. If a student uses this function and cannot undo it, they will need to return to the original CODAP link for their respective worksheet.

Additional possible North Carolina Standards alignment

Social Studies

7.G.2.1 Construct maps, charts, and graphs to explain data about geographic phenomena (e.g. migration patterns, and population and resource distribution patterns).

Information and Technology

7.TT.1 Use technology and other resources for assigned tasks.

7.TT.1.1 Use appropriate technology tools and other resources to access information.

7.TT.1.2 Use appropriate technology tools and other resources to organize information

Mathematics

7.SP.1 Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

7.SP.2 Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.

7.SP.4 Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.

8.SP.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.

VOCABULARY

- Biodiversity = the variety of life in the world or in a particular habitat or ecosystem
- Biome = a large naturally occurring community of flora and fauna occupying a major habitat (e.g., tropical rainforest)
- CODAP = Common Online Data Analysis Platform; the digital interface we use in this activity
- Data = information (facts, numbers, measurements) collected for reference or analysis
- Data analysis = the process of inspecting data with the goal of discovering relationships to draw conclusions about hypotheses
- Dependent variable = found on the y-axis; a variable whose value depends on the value of another variable (i.e. the independent variable)
- Hypothesis = a proposed explanation made on limited evidence as a starting point for further investigation
- Independent variable = found on the x-axis; a variable whose variation does not depend on another variable; this is the variable the experimenter changes
- Variable = a quantity or condition that can be measured in an experiment

Name: _____

ANTS AROUND THE WORLD

Directions:

1. Using the CODAP website you are viewing, complete the charts below.
2. For each biome, pick 3 different data points to complete the charts.
3. Find the averages for temperature and precipitation and most common food preference for the 3 data points in each biome. (Finding average: Add the numbers in column for temperature then divide by 3. Repeat with numbers from precipitation column)

Desert	Data point	Country	Temperature	Precipitation	Food preference of ants
	1				
	2				
	3				

Average desert temperature: _____

Average desert precipitation: _____

Most common desert food preference: _____

Grassland/ Cold desert	Data point	Country	Temperature	Precipitation	Food preference of ants
	1				
	2				
	3				

Average grassland/cold desert temperature: _____

Average grassland/cold desert precipitation: _____

Most common grassland/cold desert food preference: _____

Tropical seasonal forest/Savanna	Data point	Country	Temperature	Precipitation	Food preference of ants
	1				
	2				
	3				

Average tropical seasonal forest/savanna temperature: _____

Average tropical seasonal forest/savanna precipitation: _____

Most common tropical seasonal forest/savanna food preference: _____

Tropical rainforest	Data point	Country	Temperature	Precipitation	Food preference of ants
	1				
	2				
	3				

Average tropical rainforest temperature: _____

Average tropical rainforest precipitation: _____

Most common tropical rainforest food preference: _____

Temperate seasonal forest	Data point	Country	Temperature	Precipitation	Food preference of ants
	1				
	2				
	3				

Average temperate seasonal forest temperature: _____

Average temperate seasonal forest precipitation: _____

Most common temperate seasonal forest food preference: _____

Woodland/ Shrubland	Data point	Country	Temperature	Precipitation	Food preference of ants
	1				
	2				
	3				

Average woodland/shrubland temperature: _____

Average woodland/shrubland precipitation: _____

Most common woodland/shrubland food preference: _____

Q2) Looking at the data you collected above, what was the most popular food choice out of all of the biomes? List all if there was a tie.

Q3) If you were an ant, which biome would you prefer to live in? Explain what characteristics you like the most about your biome and some of the biodiversity that can be found there.

Q4) Use the biome fact sheet. Compare and contrast two of the biomes. Find at least 3 unique features for each biome and at least 3 similarities.

Biome: _____	Similarities	Biome: _____

Q5) Using CODAP, click on the graph button to create a new graph. Choose two variables to compare on this new graph.

x-axis title: _____

y-axis title: _____

- a) Summarize your graph in 1-2 sentences**

- b) Why did you choose these variables?**

- c) What do you find interesting about your graph?**

Biomes Fact Sheet

Desert

Deserts are characterized by high temperatures and very little precipitation. The average annual temperature in deserts is between 17 and 31 degrees Celsius, and the average precipitation is between zero and 100 centimeters. Some parts of the Atacama Desert in South America have recorded no rainfall in 20 years. Cloud cover is uncommon. Soil in deserts is often warm. Examples of these deserts include the Sahara and Chihuahuan deserts. Most of these areas are found between 15 and 30 degrees latitude.

