

# Investigating Multiplication and Division

## CONTENTS FOR GRADES 3–5



*Investigating Multiplication and Division* (Grades 3–5) is organized around 5 units. Each unit comprises a two-week (10-day) sequence of investigations, games, routines, and minilessons.

### 1 **Groceries, Stamps, and Measuring Strips: Early Multiplication**

BY FRANS VAN GALEN AND CATHERINE TWOMEY FOSNOT

#### ☀ **DAY ONE: INSIDE THE GROCERY STORE**

The grocery store context introduces an investigation involving grouping strategies. A math congress gives students a chance to discuss their work.

#### ☀ **DAY TWO: POSTAGE STAMPS**

A minilesson, using sets of stamps, supports the use of repeated addition and unitizing. A related investigation and subsequent math congress encourage students to structure repeated additions in a variety of multiplicative ways, to unitize, and to explore relationships among the sets of stamps.

#### ☀ **DAY THREE: DESIGNING YOUR OWN STAMPS**

A minilesson using quick images encourages the use of doubling. The subsequent investigation and math congress highlight several big ideas regarding the properties for multiplication.

#### ☀ **DAY FOUR: HOW LONG? HOW TALL?**

A minilesson using quick images supports the use of doubling, and doubling and halving. The cityscape context provides further support in doubling and introduces the terminology of “times.”

#### ☀ **DAY FIVE: THE CITY CENTER**

A minilesson supports the use of skip-counting and highlights the relationships among the three-, six-, and nine-times tables. A math congress gives students a chance to share and discuss their work from Day Four and introduces the multiplication symbol.

#### ☀ **DAY SIX: MEASURING STRIPS**

A minilesson supports the use of skip-counting and highlights the relationships among the two-, four-, and eight-times tables. Measuring strips are introduced as a tool for examining relationships with fives and tens, and threes, sixes, and nines.

#### ☀ **DAY SEVEN: MORE MEASURING STRIPS**

The use of measuring strips is extended to include consideration of the relationships among groups of two, four, eight, and seven. A math congress highlights those relationships and challenges students to generalize.

#### ☀ **DAY EIGHT: WINDOWS AND NUMBER LINE MYSTERIES**

A minilesson provides further support for doubling. An investigation and subsequent math congress explore using known products to determine unknown products with the open number line model.

#### ☀ **DAY NINE: THE BAKER’S TRAYS AND MORE NUMBER LINE MYSTERIES**

A minilesson and explorations with measuring strips highlight the use of the five- and ten-structures in solving more challenging multiplication problems. A subsequent math congress gives students a chance to discuss their work.

#### ☀ **DAY TEN: PATIOS, STICKERS, AND REFLECTIONS**

A minilesson provides further support in using the five- and ten-structures. A culminating investigation and math congress give students a chance to reflect on their mathematical development over the course of the unit.

#### ☀ **REFLECTIONS ON THE UNIT**

## 2 The Big Dinner: Multiplication with the Ratio Table

BY CATHERINE TWOMEY FOSNOT

### ☀ DAY ONE: PRICING THE INGREDIENTS

The context of preparing a turkey dinner highlights students' early multiplication strategies.

### ☀ DAY TWO: BUYING THE TURKEY

A math congress gives students a chance to share and discuss their work from Day One.

### ☀ DAY THREE: CHARTS FOR THE GROCER—TURKEY

A minilesson supports automatization of the basic facts by highlighting number relationships. The investigation and math congress focus on the ratio table and grouping strategies based on distributivity.

### ☀ DAY FOUR: CHARTS FOR THE GROCER—APPLES AND CARROTS

A minilesson further supports automatization of the basic facts by focusing on number relationships. The investigation offers more experience with the ratio table and grouping strategies based on distributivity.

### ☀ DAY FIVE: CHARTS FOR THE GROCER—APPLES AND CARROTS

A minilesson provides more practice with automatizing the basic facts. A math congress focuses on ways to add partial products and generalize the distributive property.

### ☀ DAY SIX: CHARTS FOR THE GROCER—POTATOES

A minilesson, investigation, and math congress all encourage use of the distributive property over subtraction.

### ☀ DAY SEVEN: PLAYING WITH NINES

A minilesson, investigation, and math congress all focus on the patterns that emerge when calculating with the number nine.

### ☀ DAY EIGHT: BUYING THE GROCERIES

A minilesson and investigation support students in becoming more flexible in using the distributive property over subtraction.

### ☀ DAY NINE: COOKING THE DINNER

A minilesson introduces doubling and halving as a helpful strategy for automatizing the basic facts. The investigation encourages the use of various strategies developed in the unit.

### ☀ DAY TEN: COOKING THE DINNER

A minilesson supports the generalization of the doubling and halving strategy. A math congress gives students a chance to share and discuss their work from Day Nine.

### ☀ REFLECTIONS ON THE UNIT

### 3 Muffle's Truffles: Multiplication and Division with the Array

BY ANTONIA CAMERON AND CATHERINE TWOMEY FOSNOT

#### ☀ DAY ONE: MUFFLES' TRUFFLES

The context of candy boxes and the introduction of the array model highlight some big ideas related to multiplication and division.

#### ☀ DAY TWO: MUFFLES' TRUFFLES

A math congress gives students a chance to share and discuss their work from Day One.

#### ☀ DAY THREE: DESIGNING MORE BOXES

A minilesson focuses on multiplication and division by ten and the place value patterns that result. The subsequent investigation provides opportunities to continue exploring arrays and the relationships among them.

