

How Far Away?

Overview

During this game, students use the landmark number of one hundred to explore other numbers and their relationships to one hundred. Students get the opportunity to experience adding tens and ones to numbers. Students also gain valuable experience connecting subtraction and addition.

Related Lessons

You might teach the following lessons first:

- ▶ L-2 Building the Hundreds Chart (Version 2)
- ▶ L-3 Arrow Arithmetic
- ▶ L-6 Ten More or Ten Less

Key Questions

- ▶ How far from one hundred is the number? How do you know?
- ▶ What is similar about the strategies? What is different?
- ▶ Would you rather add up from the number or subtract from one hundred? Why?

Time

30 minutes

Materials

dice, 3 per pair of students

The Hundreds Chart (Reproducible A), 1 per pair of students

counters, 6 per pair of students (see *How to Use This Resource*, page xix)

pocket hundreds chart with removable numbers *or*

hundreds chart projected on screen or interactive whiteboard

optional: *How Far Away?* Game Directions (Reproducible G-10R)

Common Core State Standards

For connections to the Common Core State Standards, see pages xxi through xxxix.

Teaching Directions

Introduce

1. Introduce the game. Explain to students that they will roll three dice, create two-digit numbers, and figure out how far from one hundred a few of the numbers are.
2. Pass out copies of The Hundreds Chart (Reproducible A), one to each pair of students.
3. Model the game. Roll the three dice and record the numbers rolled where everyone can see them.
4. Ask students to work with a partner and create several two-digit numbers using the numbers rolled. For example, if you roll a 3, a 4, and a 1, students may create the numbers thirty-four, thirty-one, forty-two, forty-one, thirteen, or fourteen.
5. After a few moments, call on several students to share the numbers they created with their partner. Mark the numbers on the pocket hundreds chart, on a chart projected with a document camera or overhead, or on an interactive whiteboard.
6. Point to a number and say, “In this activity, we’re going to try to figure out the difference between the number and one hundred. The word *difference* means how far apart the numbers are.”
7. Ask students to think about how they would solve the problem. Encourage them to use the hundreds chart they’ve been given and to talk with their partner about solution strategies.
8. Call on students to share while you record their thinking. Explain to students that as they share their strategy, you will use an open number line to record their thinking, and that the line or “jumps” is similar to when their finger is moving on a hundreds chart.

Math Matters!

How Many Numbers Are Possible?

Mathematically it is possible to create six two-digit numbers when different numbers are rolled using three dice. It is likely that, as a class, students will find all six numbers during the introduction to the game. During the exploration phase, when students work with a partner, they may only find a few of the numbers. It is not mandatory that they find all the numbers because the purpose of the activity is for students to work on finding the difference.

Example of Student Thinking and Teacher Recording

Student 1 says, “I put my finger on forty-two and counted over to fifty, which was eight and added tens until I landed on one hundred. I added five tens. Fifty and eight is fifty-eight.”

Teacher records,



Student 2 notes, “I counted by tens from forty-two. So I went fifty-two, sixty-two, seventy-two, eighty-two, ninety-two, which was fifty, and then I counted over from ninety-two, which was fifty-eight.”

Teacher records,



Differentiating Your Instruction

Gradual Release of Modeling

Some students may benefit from a gradual release model during which the teacher models a few strategies the first few times before asking the students to solve the next problem with a partner (and, finally, another problem on their own). When modeling strategies, think aloud so students hear the language used to describe the movement on the hundreds chart. Record your thinking so students see what they, in turn, are expected to record.

Math Matters!

The Open Number Line

The open number line is an efficient method for students to use to record their thinking. It supports flexible thinking because students can use it to add or subtract, and it allows them to begin with either the tens or the ones in either operation, depending on their thinking. The open number line also grows with the student as their thinking develops from simple counting strategies and moves to more complex counting strategies. An example of this would be a student who first counts by ones to find the difference between forty-two and fifty, but later knows the difference is eight and can make a jump of +8 instead of eight +1 jumps.

i Teaching Tip

Where's the Answer?

Some students may think the answer is one hundred because each strategy ends with one hundred. Some students may struggle to “see” fifty-eight because it is broken up into its place-value parts. Class discussion helps solidify students’ understanding of their peers’ thinking.

i Teaching Tip

Disequilibrium

Do not be surprised if students react with uncertainty that adding on and subtracting from will yield the same answer. *Disequilibrium*, a temporary state of confusion, is natural and important during the learning process. Students are being confronted with the concept that addition and subtraction relate, and they may not have made sense of this concept until now. They need repeated experiences with this concept to understand the relationship. It is not a skill that students can be talked into understanding.