Temperate seasonal forest

Temperate seasonal forests are dominated by deciduous trees, which lose their leaves seasonally. Often, these areas have warm and wet summers with mild winters. These forests most often occur on the east coast of North America, East Asia, and Europe. The average annual temperature ranges from 5 to 20 degrees Celsius and the annual precipitation ranges greatly from 20 to 220 cm. North Carolina is an example of a temperate seasonal forest.

Tropical rainforest

Tropical rainforests are warm year-around with high levels of precipitation. They can experience over 400cm of rain per year, and the average temperature ranges between 20 and 30 degrees Celsius. These areas are located along or close to the equator, the largest of which is the Amazon rainforest in South America. Tropical rainforests are able to support a wide range of plant and animal species because of the large amounts of natural resources found there. Rainforest areas typically have very rich biodiversity, possibly containing up to 50% of the earth's species.

Tropical seasonal forest/savanna

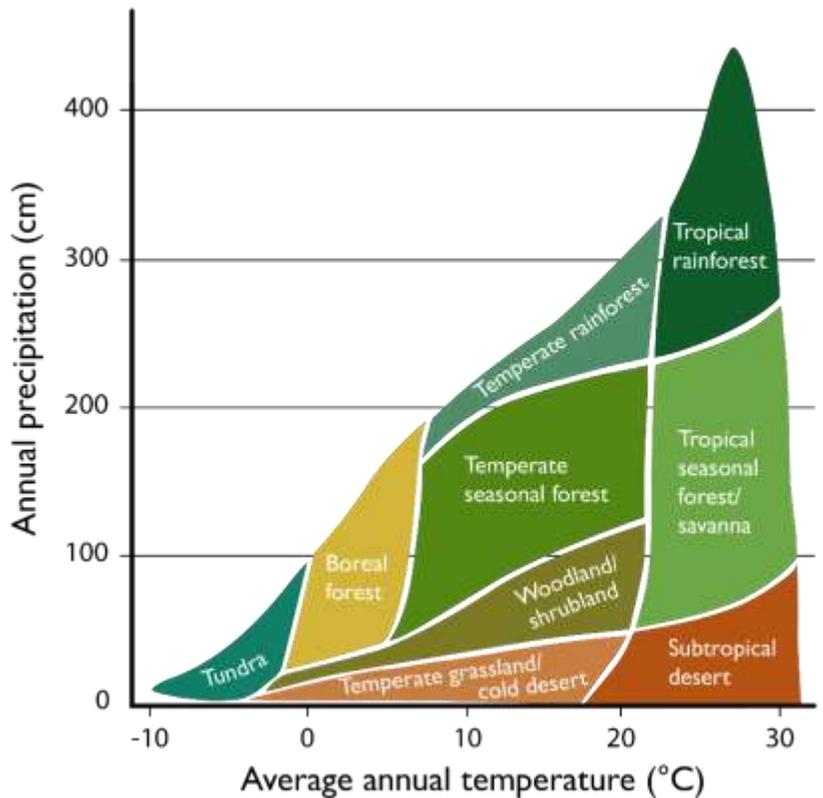
The tropical seasonal forest and savanna are actually two very similar biomes. In tropical seasonal forests, trees grow fairly densely, just like a temperate forest. In the dry season, the trees lose their leaves. Savannas are grasslands where individual trees or clusters of trees occur. The average rainfall for both areas ranges from 50 to 250 cm, and the average temperature is above 20 degrees Celsius. Most of these areas are found between 30 degrees north and 30 degrees south, including much of Mexico, sub-Saharan Africa, and Southeast Asia.

Grassland/cold desert

Grasslands and cold deserts are both characterized by less than 50 cm of rainfall annually and Grasslands, sometimes called temperate grasslands, average temperatures between -5 and 20 degrees Celsius. Grasslands, sometimes called temperate grasslands, are located in the northern hemisphere, including the United States prairie land and the Russian steppes. These areas typically have very few trees and shrubs and rich, fertile soil. Cold desert areas are similar, but further north. They are found in the Antarctic, Greenland, and Northern China.

Woodland/shrubland

The woodland and shrubland biomes receive between 20 to 100 centimeters of precipitation per year. The average annual temperatures of these areas range widely from below zero to 20 degrees Celsius. As the name suggests, plants in these biomes are usually short trees or bushes, as there are fires frequently and there is often not enough rainfall to support large tree growth. These areas are typically found on west coasts between 30 degrees North and 40 degrees South. Woodlands are often found near deserts and grasslands, including areas in California, Australia, and the Mediterranean.



