PARTICIPANT NOTES

CURRICULUM STUDY

G3M1 Multiply and Divide Friendly Numbers

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Overview

1 **Read the Grade 3 Mission 1 Overview.**

Jot down two ways students will use an understanding of equal groups to relate multiplication and division.

Mission 1

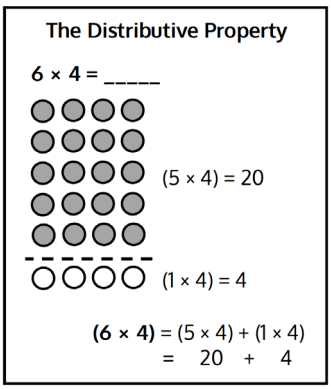
Multiply and Divide Friendly Numbers

OVERVIEW

This mission begins the year by building on students' fluency with addition and their knowledge of arrays. In Topic A, students initially use repeated addition to find the total from a number of equal groups. As students notice patterns, they let go of longer addition sentences in favor of more efficient multiplication facts. Lessons in Topic A move students' Grade 2 work with arrays and repeated addition a step further by developing skip-counting rows as a strategy for multiplication. Arrays become a cornerstone of the mission. Students use the language of multiplication as they understand what factors are and differentiate between the size of groups and the number of groups within a given context. In this mission, the factors 2, 3, 4, 5, and 10 provide an entry point for moving into more difficult factors in later missions.

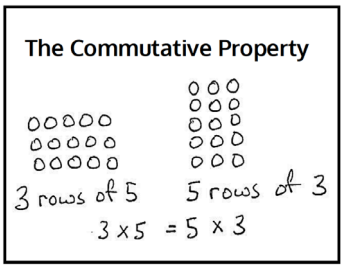
The study of factors links Topics A and B; Topic B extends the study to division. Students understand division as an unknown factor problem and relate the meaning of unknown factors to either the number or the size of groups. By the end of Topic B, students are aware of a fundamental connection between multiplication and division that lays the foundation for the rest of the mission.

In Topic C, students use the array model and familiar skip-counting strategies to solidify their understanding of multiplication and practice related facts of 2 and 3. They become fluent enough with arithmetic patterns to add or subtract groups from known products to solve more complex multiplication problems. They apply their skills to word problems using drawings and equations with a symbol to find the unknown factor. This culminates in students using arrays to model the distributive property as they decompose units to multiply.



In Topic D, students model, write, and solve partitive and measurement division problems with 2 and 3. Consistent skip-counting strategies and the continued use of array models are pathways for students to naturally relate multiplication and division. Modeling advances as students use tape diagrams to represent multiplication and division. A final lesson in this topic solidifies a growing understanding of the relationship between operations.

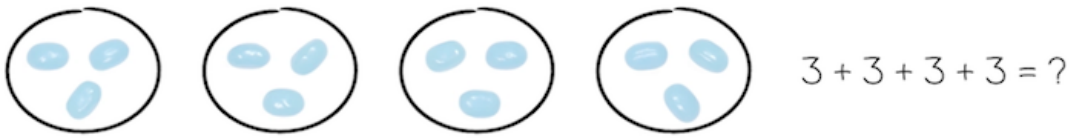
Topic E shifts students from simple understanding to analyzing the relationship between multiplication and division. Practice of both operations is combined—this time using units of 4—and a lesson is explicitly dedicated to modeling the connection between them. Skip-counting, the distributive property, arrays, number bonds, and tape diagrams are tools for both operations. A final lesson invites students to explore their work with arrays and related facts through the lens of the commutative property as it relates to multiplication.

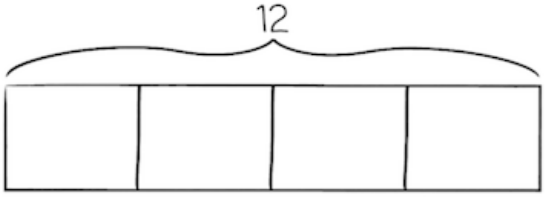


Topic F introduces the factors 5 and 10, familiar from skip-counting in Grade 2. Students apply the multiplication and division strategies they have used to mixed practice with all of the factors included in Mission 1. Students model relationships between factors, analyzing the arithmetic patterns that emerge to compose and decompose numbers, as they further explore the relationship between multiplication and division.

