# 2 Dot Plot, Mode, and Mean (Model)

## Foundational Understandings

- Data can be represented with dots in a dot plot.
- Basic frequency data can be interpreted with dot plots.
- Data can be compared using mode and mean.

## **Mastery Objectives**

- Create a dot plot
- Identify the spread of data
- Interpret basic frequency data from dot plots
- Identify mode as the highest frequency within a data set
- Identify mean as the average
- Use a calculator to calculate mean

# Challenge Objectives

- Understand the impact of an outlier on statistics
- Recalculate data eliminating the outlier

# Materials

## Supplied

- 2-column T-chart
- Teaching Dot Plot Graphic Organizer
- Number Lines: 0–10, 11–21
- Access Algebra Student Book (pgs. 4–8)
- Vocabulary cards: *data*, *dot plot*, *axis*, *horizontal*, *vertical*, *histogram*
- Calculator
- Calculator Task Analysis for Addition card
- Calculator Task Analysis for Division card
- 던 Number cards: 1–10
- Problem statements (Appendix D)

## To Bring From Home

- 🔁 Post-it Notes
- 🛃 Small dot stickers or bingo daubers
- Pictures of emotions: grumpy, tired, bored, happy, energetic, sleepy
- 🔁 Alphabet and number stamps
- Additional calculators so each student has one
- 🛃 Glue stick

# **Lesson Preparation**

1. Using a dry-erase marker, write the word *Rested* at the top of one column of the T-chart and *Not Rested* at the top of the other column.

- 2. E Project the Dot Plot Graphic Organizer (found on the flash drive) and the data set from the Student Book onto a whiteboard so you can demonstrate the steps during this lesson.
- 3. Program AAC devices with response options: Numbers 1–10; emotions, such as grumpy, tired, bored, happy, energetic, sleepy.

# **Prompts for Modeling**

Model each step of the Task Analysis in the Student Book. Have students follow your model. If needed, prompt using the least intrusive prompt (LIP) as follows:

If a student does not respond, give a verbal prompt (e.g., Write the problem on the lines in your Student Book).



If the student still does not respond or responds incorrectly, model the step again and repeat your verbal prompt to give the student another opportunity to respond.



If still no response, physically guide the student to complete the step.

# Engage the Students

٦	Feacher Task Analysis	Teacher Instructions	Student Response	For Students With Emerging Skills
1.	Engage the students and introduce the lesson.	Set up the day's lesson: Today, we're going to use <i>statistics</i> to help us answer a question. Statistics is a kind of math that uses numerical data. Without data to talk about or to analyze a question, statistics would not exist. There is a story—with characters, plots, and problems—to be uncovered behind data. The data can be exciting or disappointing. Today you will learn how to follow the steps of a Task Analysis to solve a problem.		
2.	Review the vocabulary terms.	Let's start by reviewing this unit's vocabulary words.	Responds by selecting the correct Vocabulary card given 4 cards to choose from	Responds by selecting or eye-gazing to the correct Vocabulary card given 2 or 3 cards to choose from
		Use the Vocabulary cards to review each term and definition using the constant time-delay procedure described on page 33.		
		Definitions:		
	Portental	<ul> <li>data: a collection of information expressed as numbers (quantitative)</li> </ul>		
	vertical	• <b>dot plot:</b> a graph that displays data as dots on a number line		
		• <b>axis:</b> a reference line drawn on a graph		
		• <b>horizontal:</b> going in a side-to-side direction		
		• vertical: going in an up-down direction		

