

Just in Time Quick Check
Standard of Learning 3.PS.1
Strand: Probability and Statistics

Standard of Learning 3.PS.1

The student will apply the data cycle (formulate questions; collect or acquire data; organize and represent data; and analyze data and communicate results) with a focus on pictographs and bar graphs.

Students will demonstrate the following Knowledge and Skills:

- a) Formulate questions that require the collection or acquisition of data.
- b) Determine the data needed to answer a formulated question and collect or acquire existing data (limited to 30 or fewer data points for no more than eight categories) using various methods (e.g., polls, observations, tallies).
- c) Organize and represent a data set using pictographs that include an appropriate title, labeled axes, and key. Each pictograph symbol should represent 1, 2, 5 or 10 data points.
- d) Organize and represent a data set using bar graphs with a title and labeled axes, with and without the use of technology tools. Determine and use an appropriate scale (increments limited to multiples of 1, 2, 5 or 10).
- e) Analyze data represented in pictographs and bar graphs, and communicate results orally and in writing:
 - i) describe the categories of data and the data as a whole (e.g., data were collected on preferred ways to cook or prepare eggs - scrambled, fried, hard boiled, and egg salad);
 - ii) identify parts of the data that have special characteristics, including categories with the greatest, the least, or the same (e.g., most students prefer scrambled eggs);
 - iii) make inferences about data represented in pictographs and bar graphs;
 - iv) use characteristics of the data to draw conclusions about the data and make predictions based on the data (e.g., it is unlikely that a third grader would like hard boiled eggs); and
 - v) solve one- and two-step addition and subtraction problems using data from pictographs and bar graphs.

Just in Time Quick Check

Just in Time Quick Check Teacher Notes

Supporting and Prerequisite SOL: 2.PS.1, 3.CE.1

Just in Time Quick Check 3.PS.1

1. Mrs. Lopez's class wants to make a bar graph showing the types of books that the third grade students borrowed from the school library last month. Which question would help them collect the data needed for their bar graph?
 - a) How many students are in third grade?
 - b) How long does each third grader read at home each night?
 - c) What types of books did third graders borrow from the library last month?
 - d) What types of new books did the library buy this year?

2. Mark's class wants to create a pictograph showing the different types of snacks students brought for afternoon snack time today. What would be the best way for Mark's class to collect the data needed?
 - a) Count how many students brought a snack from home today
 - b) Observe what type of snack each student brought from home today
 - c) Measure how long snack time lasts today
 - d) Survey students about which snack they like best

3. Jaquan surveys students in his class to see what color of bike they each have. This table shows the results of the survey.

Bike Colors

Color of Bike	Number of Students
Blue	6
Green	5
Red	3
Gray	2

Create a bar graph using Jaquan's data.