In the final lesson of the mission, students apply the tools, representations, and concepts they have learned to problem solving with multi-step word problems using all four operations. They demonstrate the flexibility of their thinking as they assess the reasonableness of their answers for a variety of problem types. The Mid-Mission Assessment follows Topic C. The End-of-Mission Assessment follows Topic F.

2 **Share your reflections on the progression of this mission with a partner.**





3

Solve this problem from the End-of-Mission Assessment.

Consider the strategies students may use to solve.

Mr. Lewis arranges all the desks in the classroom into 6 equal groups of 4.

a. How many desks are in his classroom? Show a picture and a multiplication sentence in your work.

b. What does the product in your multiplication sentence represent?

c. Fill in the blanks to complete a related division sentence.

_____ ÷ 4 = _____

d. What does the quotient in Part (c) represent?

Fluency

1 **Read the Group Counting activity from Lessons 1, 9, and 19.**
Think about how group counting evolves throughout the mission.

LESSON 1

Group Counting
(5 min)

Note: Basic skip-counting skills from Grade 2 shift focus in this Grade 3 activity. Group counting lays a foundation for interpreting multiplication as repeated addition. When students count groups in this activity, they add and subtract groups of 2 when counting up and down.

T: Let's count to 20 forward and backward. Watch my fingers to know whether to count up or down. A closed hand means stop. (Show signals during the explanation.)
T: (Rhythmically point up until a change is desired. Show a closed hand; then point down.)
S: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 19, 18, 17, 16, 15, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, 1, 0.
T: Let's count to 20 forward and backward again. This time whisper every other number. Say the other numbers in a regular voice.
S: (Whisper) 1, (speak) 2, (whisper) 3, (speak) 4, (whisper) 5, (speak) 6, etc.
T: Let's count to 20 forward and backward again. This time, hum every other number instead of whispering. As you hum, think of the number.
S: (Hum), 2, (hum), 4, (hum), 6, etc.
T: Let's count to 20 forward and backward again. This time, think every other number instead of humming.
S: (Think), 2, (think), 4, (think), 6, etc.
T: What did we just count by? Turn and talk to your partner.
S: Twos.
T: Let's count by twos. (Direct students to count forward to and backward from 20, changing directions at times.)

LESSON 9

Group Counting
(3 min)

Note: Group counting reviews interpreting multiplication as repeated addition. Counting by threes and fours in this activity supports work with units of 3 in this topic and anticipates work using units of 4 in Topic E.

T: Let's count by threes. (Direct students to count forward and backward to 30, emphasizing the transition from 18 to 21.)
T: Let's count by fours. (Direct students to count forward and backward to 24, emphasizing the 16 to 20 transition.)

LESSON 19

Group Counting
(3 min)

Note: Group counting reviews interpreting multiplication as repeated addition. Counting by threes, fours, fives, and sixes in this activity reviews multiplication with units of 3, 4, and 5 and anticipates multiplication with units of 6 in Mission 3.

T: Let's count by fives. (Direct students to count forward and backward to 50.)
T: Let's count by fours. (Direct students to count forward and backward to 40.)
T: Let's count by threes. (Direct students to count forward and backward to 30.)
T: Let's count by sixes. (Direct students to count forward and backward to 36, emphasizing the 24 to 30 transition.)

2 **Skim through the Whole Group Fluency materials.***

Identify 1-2 other fluency activities you'll want to emphasize in this mission.

* Access **Whole Group Fluency** materials in the Teacher-Led Instruction section of the **G3M1 mission page**.

Word Problems

1

Read Lesson 5's Whole Group Word Problem.
Then, solve using a math picture.

Stacey has 18 bracelets. After she organizes the bracelets by color, she has 3 equal groups. How many bracelets are in each group?

2 **Read Lesson 21's Whole Group Word Problem.**
Then, solve using a math picture.

There are 4 boxes with 6 binders in each one. Three brothers share the binders equally. How many binders does each brother get?

