

Activity

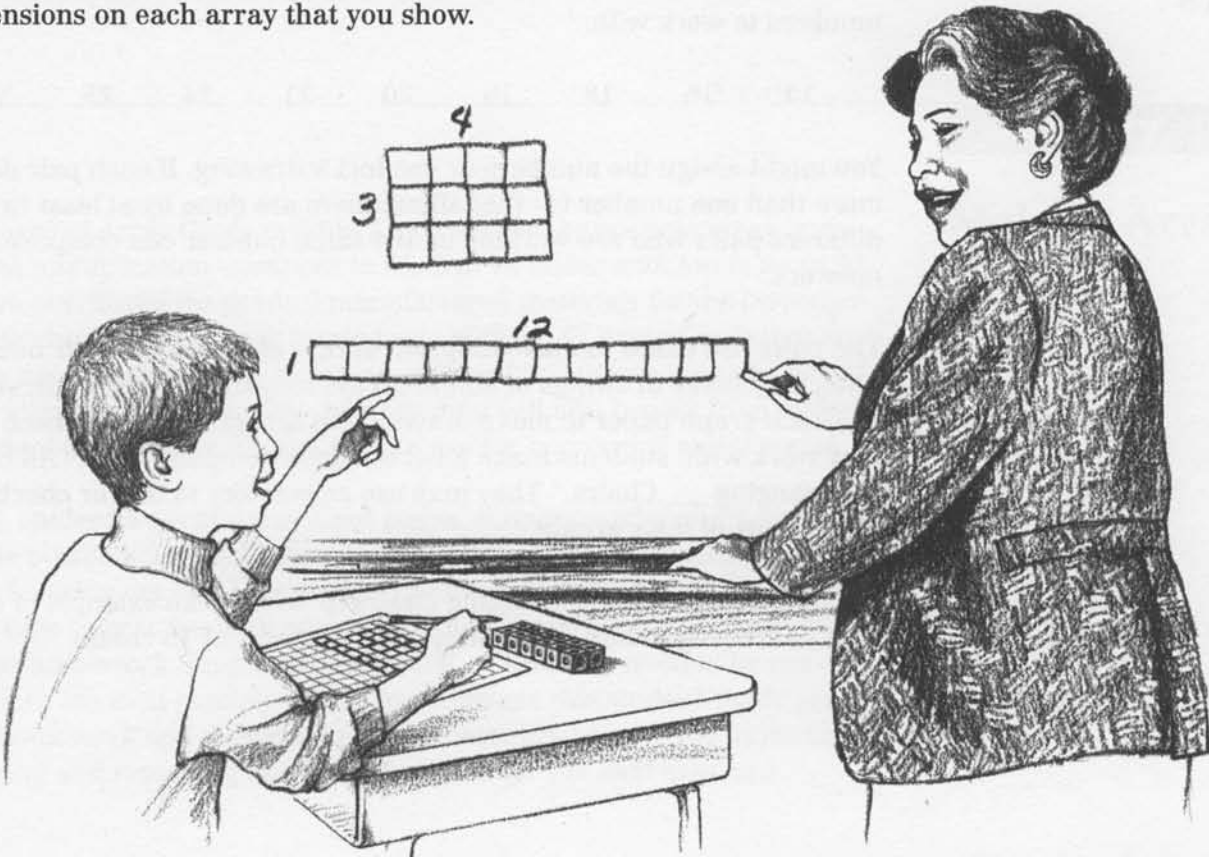
Introducing Arrays Each student needs 12 cubes to work with. Put 12 cubes on the overhead projector. Briefly explain the task:

Here's a puzzle to solve. We'll call it the Arranging Chairs puzzle. Pretend these 12 cubes are chairs. You want to arrange them in straight rows for an audience to watch a class play. You need to arrange the chairs so that there will be the same number in every row. How many different ways could you do this? How many chairs would be in each row? How many rows would there be? Try many different ways to arrange the chairs, even if some ways seem a bit silly for watching a class play.

❖ **Tip for the Linguistically Diverse Classroom** To support your explanation of the task, model the arranging of four chairs in different ways—one row of 4 across, four rows of 1 (one behind another), and two rows of 2. Make the corresponding arrangement of cubes for each.

Students spend some time making as many different rectangles as they can using the 12 cubes. When they have made several possible arrays, ask them to identify the number of rows and the number of chairs in each row. Show the students' different rectangles by drawing them on an overhead transparency of graph paper, on large graph paper, or on the board. Label the dimensions on each array that you show.

Arranging Chairs in Rectangular Arrays



Identify for students the words *array* and *dimension*.

Mathematicians sometimes call things that are grouped this way to form a rectangle an *array*.

Dimension is a name for the length or width of a rectangle. What are the *dimensions* of your rectangles? See how I'm labeling the dimensions of the rectangles as I draw them, the *length* and the *width*.

Use the term *by* when talking about dimensions and students will copy you; for example, "The dimensions of this rectangle are 2 *by* 6." List the pairs of dimensions on the board.

