Getting Ready to Teach Unit 6

Learning Path in the Common Core Standards

In this unit, children use what they know about sorting and classifying to sort and display data. They build on what they know about comparing numbers to develop comparison statements for a set of data. These comparison statements lead them to use drawings to solve comparison problems. At this grade level, solving comparison problems should focus on comparison language. Comparison language "more" and "fewer" in context is the most confusing language of all problem types. Comparison bars are a way to represent these problems and provide children a visual way to show how the numbers in the problem relate to each other. Children will continue to work with comparison situations through the elementary grades.

Help Children Avoid Common Errors

Math Expressions gives children opportunities to analyze and correct errors, explaining why the reasoning was flawed.

In this unit, we use Puzzled Penguin to show typical errors that children make. Children enjoy teaching Puzzled Penguin the correct way, why this way is correct, and why Puzzled Penguin made an error. Common errors are presented in the Puzzled Penguin feature in the following lessons:

▸ **Lesson 3:** Double counts an item when counting and recording data

▸ **Lesson 7:** Finds how many in all rather than finding how many more

In addition to Puzzled Penguin, there are other suggestions listed in the Teacher Edition to help you watch for situations that may lead to common errors. As a part of the Unit Test Teacher Edition pages, you will find a common error and prescription listed for each test item.

Math Expressions
VOCABULARY

As you teach this unit, emphasize understanding of this term.

• comparison bars
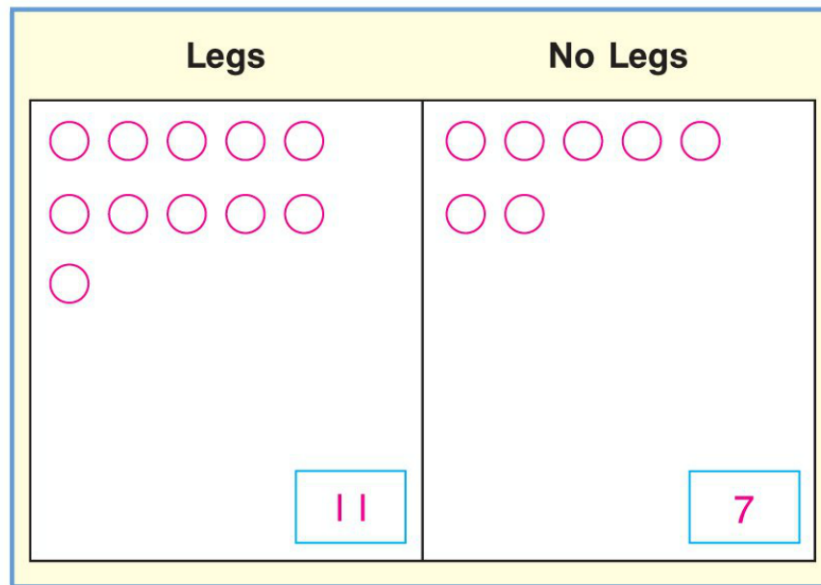
See the Teacher Glossary.
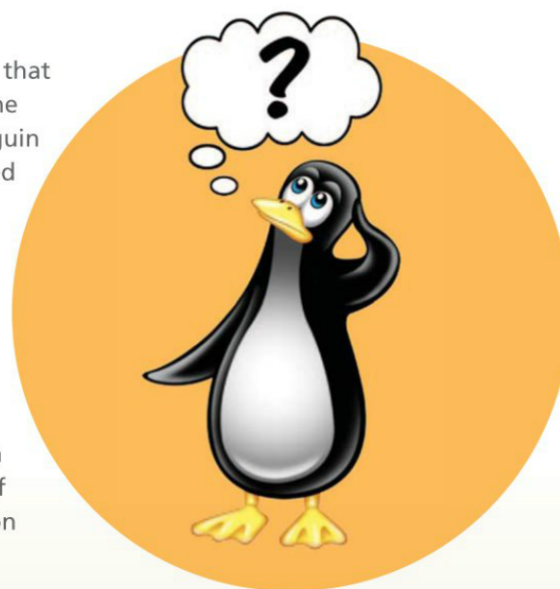
Represent and Compare Data

Sorting Data Sorting is the first step for representing data. In Lesson 1 children cut out pictures of bugs and sort them into two categories.

Legs	No Legs
◯ ◯ ◯ ◯ ◯ ◯ ◯ ◯ ◯ ◯ ◯	◯ ◯ ◯ ◯ ◯ ◯ ◯
11	7

A series of steps for representing data are introduced to children.

1) Gather the data (in this case, bugs).
2) Identify the attribute for the sorting rule (legs or no legs).
3) Classify the data according to the sorting rule.
4) Record a mark for each item. (In this case, children use circles and 5-groups because they are familiar with counting 5-groups.)

Comparing Data Children discuss how they can compare the data.

- When we compare two groups of things in math, we look at them together.
- Which group has more?
- How do you know there are more bugs with legs than bugs without legs?
- Which group has fewer?
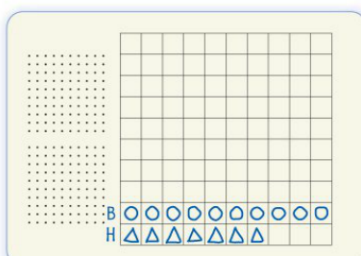- How do you know there are fewer bugs without legs than bugs with legs?