#### ☀ DAY FOUR: DESIGNING MORE BOXES

A math congress gives students a chance to share and discuss their work from Day Three and highlights the open array as a tool to represent and explore partial products.

#### ☀ DAY FIVE: BLUEPRINTS FOR MUFFLES' ASSORTMENT BOXES

A minilesson using quick images encourages students to use partial products to find the products represented by larger arrays. The subsequent investigation continues to support the use of partial products, and open arrays as representations of them.

#### ☀ DAY SIX: BLUEPRINTS FOR MUFFLES' ASSORTMENT BOXES

A minilesson using quick images provides additional support for using partial products to find the products represented by larger arrays. Preparations for a math congress provide an opportunity for students to reflect on their own, and each other's, work.

#### ☀ DAY SEVEN: ASSORTMENT BOXES

A minilesson revisits the ten-times strategy explored earlier in the unit. It also challenges students to use partial products to solve problems without the benefit of quick images as a support. A subsequent math congress focuses on the distributive and associative properties.

#### ☀ DAY EIGHT: THE BIG MIX-UP

A minilesson offers more students more experience in solving problems without the benefit of quick images as a support. The subsequent investigation provides another opportunity to explore the distributive property.

#### ☀ DAY NINE: THE BIG MIX-UP

A final minilesson encourages use of partial products and ten-times. The subsequent math congress gives students a chance to share and discuss their work from Day Eight.

#### ☀ DAY TEN: A DAY FOR REFLECTING

Creation of a wall display, gives students a chance to reflect on and celebrate their mathematical development.

#### ☀ REFLECTIONS ON THE UNIT

## 4 The Teachers' Lounge: Place Value and Division

BY CHRIS NATALE AND CATHERINE TWOMEY FOSNOT

### ☀ DAY ONE: THE TEACHERS' LOUNGE

The context of vending machines in a teachers' lounge supports the development of several big ideas related to division.

### ☀ DAY TWO: THE TEACHERS' LOUNGE

A math congress gives students a chance to share and discuss their work from Day One.

### ☀ DAY THREE: THE ICED TEA MACHINE

A minilesson, investigation, and math congress focus on the ten-times strategy (using partial products) for division.

### ☀ DAY FOUR: FILL THE MACHINE

A minilesson highlights the place value patterns when multiplying by ten and further supports using partial products. The Fill the Machine game provides more practice with combining partial products efficiently.

### ☀ DAY FIVE: AMUSEMENT PARK CONVERSATION

A minilesson, investigation, and math congress continue to support the development of using the ten-times strategy.

### ☀ DAY SIX: AMUSEMENT PARK, TICKETS FOR RIDES

A minilesson introduces the open array model to highlight the relationship between multiplication and division. The investigation provides more experience using ten-times and partial products.

### ☀ DAY SEVEN: AMUSEMENT PARK, TICKETS FOR RIDES

A math congress gives students a chance to share and discuss their work from Day Six. A minilesson encourages students to combine partial quotients when dividing greater numbers.

### ☀ DAY EIGHT: TICKETS FOR THE TEACHERS

A minilesson provides more practice with combining partial quotients when dividing larger numbers. The investigation and math congress focus on using place value patterns in division.

### ☀ DAY NINE: WHAT TO DO WITH THE REMAINDERS?

A minilesson provides further support in using partial quotients. The investigation focuses on treating the remainder meaningfully based on the context of the problem.

### ☀ DAY TEN: OPPORTUNITIES FOR ASSESSMENT

Individual assessments provide insight into the development of students' division strategies.

### ☀ REFLECTIONS ON THE UNIT

## 5 The Box Factory: Extending Multiplication with the Array

BY MIKI JENSEN AND CATHERINE TWOMEY FOSNOT

### ☀ DAY ONE: EXPLORING BOX DESIGNS

The box factory context supports the development of several big ideas and strategies related to multiplication. A math congress gives students a chance to show and discuss their work.

### ☀ DAY TWO: EXPLORING BOX DESIGNS

A minilesson encourages the use of doubling and halving. As the box investigation continues, students begin to work more systematically.

### ☀ DAY THREE: EXPLORING BOX DESIGNS

A math congress gives students a chance to share and discuss their work from Days One and Two.

### ☀ DAY FOUR: HOW MUCH CARDBOARD IS NEEDED?

A minilesson supports the use of ten-times and partial products. A new investigation focuses on the relationship between surface area and volume.

### ☀ DAY FIVE: HOW MUCH CARDBOARD IS NEEDED?

A math congress gives students a chance to share and discuss their work from Day Four.

### ☀ DAY SIX: PRICING BOXES

A minilesson encourages the use of doubling and halving, and tripling and thirding. A new investigation supports an understanding of the associative property.

### ☀ DAY SEVEN: PRICING BOXES

A minilesson focuses on the generalization of the associative property. A math congress gives students a chance to share and discuss their work from Day Six.

### ☀ DAY EIGHT: SHIPPING BOXES

A math congress gives students a chance to extend the discussion of their work from Day Six. A new investigation extends students' understanding of volume.

### ☀ DAY NINE: SHIPPING BOXES

A minilesson encourages the use of a variety of strategies for multiplication. A math congress gives students a chance to share and discuss their work from Day Eight.

### ☀ DAY TEN: A DAY FOR REFLECTING

Creation of a learning wall gives students a chance to reflect on and celebrate their mathematical development.

### ☀ REFLECTIONS ON THE UNIT