Differentiation in Investigation 3

Mathematics in This Investigation

The mathematics focuses on understanding arrays as a model for multiplication and on using the arrays to learn the multiplication combinations with products up to 50.

Additional Resources: *Learning Multiplication Combinations,* pages 160–162 (See Curriculum Unit 5); *Count and Compare: A Visual Representation for Multiplication,* pages 97–99 (See *Implementing Investigations in Grade 3*)

Understanding the Mathematics

Students work systematically to find all the ways to represent a number with arrays, using strategies that rely on knowledge about equal groups (e.g., 2 will work for all even numbers), known multiplication combinations, relationships between combinations (e.g., if 2 × 8 works, then 8 × 2 does, too), and previously determined arrays. To find the total number of squares in an array, students may "just know" the product. If not, they count by groups or use a combination they do know. They are fluent with all or most of the multiplication combinations, and they use the ones they know to write clues for the ones they don't yet know.

Option: Assign the **Extension** activity.

Partially Understanding the Mathematics

Students find many of the ways to represent a number with arrays, but they may not find all of the possible factor pairs. To find the total number of squares in an array, they count by groups, use multiplication combinations they know, or reflect on other arrays that they know. They are gaining fluency with the multiplication combinations, and they are getting better at using known combinations to figure out ones they don't know.

Option: Assign the **Practice** activity.

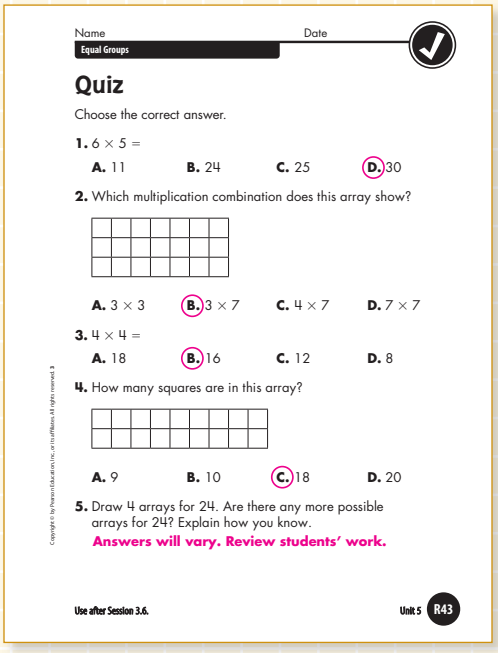
Not Understanding the Mathematics

Students find some of the ways to represent a number with arrays, but they work in a more random fashion. When faced with a multiplication combination, or finding the total number of squares in an array, they count by 1s or may be beginning to count by groups.

Option: Assign the **Intervention** activity.

Investigation 3 Quiz

In addition to your observations and students' work in Investigation 3, the Quiz (R43) can be used to gather more information.



Name Date

Equal Groups

Quiz

Choose the correct answer.

1. 6 × 5 =

A. 11 **B.** 24 **C.** 25 **D.** 30

2. Which multiplication combination does this array show?

A. 3 × 3 **B.** 3 × 7 **C.** 4 × 7 **D.** 7 × 7

3. 4 × 4 =

A. 18 **B.** 16 **C.** 12 **D.** 8

4. How many squares are in this array?

A. 9 **B.** 10 **C.** 18 **D.** 20

5. Draw 4 arrays for 24. Are there any more possible arrays for 24? Explain how you know.

Answers will vary. Review students' work.

Use after Session 3.6.

Unit 5 R43

Intervention

20 MIN INDIVIDUALS

Arrays and Skip Counting

Use anytime after Session 3.2.

Math Focus Points

- Using arrays to find factors of 2-digit numbers up to 50

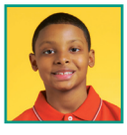
Vocabulary: array

Materials: crayons, M20

Remind students of the Making Array Cards activity in Session 3.2. I noticed that you counted the squares one by one when you were finding the total number. Let's see if there is a faster way to do that.