Group member names: _____

ANTS AROUND THE WORLD

Presentation Guide

Using the global ant data and your analysis skills, you will come to an evidence-based conclusion that answers a **HUGE** question about our **tiny** ant friends, and present your findings to the class.

Remember, these questions haven't been answered yet, even by brilliant scientists!

- 1. Select a question that you can analyze using the data on CODAP. This question can be anything that interests your group connected with the data.**

Sample Questions:

- How does precipitation in an area affect the ants' food preference?
- Do ants at similar latitudes prefer the same food sources? What about longitudes?
- What connections are there between an ant's biome and its food choices?
- In which areas did ants differ most from their normal diet (honeydew)? Why?
- How is the diet of ants close to the ocean different from ants further inland?
- How will increased global temperatures most likely affect ant diets in the future?
- How does elevation affect the ants' food preference?

...Or CREATE YOUR OWN!

Write your final question choice here

- 2. Create a presentation. You can use Prezi, PowerPoint, Google Slides, or another method of presentation. Make sure that all of your group members are able to edit the presentation.**
- 3. Include the following in your presentation:**
 - Your question and the reason you picked the question
 - A hypothesis as to what the answer to the question might be.
 - The reasoning behind your hypothesis. (Remember that a hypothesis is an EDUCATED guess.)
 - At least two graphs from CODAP that provide evidence to support your conclusion.
 - Your final evidence based conclusion
 - Questions that you could ask based on your conclusion/evidence
- 4. Plan for questions that other groups might ask you, and be ready to defend your conclusion and respond to skeptical classmates.**
- 5. Check the rubric to be sure that you have met all criteria.**

Group member names: _____

ANTS AROUND THE WORLD

PRESENTATION RUBRIC

	Level 1	Level 2	Level 3	Level 4
Question	Question is not stated.	Question is stated, but lacking reasoning behind the question.	Presentation begins with question and somewhat explains the importance of the question	Presentation begins with question and fully explains the importance of the question
Hypothesis	Hypothesis does not match the question, or isn't stated.	Hypothesis aligns to the question but reasoning is absent.	Hypothesis aligns to the question, but the logic behind the hypothesis is unclear.	Hypothesis aligns to the question, and logic behind the hypothesis is clearly stated.
Data Analysis	No graphs from CODAP are included in the presentation, or team members are unable to explain the relevance of graphs to their question	At least one graphs that align to the question are included, and the team members partially explain the relevance of the graphs.	One graph that aligns to the question is included, and team members are able to fully explain the relevance of the graph to the question.	At least two graphs that align to the question are included, and team members are able to fully explain the relevance of the graphs to the question.
Conclusion	Conclusion does not reference hypothesis or evidence.	Conclusion states whether hypothesis was incorrect or correct but does not cite evidence to support claim.	Conclusion states whether hypothesis was incorrect or correct and cites evidence to support claim, but is not concise or is unclear.	Conclusion concisely states whether hypothesis was incorrect or correct and cites evidence to support claim.
Next Steps	There are no future questions.	Future questions are not closely related to the original question.	Future questions are related to original question, but connection is vague.	Future questions are related to original question, and the connection is clearly explained.
Q&A	Team members are unable to answer questions related to their conclusion.	Team attempts to defend their conclusion when responding to questions but answers are not evidence-based.	Team can defend their conclusion when responding to some questions from the audience using evidence.	Team can defend their conclusion when responding to all questions from the audience using evidence.

Teacher Comments

SCORE: _____

Comparing your Ant Picnic results to global data in CODAP

This document will guide you through comparing your own Ant Picnic data to data collected by scientists around the world.

Directions:

1. Open [CODAP](#)
2. Scroll to the bottom right corner of your CODAP screen to find the questionnaire. This is where you will enter your data.
3. Drop down to select your country.
4. Enter your name.
5. Enter your school.
6. Enter the latitude and longitude coordinates for the location of your Ant Picnic site. Use an address to GPS converter if needed.
7. Click next.
8. If you know the information for your site's elevation, distance from the ocean, temperature, and mean annual precipitation, enter it. Then click next. Having this information for your site will allow to compare your site more accurately with others around the world.
9. Describe the habitat of your site.
Example: paved area with some grass nearby
10. Select your biome and click next.
11. Click enter observations
12. Select your first bait type.
13. Enter the number of ants that came to the bait type.
14. If you had more than one station for this bait, enter the percent of baits that were visited by at least one ant.
Example: If I had 4 sugar baits but only two of the baits attracted ants, I would enter 50%.
15. Click "next".
16. Click "Enter Another Observation".
17. Repeat steps 12-16 until you have entered all six bait types.
18. When you are finished, you will be able to see your data set in the table as well as on the map.
19. Now you can compare your data to the data from other sites.
Possible research questions:
 - How does your site compare to a site in a different biome in terms of food preference? What could be the cause of the difference?
 - How does food preference at your site compare to food preference at a much warmer site? What about a much colder one?
 - Compare your site to a site on the same latitude. Are there similarities in food preference?
 - How does the number of ants at your site compare to the number of ants in much wetter (higher average precipitation) places?
 - Or explore your own questions!

