2:4 Animals in the Park

Teacher Notes

Central math concepts

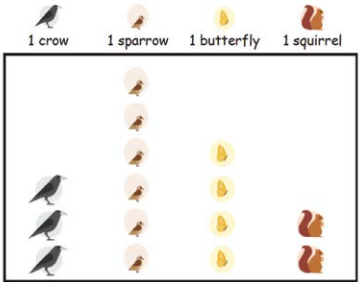
Students' data work in the primary grades involves representing and interpreting categorical data, which is data that arises from classifying or sorting into categories.[†] In a picture graph like the one shown in task 2:4, the small pictures of animals stacked in columns are the individual data points. Interpreting such a chart involves grasping the correspondence between a data point (picture of an animal) and the particular fact it represents (seeing an animal of that kind).

Students' analysis of categorical data connects directly to their uses of addition and subtraction to solve problems in context. In grade 2, when students "solve simple put-together, take-apart, and compare problems using information presented in a bar graph" (2.MD.D.10), they are also using "addition and subtraction … to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions" (2.OA.A.1). More generally, there are close connections in every elementary grade between students' data work and their expanding use of numbers and operations in context; see Table 1, p. 4 of the *Progression* document for a list of these connections in grades K–5.

In grade 2, students draw picture graphs in which each picture represents one object, and they draw bar graphs with a single-unit scale. Drawing a picture graph or a bar graph involves identifying quantities in the situation, specifying units of measure, and attending to precision. To support students in creating picture graphs and bar graphs, grid paper is useful. As noted in the *Progression* document (p. 7), "When drawing picture graphs on grid paper, the pictures representing the objects should be drawn in the squares of the grid paper." For bar graphs, "the tick marks on the count scale should be drawn at intersections of the gridlines. The tops of the bars should reach the respective gridlines of the appropriate tick marks." For both kinds of graphs, as suggested in the *Progression* document (p. 3), "a template can be superimposed on the grid paper, with blanks provided for the student to write in the graph title, scale labels, category labels, legend, and so on."

As the *Guidelines for Assessment and Instruction in Statistics Education Report* notes, "data are not just numbers, they are numbers with a context. In mathematics, context obscures structure. In data analysis, context provides meaning."[‡] Thus as the *Progression* document notes, "students should work with data in the context of science, social science, health, and other subjects, always interpreting data plots in terms of the context they represent" (p. 3). That said, "students do not have to generate the data every time they work on making bar graphs and picture graphs. That would be too time-consuming. After some experiences in generating the data, most work in producing bar graphs and picture graphs can be done by providing students with data sets" (p. 7). In task 2:4, the picture graph is provided for the student.

2:4 Faith went to the park. The picture graph shows all of the animals Faith saw.



Faith said, "I saw fewer butterflies than birds." How many fewer butterflies did Faith see?

Answer

Faith saw 5 fewer butterflies than birds.

Click here for a student-facing version of the task.

Refer to the Standards

2.MD.D.10; MP.4, MP.6. Standards codes refer to www.corestandards.org. One purpose of the codes is that they may allow a task to shed light on the Standards cited for that task. Conversely, reading the cited Standards may suggest opportunities to extend a task or draw out its implications. Finally, Standards codes may also assist with locating relevant sections in curriculum materials, including materials aligned to comparable standards.

Aspect(s) of rigor:

Application

Additional notes on the design of the task

- The task blends two situation types, *Put Together with Total Unknown* and *Compare with Difference Unknown* ('fewer' language).

Relevant prior knowledge

The following mathematics knowledge may be activated, extended, and deepened while students work on the task: comparing numbers; adding and subtracting single-digit numbers; and using addition and subtraction to solve problems in context.

Extending the task

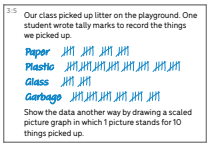
How might students drive the conversation further?

