

CHANGES IN MY STATE

TEACHER VERSION

Subject Level:
Elementary School Math

Grade Level:
3

Approx. Time Required:
45-60 minutes

Learning Objectives:

- Students will be able to create a bar graph to represent data.
- Students will be able to use their bar graph to make comparative statements.

Activity Description

Students will learn about their state as they collect and organize business information using State Facts for Students, a U.S. Census Bureau data tool. Students have the opportunity to examine data about kids their age, as well as a variety of other facts selected to appeal to young students. Students will create a bar graph to represent how the numbers of selected business types have changed between 2010 and 2022.

Suggested Grade Level:
3

Approximate Time Required:
45-60 minutes

Learning Objectives:
- Students will be able to create a bar graph to represent data.
- Students will be able to use their bar graph to make comparative statements.

Topics:
- Bar graphs
- States

Skills Taught:
- Creating a bar graph
- Determining appropriate scale
- Formulating a hypothesis
- Interpreting a bar graph

Materials Required

- The student version of this activity, 4 pages
- A computer with Internet access for each student
- Colored pencils or markers
- Graph paper

This activity uses the following online tool:

- State Facts for Students
  www.census.gov/programs-surveys/sis/resources/data-tools/state-facts.html

For information to help you introduce your students to the Census Bureau, read "*Census Bureau 101 for Students.*"

Standards Addressed

See charts below. For more information, read "*Overview of Education Standards and Guidelines Addressed in Statistics in Schools Activities*."

Common Core State Standards for Mathematics

Standard	Domain	Cluster
CCSS.MATH.CONTENT.3.MD.B.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs.	3 MD – Measurement & Data	Represent and interpret data.

Common Core State Standards for Mathematical Practice

Standard
CCSS.MATH.PRACTICE.MP5. Use appropriate tools strategically. Students will use bar graphs to answer questions that they generate.
CCSS.MATH.PRACTICE.MP6. Attend to precision. Students will use precision when choosing a scale that will communicate information clearly. They will label the axes of their graphs and be encouraged to graph neatly.

National Council of Teachers of Mathematics' Principles and Standards for School Mathematics

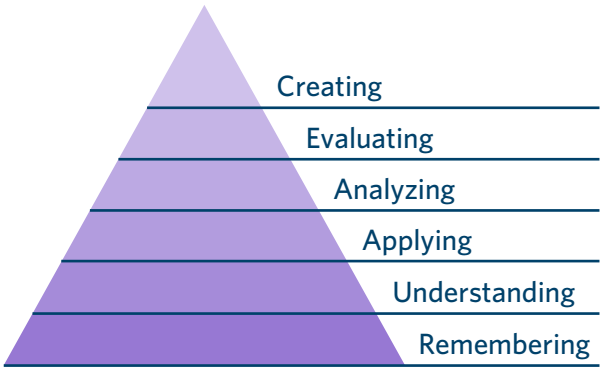
Content Standard	Students should be able to:	Expectation for Grade Band
Data Analysis and Probability	Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.	Represent data using tables and graphs such as line plots, bar graphs, and line graphs.
Number and Operations	Compute fluently and make reasonable estimates.	Develop fluency in adding, subtracting, multiplying, and dividing whole numbers.

Guidelines for Assessment and Instruction in Statistics Education

GAISE	Level A	Level B	Level C
Formulate Questions	X		
Collect Data	X		
Analyze Data	X		
Interpret Results	X		

Bloom's Taxonomy

Students will ***create*** a bar graph to represent numeric data from the Census Bureau. Students will also ***apply*** their understanding of bar graphs to write comparative statements about the data.



Teacher Notes

Before the Activity

Students should have a basic understanding of the following concept:

- Creating bar graphs

Teachers will direct students to type ***www.census.gov/programs-surveys/sis/resources/data-tools/state-facts.html*** in their browser to get to the State Facts for Students tool and then select the state where they live. Teachers will ask students what questions they could answer using the tool. At first, student questions may involve using only one number, such as "How many toy stores were there in Michigan in 2022?" Teachers should encourage students to ask questions that would involve using more than one number, such as "How many more toy stores were there than amusement parks in Michigan in 2022?"

Teachers should note that some questions are more easily answered with raw data (e.g., "How many more zoos and botanical gardens are there than amusement parks?"), while other questions may be more easily answered by referencing an appropriate bar graph (e.g., "Which type of business grew the most between 2010 and 2022?"). Teachers should be aware of this so that students see creating bar graphs as a way to more easily answer questions, rather than as an exercise limited to math class.

