

Pre-Teaching and Warm-Up Activities

Foundational Understandings

- Graphs are visual representations of data sets.
- Data can be plotted on graphs and represented with plots and bars.
- Questions can be answered and plotted on graphs by visually looking at graphs.

Graphing Skills and Concepts to Review

- Data represents information that helps us solve problems.
- Data can be analyzed visually through the use of graphs.
- Graphs are set up with an x (horizontal) and y (vertical) axis; the axes are labeled depending on the largest and smallest data value.
- A data set is a group of all the data collected surrounding one topic.
- Each data point represents information from a data set.
- Data can be visually analyzed in categories of more and less.
- Numbers have values that are greater (larger value) or less than (smaller value) each other.
- Sometimes data needs to be added together and/or divided (addition and division) in order to be analyzed.

Unit Vocabulary

Key Terms to Introduce

The following are key terms that will be used throughout this unit. At the end of this pre-teaching lesson, you will conduct a vocabulary activity using a constant time-delay procedure to help students learn these terms.

- **data:** a collection of information expressed as numbers (quantitative)
- **dot plot:** a graph that displays data as dots on a number line
- **axis:** a reference line drawn on a graph

- **horizontal:** going side-to-side
- **vertical:** going in an up-down direction
- **histogram:** a graph that displays data using bars of different heights

Foundational Vocabulary to Review (If Needed)

The following vocabulary terms will come up in the unit's lessons. If students don't know these foundational terms yet, you may wish to review them here and/or before teaching each lesson. A handy source of definitions of math concepts (with accompanying illustrations) is available at:

www.mathsisfun.com/definitions

- graph
- least (less than, smaller than)
- most (more than, greater than, larger than)
- add
- divide
- number line (including the concept of the value of numbers on the line as larger and/or smaller)
- set
- average
- estimate

Objectives

- Recognize and collect data
- Identify more than or less than, most or least
- Identify a data set

Warm-Up Activity 1

Materials

Supplied

- Vocabulary card: *data*
- Geoboard and pegs
- Concept card: *data set*
- ➕ Number cards: 1–10
- ➕ Counting cubes

To Bring From Home

- Tangible objects to distribute (e.g., pencils, rocks, pennies, paperclips)
- Post-it Notes (approx. 3" × 3")
- Dry-erase marker

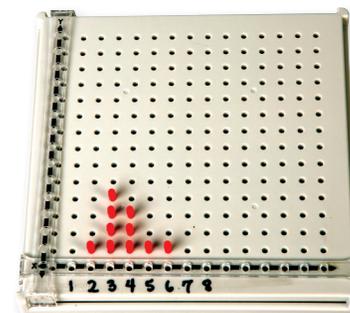
Lesson Preparation

1. Prepare the geoboard by using a dry-erase marker to write numbers 1–10 on the *x*-axis.
2. ➕ Program AAC devices with: Numbers 1–10, most, least, more than, less than.

Task

1. Hold up the Vocabulary card for *data* and define the word *data* ("information expressed as numbers"). Then hold up the *data set* Concept card and show students that a group of numbers or a group of data makes a data set.

2. Hand out tangible items to each student (e.g., pencils, pennies, paperclips, rocks). Vary the amount of the items you pass out so each student has a different amount (e.g., 1 pencil, 3 pencils, 5 pencils, 8 pencils, 10 pencils). Ask, **How many [pencils] do you each have? Let's collect the data! Let's make a data set.**
3. As each student answers the question, write the number of pencils he or she has on a Post-it Note. Collect each student's pencils and place them next to the Post-it Note with the number as a visual reminder.
4. Once students have shared their data, write the data set where all students can see it and review together (e.g., Data Set: 1, 3, 5, 8, 10). Focus on helping students recognize that you have collected a *data set*. Begin to emphasize this term.
5. Compare the different data. Point to different sets [of pencils] and compare the sets to identify which has more and which has less. Repeat as necessary until you are certain students visually perceive the sets as *more than* and *less than* another data set.
6. Using the geoboard and the pegs, ask students to place pegs in the geoboard to represent the numbers in the data set (e.g., place pegs to show the number of students who had 2 in their set). Repeat with all data points.