Teacher Task Analysis	Teacher Instructions	Student Response	For Students With Emerging Skills
	<ul> <li>histogram: a graph that displays data using bars of different heights</li> </ul>		
	NOTE: You may also need to review the following foundational vocabulary as they come up in the lesson: <i>graph, least, most, add, divide, number line, set, average</i> .		
3. Outline the lesson and link it to the students' prior knowledge.	Before we get started with our math story, let's think about sleep. Sleep is very important to your health. Scientists explain that sleep is like food for your brain. It gives you energy for the next day.		
	Getting the right amount of sleep helps you learn, remember, feel good, and look good. If you don't get enough sleep, you might become grumpy, forgetful, and you may even get pimples!		
	Display the 2-column T-chart. Discuss with the students how they feel when they are rested and how they feel when they are not rested and lacking sleep. Write their emotions, feelings, and descriptions in the appropriate columns of the T-chart.	Describes how he or she would feel by stating an emotion, feeling, or description	Sorts pictures of emotions and feelings on the columns on the T-chart
	Today we will learn more about a student named Zane who is not sure about how much rest he needs. I will show you how to follow steps to solve Zane's math problem using a dot plot. Remember, a <i>dot plot</i> is a type of graph that shows data using dots.		

# Teach the Task Analysis

Student Task Analysis	Teacher Instructions	Student Response	For Students With Emerging Skills
1. Listen to or read the math story.	Let's begin. Open your Student Book to Lesson 2. Read the math story with me.	Listens to the story being read; follows along in the Student Book	Watches as the words are read and pointed to by you or a peer
	Read the math story and encourage students to follow along.		



Identify the problem.

## Math Story

Zane has a basketball game against a rival team on Friday. His coach told the team to get plenty of rest. Zane wants to be sure he is rested for the game, but he likes to stay up late at night playing video games. He usually gets about 6 hours of sleep per night. He wonders if this is enough sleep to feel well-rested. He decides to ask several of his classmates how many hours of sleep per night they usually get. He will then compare the data he collects from his friends to how many hours he sleeps and decide if he is getting enough sleep.

Zane asked 10 of his classmates who seem to be well-rested how many hours per night they usually sleep. Here is the data set Zane collected:

## Data Set

9 hours	10 hours	7 hours	8 hours	9 hours

9 hours 5 hours 8 hours 10 hours 9 hours



UNIT 1 • Lesson 2 • 5

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Student Task Analysis	Teacher Instructions	Student Response	For Students With Emerging Skills
	We have read the math story about Zane. Let's check off Step 1 of the Task Analysis.	Checks off (√) Step 1	Finds Step 1 on the Task Analysis and checks it off () with your help
2. Identify the problem.	In this story, Zane wants to be sure he has plenty of sleep before the basketball game on Friday. He isn't sure if 6 hours per night is enough sleep. We can use data to help Zane answer his question. What did Zane want to make sure he was getting enough of?	Responds <i>sleep</i>	Responds <i>sleep</i>
	Yes, sleep.		
	Point to the data set in the Student Book. (As an alternative, project the page on to a whiteboard.) Here's the data Zane has. Remember, this data is called a <i>data set</i> . The data set says Zane asked 10 of his classmates, who seem to be well-rested, how many hours per night they usually sleep. The data set shows what they answered.		
	Help students identify the problem. What is the problem we are solving? We want to know	Responds how many hours of sleep	Given 2 choices, chooses <i>hours</i> of sleep
	Yes. Let's write the words <i>how many hours of sleep</i> on the lines in your Student Book for identifying the problem. Zane wonders how many hours of sleep his rested classmates get.	Writes the problem statement on the lines in the Student Book	Glues the problem statement onto the lines provided in the Student Book or has a scribe help write it
	Very good. You have identified the problem, so where will you check off that step? Very good.	Checks off (√) Step 2 on the Task Analysis	Finds Step 2 on the Task Analysis and checks it off () with your help