Teachers may want to model creating a bar graph by using data from a different state. For example, suppose a teacher were to plot the number of each type of business in 2010 and 2022 for Massachusetts. Here are some things a teacher could say to draw students' attention to the material:

- "First, I'm going to put the categories of business on the bottom, the horizontal (x) axis."
- "Next, I have to think about the vertical (y) axis, which represents the number of businesses of each type. What's the greatest number I have to go to? I'm going to round up so that my graph will look neater. If I have to get all the way from 0 businesses to 5,300 businesses, how much should each square on my graph paper represent?"
- "Now I'm going to make the bars. I'll use two different colors for the bars and make a key so that everything is clear. First I'll make the bar for the number of dentist offices in Massachusetts in 2010. Then, right beside it, I'll make a bar for the number of dentist offices in Massachusetts in 2022. By having them next to each other, I can see more clearly how the numbers of dentist offices have changed."

Teachers will direct students to work individually or in pairs to create their bar graphs.

During the Activity

As students select their business types, teachers should guide them toward data sets that lend themselves easily to visual comparison in a bar graph. In other words, teachers should steer students away from data sets that would require plotting very large numbers against smaller numbers.

Teachers will monitor students as they work, paying special attention to the reasonableness of the scales for their bar graphs and encouraging students to use precision.

To help students articulate their thinking, teachers could ask them to explain aloud how they determined the scale for their vertical axis.

Teachers should keep in mind that students may have different ways of thinking about which numbers of business types changed the most. For example, in Massachusetts, the number of fast-food restaurants increased by 680 (from 4,591 in 2010 to 5,271 in 2022) while the number of video/disc rental stores decreased by 147 (from 156 in 2010 to 9 in 2022). However, in a bar graph, it is easier to visualize that there was a decrease in video/disc rental stores between 2010 and 2022..

Teachers can briefly discuss how people rented or purchased VHS (Video Home System) tapes or DVDs (Digital Video Discs) from video rental stores. Ask students if they have visited or seen a video/disc rental store and what may have contributed to their decline in the United States.

Teachers should encourage students to see that there are many ways of answering one question, demonstrating how bar graphs highlight these different answers that may not have been as apparent in the raw numerical data.

After the Activity

Teachers should ask students to reflect on what they learned.

Extension Ideas

- Teachers could direct students to create additional bar graphs comparing the numbers of business types in a different state, which addresses the GAISE framework by helping students understand variability: that results may differ among different groups. Students should notice how the scales of the different graphs may impact how they interpret the graphs of different states together. For instance, if students live in Massachusetts, teachers might ask, "Do you think the bar graphs for all states would look the same? How do you think Florida's graph might be different?"
- Teachers could direct students to investigate the percentage of homes with computers and the numbers of video/disc rental stores in a state to determine any relationship.

Student Activity

Click *here* to download a printable version for students. This activity uses the following online tool:

- State Facts for Students
  www.census.gov/programs-surveys/sis/resources/data-tools/state-facts.html

Student Learning Objectives

- I will be able to create a bar graph.
- I will be able to use my bar graph to make comparisons.

The U.S. Census Bureau collects information about all people in the United States through a nationwide count, called the census, which happens every 10 years. The Census Bureau also collects data at other times through additional sample surveys.

A good way to compare data is to represent those data in a bar graph.

You are going to compare how the numbers of a few different types of businesses changed between 2010 and 2022 by creating a bar graph. When creating your graph, you must decide the scale of your y-axis, meaning the number that one square on your graph paper represents on the "up-and-down" side of your graph. For example, one square could represent five stores, or it could represent 20 stores.

Start by typing this URL into your browser to get to the State Facts for Students tool: *www.census.gov/programs-surveys/sis/resources/data-tools/state-facts.html*. Then select the state where you live. Scroll down to the Businesses section (in purple) at the bottom of the page.

1. Choose three business types that you would like to compare in your state and write them in the left column of the table below. Then write how many of each business type existed in your state for 2010 and 2022 in the next two columns.