7. Next, identify the data set (the number) that is the largest on the geoboard. Identify the data set (the number) that is the smallest on the geoboard. Use terms to describe the relationships, like *more than*, *greater than*, *less than*, *larger than*, *smaller than* [e.g., **2 pegs is less than, smaller than 5 pegs**]. Make sure to help students connect the concept of pegs representing students; pegs = the number of students with that amount of [pencils]. Point out to students how easy it is to view the data on the geoboard to see the largest set, the smallest set, etc.
8. Repeat the task using data regarding the number of pets students have. Ask, **How many pets do you have?** Ask students to represent their *data* as a numeral with the same number of images on a blank Post-it Note (e.g., Draw 2 pets [bird and cat] and write the number 2; paste 3 dogs and write the number 3). Ask students to collect data from one or two classmates and then write down the data they collected. Remind them that they created a data set.



9. Once students have collected their data, gather the Post-it Note from each student. Combine all Post-it Notes. Write the data set where all students can see it. Review the data set together (e.g., 2, 2, 3, 5, 4, 1, 0, 2).
10. Using the geoboard and pegs, ask students to place pegs in the geoboard to represent the data regarding

pets. Repeat with all data points. Emphasize the terms *data* and *data set* and compare data using *more than*, *less than*, *greater than*, *smaller than*, *larger than*, *most*, and *least*.

11. Continue with other examples as needed.
12. Make certain all students can identify that data is information. If needed to further develop, ask students a personal question that has a numerical value, and then have them identify the information needed (e.g., **How many hats do you have?** The students respond with 3, so then ask, **What is the data?** Students respond with the same answer, 3).

For Students With Emerging Skills:

For students who are still working on numeral identification, display Number cards one at a time (either Number cards for 1–3, 1–5, or 1–10). Using the time-delay procedure (see p. 33), point to the number and name it (e.g., **This is 2**). Have the student point to the number. Repeat with the next number. After several trials, provide the student with two or three number cards at a time and ask him or her to find the number you name (e.g., **Where is 2?**).

Additionally, to build the concepts of *more* and *less*, or *more than*, *less than*, *greater than*, *smaller than*, and *larger than* related to numbers and amounts, use differing amounts of objects, have the student match the Number card to the sets of objects and then identify the sets that are more than, greater than, larger than, etc.

Objectives

- Identify a graph
- Identify a dot plot

Warm-Up Activity 2

Materials

Supplied

- Access *Algebra* Student Book (pgs. 61–63)
- Concept cards: *dot plot*, *bar graph*, *histogram*, *circle graph* (2 of each)
- Concept cards: Nongraph images
- Vocabulary cards: *dot plot*, *histogram*

Lesson Preparation

1.  Photocopy the graph and nongraph Concept cards.
2.  Program AAC devices with response options: dot plot, histogram, graph, not.

Task

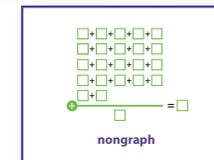
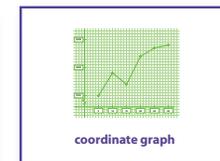
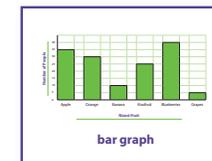
1. Review (or teach) the vocabulary word *graph* and its definition. Say, **A graph is a drawing of dots, lines, or bars, etc., that shows how much or how quickly something changes.** Show students the Concept cards for graphs and point out how different the graphs are but how they are all drawings that show change. Also refer students to the Resources pages at the back of their Student Book to see the different types of graphs.

2. Using the Concept cards, use a Model—Lead—Test procedure to review graph versus not a graph.

Model by displaying 2 graph Concept cards and 1 nongraph Concept card (i.e., 2 examples and 1 nonexample). Point to the graph examples and the nongraph example and label each (e.g., **This is a graph. This is a graph. This is not a graph.**)

Lead the students. Shuffle the cards so they are in a different order. This time have students join you in pointing and labeling the cards. Say **it with me, “This is a graph. This is a graph. This is not a graph.”**

Test each student by placing 1 graph Concept card and 3 nongraph Concept cards in front of a student. Say, **Your turn. Find a graph.** Then say, **Point to a picture that is not a graph.** Repeat with each student.