Teacher Instructions	Student Response	For Students With Emerging Skills
In this story, Zane wants to get plenty of sleep and he is interested in how many hours per night of sleep his peers get. To find the answer, we will make a dot plot graph with the data.		
Display the Teaching Dot Plot Graphic Organizer. (As an alternative, project the graphic organizer onto a whiteboard.) Point to the horizontal line, the <i>x</i> -axis, on the graphic organizer. Here on this axis we will plot our data. What is this axis called?	Responds <i>x</i> -axis	Points to the letter <i>x</i> on the graphic organizer
Yes, this is the x-axis. We need to write the title below this axis. The title tells us the type of data we are plotting. Ask, What type of data do we need to plot? Wait for a response or provide a prompt for the answer as needed.	Indicates hours of sleep per night	Given 2 choices, chooses <i>hours</i> of sleep
Say, <b>That's right. Hours of sleep per night.</b> Model writing "Hours of Sleep per Night" on the graphic organizer.		
Point to the title below the <i>x</i> -axis and say, <b>This says, Hours</b> of Sleep per Night. Now you write it below the horizontal <i>x</i> -axis in your Student Book.	Copies the words <i>Hours of Sleep per Night</i> onto the graph title line	Points to where the title should be written in the Student Book or has a scribe help write it
Very good. You have titled the graph so where will you check off that step? Very good.	Checks off (√) Step 3 on the Task Analysis	Finds Step 3 on the Task Analysis and checks it off () with your help
	<text><text><text><text><text><text><text></text></text></text></text></text></text></text>	Teacher InstructionsStudent ResponseIn this story, Zane wants to get plenty of sleep and he is interested in how many hours per night of sleep his peers get, To find the answer, we will make a dot plot graph with the data.Display the Teaching Dot Plot Graphic Organizer. (As an alternative, project the graphic organizer onto a whiteboard.) Point to the horizontal line, the x-axis, on the graphic organizer. Here on this axis we will plot our data. What is this axis called?Responds x-axisVes, this is the x-axis. We need to write the title below this axis type of data do we need to plot? Wait for a response or provide a prompt for the answer as needed.Indicates hours of sleep per nightSay, That's right. Hours of sleep per night. Model writing "Hours of sleep per Night" on the graphic organizer.Copies the words Hours of sleep per Night. Now you write it below the horizontal axis in your Student Book.Very good. You have titled the graph so where will you check off that step? Very good.Checks off (s) Step 3 on the fask Analysis

Student Task Analysis	Teacher Instructions	Student Response	For Students With Emerging Skills
<b>4.</b> Set up the graph.	Say, Next, to look at Zane's data in a dot plot, we need to set up the horizontal axis—the <i>x</i> -axis—of our graph (point to the <i>x</i> -axis). First, we need to determine the numbers we will use. We need to think about the smallest number to the largest number. We call this the <i>spread</i> . The spread is "the smallest number to the largest number."		
	To find the spread, we look at the data to find the smallest number overall and the largest number overall. Let's do that.		
	Look at the data set. Find the smallest number. Wait or prompt for a correct response.	Identifies the smallest number in the data set as 5	Given 3 or 4 Number cards, chooses 5, or points to 5 on the Number Line
	That's right; 5 is the smallest number. Now find the largest number. Wait or prompt for a correct response.		
	Good. The largest number is 10, so our spread is from 5 to 10.	Identifies the largest number in the data set as 10	Given 3 or 4 Number cards, chooses 10 or points to 10 on the Number Line
	Now that we know the spread, we can add the numbers to the axis. Point to the first box on the axis. Model writing the smallest number (5) in the first box on the graphic organizer.		
	Your turn. Now you put the smallest number in the first box on the page in your Student Book. Wait for students to follow your model.	Places or writes the smallest number on the <i>x</i> -axis in the first position	Stamps or sticks numbers on the graphic organizer
	Student Task Analysis 4. Set up the graph.	Student Task AnalysisTeacher Instructions4. Set up the graph.Say, Next, to look at Zane's data in a dot plot, we need to set up the horizontal axis—the x-axis—of our graph (point to the x-axis). First, we need to determine the numbers we will use. We need to think about the smallest number to the largest number. We call this the spread. The spread is "the smallest number to the largest number."To find the spread, we look at the data to find the smallest number overall and the largest number overall. Let's do that.Look at the data set. Find the smallest number. Wait or prompt for a correct response.That's right; 5 is the smallest number. Now find the largest number. Wait or prompt for a correct response.Good. The largest number is 10, so our spread is from 5 to 10.Now that we know the spread, we can add the numbers to the axis. Point to the first box on the graphic organizer.Your turn. Now you put the smallest number in the first box on the page in your Student Book. Wait for students to follow your model.	Student Task AnalysisTeacher InstructionsStudent Response4. Set up the graph.Say, Next, to look at Zane's data in a dot plot, we need to set up the horizontal axis—the x-axis—of our graph (point to the x-axis). First, we need to determine the numbers we will use. We need to think about the smallest number to the largest number. We call this the spread. The spread is "the smallest number to the largest number."Identifies the smallest number overall and the largest number. Wait or prompt for a correct response.Identifies the smallest number in the data set as 5That's right; 5 is the smallest number. Now find the largest number. Wait or prompt for a correct response.Identifies the largest number in the data set as 10Now that we know the spread, we can add the numbers to the axis. Point to the first box on the axis. Model writing the smallest number (5) in the first box on the graphic organizer. Your turn. Now you put the smallest number in the first box on the page in your Student Book. Wait for students to follow your model.Places or writes the smallest number on the x-axis in the first position

