

LOOKING AT NUMBERS OF BIRTHS USING A LINE GRAPH

TEACHER VERSION

Subject Level:
Elementary School Math

Grade Level:
4-5

Approx. Time Required:
45 minutes

Learning Objectives:

- Students will be able to create a line graph with large numbers and choose an appropriate graph scale.

Activity Description

After looking at census data, students will determine the birth years of children who were aged 8 through 11 in 2023. Then they will use their data to create a line graph, with an appropriate scale and axes labels, to compare and contrast the estimated number of births in their state and in another state during each year.

Suggested Grade Level:
4–5

Approximate Time Required:
45 minutes

Learning Objectives:

- Students will be able to create a line graph with large numbers and choose an appropriate graph scale.

Topics:

- Line graphs

Skills Taught:

- Creating a line graph
- Comparing multiple lines on a line graph
- Determining an appropriate scale

Materials Required

- The student version of this activity, 3 pages
- A computer with Internet access for each student (or printouts of State Facts for Students pages for chosen states)
- Colored pencils or crayons
- Rulers
- Teacher computer with Internet access and a projector to display web sites

This activity uses the following online tool:

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

For more information to help you introduce your students to the Census Bureau, read "*Census Bureau 101 for Students*." This information sheet can be printed and passed out to your students as well.

Standards Addressed

See chart 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.5.G.A.1 Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., *x*-axis and *x*-coordinate, *y*-axis and *y*-coordinate).	5 G – Geometry	Graph points on the coordinate plane to solve real-world and mathematical problems.

Standard	Domain	Cluster
CCSS.MATH.CONTENT.5.G.A.2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.	5 G – Geometry	Graph points on the coordinate plane to solve real-world and mathematical problems.

Common Core State Standards for Mathematical Practice

Standard
CCSS.MATH.PRACTICE.MP4. Model with mathematics. Students will use a coordinate plane to display data about the number of births in two states over time.
CCSS.MATH.PRACTICE.MP6. Attend to precision. Students will use precision to choose a scale that communicates information clearly. They will also label the axes of their graphs and be encouraged to graph neatly.

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

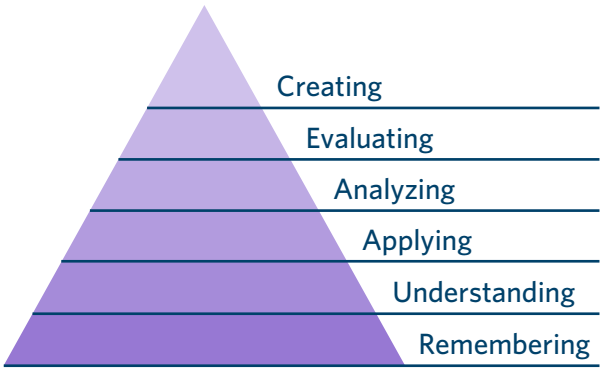
Content Standard	Students should be able to:	Expectation for Grade Band
Algebra	Use mathematical models to represent and understand quantitative relationships.	Model problem situations with objects and use representations such as graphs, tables, and equations to draw conclusions.
Algebra	Analyze change in various contexts.	Investigate how a change in one variable relates to a change in a second variable.
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.

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 use census data to ***create*** a line graph about the number of births in two states over four years.



Teacher Notes

Before the Activity

Students must understand the following key terms:

- **Axes** – the lines at the side and bottom of a graph
- **Compare** – to find how things are similar
- **Contrast** – to find how things are different
- **Data** – facts usually represented by numbers
- **Population** – the number of people living in an area
- **Scale of a graph** – the distance between equal marks on a graph's axes, representing the relation between a data set's units and how they appear on the graph

Students should have a basic understanding of the following ideas and concepts:

- Ability to create an appropriate scale
- Ability to label the *x*- and *y*-axes on a graph
- Understanding of a key on a graph and its purpose
- Understanding of the rules of subtraction

Teachers should ask students what parts of a graph must be included for people to understand it, guiding them to discussing the *x*- and *y*-axes labels and an appropriate scale.

Teachers should then tell students that in the activity they will find out how the number of people born each year has changed in different states in specific years. Teachers should point out that population changes impact many decisions, like whether to build new schools.

During the Activity

Teachers should display State Facts for Students (*www.census.gov/programs-surveys/sis/resources/data-tools/state-facts.html*) on the screen, clicking through the map to see the data first for the school's state and then for any other state. Teachers should draw attention to the number of 8- through 11-year-olds in those states in 2023 and ask students to work together to figure out these children's birth years, recording their answers in the right column of their tables. Teachers should then have a student share with the class his or her strategy for solving this math problem.

Teachers could then ask students whether the State Facts for Students numbers represent the number of babies actually born in these states during the birth years they calculated earlier (i.e., 2012–2015). Students may identify problems with this assumption, like the possibility of families moving to another state before 2023 or the possibility of immigrant families. This information could be used to discuss the statistical idea of variability

with students, and teachers could say: "Can we be absolutely sure about the number of births we calculate in these states for a particular year? Why or why not? We might be a little too high or too low."