Name: _____

Getting to know CODAP

1. On CODAP, look at the "Relationship Between Temperature and Precipitation at Collection Sites" graph. What biome has the highest temperature as well as the highest amount of precipitation? _____
2. Looking at the same graph, what was the coldest temperature recorded? Be sure to include units. _____
3. Looking at the same graph, what was the lowest precipitation recorded? Be sure to include units. _____
4. Look at the table. Make sure the "Countries" column is on the left-most side of the table. Click on Brazil. Look at the "Bait Type" and "Total Ant Bait Type" columns for Brazil (they should be highlighted now). How many ants chose cookie? ____ How many ants chose sugar? ____
5. What was the most popular food choice in Brazil? _____
6. How many ants chose the answer for number 5? _____
7. What was the total number of ants that were collected from Brazil (add all the numbers from "Total Ant Bait Type")? _____
8. What percentage of the ants from Brazil chose Cookie? Round to the nearest tenths place. _____
9. What percentage of the ants from Brazil chose Amino Acid? Round to the nearest tenths place. _____
10. Write a ratio to compare the amount of ants that chose water in Uganda to those that chose water in Peru. ____ to ____
11. Click on USA. The data from USA came from 4 different biomes. Olive oil was the most popular choice for 2 of the biomes. Which 2 biomes had olive oil as the most popular choice? (Select 2)
 - a. Temperate Seasonal Forest
 - b. Woodland/Shrubland
 - c. Tropical Seasonal Forest/Savanna
 - d. Grassland/Cold Desert
12. What was the least popular food choice for ants in Spain?
 - a. Salt
 - b. Water
 - c. Amino Acids
 - d. Sugar
13. For the sample taken in France, what is the ratio of baits with 0 compared to the total amount of bait choices? Reduce your fraction to the simplest form.
14. From the same sample taken in France, what percent of the ants chose sugar? Round to the nearest tenths place.
15. What was the average amount of precipitation, in mm, for all sites in Guatemala? Note that the numbers repeat.

Name: _____

Getting to know CODAP – answer key

1. On CODAP, look at the “Relationship Between Temperature and Precipitation at Collection Sites” graph. What biome has the highest temperature as well as the highest amount of precipitation? **Tropical rainforest**
2. Looking at the same graph, what was the coldest temperature recorded? Be sure to include units. **0 °C**
3. Looking at the same graph, what was the lowest precipitation recorded? Be sure to include units. **167 mm**
4. Look at the table. Make sure the “Countries” column is on the left-most side of the table. Click on Brazil. Look at the “Bait Type” and “Total Ant Bait Type” columns for Brazil (they should be highlighted now). How many ants chose cookie? **605** How many ants chose sugar? **841**
5. What was the most popular food choice in Brazil? **Olive oil**
6. How many ants chose the answer for number 5? **2613**
7. What was the total number of ants that were collected from Brazil (add all the numbers from “Total Ant Bait Type”)? **4724**
8. What percentage of the ants from Brazil chose Cookie? Round to the nearest tenths place. **12.8 %**
9. What percentage of the ants from Brazil chose Amino Acid? Round to the nearest tenths place. **4.7 %**
10. Write a ratio to compare the amount of ants that chose water in Uganda to those that chose water in Peru. **26 to 28 (red. 13 to 14)**
11. Click on USA. The data from USA came from 4 different biomes. Olive oil was the most popular choice for 2 of the biomes. Which 2 biomes had olive oil as the most popular choice? (Select 2)
 - a. **Temperate Seasonal Forest**
 - b. Woodland/Shrubland
 - c. **Tropical Seasonal Forest/Savanna**
 - d. Grassland/Cold Desert
12. What was the least popular food choice for ants in Spain?
 - a. Salt
 - b. **Water**
 - c. Amino Acids
 - d. Sugar
13. For the sample taken in France, what is the ratio of baits with 0 compared to the total amount of bait choices? Reduce your fraction to the simplest form. **2/3**
14. From the same sample taken in France, what percent of the ants chose sugar? Round to the nearest tenths place. **81.3 %**
15. What was the average amount of precipitation, in mm, for all sites in Guatemala? Note that the numbers repeat. **1808 mm**