# Student Task Analysis Teacher Instructions Student Response For Students With Emerging Skills Great Remember that the largest number in the spread is Responds 6 Responds 6

Analysis			Emerging Skills
	Great! Remember that the largest number in the spread is 10. So we need to write all the numbers from 5 to 10 on the horizontal axis. What number comes after 5? Yes, 6. I'll write 6 in the next box. You do the same. What number comes after 6?	Responds 6	Responds 6
	Model the next steps and repeat until students write and place numbers to 10 in the appropriate places on their dot plots. Ten was the largest number. There are no numbers in our data set larger than 10 so we do not have to write anymore numbers on the line.	Fills in numbers up to largest amount and stops	Stamps or sticks numbers on the graphic organizer
	Very good. You have set up the graph so where will you check off that step? Very good.	Checks off (√) Step 4 on the Task Analysis	Finds Step 4 on the Task Analysis and checks it off () with your help
<b>5.</b> Graph the data.	Now we need to graph our data. We will put a dot on the graph for each value in the data set. This will help us learn about the data set.		
	Remember, Zane asked his classmates who seem well-rested how many hours per night they sleep. Point to the first number in the data set in a Student Book. For example, the first person told Zane they sleep 9 hours per night. We need to put this data on our dot plot. Point to the teaching graphic organizer. I will put one dot in the 9 column of the dot plot. Demonstrate. Now your turn. Wait for students to follow your model.	Makes dots on the Dot Plot representing the data points in the data set	Identifies where to place a dot when shown a numeral from the data set (e.g., 8) and given a choice of 2 or 3 places on the dot plot (use a Post-it Note to cover other places); uses a Bingo dauber or circle stickers to make dots on the dot plot

Student Task Analysis	Teacher Instructions	Student Response	For Students With Emerging Skills
	Good work. What is the next number in the data set? Yes, 10. I'll put a dot in the column above the number 10. Model, then wait for students to do the same.	Responds 10	Points to 10
	Repeat for each number in the data set.		
	Very good. You have graphed the data so where will you check off that step? Very good.	Checks off (√) Step 5 on the Task Analysis	Finds Step 5 on the Task Analysis and checks it off (√) with your help
<b>6.</b> Calculate the mode.	Now that we have added all of the dots on the dot plot, we can see the hours per night that <b>most</b> of Zane's classmates sleep. Most sleep 9 hours per night. Point to 9 on your dot plot.	Points to 9	Points to 9 or points to where you are pointing
	In statistics, mode is the value—the number—that occurs the most frequently in a data set. Remember, Zane is trying to find out how many hours per night he should sleep to get plenty of rest. He asked classmate who seemed well-rested.		
	Look at the dot plot. How many hours per night do most people sleep? This is the amount with the most frequency. Wait for students to respond.	Points to the mode (hours per night that most classmates sleep)	Given 2 or 3 choices (cover all columns but 2 or 3 with a Post-it Note), chooses the most (the highest number of dots)
	Yes, 9 hours. 9 hours is the mode—the most. The mode tells us that most of Zane's well-rested classmates sleep 9 hours per night. Let's record that information on the Data Table.	Records data on the Data Table	Stamps or sticks the number onto the Data Table
	We have finished Step 6. Let's check off that step.	Checks off ( $$ ) Step 6 on the Task Analysis	Finds Step 6 on the Task Analysis and checks it off ( $$ ) with your help