Teachers should monitor students as they work, paying special attention to the reasonableness of their scales for the line graphs and encouraging precision with the use of rulers. Teachers should explain to students that a squiggly line on a graph's y-axis can be used to indicate a break in its scale when all data points are very large.

After the Activity

Teachers should have students compare and contrast the lines of their two states and then discuss with them how the estimated number of births changed over the four years for the two states.

Students should then discuss their own observations and questions about the data and draw conclusions about trends.

Extension Ideas

- Teachers could have students compare and contrast the number of births for more than two states.
- Teachers could have more advanced students compute the average birthrate for each state (the number of live births in a year for every 1,000 people) to identify different trends and to consider, for example, how a birthrate can remain stable while a population increases overall.

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 line graph with large numbers and choose an appropriate scale for my graph.

The U.S. Census Bureau collects and organizes a wide variety of population data and other types of information for the nation, states, and counties. Governments, businesses, and school districts use this information to make decisions that affect everyone — including students like you!

A good way to compare and contrast data is to place those data on a graph. You are going to use 2023 data from State Facts for Students to make a line graph comparing the estimated numbers of births in two U.S. states over four years. Use the table below to record your data.

Student answers and graphs will vary depending on the states selected. The sample answers and graphs below use data from Ohio and Michigan.

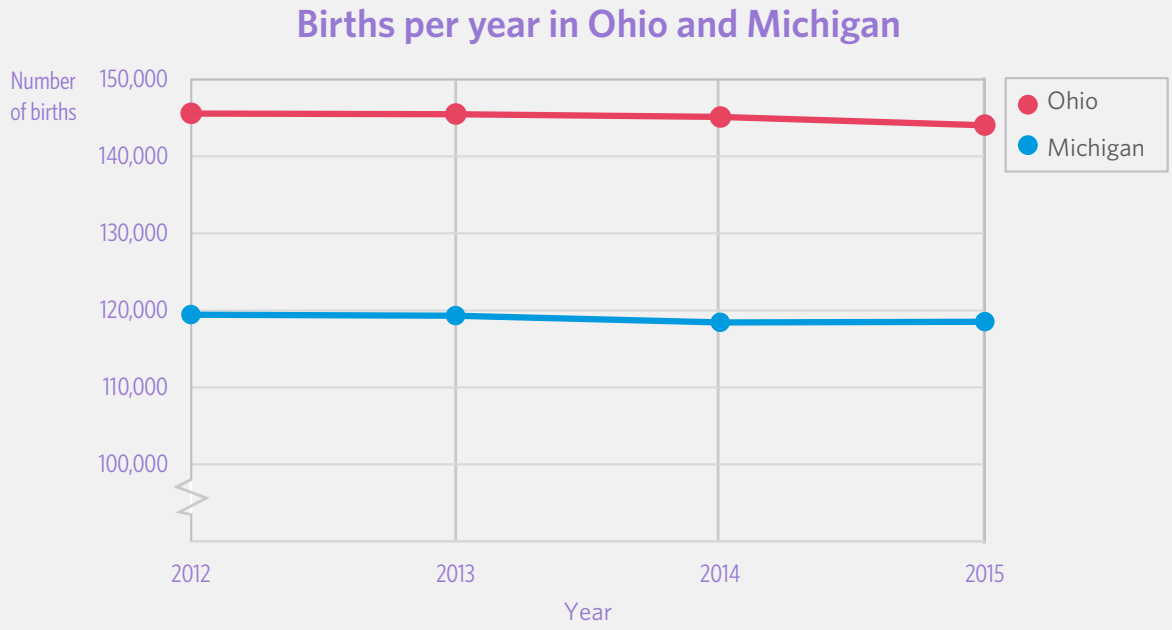
My state is **Ohio**. I am comparing it with **Michigan**.

Number of Kids Per State in 2023

Age in 2023	My State: Ohio	Comparison State: Michigan	Birth Year
8	145,591	119,442	2015
9	145,496	119,310	2014
10	145,128	118,441	2013
11	144,045	118,518	2012

1. Create a line graph of your data on the grid below:
2. Choose two different colors (one for each state) and make a key so that readers can understand which line is for which state.
3. Choose a scale for your vertical axis and label it "Number of births."
4. Write the four birth years from your table on the horixontal axis and label it "Year."
5. Mark your data points, and connect each point to the next with a line.
6. Give your graph a title.

Sample student graph:



7. What do you notice about the numbers of births in your state for these four years?

   The number of births in Ohio went up each year.

8. What do you notice about the numbers of births in your comparison state for these four years?

   The number of births in Michigan went down from 2012 to 2013 and then increased in 2014 and 2015.

9. How do the numbers of births in each state compare over the four years?

   The number of births in Ohio went up each year. The number of births in Michigan went down from 2012 to 2013 and then increased in 2014 and 2015. In all four years, there were more births in Ohio than in Michigan.

10. How does your line graph help you see changes in numbers of births differently than the table does?

    The graph helped me see the overall pattern better than the table did. It was easy to see that there were more births in Ohio than in Michigan each year.