4. Tonya recorded the amount of rainfall in Richmond for four weeks. This table shows the data she collected.

Rainfall in Richmond

Week	Number of Inches
1	5
2	2
3	3
4	6

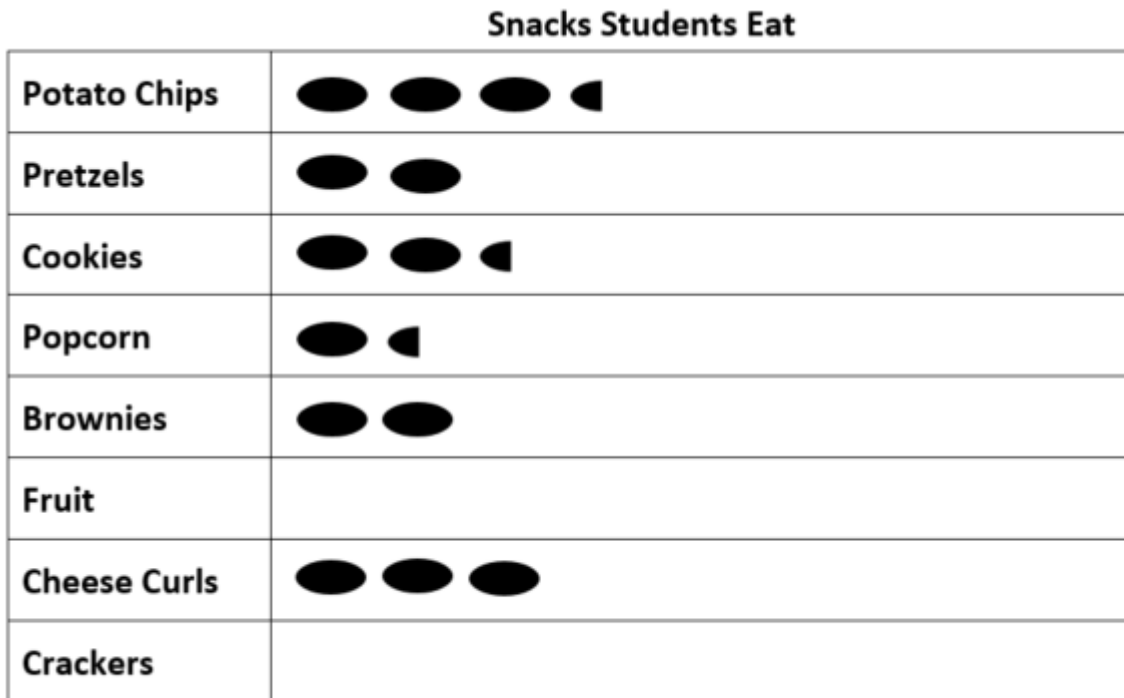
Create a pictograph using the data Tonya collected.

Rainfall in Virginia

Week 1	
Week 2	
Week 3	
Week 4	

Key: ○ = 2 inches of rainfall

5. Jessica surveyed her students to find out who eats certain snacks. Jessica made a pictograph of her results. Use this pictograph to answer the questions below.



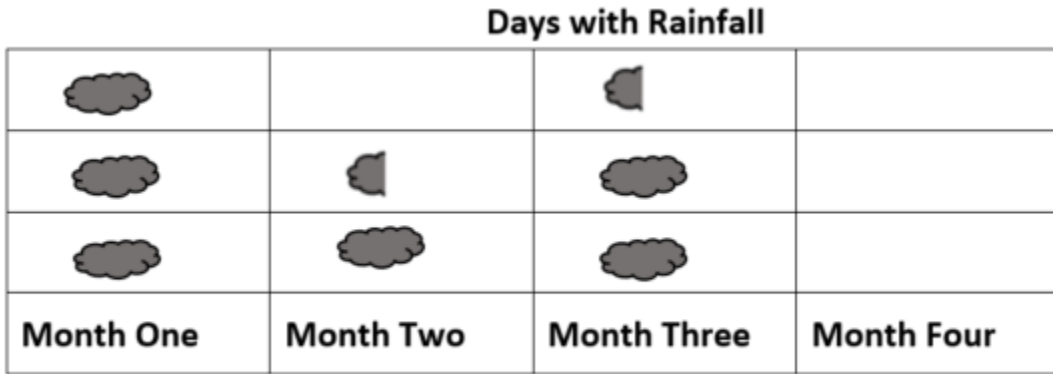
Key:  = 2 students

Based on the pictograph, circle each true statement.

- The number of students who eat cookies is exactly 2 more than the number of students who eat popcorn.
- The number of potato chips students eat is exactly $3\frac{1}{2}$.
- The fewest number of students eat popcorn.
- A total of 13 students were surveyed for this graph.

Write one sentence comparing the data for brownies and popcorn.

6. Tom observed the number of days that had rainfall for four months. The pictograph represents the data Tom collected. Use the data to answer the questions.



