LESSON PLAN

SOLVE PROBLEMS WITH PICTOGRAPHS AND BAR GRAPHS
GRADES 3–5

SUMMARY

Students connect repeated addition of fractions to multiplying fractions by whole numbers.

COMMON CORE STANDARD(S)

3.MD.A.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs.

DURATION

Two 45-minute classroom periods
Engage and Explore, Explain, Elaborate page 1—one 45-minute classroom period
Elaborate page 2, Evaluate—second 45-minute classroom period

MATERIALS

Colored index cards (or other item such as plastic building blocks or crayons in various colors).
Blank tally chart and blank poster paper for graphs.
Two prepared graphs, Favorite Sports and Favorite Seasons (described below).

ENGAGE AND EXPLORE

Engage students by telling them that the class will conduct a survey to determine students’ favorite colors. This activity will activate prior knowledge of graphing data on a bar graph and pictograph and using the data to solve problems.

Place the colored index cards on a desk at the front of the room and have students come up one by one to select their favorite color from four stacks of colors: blue, red, green, and yellow. Together, tally the class results: call out each color and have students who have chosen that color hold up their index card.
Model for students how to tally up the category counts on the tally sheet. Ask students if anyone can remember how to graph data on a bar graph (students in Grade 2 learned how to draw a pictograph and a bar graph with single unit scale to represent a data set with up to four categories). Have an open discussion about how to create a bar graph.

Model for students how to label the bar graph with a title, horizontal list of color categories, and vertical single unit tick marks. Plot the data from the tally sheet on the bar graph, explaining (or allowing a student to explain) how each square represents one vote so we need to shade the number of boxes or up to the correct tick mark for each category. Complete the graph for all colors.

Explain to students that we can use the graph to answer questions about the data, such as:

- How many more students prefer blue than red?
- How many fewer students prefer yellow than students who prefer green and red combined?
- How many total students voted?

Note: Tailor the questions to the class survey results.

Explain to students that you can use the same data to make a pictograph. Ask students if anyone can explain what a pictograph is and how to make one. Tell students that you will use a smiley face as the picture that represents one vote for a color.

On a blank poster or graph template, repeat the steps of labeling your graph. Emphasize that the pictograph includes a key, which explains what your picture represents. That is, one smiley face = 1 vote. Complete the pictograph using the data from the tally chart. Ask students: can we answer the same questions using the pictograph that we could with the bar graph? [Yes. Both allow us to make comparisons between categories.]

Ask students to consider the question: What if we had surveyed every student in the school and not just our class? In what way would our graphs be the same? Different? Encourage a conversation about plotting many more votes on a bar chart with tick marks that go up by one unit or on a pictograph where one smiley face = one vote. Ask students if they think it would be easier or more difficult to make comparisons with the graphs of the entire school’s data.

Some students may say it would be more difficult to make comparisons with the entire school’s data, because there would be so many more votes. Use this as an opportunity to ask students for suggestions for ways to make it easier to make a bar chart or pictograph for the entire school’s data. Accept any suggestions that make sense, not just suggestions that involve changing the scale.

Then, tell students that today they’re going to learn one way to make these bar graphs and pictographs easier. If any students did suggest changing the scale on the bar graph or pictograph, refer back to this idea and then expand on it. If not, explain that we don’t have to say each square on the bar graph represents 1 vote. Each square can represent more votes, like 10. You can tell how many votes each square represents by changing the numbers on the tick marks at the side of the graph. Then, you can represent greater numbers on the graph without using so many squares.

You can do the same thing on the pictograph: each smiley face can represent more than one vote. You can tell how many votes each smiley face represents by changing the key; instead of one smiley face = 1 vote, it could be one smiley face = 5 votes, or 10 votes, or 100 votes.

Tell students that this is called changing the scale of the graph. When you want to graph large numbers, it’s often useful to use a scaled graph.

Show students a new bar graph, titled Favorite Sports. The graph should have four bars, each representing a different sport, and a scale of 10. So that it is easy to read, make the height of each bar a multiple of 10 (so they all line up perfectly with a tick mark). Explain that this graph represents survey results of a group of people’s favorite sports.

Ask students what they notice about the graph that is different from the bar graph they made. Highlight responses that include that the tick marks are labeled by 10s instead of by 1s.

Model reading a bar from the graph. For example, point out that the soccer bar goes up to the tick mark labeled 30, so 30 people picked soccer as their favorite sport. Then, ask students what the other bars on the graph mean. Have a different student read each bar.
EVALUATE

Have students gather in groups of 2 or 4 to compare and discuss their answers to the problems. Allow students enough time to communicate with their peers about their process and their thinking. Encourage students to use correct mathematical language when discussing their process. Have each group choose two questions they want more information about, or they want to discuss as a class.

When groups are ready, take questions from students. Encourage groups to answer questions brought up by other groups.

Students can play the online Kahoot! quiz game located below the video. It provides downloadable scores at the end of the quiz game. Alternatively, you can use the paper quiz, or the exit ticket questions. All these resources are located below the video in the assessment section.

ELABORATE

Direct students to use their new understanding to complete the practice problem worksheets. Page 1 contains bare mathematical problems to solidify understanding of the process. Page 2 contains application problems for students to apply the process to solve real-world problems.

EXPLAIN

WATCH THE GENERATION GENIUS SOLVE PROBLEMS WITH PICTOGRAPHS & BAR GRAPHS VIDEO AS A GROUP
Facilitate a conversation using the Discussion Questions.

Return to the discussion about how, when graphing large numbers on a bar graph or pictograph, using a scale greater than one unit makes it easier to read the graph and solve problems using the data in the graph.