- Students could create a bar graph of the same data and compare the way it represents the data to the way the picture graph represents the data. Are there advantages to each?
- Students could recategorize the data in three categories: Birds, Butterflies, and Squirrels. What would the bar graph look like for these categories?
- Students could ask questions similar to those in the task to analyze another set of data they have collected in the classroom or in their community.

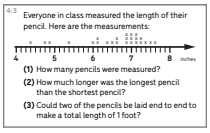
Related Math Milestones tasks

See the Map of Addition and Subtraction Situations in K–2 Math Milestones to find tasks in grades K, 1, and 2 that cover the various addition and subtraction situation types.

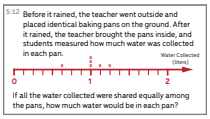
3:5



4:3

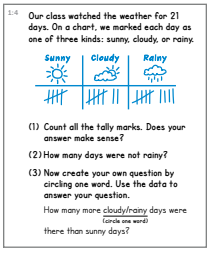


5:12



In later grades, task **3:5 Playground Cleanup** involves creating a scaled picture graph. Tasks **4:3 Pencil Data** and **5:12 Rain Measurements** involve problem solving based on measurement data displayed in line plots.

1:4



K:14

In earlier grades, task **1:4 Analyzing Weather Data** involves asking and answering questions about categorical data organized in a tally chart. Task **K:14 Animals from Land and Sea** involves a comparison based on classifying into categories.

Additional notes on the design of the task (continued)

- If a student says, "Faith saw 2 fewer butterflies than birds," then the student might not have thought to combine the crows and the sparrows into the category (or unit) "birds." In that case, it is advisable to respond to the student by emphasizing what the student did correctly. The student correctly compared the number of butterflies Faith saw to the number of sparrows Faith saw.

Curriculum connection

1. In which unit of your curriculum would you expect to find tasks like 2:4? Locate 2–3 similar tasks in that unit. How are the tasks you found similar to each other, and to 2:4? In what specific ways do they differ from 2:4?
2. Thinking about the curriculum unit you identified, at what point in the unit might a task like 2:4 help students converge toward grade-level thinking about the important mathematics in the task? What factors would you consider in choosing when to use such a task in the unit?*

† Common Core Standards Writing Team. (2011, June 20). *Progressions for the Common Core State Standards in Mathematics (draft): K–3, Categorical Data; Grades 2–5, Measurement Data*. Tucson, AZ: Institute for Mathematics and Education, University of Arizona.

‡ The Guidelines for Assessment and Instruction in Statistics Education Report was published in 2007 by the American Statistical Association, http://www.amstat.org/education/gaise.

* Math Milestones™ tasks are not designed for summative assessment. Used formatively, the tasks can reveal and promote student thinking.

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Teacher Notes

Anticipating and responding to student thinking about the task

Imagine how students might think about the task, and what you might see and hear while they work.

On this page, you can write your thoughts on the following questions.

Solution Paths

- What solution paths might you expect to see?
- What representations might you see? What correspondences between those representations might be noticed by students (or be worth pointing out to students) and discussed by them?
- What misconceptions or partial understandings might be revealed as students work on the task? How could you respond to these positively and productively?

Language

- What might you expect to hear from students engaged with the task? What does that language reveal about their mathematical thinking, and how might you respond to different ways of thinking?
- If students are using early English or using multiple languages in an integrated communication system, how might you help their classmates see those mathematical ideas as valuable?
- Even when using nascent language, students are thinking and communicating their thinking. What might it look like to respond positively and productively to the mathematics in their thinking before giving feedback on the language used?

Identity, Agency, and Belonging

- How can you engage students' interests, experiences, or funds of knowledge?
- How can you build students' self-confidence as learners, thinkers, and doers of mathematics?
- What choices are there for a student to make in the task? How can you build students' agency to the point where they notice and make these choices to solve problems?
- How might one use feedback to build student agency? Where might there be opportunities to build students' self-confidence?