3. Review (or teach) *dot plot* and its definition. Show students the dot plot Vocabulary and Concept cards and also the dot plot in the Resources section of their Student Book. Say, **A dot plot is a “graph that displays data as dots on a number line.”**

4. Use a Model—Lead—Test procedure to teach dot plot versus not a dot plot.

Model by displaying 2 dot plot Concept cards and one other graph Concept card (i.e., 2 examples and 1 nonexample). Point to the dot plot examples and nongraph example and label each (e.g., **This is a dot plot graph. This is a dot plot graph. This is not a dot plot graph.**)

Lead the students. Shuffle the cards so they are in a different order. This time have students join you in pointing and labeling the cards. **Say it with me, “This is a dot plot graph. This is a dot plot graph. This is not a dot plot graph.”**

Test each student by placing 1 dot plot Concept card and 3 non-dot plot Concept cards in front of a student. Say, **Your turn. Find a dot plot graph.** Then say, **Point to a picture that is not a dot plot graph.**

5. Review (or teach) *histogram* and its definition. Say, **A histogram is a “graph that displays data using bars.”** Show students the Vocabulary and Concept cards for histogram and also the histogram in the Resources pages of their Student Book.

6. Use a Model—Lead—Test procedure to teach histogram versus not a histogram.

Model by displaying 2 histogram Concept cards and 1 other graph Concept card (i.e., 2 examples and 1 nonexample). Point to the histogram examples and nonhistogram example and label each (e.g., **This is a histogram graph. This is a histogram graph. This is not a histogram graph.**)

Lead the students. Shuffle the cards so they are in a different order. This time have students join you in pointing and labeling the cards. **Say it with me, “This is a histogram graph. This is a histogram graph. This is not a histogram graph.”**

Test each student by placing 1 histogram Concept card and 3 nonhistogram Concept cards in front of a student. Say, **Your turn. Find a histogram graph.** Then say, **Point to a picture that is not a histogram graph.**

For Students With Emerging Skills:

Use a photocopy of the dot plot and histogram Concept cards. Have them match the dot plot Concept card to the same picture on the photocopy. Repeat with each *dot plot* Concept card, repeating the words *dot plot* each time the student matches the Concept card to its corresponding picture.

Repeat with each histogram Concept card, repeating the word *histogram* each time the student matches the card to the picture of the card.

Objectives

- Identify horizontal
- Identify vertical
- Identify an x -axis
- Identify a y -axis

Warm-Up Activity 3

Materials

Supplied

- Geoboard and pegs
- Vocabulary cards: *horizontal*, *vertical*
- Graph images (Appendix C)

To Bring From Home

-  Wiki sticks or pipe cleaners in two colors
- Sheet of paper

Lesson Preparation

-  Program AAC devices with response options: x -axis, y -axis, not.

Task

1. Show the Vocabulary cards for *horizontal* and *vertical*. Point out that horizontal lines go side to side like the horizon and vertical lines go up and down like a tree or a tall building.
2. Introduce the geoboard as a way to make a graph, saying, **Today we will be learning about parts of a graph. We can make a graph using this geoboard.** Point to the horizontal axis and say, **This part of the graph is called the x -axis. The x -axis is horizontal. Remember that horizontal lines go side to side like the horizon. The x -axis goes side to side. See? Point to the x -axis on the geoboard.** Next, point to the vertical axis and say, **This part of the graph is called the y -axis. The y -axis is vertical. Remember that vertical lines**

go up and down like a tree. The y -axis goes up and down. See? Point to the y -axis on the geoboard.