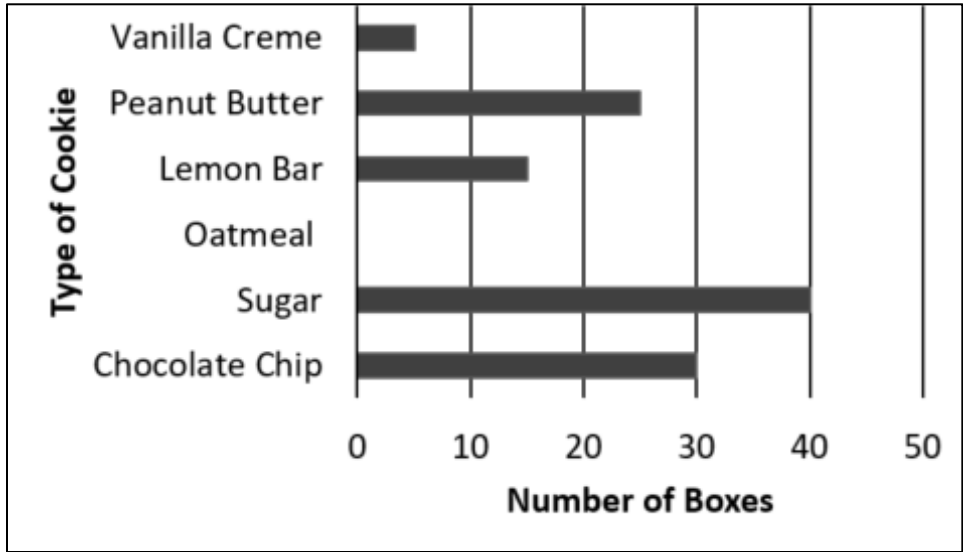
Key:  = 10 days

Which month had the least amount of rainfall? _____

How many days did Tom observe rainfall in Month Three? Explain how you know.

7. A store manager counted the number of boxes of cookies on a shelf in her store. This graph shows that information.

Title: _____



- a) Create a title for this graph and write it above the graph.
- b) Write two sentences that describe the information represented in the graph. Use one of these words in each sentence: *greatest*, *least*, *same*.

#1: _____

#2: _____

3.PS.1 Just in Time Quick Check Teacher Notes

Common Errors/Misconceptions and their Possible Indications

1. Mrs. Lopez's class wants to make a bar graph showing the types of books that the third grade students borrowed from the school library last month. Which question would help them collect the data needed for their bar graph?
 - a) How many students are in third grade?
 - b) How long does each third grader read at home each night?
 - c) What types of books did third graders borrow from the library last month?
 - d) What types of new books did the library buy this year?

A common error some students may make is to choose a question that sounds school-related but does not match the purpose of the graph. For example, students may choose a) because it asks about third grade students. However, answering a) will give a single number (e.g., there are 67 students in third grade), rather than categories of books that can be displayed on a bar graph. It may be beneficial for students to note what kind of data would be provided by answering each question and relating it to the data that Mrs. Lopez's class wants to show in the bar graph (e.g., the answer to b) will give numerical values that would not be helpful when determining the types of books borrowed from the library).

2. Mark's class wants to create a pictograph showing the different types of snacks students brought for afternoon snack time today. What would be the best way for Mark's class to collect the data needed?
 - a) Count how many students brought a snack from home today
 - b) Observe what type of snack each student brought from home today
 - c) Measure how long snack time lasts today
 - d) Survey students about which snack they like best

Students may struggle to determine what data are needed to answer a formulated question or they may struggle to determine the best way to collect the data. In the example above, students may choose an answer choice that is related to snacks but does not provide data that can be displayed in a pictograph. For example, students may choose a) because it mentions the number of snacks brought from home today. However, this data collection method would result in a single number (e.g., 17 students brought snacks from home today).

Additionally, students may incorrectly choose d) because they see students' favorite snacks as a proxy for the snack that they brought from home. However, this is not the best choice because a student's favorite snack could be peanut butter crackers, but they brought pretzels from home as their snack.