Distribute one 4 × 6 array to each student. How many rows are in the array? How many squares are in each row? How can you use skip counting to find the total number of squares?

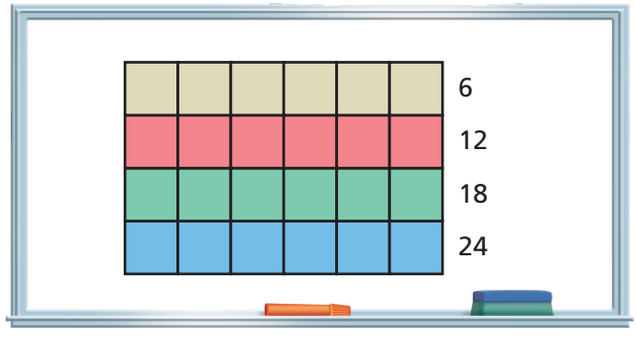
Students might say:



"There are 4 rows. There are 6 squares in each row. I can count by 6s four times."

There are 4 groups of 6. Color each group a different color. How many squares are in 1 group? 2 groups? 3 groups? 4 groups?

Draw the grid on the board using a different color for each row. Write the partial totals at the right.



Distribute the other 4 × 6 array to each student.

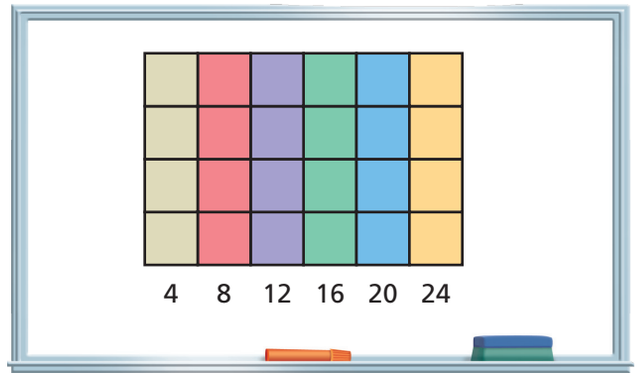
How many columns are in the array? How many squares are in each column? How can you use skip counting to find the total number of squares?

Students might say:

"There are 6 columns. There are 4 squares in each column. I can count by 4s six times."

There are 6 groups of 4. Color each group a different color. How many squares are in 1 group? 2 groups? 3 groups? 4 groups? 5 groups? 6 groups?

Draw the grid on the board using a different color for each column. Write the partial totals underneath.



As time allows, repeat the activity with different arrays.

ELL English Language Learners

Provide a Word List English Language Learners often confuse *row* and *column*. Write *row* and *column* on the board and discuss their meanings. Have students write words or draw pictures for each to help them remember the difference. Some beginning ELLs may also confuse *row* with either the act of rowing or roe.

Additional Resource

Student Math Handbook page 49

Practice

20 MIN GROUPS

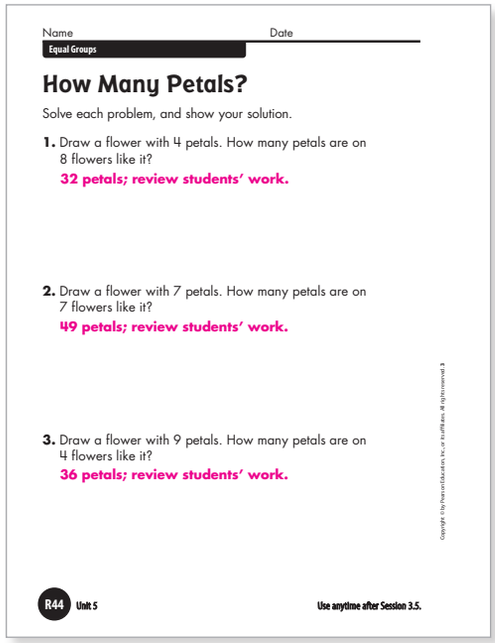
How Many Petals?

Use anytime after Session 3.5.