9. Ask students to review the two strategies and talk to their partner about what is similar and different about the two strategies. Use this opportunity to point out that either strategy yields the same difference. Ask students to confirm the difference and find where the difference (fifty-eight) is shown in the written strategy.

10. Typically, students would rather add on than subtract from a number. If subtracting from one hundred is not brought up by a student, consider modeling this strategy with the class. For example, “I wonder if we start on one hundred and subtract until we reach forty-two what the difference, or answer, would be? Do you think it will be the same? Let’s try it! We’ll start with our finger on one hundred and jump back until we get to forty-two. Count back by tens: one hundred, ninety, eighty, seventy, sixty, fifty. Stop here for a moment. If we count back another ten, we’ll land on forty. Because we’re trying to get to forty-two, forty would be too far back, so at this point we have to start counting back by ones—forty-nine, forty-eight, forty-seven, forty-six, forty-five, forty-four, forty-three, forty-two. Now let’s count to see how many steps we took backward. We went back five tens, or fifty, and eight ones, making fifty-eight steps back.” Some students may seem surprised that adding on from forty-two and subtracting from one hundred yield the same difference or answer. Consider recording this answer so students can see the similarities with the previous adding-up strategies:



11. Pick another number that is marked on the hundreds chart and ask students to use their hundreds charts to find the difference. Encourage them to use one of the previously discussed strategies and talk with their partner about their thinking.
12. Call on students to share their thinking. Record their thinking. Repeat using an open number line.
13. Tell students that after finding the difference between one hundred and two rolls, students should pick the dice up and roll again. Roll the dice and record the numbers rolled.
14. Ask students to turn to their partner and create several two-digit numbers using the numbers rolled.
15. After a few moments, call on several students to share the numbers they created with their partner. Mark the new set of numbers on the displayed hundreds chart.
16. Pick a number and repeat the process of finding the difference. Choose another number and, again, repeat the process of finding the difference.

Differentiating Your Instruction

Finding the Difference Mentally

Depending on the level of learners in your classroom, there may be some students who can begin finding the difference mentally. Encourage them to do so and record their thinking using an open number line or another method that makes sense to them. During the exploration, look for students who may benefit from being encouraged to think mentally about the problem.

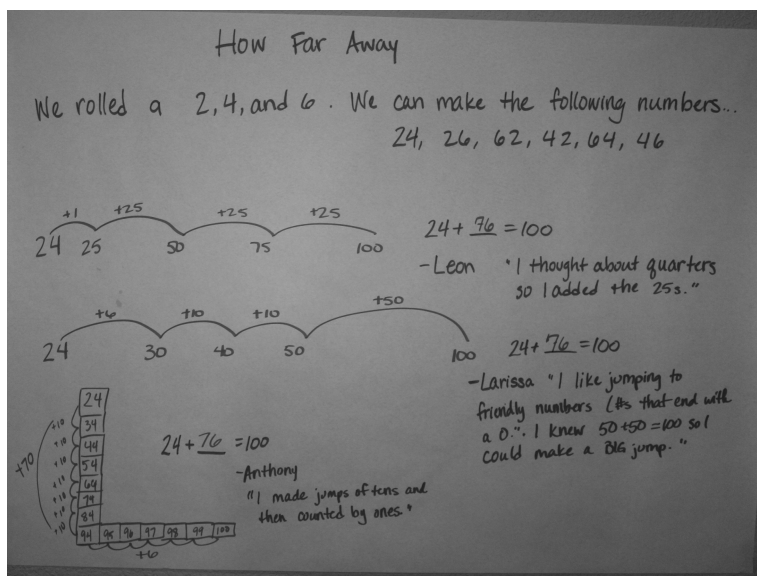


FIGURE G-10.1 An example of a teacher recording in a second-grade classroom. Second graders use a variety of strategies to find the difference. It is important for you to record their thinking so all students have access to their peers' thinking.

Explore

17. Explain to students they will now play the game with a partner. Review the directions and post them where all students can see them.

How Far Away? Game Directions

1. Roll three dice.
 2. Create two-digit numbers and mark them on the hundreds chart.
 3. Pick two of the numbers and find the difference between the numbers and one hundred.
 4. Record your thinking.
 5. Repeat the process.
18. Pass out hundreds charts, dice, and counters for students to use to mark their hundreds chart.
 19. As students work on the activity, walk from group to group, asking the key questions listed at the beginning of this game. Encourage students to check their answer by also subtracting from one hundred.