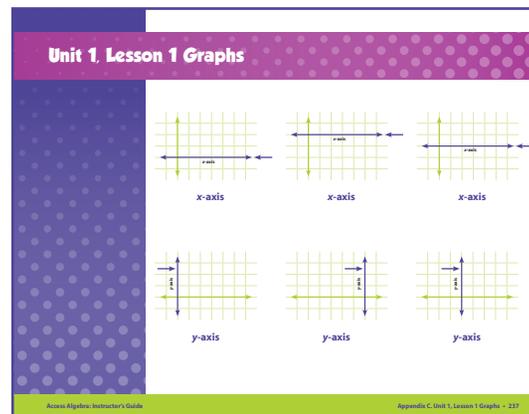
3. Ask students to draw an x -axis and a y -axis on a sheet of paper. **Let's draw the first line like the horizon. We say this line is horizontal. It forms an x -axis. Yes, that is the x -axis. The x -axis is horizontal. Where should we draw the next line to create the y -axis? Very good, the y -axis is vertical. It goes up and down like a tree.**
4. Use the images in Appendix C and the Model—Lead—Test procedure to review x -axis versus y -axis.

Model by displaying Appendix C. Point to the x -axis on 2 graphs as examples and the y -axis on the other (the nonexample). Point to the x -axis on 2 graphs as you say, **This is the x -axis. This is the x -axis.** On the third graph, point to the y -axis and say, **This is not the x -axis).**

Lead the students. This time have students join you in pointing and labeling the axes. **Say it with me, "This is the x -axis. This is the x -axis. This is not the x -axis."**

Test each student. Say, **Your turn. Find the x -axis on a graph.** Then say, **Point to an axis that is not the x -axis.** Repeat with each student.

5. Repeat for the y-axis.



For Students With Emerging Skills:

Ask students to create an x -axis and a y -axis using Wiki sticks or pipe cleaners. Let's place this [Wiki stick] horizontally to form an x -axis. Yes, that is the x -axis. It is horizontal like the horizon. It goes side to side. Where should we put this [Wikki stick] to create the y -axis? Very good, it is vertical like a tree or a tall building. It goes up and down.

Use stimulus fading for students who are struggling to identify the axes. Prepare copies of the graphs in Appendix C, highlight the axis you want the students to point to (e.g., point to the x -axis). Fade the highlight into a colored line when students are successful at identifying the x -axis, then fade into only a dot of color on the line.

Objective

- Create a dot plot using a geoboard
- Review the term *mode*

Warm-Up Activity 4

Materials

Supplied

- Geoboard and pegs
- Number cards: 1–10
- Number Line: 0–10
- Counting cubes

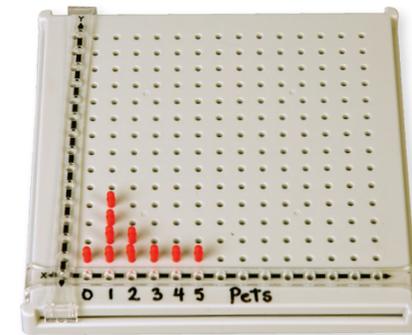
Lesson Preparation

1. Add numbers 1–10 to the x -axis on the geoboard using a water-based or dry-erase marker.
2. ➤ Program AAC devices with response options: dot plot, numbers 1–10.

Task

1. Discuss the use of graphs to visually represent data. For this activity, you will be creating a dot plot to help students understand that graphs visually represent data.
2. Remind students about the data they collected in Warm-Up Activity 1. For this activity, students can use the same data from Warm-Up Activity 1 or collect new data.
3. Tell students that in this activity, the pegs will represent them and the number of pets each of them has (i.e., if they have 2 pets, they will be represented with 1 peg above the 2). Then model how to plot data by placing the pegs in the geoboard.