Math Focus Points

- Identifying and learning multiplication combinations not yet known
- Using known multiplication combinations to determine the product of more difficult combinations

Materials: R44



Name Date

Equal Groups

How Many Petals?

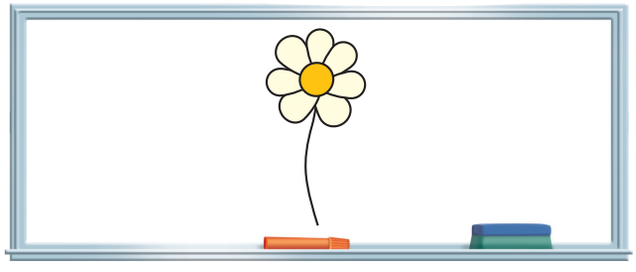
Solve each problem, and show your solution.

1. Draw a flower with 4 petals. How many petals are on 8 flowers like it?
32 petals; review students' work.

2. Draw a flower with 7 petals. How many petals are on 7 flowers like it?
49 petals; review students' work.

3. Draw a flower with 9 petals. How many petals are on 4 flowers like it?
36 petals; review students' work.

Draw a flower with 7 petals on the board.



This flower has 7 petals. How many petals are on 5 flowers like this one?

Have students work together to solve the problem. What combinations with 5 or 7 as a factor did you use to help you?

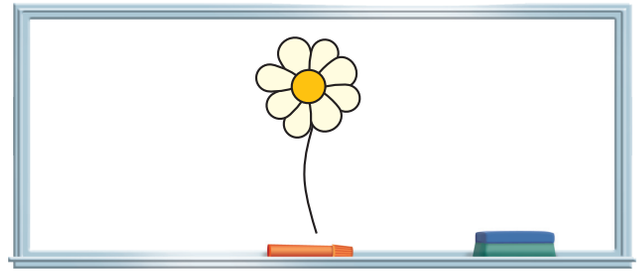
Students might say:

"First I solved 5 × 5 = 25. Then I solved 5 × 2 = 10; 25 + 10 = 35."

"I thought about the array, 5 × 7. 4 rows of 7 equal 28. There's 1 more row of 7. So 28 + 7 = 35."

[Becky] broke 5 × 7 into (5 × 5) + (5 × 2). [Dwayne] broke 5 × 7 into (4 × 7) + (1 × 7). They both used combinations they knew to find the product. What other combinations do you know that can help you solve 5 × 7?

Now draw a flower with 8 petals on the board.



This flower has 8 petals. How many petals are on 6 flowers like this one? Have students work together to solve the problem. Then have volunteers name known combinations they used to solve it. List the combinations on the board.

Distribute copies of How Many Petals? (R44).

ELL English Language Learners

Use Repetition Ask each question again using a simpler, shorter form. For example: Seven petals are on 1 flower. How many petals are on 5 flowers?

Additional Resource

Student Math Handbook

Game: *Count and Compare* SMH G9

Materials: Array Cards

Extension

25 MIN PAIRS

Arranging More Chairs

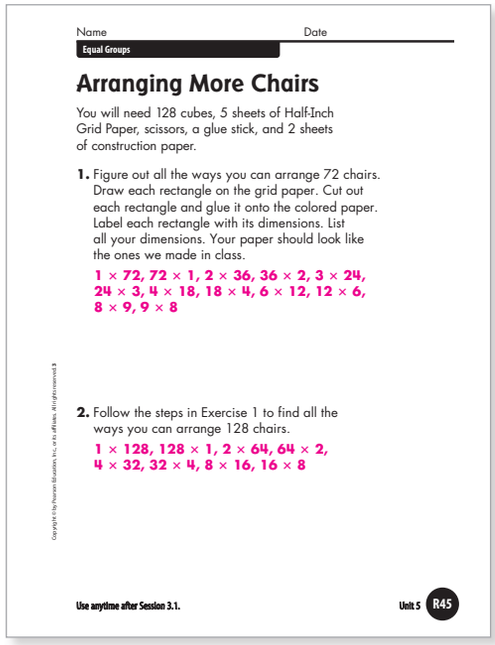
Use anytime after Session 3.1.