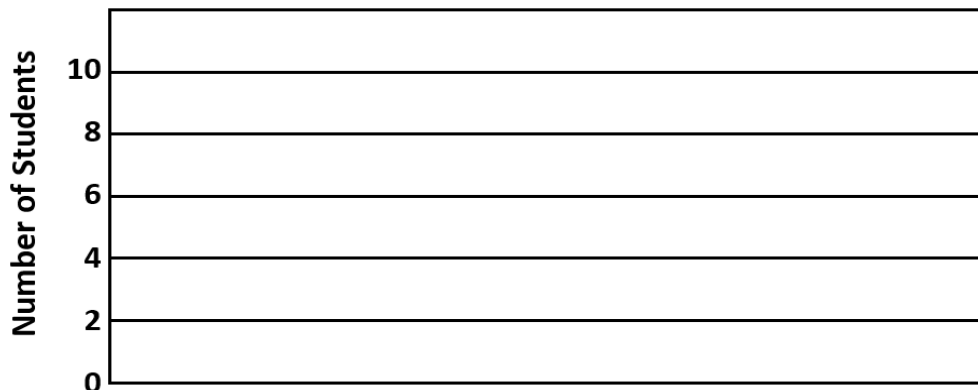
It may be helpful for students to consider what type of information would be provided through the data collection method in each answer choice and see whether it gives the type of information that Mark's class is seeking.

3. Jaquan surveys students in his class to see what color of bike they each have. This table shows the results of the survey.

Bike Colors

Color of Bike	Number of Students
Blue	6
Green	5
Red	3
Gray	2

Create a bar graph using Jaquan's data.



Color of Bike

Students often have the misconception that all intervals on a bar graph are equal to 1 and may shade their bars all the way to the top for 6, to the 10 line for 5, to the 6 line for 3, and to the 4 line for 2. These students may benefit from collecting data and creating bar graphs with a variety of scale intervals and from skip counting by the interval used in the scale.

Students may struggle to shade in the bars for numbers that are not explicitly on the scale (i.e., 5 and 3). Students who do not shade the bar representing 5 halfway between 4 and 6 and the bar representing 3 halfway between 2 and 4 may need more experience representing quantities that fall between the intervals used in the scale on a bar graph. Opportunities to compare two different bar graphs that represent the same data but have different scales (e.g., a bar graph with a scale interval of 1 and a bar graph with a scale interval of 2), and engaging in class discussions about the similarities and differences in the representations will be beneficial for students.

Students who do not give the graph a title or label the bars for the categorical axis will benefit from more experience transferring data that have been collected into a graph. Access to blank bar graph templates that include empty boxes for the missing parts of a graph may be helpful as students develop this skill.

4. Tonya recorded the amount of rainfall in Richmond for four weeks. This table shows the data she collected.

Rainfall in Richmond

Week	Number of Inches
1	5
2	2
3	3
4	6

Create a pictograph using the data Tonya collected.