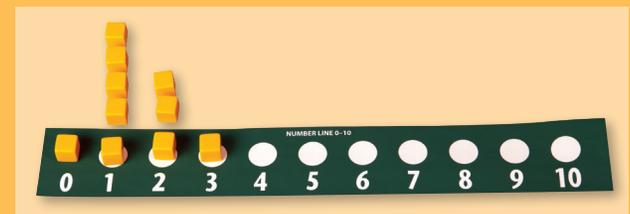
4. Help each student identify the number of pegs that represent the data (e.g., how many students have 0 pets; how many students have 1 pet, how many students have 2 pets, etc.), each time placing pegs in the geoboard to represent the data.
5. Use new data if students need additional practice. If needed, write the data where students can see it:
 - Identify the x -axis (# of pets).
 - Identify the number of the first set of data (e.g., 4 students have 1 pet).
 - Place the number of pegs in the geoboard.
 - Identify the number of the second set of data (e.g., 2 students have 2 pets).
 - Repeat with the next value in the data set.



6. Tell students they just created a dot plot. Have them say the words *dot plot*.
7. Provide more data sets and have students practice placing pegs in the geoboard.
8. Review the term *mode*. Point to the column with the most pegs. Say, **This column has the most. The column with the most pegs is called the *mode*. *Mode* means “the most.” We’ll be using the word *mode* in this unit.**

For Students With Emerging Skills:

Show students the number that represents the data (e.g., 5) and help students match a Number card to the corresponding number of pegs on the geoboard. Or use the Number Line and have students place counting cubes above the number.



Objectives

- Add sets of numbers using a calculator
- Divide numbers using a calculator
- Review the term *mean*

Warm-Up Activity 5

Materials

Supplied

- Calculator
- Symbol cards: *add (+)*, *divide (\div)*
- Calculator Task Analysis for Addition card (1 per student)
- Calculator Task Analysis for Division card (1 per student)
- Addition Equation cards
- Division Equation cards
-  Number cards: 1–10

To Bring From Home

-  Additional calculators so each student has one

Lesson Preparation

Write several data sets of numbers (such as the data regarding pets from Warm-Up Activity 1) where students can see them.

Task

1. Explain, **Sometimes we look at data points individually, but sometimes we need to add them all together to get different information. For example, in Warm-Up Activity 1, we looked at how many pets each student has, but we may want to know how many pets we have altogether. We can add the numbers together to find this information.**

2. Provide access to a calculator and a Calculator Task Analysis for Addition card. Have students practice adding together all of the data in each data set. Model how to add the points of data.
3. Provide each student with an Addition Equation card to practice adding; then have students pass the card to the left and receive a new one to practice with.
4. Provide students with a Division Equation card. Explain, **Sometimes we need to divide numbers into parts. Let's review how to divide using a calculator. For example, if the Animal Shelter has 12 pets and 6 people are waiting to feed them, how many pets will each person need to feed? We can find the answer to this question by dividing the number of pets by the number of people: $12 \div 6 = 2$.** Have students use the cards to practice.
5. We also use addition and division to calculate the average of numbers. Average is also called the *mean*. *Mean* means "average." We'll learn more about calculating the mean in this unit.

For Students With Emerging Skills:

For students with limited numeral recognition, have them use Number cards 1–10 to match to the buttons on the calculator. If possible, immediately pair the items (e.g., 2 pencils) when a student touches the numeral on the calculator to reinforce the concept of the data (e.g., 2 items = numeral 2).

Objective

- Identify vocabulary words: data, dot plot, axis, horizontal, vertical, histogram

Warm-Up Activity 6

Materials

Supplied

- Vocabulary cards: *data*, *dot plot*, *axis*, *horizontal*, *vertical*, *histogram*
- Access Algebra* Student Book (pgs. 2–3)

Lesson Preparation

If students still need to learn foundational terms, create vocabulary cards and include them in this activity (e.g., *graph*, *least*, *most*, *add*, *divide*, *number line*, *set*, *average*).

Task

Using the Vocabulary cards, review each vocabulary term and its definition using the time-delay procedure as outlined below. Note that the words *touch* and *find* are used in the directions, but you may change the verbs as appropriate for each student (e.g., use *look at* for students who eye-gaze as their mode of responding). In future lessons, refer to the Time-Delay Procedure card for instructions.

Time-Delay Procedure



ROUND 1: 0-Second Time Delay

- Step 1** Present the target Vocabulary card and 3 distractor cards to a student.

