Muse Machine 2025 Summer Institute-Inspired Lesson Plan

Graphing My Home: A Review of Four-Quadrant Graphing

Developed by Angela Streby

Incarnation Catholic School

Dayton, OH

Lesson Plan Summary:

Elementary math often emphasizes equations and correct answers. Inspired by the 2025 Summer Institute *Storytelling and the Folk Arts Spirit: The Roads that Lead to Home*, Angela Streby of Incarnation Catholic School adapted the idea of "mapping home" into a graphing lesson. Students identified personal concepts of home and plotted them on coordinate grids, reinforcing vocabulary, axes, points, and ordered pairs while showing that accuracy can yield multiple valid answers. Student reflections confirmed the lesson's impact on their knowledge of graphing concepts as well as deeper than expected personal connections to the work.

Muse Machine Lesson Plan – Summer Institute 2025

Instructor: Angela Streby
Title of Lesson: Graphing My Home: A Review of Four-Quadrant Graphing
Subject Area & Grade Level: PreAlgebra/8th Grade
Summer Institute Inspiration: Mapping Home with Chris Westhoff

OVERVIEW OF THE LESSON

Summary:

After discussing what home means to the students, they will map out at least five items/symbols/people on grid paper. Students will then review basic four quadrant graphing using their maps.

Enduring Understandings:

- Abstract ideas can be represented symbolically in many valid ways.
- Mathematical structures, such as the coordinate plane, provide shared rules that make different representations understandable and comparable.
- Accuracy in mathematics comes from correctly applying conventions (axes, scale, origin, ordered pairs), not from everyone producing the same visual result.

Ohio Math Standards:

6.NS.6 Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.

> **a)** Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of a number is the number itself, e.g., −(−3) = 3, and that 0 is its own opposite.
>
> **b)** Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.
>
> **c)** Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.

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Objectives & Outcomes:

1. Students will discuss what “home” means to them: places, items, people, feelings, etc.
2. Students will draw their representation of “home,” including five pieces with the most important piece in the middle.
3. Students will create a four-quadrant coordinate plane (drawing the x- and y-axis and labeling scales) with their most important part of home as the origin.
4. Students will plot points in the middle of each piece of their home and label their coordinates.

Teaching Approach(es):

Full group discussion, independent work

Assessment Tool(s):

- 20-point graphing rubric
- Empathy survey

LESSON PREPARATION

Teacher Needs:

Teacher Context

Home is often thought of as a physical place that can be mapped out. However, one can also identify home symbolically, such as being near certain people or having feelings of love and safety. Not everyone will have the same definition of home. Knowing what home means to each student will also provide the teacher more insight and understanding into who they are and what they may need in the classroom.

Helpful Hints

1. Have the students make a list of their ideas during their discussion of “home.”
2. Provide an example of a map with physical landmarks and a map with more abstract pieces (feelings or people that have no definite correct physical arrangement).

3. Some students may place all five pieces in the same quadrant but should still show and label the other quadrants to demonstrate understanding.
4. Have the students complete their "maps" on grid/graph paper.

Student Needs:

Prior Knowledge

Since this lesson is a review, students should already be familiar with labeling ordered pairs, x- and y-axis, four quadrants, scales, and integer placement on number lines.

Student Voice

Students will discuss what "home" means to them. Those who are willing may share their "maps" of home with the class.

Vocabulary

- *quadrant*: one of four regions created when the x-axis and y-axis intersect on a Cartesian plane
- *x-axis*: the horizontal (side to side) number line in a Cartesian coordinate system
- *y-axis*: the vertical (up and down) number line in a Cartesian coordinate system
- *origin*: the point (0, 0) on a coordinate plane where the x- and y-axis intersect
- *ordered pair*: a set of two elements where the order in which the elements are listed matters (x, y)

EVIDENCE OF OUTCOMES

Students will plot points in the middle of each of their home elements. They will set up a four-quadrant graph over their map with the most important element as the origin. All points will be labeled with the correct ordered pair. Other labeled items will include the x- and y-axis, axis scales, and quadrant numbers. Students' chosen representations of home will make sense symbolically.

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LEARNING PLAN

Teaching Inquiry

How can the storytelling exercise of "mapping home" be used to help students practice plotting points on a four-quadrant graph?

Essential Question

How do mathematical structures help us represent and communicate abstract ideas, even when those ideas differ from person to person?

Resources/Materials

- Grid/Graph paper for each student
- Straightedges (ruler)
- Pencils and erasers
- Colored pencils (especially black)
- Empathy survey (two copies per student for pre- and post-activity survey)

Hook

"What does 'home' mean to you?"

Tell the students about what was experienced at the Summer Institute and the focus on the idea of home and culture within folk arts traditions.

Main Lesson Narrative/Sequence

Day 1 (40 min.)

1. Take the empathy survey.
2. Talk to the students about the Summer Institute, how the ideas of home and culture play into our creativity when creating art. We had sessions about storytelling, folk music, creative movement and body percussion, creating art without focusing on being "perfect," the importance of local music and stories on the radio, etc. The first creative

session dealt with the idea that "home is where your story begins, so how does one create a visual map when describing "home?"