3×4	2×6	1×12
4×3	6×2	12×1

Have we made all of the possible rectangles? Is our list of dimensions complete? Each of the dimensions on this list is a *factor* of 12. What are all the factors of 12? (1, 2, 3, 4, 6, 12)

Activity

Arranging More Chairs

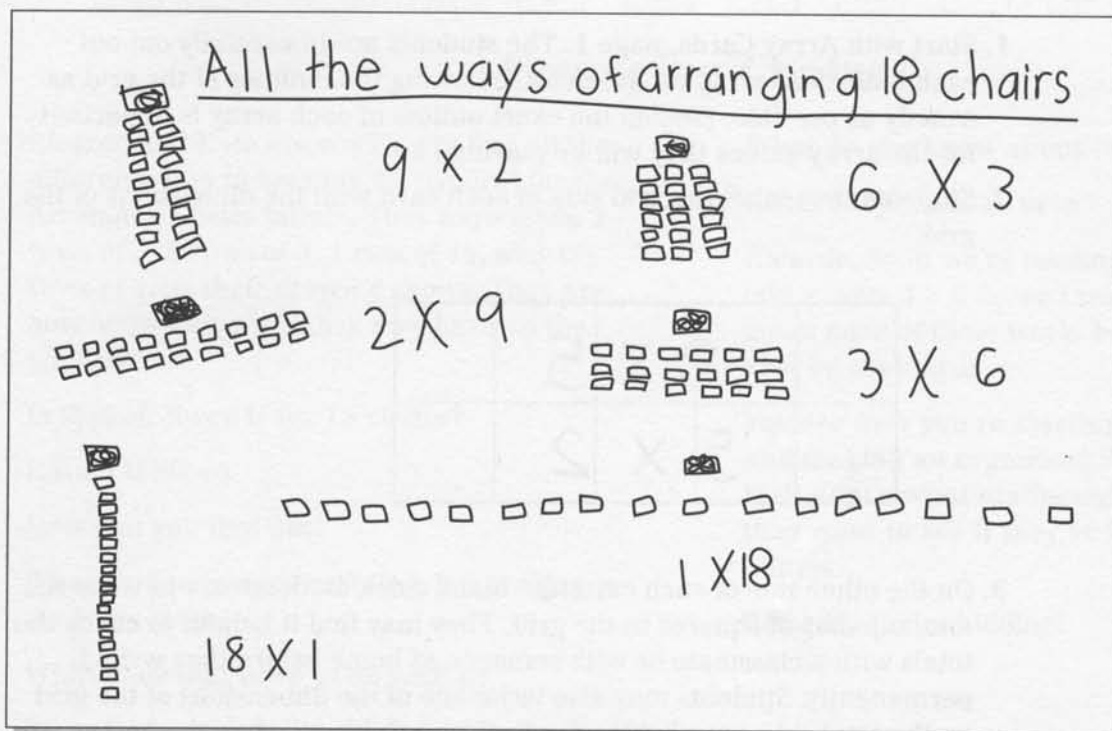
Students continue to work on the Arranging Chairs puzzle, this time with different numbers of chairs. Give each pair of students one of the following numbers to work with:

15 16 18 19 20 21 24 25 30

You might assign the numbers or conduct a drawing. If each pair does more than one number (so that all numbers are done by at least two pairs), different pairs who are working on the same number can compare their answers.

The pairs use cubes to make different arrays of chairs for their number. Then they make drawings of all the arrays they find. If you want, supply half-inch graph paper to make drawing the arrays easier. For each number they work with, students make a list of dimension pairs titled "All the Ways of Arranging ___ Chairs." They may use calculators to find or check the dimensions of their arrays.

See the **Dialogue Box**, Arranging Chairs (p. 47), for an example of a student pair trying to find all possible arrangements of 15 chairs.



When they are finished, invite pairs of students to report their findings, one number at a time. Make a list of the dimensions of the arrays students made for each number. Point out that the number 19 makes only two arrays—1 by 19, and 19 by 1. Remind students about prime numbers—those that didn't turn up on any highlighted charts except their own. Ask:

What other numbers would have only two arrays?

Activity

Making Array Cards

The six pages of Array Cards provide 51 arrays—every possible array representing the multiplication equations in the 2 to 12 tables *with totals up to 50*. If you have purchased the grade 3 manufactured materials for the *Investigations* curriculum, you will have printed sets of these 51 Array Cards that students can use in class. If not, you or an aide will have already made sets of cards for class use. In either case, each student will also benefit from making an individual set of paper Array Cards to use for homework assignments.

Give each student a set of Array Card pages, scissors, and a quart-size resealable plastic bag to hold the cut-apart array cards. Introduce the process of cutting out and labeling the cards as a whole-class activity. Give students time to practice with one or two sheets, and then have them do the rest as homework. Emphasize that all the cards will need to be prepared before the next session. (Some teachers use this student-made set for both homework and classwork. In that case, underscore the importance of preparing and returning the cards to school for the next session.)