Different Sorting Rules Children explore different ways to sort data. They take the same bugs and then sort them using a different attribute; this time the sorting rule involves color.

from **THE PROGRESSIONS FOR THE COMMON CORE STATE STANDARDS ON MEASUREMENT AND DATA**

Sorting Data Students in Grade 1 begin to organize and represent categorical data. For example, if a collection of specimens is sorted into two piles based on which specimens have wings and which do not, students might represent the two piles of specimens on a piece of paper, by making a group of marks for each pile.

Comparison Drawings While children in Grade 1 are not required to make a picture graph, they explore using pictures to organize data.

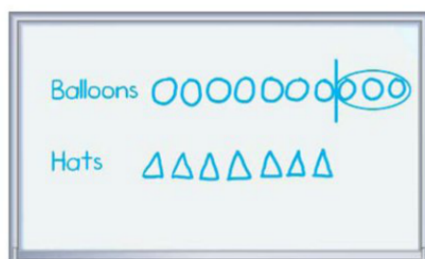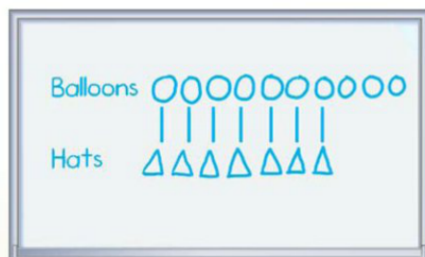Teacher's Representation on Board
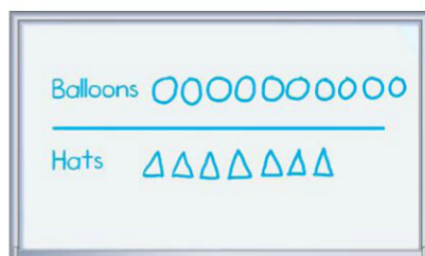
Child's Representation on 10 × 10 Grid

> **from THE PROGRESSIONS FOR THE COMMON CORE STATE STANDARDS ON MEASUREMENT AND DATA**
>
> **Categorical Data** The K–5 standards run along two paths. One path deals with categorical data and focuses on bar graphs as a way to represent and analyze such data. Categorical data comes from sorting objects into categories—for example, sorting a jumble of alphabet blocks to form two stacks, a stack for vowels and a stack for consonants. In this case there are two categories (Vowels and Consonants). Students' work with categorical data in early grades will support the later work with bivariate categorical data and two-way tables in eighth grade.

Break-Apart Stick One way to compare is for children to draw a Break-Apart Stick to better see how many more and how many fewer there are.

Matching Pairs Another way to compare is for children to draw matching lines.

Using these methods, children have a visual way to see the total number of data, as well as which set has more or fewer and how many more or fewer.

Making a Visual Image After counting jumps, children use Stair Steps to visualize the data. Children explore this idea using "jumps." Then they represent the jumps with Stair Steps so they can more easily see how the 'jumps' compare.

Number of Jumps
Abby 9
Karl   6
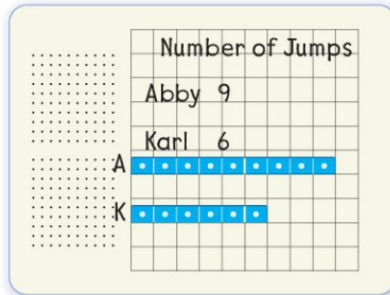
Data Sets with Three Categories Children use connecting cubes to explore data sets with three categories.

Watch as each cube is taken from the bag.

3. Draw circles to show how many of each color.

Colors in the Bag										
Red	◯	◯	◯							
Yellow	◯	◯	◯	◯	◯	◯	◯	◯		
Blue	◯	◯	◯	◯	◯	◯				

Collect and Represent Data

Collect Data The teacher lists three colors on the board, such as red, blue, and green. Children indicate their favorite color with a show of hands. The teacher writes the numbers next to the names for the color.

Step 1
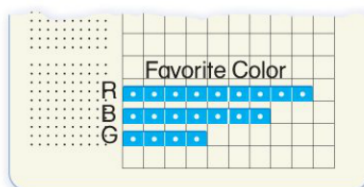
Step 2

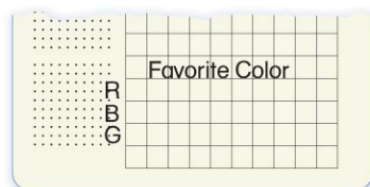**Comparison Questions** Children use these data displays to generate their own questions. These questions can be connected to different problem types, including Put Together/Take Apart with Total Unknown, *Compare* problems, and also problems that call for the addition of three numbers.

• Which color do the most people like?
• How many more people like blue than green?
• How many more votes would green need to have as many as red?
• How many people voted altogether?
• How many people chose green or red as their favorite color?

Children generate data displays based upon class responses.