3. Ask the question: What does the word "home" mean to you? Write down what the students say on the board. See if there are any commonalities. If the students are giving more physical descriptions, steer them toward abstract descriptions (How does home feel? What do you feel when you think of home?). Bring up the fact that not everyone has one home, and some students may have no home. What does that do to their definition of "home?" The key is to get a variety of answers and get the students thinking. (Period 2 discussion, Period 3 discussion)

4. Give each student a piece of grid/graph paper (no axis or scales given). Have the students put their names on the back of the paper (anonymity makes students more comfortable and less inhibited in their creativity when their work might be displayed). Prompt them to think of the five most important things they could draw to make a "map" of their home. It could be an actual map of their home with the physical objects that are in the area around it (trees, fire pit, creek, pool, swing set, friend's house, lamppost, etc.). It could be a map of what is most important about their home (family, pets, toys, etc.). It could be symbols that represent their feelings about home (heart for love, blanket for security, etc.).

5. Once the majority of the students are finished, ask for volunteers to share their "maps".

6. Ask: a) "Did everyone draw the same thing?" b) "Did everyone use the space on the paper the same?" c) "Is there one right answer?" (No.) d) "Why isn't there one right answer?" (Everyone is different, has had different experiences, grown up in different areas with different people, etc.)

7. Remind the students to put their name on the back of the paper and collect them.

Day 2 (40 min.)

1. Hand back the students' papers. Ask for a volunteer to share what we did yesterday. Ask what was decided about whether or not there was one correct answer when drawing their maps.

2. Ask "Does math always have one right answer?" (If yes, why do you think that? If no, where in math can we have different answers?) Usually, math has one correct answer, but when we estimate, we can arrive at different answers depending on how we estimate.

3. “On what kind of paper did I have you draw your map?” (Grid/graph paper) “So, let’s focus on graphing. When we graph data, is it important to graph points correctly? Why?” (If we graph data points inaccurately, lines of fit could be very different.)

4. Tell the students that we are going to review the basics of graphing. Ask “What are the two main lines that set up our graphs?” (x- and y-axis), “Which is which? How are they positioned on the paper?” (x-axis is horizontal and y-axis is vertical), “What is the point where the x- and y-axes intersect called?” (origin), “And how is the origin labeled?” (0, 0)

5. Have the students look at their drawings of home and decide which piece is the most important. They will draw a point near the middle of that piece where two gridlines cross. They will then label that as the origin. Using a ruler they will draw the x- and y-axis, labeling them at one end.

6. Have the students draw points in the center of each piece drawn on their paper where two gridlines cross. Ask the students “How do we know what to label our other pieces?” (they will probably say to count the squares from the origin). “So each square is one unit? What tells you that?” (you are trying to get them to realize they need to have a scale labeled before they can label their points).

7. Have the students label the scales on the x- and y-axes such that each square is one unit in length. Once both scales are labeled, have them label the rest of the points with coordinates.

8. “The graph has been cut into four pieces by the x- and y-axes. Does anyone remember what we call them?” (quadrants), “And how do we label them?” (Roman Numerals), “So which quadrant is number I?” (top right, both x and y are positive), “Which is II?” (top left, x is negative and y is positive), “Which is III?” (bottom left, both x and y are negative), “So that makes IV the bottom right.” (x is positive and y is negative).

9. We are finished for now. Collect the papers. If students would like to color their home elements (neatly and all labels must be easily read), they can earn one point of extra credit on their first quiz (must be returned the next day).

10. Take empathy survey.

Demonstration of Learning

Students will produce and submit a graph with at least 5 recognizable elements drawn, each labeled with the correct ordered pair. Also, they must have the x- and y-axes drawn and labeled correctly, as well as labeling the scales and quadrants correctly.

Period 2 Discussion
Period 3 Discussion
Rubric
Student Work #1
Student Work #2
Student Work #3
Empathy Survey Data

Final Review

I will know the students met the objectives based on the accuracy of their labeling and how well their final "map" creation meets the scoring criteria.

LESSON REFLECTION

Students: Students mentioned that they felt more focused during the lesson because they were allowed to take ownership for their work, to give their own opinions and be creative. They liked how while they were reviewing the same ideas as their peers, each of their graphs were unique. Those that shared their graphs with the class said they felt seen and understood. They are looking forward to what we will do next with their graphs of "home".

Teacher: First, when I do this lesson again, I would make sure to print the grid on both sides of the paper, so they don't ask which side to use or whether they can use the blank side. That way no explanation is needed as to why we are drawing on a grid (don't want to give away too much info in the beginning about what we are going to do in the activity).

Second, I would limit them to just five elements. I had many students in both of my classes fill the paper with elements of "home" that I was slightly concerned about them being able to see the graphing elements once they drew/labeled them.

Overall, I was really pleased with how the lesson went in my two PreAlgebra classes. A lot of students were willing to add ideas about what a "home" was to our brainstorming list, and several students had the courage to share their renditions of "home," showing the diversity in their ideas. I intend on keeping the students' papers until we get to graphing lines. They will create at least three lines through their points and find the equations of those lines using the coordinates of the points they initially drew in the center of their elements.

As for the empathy survey, out of 34 students, half of their empathy scores increased, 13 saw no change, and only 4 had a decrease in their scores. So overall, the discussion about “home” meaning something different for everyone had a positive impact on how they looked at each other with care. It’s amazing what a simple discussion can do to help empathy for one another grow!