Rainfall in Virginia

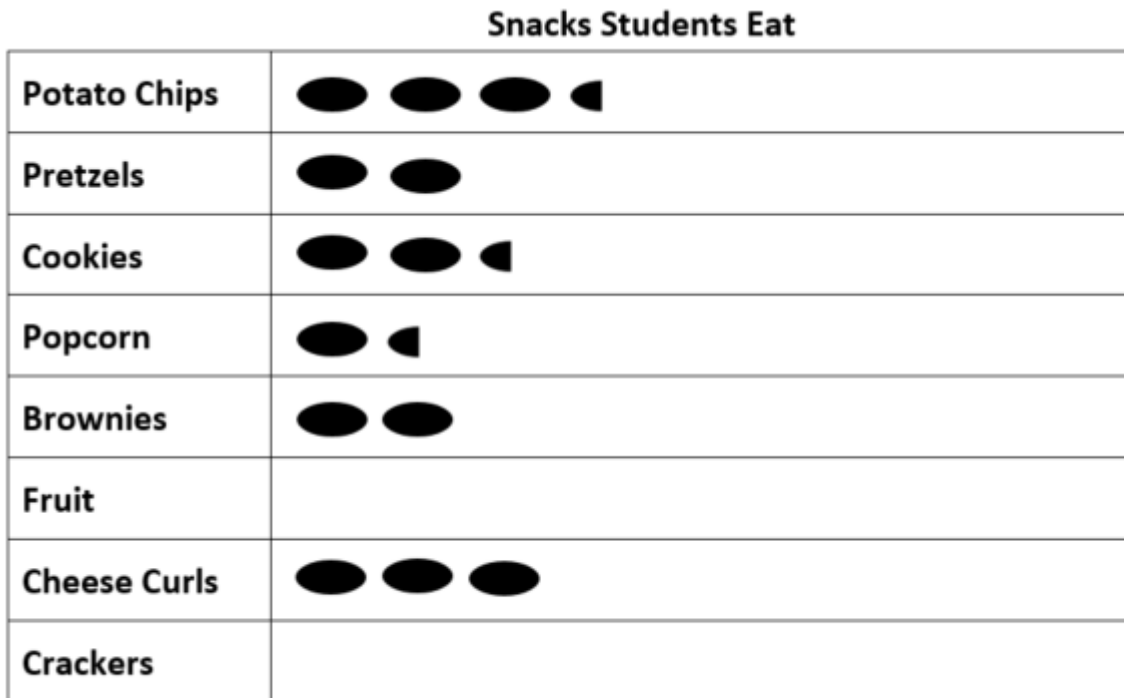
Week 1	
Week 2	


Week 3	
Week 4	

Key: ○ = 2 inches of rainfall

A common error students may make is to neglect to use the key and to represent 1 inch of rainfall with one circle. This may indicate that students do not understand that $\frac{1}{2}$ of 1 circle should be used to represent 1 inch of rainfall in this pictograph. Teachers should draw students' attention to the key and encourage students to highlight or circle it. Additionally, if students do not yet recognize that each symbol in a pictograph can represent a quantity greater than 1, they may benefit from instruction in skip counting, even/odd numbers, and halving. More experience analyzing and discussing data represented in pictographs that use half-symbols to represent quantities may be helpful. Some students may also have difficulty because the weeks are represented by numbers, and the rainfall is represented by numbers. They may use the number of the week rather than the inches of rainfall to determine how many circles to put in each row.

5. Jessica surveyed her students to find out who eats certain snacks. Jessica made a pictograph of her results. Use this pictograph to answer the questions below.



Key:  = 2 students

Based on the pictograph, circle each true statement.

- The number of students who eat cookies is exactly 2 more than the number of students who eat popcorn.
- The number of potato chips students eat is exactly $3\frac{1}{2}$.
- The fewest number of students eat popcorn.
- A total of 13 students were surveyed for this graph.

Students who fail to choose option a) may not be using the key in their analysis of the pictograph. Experience constructing pictographs that have different keys may help students develop an understanding of the importance of the key. Students who choose b) are interpreting each symbol as 1 snack rather than as 2 students. As with statement a), these students would benefit from experience analyzing pictographs where each symbol represents 2, 5, and/or 10. Students who choose c) may be disregarding the categories that have 0 symbols, or they may need experience describing and comparing data using mathematical vocabulary (e.g., least, fewer, more, greater, greatest). Students who choose d) as a true statement may not know how to count the half-ovals and

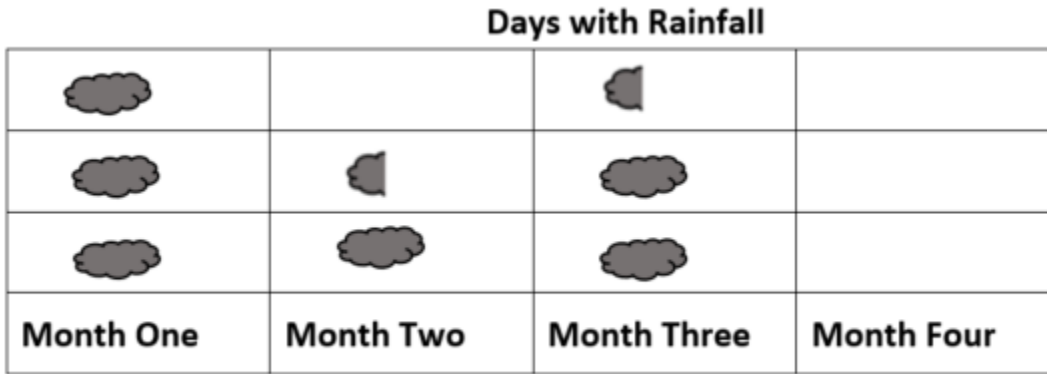
that each full oval represents 2 students. These students would benefit from additional experience with pictographs that use symbols to represent half of the quantity described by the key.