   Student answers will vary; sample answers below are for amusement parks, zoos and botanical gardens, and ice cream and frozen dessert makers in Ohio:

Business Type	2010	2022
Amusement Parks	22	17
Zoos & Botanical Gardens	22	24
Ice Cream & Frozen Dessert Makers	9	11

2. Of these three business types, which one had the smallest number in 2010? What is that number?

   Ice Cream & Frozen Dessert Makers: 9

3. Of these three business types, which one had the largest number in 2010? What is that number?

   Amusement Parks and Zoos & Botanical Gardens (tie): 22

4. Which type of business had the smallest number in 2022? What is that number?

   Ice Cream & Frozen Dessert Makers: 11

5. Which type of business had the largest number in 2022? What is that number?

   Zoos & Botanical Gardens: 24

6. What is the difference between the smallest data point and largest data point in your chart? Show your work.

   22 – 9 = 13

7. Before you create a bar graph of these data, choose a scale for the y-axis (the vertical or "up-and-down" axis) that makes sense (not too big and not too small). Write your scale here:

   _____ squares = _____ businesses

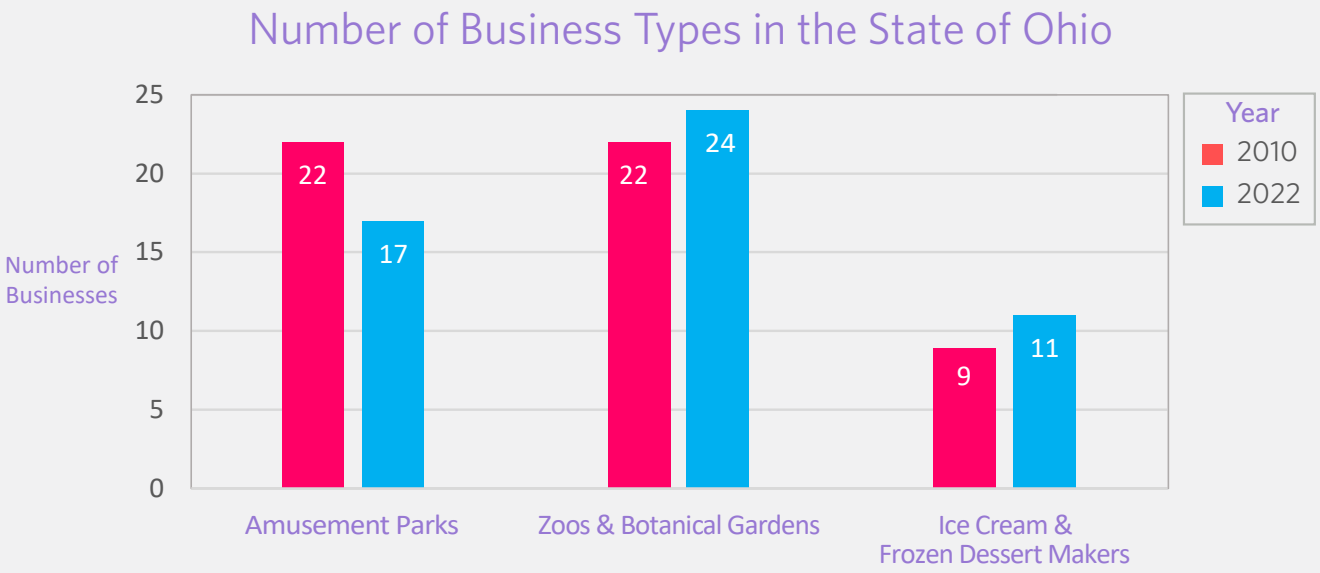
   Student answers will vary. Teachers may want to help students by modeling thinking aloud: "I have to go all the way to 24; 25 is a nicer number than 24 because I could count up by fives. I will space out my scale lines evenly along the vertical axis."

8. Now on your graph paper, write the scale and labels that indicate the types of businesses you chose.

   See sample student bar graph below.

9. Create your bar graph on your graph paper.

   Sample student bar graph:



Reflection Questions

1. What surprises you about the differences in the numbers of business types between 2010 and 2022? Why does this surprise you?

   Student answers will vary but could include the following: I'm surprised that there were fewer amusement parks in 2022 than 2010, because I like amusement parks and hoped that there would be more instead of fewer.

2. Which business type in the graph saw the greatest increase or decrease between 2010 and 2022? Write a hypothesis statement for this increase or decrease. Then explain what you think might happen with this type of business in the future.

   Student answers will vary but could include the following: I think that the number of amusement parks decreased the most between 2022 and 2010 because the roller coasters broke and it cost too much money to fix them. I don't think the number of amusement parks will continue to decrease because people really like to ride roller coasters so there have to be enough places to do that.

Teachers may want to mention that outside factors (e.g., an increase in population, technology changes, etc.) may also affect changes with businesses.

3. What other questions could your graph help you answer? Write your own question that can be answered by using your graph.

   Student answers will vary but could include the following: Of the numbers of the three business types, which changed the least between 2010 and 2022?