Student Task Analysis	Teacher Instructions	Student Response	For Students With Emerging Skills
7. Calculate the mean.	Looking at the most hours, the mode, is important information, but I think it would be useful to look at the data in another way, too.		
	The mean is the average amount. If Zane wanted to figure out on average how many hours of sleep his classmates get, he would look at the mean—the average. The average could also help him decide how many hours he should be sleeping before Friday's big game.		
	To calculate the average number of hours his well-rested classmates sleep per night, we don't need a dot plot. What is another word for average? Yes, <i>mean</i> . He will calculate the mean.	Responds with the word <i>mean</i>	Repeats the word <i>mean</i> after you
	If we add up all of the data in the data set and divide the data by the total number of data points, we can find the mean.		
	We can use the Mean Graphic Organizer in your Student Book to calculate the mean. Put all of the data from the data set into the graphic organizer in your Student Book. Demonstrate how to write each data point in each box of the graphic organizer. Then show students how to use the calculator to add the data points and divide by the number of data points.	Uses the Mean Graphic Organizer and a calculator to find the mean of the data set	Stamps, writes, or sticks the correct number in the graphic organizer; uses the Calculator Task Analysis for Addition to add data points and the Calculator Task Analysis for Division to divide OR
	The mean tells us the average hours per night Zane's well-rested classmates sleep. The mean we calculated is 8.4. Record the mean on your Data Table.	Records the mean on the Data Table	Matches numerals and symbols from the graphic organizer to the calculator

Student Task Analysis	Teacher Instructions	Student Response	For Students With Emerging Skills
			Stamps, writes, or sticks the correct number in on the Data Table
	We have finished Step 7. Let's check off Step 7.	Checks off (√) Step 7 on the Task Analysis	Finds Step 7 on the Task Analysis and checks it off () with your help
8. Analyze the data and state the solution to the math story problem.	Now, look at the information on your Data Table. How does the mean compare to the mode? How does the average of hours compare to the hours most often slept? Which should Zane choose to be sure he is getting as much rest as his friends?	Uses the Data Table to identify if the mode or the mean is greater	Chooses a value that is greater than the other
	We use data to make decisions about real-life problems. In this story, Zane wanted to know how many hours of sleep would be plenty of rest. We identified the mode to determine the hours per night that most of his well-rested classmates sleep.		
	Then we used the Mean Graphic Organizer to find the average number of hours per night his well-rested classmates sleep. How many hours per night of sleep do you think should Zane should try to get each night before the game on Friday?	States how many hours Zane should sleep per night	
	You've finished Step 8. Let's check it off (√).	Checks off (√) Step 8 on the Task Analysis	Finds Step 8 on the Task Analysis and checks it off () with your help

**Challenge Problem** 

To add challenge to the lesson, read this extension to the math story aloud to students who are ready for a challenge:

Zane saw his classmate who slept 5 hours per night sleeping during biology. He realized that maybe this student was not well-rested after all. An *outlier* is a number that is very different than the other numbers in a data set. In this data set, the number 5 is different than the other numbers because it is a lot less than 8, 9, or 10. Zane decides to take the outlier out of the data set and recalculate the mean to see if that changes the average hours per night.

Have students recalculate the mean for hours of sleep using the 9 remaining data points. Compare the difference in hours of sleep per night without the outlier.



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# Answer Keys

	Data Table	
		Answer
alyze the data and te the solution to the th story problem.	Mode         MOST frequent value on           MODE         the dot plot	9
	Mean         AVERAGE           M=4+A+N	8.4
	Is 6 hours of sleep per night enough for Zane to feel well-rested?	
	Based on the data he collected, how many hours of sleep do you think Zane should try to get each night?	
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