3 **Skim through the Whole Group Word Problems materials.***
Take note of the different strategies and models that students will use throughout this mission.

* Access **Whole Group Word Problems** materials in the Teacher-Led Instruction section of the **G3M1 mission page.**

Small Group Lessons

1

Read the Opening Problem and Problem 1 from Lesson 11.

As you read, note where representations of equal groups occur, and how they connect to each other.

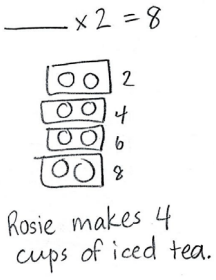
Lesson 11

Model division as the unknown factor in multiplication using arrays and tape diagrams.

Materials: (S) Personal white board

Opening Problem

Rosie puts 2 lemon slices in each cup of iced tea. She uses a total of 8 slices. How many cups of iced tea does Rosie make?



Note: Students may have solved the problem as shown or by using division (8 ÷ 2 = 4). This problem leads into modeling with tape diagrams, which is introduced in the lesson.

Problem 1: Relate arrays to tape diagrams, modeling division where the quotient represents the number of groups.

T: (Draw or project a 2 × 4 array.) The columns in this array show the number of lemon slices in 1 cup of Rosie's iced tea. Reread the Opening Problem, and tell your partner what the unknown represents.

S: The unknown is the number of cups, or groups.

T: How might this array help us solve 8 ÷ 2 = ____?

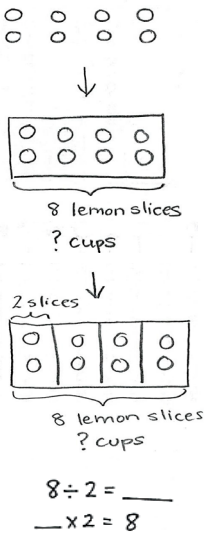
S: We can count the number of columns to find how many cups. → 2 times 4 equals 8, so 8 ÷ 2 = 4.

T: (Draw a rectangle around the array.) What is the total number of lemon slices?

S: 8 lemon slices.

T: (Bracket the rectangle and label the whole *8 lemon slices*.) The question asks how many cups of iced tea Rosie makes. Do the cups represent the number of groups or the number of lemon slices in each group?

S: The number of groups.



YOUR NOTES

YOUR NOTES

T: (Under *8 lemon slices*, label the unknown as *? cups*.)
T: Watch how I show the number of slices in one cup. (Draw lines to divide columns and label 1 unit as *2 slices*.) Where do we see the cups in our diagram?
S: You made 4 cups with the dividing lines.
T: By adding lines and labels to our array, we made a tape diagram. Each boxed column shows 1 **unit**. One unit represents 1 cup and has a value of 2 slices. Notice that I labeled the diagram with all of the known and unknown information from the problem as we solved. That made it a helpful tool for understanding the problem.
T: (Write 8 ÷ 2 = ___ and ___ × 2 = 8.) Talk to your partner about how the tape diagram helps you see the unknown in both equations.
S: (Discuss.)

In Problem 1, the quotient represents the number of groups. Repeat the process using the following examples, reminding students to label known and unknown information from the problem on every tape diagram.

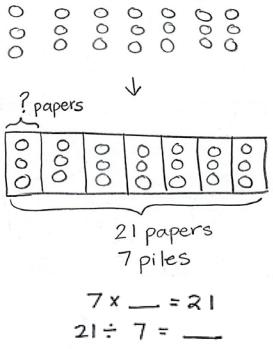
- 10 ÷ 2 = 5
- 18 ÷ 3 = 6

OPTIONAL FOR FLEX DAY: PROBLEM 2

Problem 2: Use arrays to draw tape diagrams, modeling division where the quotient represents the number of objects in each group.

Write or project the following problem: Ms. Alves puts 21 papers in 7 piles. How many papers are in each pile?