- Step 2** Point to the target card and say (while still pointing to the card), **This is the word** [*data*]. **Touch** [*data*].

- Step 3** Provide feedback.

- If the student touches the correct card, give specific praise, **Yes**, [*data*]. **Good job finding** [*data*]. [*Data*] is ["information expressed as numbers"].
- If the student does not touch where you are pointing or makes no response, use a physical prompt to guide the student to locate the word and then give specific feedback, **Yes, you pointed to** [*data*]. [*Data*] means ["information expressed as numbers"].

NOTE: There should be no errors in this round.

- Step 4** Shuffle the cards and repeat the process with each target Vocabulary card.

- Step 5** Repeat these steps with each student in the group; then proceed to Round 2, using a 4-second time delay.



ROUND 2: 4-Second Time Delay

- Step 1** Present the target Vocabulary Card and 3 distractor cards to one student.

- Step 2** Say, **Show me** [*data*]. Wait up to 4 seconds for a response before prompting the student. (For students who can read, alternatively ask, **What word is this?** Rather than **Show me** [*data*].)

- Step 3** Provide feedback.

- If the student touches the correct card, give specific praise, **Yes, [data]. Good job finding [data]. [Data] means [“information expressed as numbers”].**
- If the student makes no response, use a physical prompt to guide the student to the correct word and then give specific praise, **Yes, [data]. You pointed to [data]. [Data] means [“information expressed as numbers].**

OR

- If the student responds incorrectly, point to the correct word and say, **This is [data]. Touch [data].**

NOTE: If possible, try to block errors and redirect the student to the correct response. If the student makes an error, do not attend to it (that is, do not say, “No, that word is [scale]”).

Step 4 Shuffle the cards and repeat the process with each target Vocabulary card.

Step 5 Repeat these steps with each student in the group.

NOTE: If a student makes repeated errors for Round 2, stay with Round 1 for a few lessons but return to Round 2 when appropriate.

For Advanced Learners

Present the Vocabulary Cards and have each student find the matching card when you give a definition.

Definitions:

- **data:** a collection of information expressed as numbers (quantitative)
 - **dot plot:** a graph that displays data as dots on a number line
 - **axis:** a reference line drawn on a graph
 - **horizontal:** going in a side-to-side direction
 - **vertical:** going in an up-down direction
 - **histogram:** a graph that displays data using bars of different heights
1. Have students open their Student Books and complete the Warm-Up activity. **Let’s practice what we learned in these Warm-Up activities. Turn to page 2 in your Student Books and complete the activities.**

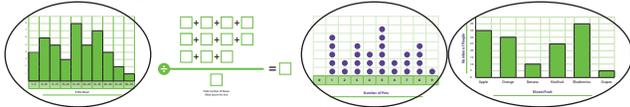
For Students With Emerging Skills:

If a student continues to answer incorrectly, repeat Round 1 with a 0-second time delay. Students who are making errors continuously are guessing; therefore, an errorless round will provide more specific feedback on the correct answer.

Answer Keys

LESSON 1

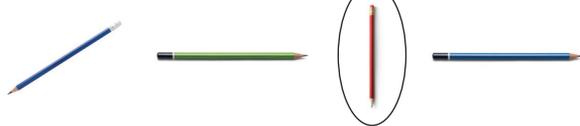
1. Circle the pictures of graphs.



2. Which pencils are horizontal? Put an X on them.



3. Circle the pencil that is vertical.



4. Fill in the blanks:

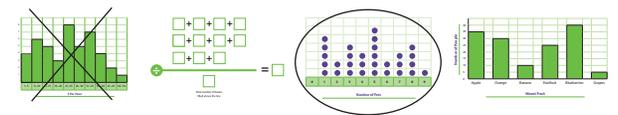
The mean is the average _____.

The mode is the most _____.

The x-axis is a horizontal _____ line.

The y-axis is a vertical _____ line.

5. Circle the dot plot. Put an X on the histogram.



6. Fill in the blanks:

A line going from side to side like the horizon is horizontal _____.

A line going up and down like a tall tree is vertical _____.