Math Focus Points

- Using arrays to model multiplication situations

Vocabulary: dimension

Materials: connecting cubes (64 per pair), construction paper, scissors, glue sticks, M14 (4 per pair), R45



Name Date

Equal Groups

Arranging More Chairs

You will need 128 cubes, 5 sheets of Half-Inch Grid Paper, scissors, a glue stick, and 2 sheets of construction paper.

1. Figure out all the ways you can arrange 72 chairs. Draw each rectangle on the grid paper. Cut out each rectangle and glue it onto the colored paper. Label each rectangle with its dimensions. List all your dimensions. Your paper should look like the ones we made in class.

1 × 72, 72 × 1, 2 × 36, 36 × 2, 3 × 24, 24 × 3, 4 × 18, 18 × 4, 6 × 12, 12 × 6, 8 × 9, 9 × 8

2. Follow the steps in Exercise 1 to find all the ways you can arrange 128 chairs.

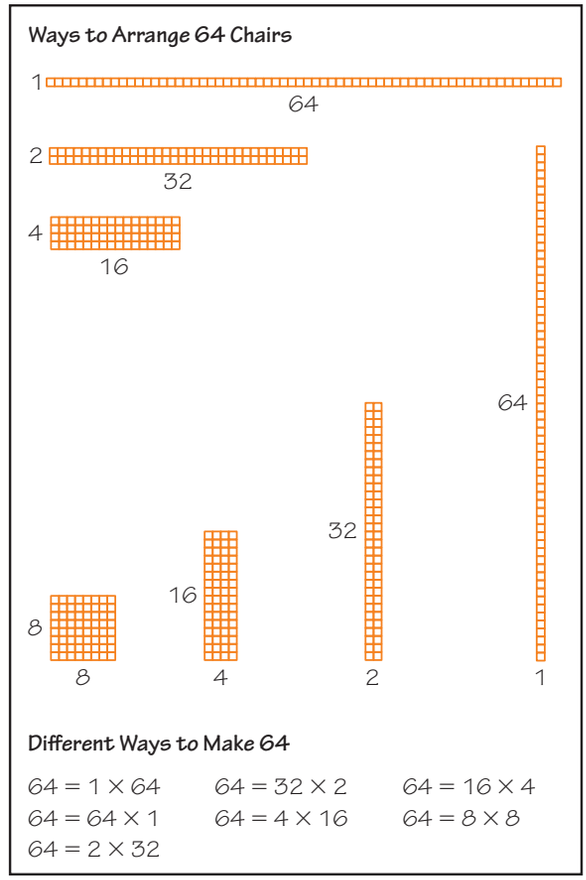
1 × 128, 128 × 1, 2 × 64, 64 × 2, 4 × 32, 32 × 4, 8 × 16, 16 × 8

Use anytime after Session 3.1. Unit 5 R45

Remind students of the Arranging Chairs activity in Session 3.1. Point to some of the posters in the classroom display.

You used cubes to find all the possible ways to arrange a certain number of chairs. Each arrangement was shown as an array.

Distribute the materials. Today you will find all the possible arrangements for 64. Draw each array on Half-Inch Grid Paper (M14). Cut out the arrays, glue them onto a piece of colored paper, and write the title "Ways to Arrange 64 Chairs." Label the dimensions of each array. Students find all the possible arrangements. Then partners share their posters and talk about what they notice.



Distribute copies of Arranging More Chairs (R45). Each student will need 128 cubes, 5 copies of M14, scissors, a glue stick, and 2 sheets of construction paper.

ELL English Language Learners

Partner Talk Have pairs describe arrangements. More proficient speakers should choose an array and describe the arrangement first. Have less proficient speakers repeat for another array. Then have them work together to discuss similarities and differences between the arrays.

Additional Resource

Student Math Handbook page 45