For each of these misconceptions, having students explain their thinking about graphs provides teachers with meaningful and actionable information for the next instructional steps.

Write one sentence comparing the data for brownies and popcorn.

Students who are unable to write a sentence that correctly compares brownies and popcorn may benefit from an opportunity to talk with a peer or with the teacher about their comparison before writing about it. Additionally, providing scaffolding (e.g., sentence starters, anchor charts, list of mathematics vocabulary words) may help students develop the ability to describe data represented in graphs in written form.

6. Tom observed the number of days that had rainfall for four months. The pictograph represents the data Tom collected. Use the data to answer the questions.



Key:  = 10 days

Which month had the least amount of rainfall? _____

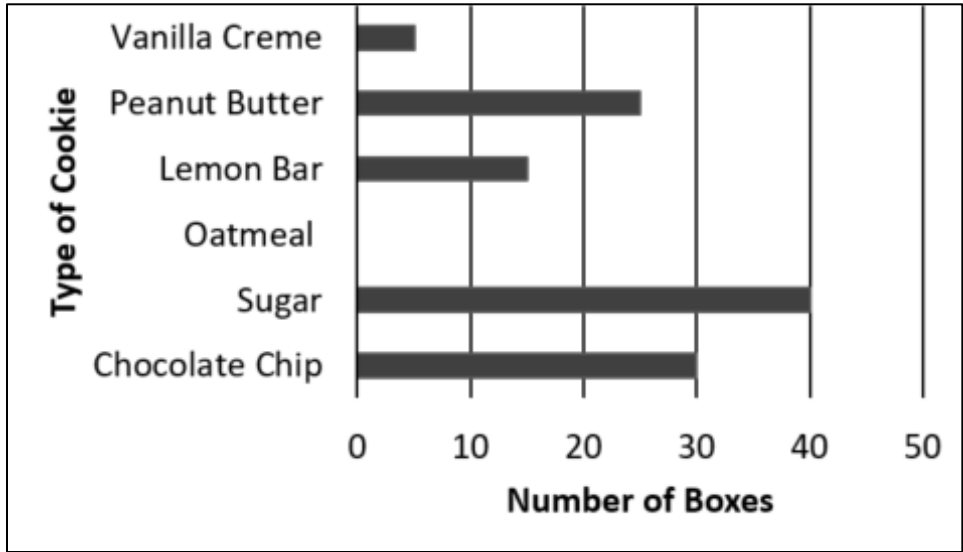
Students who struggle with the idea of zero as being the least and may choose Month Two. Exposing students to graphs that include zero as a result will help students overcome this misconception.

How many days did Tom observe rainfall in Month Three? Explain how you know.

Students may have difficulty interpreting the $\frac{1}{2}$ cloud as representing 5 days, or they may believe that the $2\frac{1}{2}$ clouds represent $2\frac{1}{2}$ days. For these misconceptions, students would benefit from experience creating and interpreting pictographs for which the symbols represent multiples of 2, 5, or 10 and that require them to include $\frac{1}{2}$ symbols.

7. A store manager counted the number of boxes of cookies on a shelf in her store. This graph shows that information.

Title: _____



- a) Create a title for this graph and write it above the graph.

Students may title the graph with information that is too specific (e.g., Types of Cookies or Vanilla Creme) rather than information that describes the main idea represented. These students may benefit from more discussion of what the title tells us and opportunities to consider titles that are too narrow, too broad, and “just right.”

- b) Write two sentences that describe the information represented in the graph. Use one of these words in each sentence: *greatest, least, same.*

#1: _____

#2: _____

Students who are unable to compare the data categories represented in the graph using the vocabulary provided may benefit from an opportunity to talk with a peer or with the teacher about their description before writing about it. Teachers are encouraged to provide scaffolding (e.g., sentence starters, anchor charts, list of mathematics vocabulary words) to help students develop the ability to compare data represented in graphs in written form.