T: Read the problem. What is unknown?
S: The number of objects in each group.
T: Model the problem on your personal white board as an array where each column represents 1 pile.
S: (Draw array, shown at right.)
T: Count to find how many papers are in each of Ms. Alves's piles.
S: (Count to find 3 papers.)
T: Work with a partner to model the problem as a tape diagram. Be sure to label the diagram with known and unknown information. Use your array to help.
S: (Draw tape diagram shown on previous page.)
T: Use the tape diagram to write multiplication and division equations that show the unknown.



S: (Write 7 × ___ = 21 and 21 ÷ 7 = ___.)

In Problem 2, the quotient represents the number of objects in each group. Repeat the process using the following examples:

- 16 ÷ 2 = 8
- 24 ÷ 3 = 8

T: Compare models. What are the similarities and differences between arrays and tape diagrams?

S: The tape diagram is like a labeled and boxed array. → They both show the 7 piles, 3 papers in each pile, and 21 papers total. → The labels make the tape diagram a little easier to use.

YOUR NOTES

NOTES

Debrief Questions

- Compare how **units** are represented in tape diagrams and in arrays.
- How can each model represent both types of unknowns?
- Compare the way you solved the Opening Problem with the tape diagram model we learned today.

Multiple Means of Engagement

The numbers in the Opening Problem may be too simple. They were chosen to compliment the introduction of the tape diagram in the lesson. If needed, change the numbers in the Opening Problem to meet the needs of the class, and adjust the opening language of the lesson accordingly.

Multiple Means of Engagement

Support students to work at individualized levels by inviting them to choose to work independently or with a partner to solve additional examples.

Tape Diagrams

Students are familiar with tape diagrams from Grade 2. They use tape diagrams to represent the information given in a problem, and then analyze the model to help determine the unknown and solve. As tape diagrams are reviewed, ask why the diagram might have that name. Guide students to make connections that help them remember the name.

2

Look at the equations used in Problem 1 of Lesson 11.

Underline and/or add in questions to remind students of the meaning of each factor and the total.

3

Skim through the Small Group Lessons materials to find the next lesson you're going to teach.*

Identify the representations students might use in this lesson.

Write questions in the margin that you could use if students are struggling with the meaning of the equal groups and the total.

* Access **Small Group Lessons** materials in the Teacher-Led Instruction section of the **G3M1 mission page.**

Learning Extension

With Zearn Math, students learn content in two ways. During today's Grade 3 Mission 1 Study, we explored one way - **Teacher-Led Instruction**.

As learning extension work, we recommend that you complete all the **Independent Digital Lessons** to explore the other way that students will learn content in Grade 3 Mission 1. We have highlighted some of these lessons below, and have suggested ways to incorporate content from these lessons into your live instruction.

Focus on the following lessons in Grade 3 Mission 1:

- **Lessons 1 and 3**
  In these introductory Independent Digital Lessons, students practice drawing equal groups and relate these groups to multiplication. These are important foundational lessons because they help students establish a conceptual understanding of multiplication that connects to the work they did with equal groups in Grade 2 Mission 6.

- **Lesson 6**
  This lesson helps students draw the connection between multiplication and division as they use arrays to represent problems. Understanding the relationship between these two operations will empower students to flexibly solve more complex problems. Students who are struggling with this concept may benefit from discussing the arrays in the context of a word problem.

- **Lesson 9**
  In this lesson, students are introduced to the distributive property of multiplication. They learn that a multiplication fact can be broken into the sum of two other

multiplication facts. The distributive property is sometimes a tricky concept for students, but it helps them understand there are multiple ways to solve a given problem. Use Small Group Lessons to explore different ways students break up multiplication problems. Students will explore this strategy further throughout this Mission and in Mission 3.

- **Lesson 12**
  This lesson falls within an important topic, where students use tape diagrams to represent division. Students may struggle with this lesson as they use tape diagrams in a new way. One tape diagram can represent a multiplication *and* division equation, so the modeling will deepen the connection between these operations.

- **Lesson 21**
  Lesson 21 is an end-of-topic lesson. The tower reviews content from Lessons 18 to 21 and assesses the developing understanding of multi-step word problems. Discussing the steps to solving during Whole Group Word Problems time can help prepare students for this final lesson.

If your students need additional support with this content, consider using Small Group Lessons from this foundational mission during flex time:

- **G2M6**