Teaching Tip

From Partners to Solo

The purpose of having students work in partnerships during this game is to promote discussions about their thinking and about strategies for finding the difference. Students gain valuable information when they hear their peers thinking, and they solidify their own thinking when they verbalize their own thinking. Later, students can engage in this activity on their own. The purpose of working solo is to give students computation practice. The activity can then be taken up for a grade or assessment.

Teaching Tip

Managing the Use of Dice

Using dice can be problematic if students are rolling them across the entire floor or throwing them across tables. To prevent such scenarios, give each group of students a 6-by-6-inch square of soft foam or cotton batting, and tell students they will lose their turn if they roll the dice off the foam. Setting such parameters decreases chaos (rolling—and in some cases, flying!—dice) and maintains control in the classroom.

Summarize

20. Ask students to return the dice and hundreds charts before beginning a whole-class discussion. Gather students together.
21. Use the numbers marked on the hundreds chart from when you introduced the game. Choose a number (in this case, use thirty-one) and ask students to find the difference. Call on one student and record his thinking. If he uses addition, ask if anyone can use subtraction to solve the problem; scribe that student's thinking.
22. Point to the addition strategy and name it by saying, "This strategy is called adding on or finding the missing addend. We can write a number sentence or equation. What number did we start with?" Record 31. "We added something to that number to reach one hundred." Record $+ \underline{\quad} = 100$. The final recording may look something like this:

$$31 + \underline{\quad} = 100$$

23. Point to the blank and tell students, "In addition problems, the numbers we add are called *addends*. In this problem, one is missing, so we call it a *missing addend* problem."

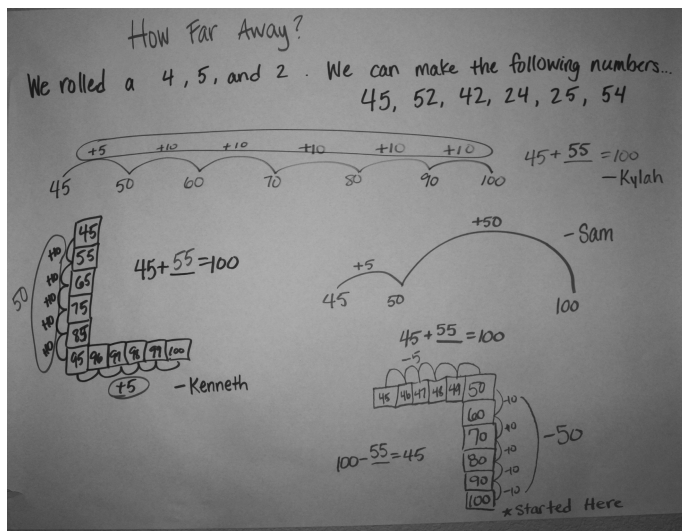


FIGURE G-10.2 Mrs. Conklin noticed that second graders in this class seemed more comfortable with finding the missing addend. She introduced using subtraction to find the difference, and they discussed how it was similar and different compared with one student's (Kenneth's) strategy.

Math Matters!

Connecting Addition and Subtraction

It is important for teachers to connect the relationship between addition and subtraction when working with multiple-digit numbers. *How Far Away?* offers an opportunity for students to experience how the difference stays the same whether they add on or subtract from. When you foster that thinking about adding on, students begin to calculate mentally with greater ease. Recording the equations and facilitating a class discussion helps students to begin to make these complex connections among operations. To read more about the connection between addition and subtraction, we recommend *Math Matters* by Suzanne Chapin and Art Johnson (Scholastic, 2006).

Homework

For homework, send materials and game directions (see Reproducible G-10R *How Far Away?*) home with a note attached asking parent and child to play the game three times, and to return the student's recording sheet to class.

24. Point to the subtraction problem and name it by saying, "This strategy is called *subtracting from* or *finding the missing number*. We can write a number sentence or equation. This time, what number did we start with?" Record 100. "We subtracted something from one hundred to reach thirty-one." The final recording may look something like this:

$$100 - \underline{\quad} = 31$$

25. Point to the blank and tell students, "We didn't know when we started what we were subtracting until we reached thirty-one."
26. Ask students to compare with their partner the equations and strategies they recorded. Encourage them to discuss what is similar and what is different.
27. Close by saying, "Addition and subtraction are related to each other. Some of you will feel more comfortable adding on from a number, whereas others of you will want to subtract from a number. I encourage you to try both and see which one feels most efficient or most comfortable to you."