



Investigations

in Number, Data, and Space®

Unit Guide for Grade 4, Unit 1:
Factors, Multiples, and Arrays
Multiplication and Division 1



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Factors, Multiples, and Arrays

Multiplication and Division 1

Unit Summary:

Students deepen their understanding of the operation of multiplication. Students use rectangular arrays to represent the relationship between factors and multiples, use what they know to solve problems that increase in size, and focus on solving problems efficiently. They continue to develop fluency with multiplication combinations (facts up to 12×12).

Materials:

Factors, Multiples and Arrays (1 per person)

Resource Master M2, One Centimeter Grid Paper (2-3 per person)

12 x 18 construction paper (1 per person)

Student Activity Book p. 19, Multiple Turn Over Recording Sheet (1 per person)

Resource Master M45, Multiple Turn Over (1 per pair)

Multiple Cards (1 set per pair, use manufactured decks or Resource Masters M46-M49, see materials to Prepare, p. 55)

Calculators (optional)

Student Activity Book pp. 39-40, Factors of 16 and 48 (1 per pair)

Do the following activities from *Factors, Multiples, and Arrays*:

1. Identify the mathematics in the unit

To get an overview of the mathematics students will be doing in this unit, refer to these sections in the unit front matter. As you look at these sections, begin thinking about the main mathematical ideas students work on in this unit.

- Turn to pp. 8-9, *Overview of This Unit*, pp. 8-9. Look at the title of each Investigation and read the summary for each Investigation.
- Review the *Mathematics in This Unit* essay, pp. 10-13. Look at the Mathematical Emphases and Math Focus Points. (The emphases are numbered, and can be found above bulleted lists of Math Focus Points.)
- Read the “Benchmarks in This Unit” in the table on p. 15, *Assessing the Benchmarks*.

Discuss

- What mathematical ideas and skills are students working on in this unit?
- What mathematics are students expected to know at the beginning of the unit? At the end?

2. Making Arrays (Session 1.2)

In this Investigation, students use arrays to represent multiplication situations. In this session, they use what they know about multiplication to find all the arrays for given numbers.

- Read the Activity, *Introducing Making Arrays*, pp. 33-34, to understand how students are introduced to arrays in Grade 4. Read the Activity, *Making Arrays*, pp. 34-37, and choose one set of numbers to work on. (Make sure that each person in your group chooses a different pair of numbers from the list on p. 34.)
- Read the Teaching Note, “Factors of a Number and Its Multiples,” p. 34.

Discuss

- What are the smallest and largest factors you found for your number? Could there be anything smaller or larger?
- Were there numbers that you knew wouldn't work? Why?
- How do you know you have all the arrays for a number?
- How does the array model support students in learning multiplication combinations?

3. Playing Multiple Turn Over (Session 2.3)

Students have been working on their multiplication facts and identifying two factors that multiply together to make a multiple (for example, $8 \times 6 = 48$; 48 is a multiple of both 6 and 8). In this session, students are introduced to the game *Multiple Turn Over* to work on the relationship between factors and multiples and to continue to practice multiplication facts up to 12×12 .

- Read the Activities, *Introducing Multiple Turn Over*, pp. 72-73, *Playing Multiple Turn Over*, pp. 73-75. Play 3 or 4 rounds of the game with a partner.

Discuss

- What knowledge of multiples are you using? For example, do you know that even numbers are multiples of 2, or that multiples of 5 end in 0 or 5?
- How did you determine the factors of each multiple? Did you “just know” them, and/or use reasoning?
- What strategies might students use in choosing a multiple on the board to cover?

- Read the Dialogue Box, *Identifying Factors and Multiples in Multiple Turn Over*, p. 133.

Discuss

- What knowledge of factors and multiples are these students using as they explain their strategies?

4. Factors of 16 and 48 (Session 3.3)

In this Investigation students use what they know about factors of one number to find factors of other numbers. In this session, they explore the concept that the factors of a number are also factors of a multiple of that number.

- Read the Activity, *Factors of 16 and 48*, pp. 106-108. Work with a partner to complete Student Activity Book pp. 39-40, *Factors of 16 and 48*, using any representations that might be useful.

Discuss

- How did you explain why the factors of 16 are also the factors of 48?
- How are the factors of 16 and 48 related? That is, how many 3s fit in to 16? How many 3s fit in to 48? Why is that?
- How might students use arrays to demonstrate the relationship between the factors of 16 and 48?

- Read the section *Finding Factors*, p. 17, *Algebra Connections in This Unit*.
- Read the Discussion: *Are the Factors of 16 also Factors of 48?*, pp. 108-110, to see examples of student's explanations.

Discuss

- How would you describe the relationship between the factors of 16 and 48?
- Is this relationship true with any other factors? How do you know?
- How does this activity support students in extending their knowledge of factors?

5. Wrap Up

- Look back at the unit overview, pp. 8-9.

Discuss

- How do the activities done during this unit study fit into the overall mathematical storyline of the unit?

Other Key Features of *Factors, Multiples and Arrays*

- Algebra Connections in This Unit, pp. 16-17
- Ten-Minute Math in This Unit, p. 18
 - Today's Number*
 - Quick Images*
 - Counting Around the Class*
- Assessment
 - Representing 8×6 (Session 1.5)
 - Resource Master M32, Assessment Checklist
 - Multiplication Combinations (Session 2.5)
 - Teacher Note, pp. 120-122
 - End-of-Unit Assessment (Session 3.4)
 - Teacher Note, pp. 123-127