Comparison Problems

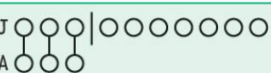**Introduction to Comparison Bars** In previous lessons, children used Stair Steps and comparison drawings to represent data. These representations showed all the items so there was a concrete visual comparison that children could use to find the answer to the comparison questions.

> Jeremy has 10 crayons. Amanda has 3. How many more crayons does Jeremy have than Amanda?

J ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪

A ▪ ▪ ▪

J ◯◯◯|◯◯◯◯◯◯◯
A ◯◯◯

The Stair Steps and comparison drawings are readiness for the comparison bars that are introduced in this lesson. In Lesson 6, children learn that comparison bars emphasize the relationship of the numbers in the problem. When children are operating at a symbolic level, these comparison bars help children see how the numbers relate to each other. Then they can add or subtract to answer the question.

J | 10 |

A | 3 | (?)

In Lessons 7 and 8, children continue to discuss and solve comparison problems. They illustrate them using comparison bars.

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from **THE PROGRESSIONS FOR THE COMMON CORE STATE STANDARDS ON OPERATIONS AND ALGEBRAIC THINKING**

Compare Situations In a Compare situation, two quantities are compared to find "How many more" or "How many less." One reason Compare problems are more advanced than the other two major types is that in Compare problems, one of the quantities (the difference) is not present in the situation physically, and must be conceptualized and constructed in a representation, by showing the "extra" that when added to the smaller unknown makes the total equal to the bigger unknown or by finding this quantity embedded within the bigger unknown.

Compare Problem Types

Math Expressions integrates a research-based algebraic problem solving approach that focuses on problem types throughout the program: understand the situation, represent the situation with a math drawing or an equation, solve the problem, and see that the answer makes sense.
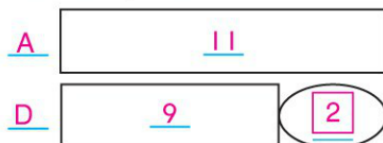
Compare with Difference Unknown (How many more?)

Tessa has 15 pens.
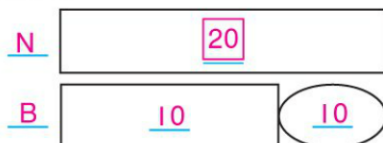Sam has 9 pens.
How many more pens
does Tessa have than Sam?

T ___ | 15 |
S ___ | 9 | (6)

Compare with Difference Unknown (How many fewer?)

Dan reads 9 books.
Ana reads 11 books.
How many fewer books
does Dan read than Ana?

A ___ | 11 |
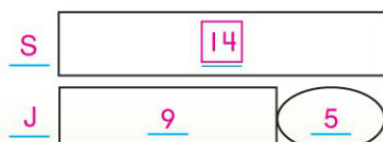D ___ | 9 | (2)

Compare with Bigger Unknown ("more"?)

Noah has 10 more caps than Ben.
Ben has 10 caps.
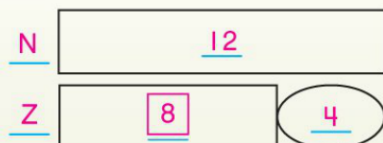How many caps does Noah have?

N ___ | 20 |
B ___ | 10 | (10)

Compare with Bigger Unknown ("fewer"?)

Jim pops 5 fewer balloons than
Sadie. Jim pops 9 balloons.
How many balloons does Sadie pop?

S ___ | 14 |
J ___ | 9 | (5)

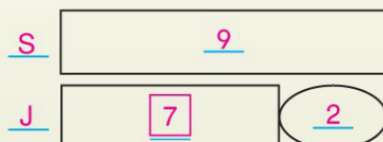### Compare with Smaller Unknown ("more"?)

Nick hikes 12 miles in the forest.
Nick hikes 4 more miles than Zia.
How many miles does Zia hike?

N ___ | 12 |
Z ___ | 8 | (4)

Compare with Smaller Unknown ("fewer"?)

Jen eats 2 fewer carrots than Scott.
Scott eats 9 carrots.
How many carrots does Jen eat?

S ___ | 9 |
J ___ | 7 | (2)

from **THE PROGRESSIONS FOR THE COMMON CORE STATE STANDARDS ON OPERATIONS AND ALGEBRAIC THINKING**

Language of Comparisons The language of comparisons is also difficult. For example, "Julie has three more apples than Lucy" tells both that Julie has more apples and that the difference is three. Many students 'hear' the part of the sentence about who has more but do not initially hear the part about how many more; they need experience hearing and saying a separate sentence for each of the two parts in order to comprehend and say the one-sentence form.

Another language issue is that the comparing sentence might be stated in either of the two related ways, using "more" or "less." Students need considerable experience with "less" to differentiate it from "more"; some children think that "less" means "more."

Finally, as well as the basic "How many more/less" question form, the comparing sentence might take an active, equalizing and counterfactual form (e.g., "How many more apples does Lucy need to have as many as Julie?") or might be stated in a static and factual way as a question about how many things are unmatched (e.g., "If there are 8 trucks and 5 drivers how many trucks do not have a driver?"). Extensive experience with a variety of contexts is needed to master these linguistic and situational complexities.