

Dice Activities for Division

Introduction

Fluency with the operation of division is a critical skill for the journey into more complex mathematical challenges. Of the four operations, division can be the most tedious for students. It is often taught as a series of memorized procedures, making it difficult for students to wrap their minds around what is actually happening. Students are asked to practice solving division equations without a sense of the underpinnings of the operation.

Dice Activities for Division focuses on developing mental acuity and fluidity with the concepts of divisor, dividend, quotient, and remainder. When experiencing division in a gamelike context, students readily engage in the activities and actually request opportunities to practice, or—as they would call it—“play the game.” Fluidity comes only with practice based upon understanding.

With a solid handle on division facts, students can more easily navigate their way through the more complex study of fractions and pre-algebra concepts. The factor and remainder activities further develop students’ understanding of how numbers work.

The preceding book, *Dice Activities for Multiplication*, serves as a foundation for the explorations of the ideas of division presented in this text. The format should be familiar to students who have used the *Multiplication* book, allowing them a greater opportunity for addressing the mathematical concepts involved. The common structures of the activities include graphs, charts, and Tic-Tac-Toe. Division concepts addressed include:

- Division without remainders
- Connection to the inverse operation of multiplication
- Multiples and factors
- Remainders

Dice Activities for Division focuses on the Common Core Standards of Operations and Algebraic Thinking and Number and Operations in Base Ten. It also addresses reasoning, problem solving, and probability.

The authors currently use *Dice Activities for Division* as part of their curriculum in training elementary school

teachers to teach mathematics. The activities require only the use of dice and tiles or tokens—all commonly available classroom manipulatives. The activities are easily adapted to home schooling and for parents who wish to participate in the education of their children. The activities are engaging, generate a friendly competition, and provide a reason for learning division concepts.



Our work is continually expanding, and we welcome any suggestions for modification of these activities that will lead to greater mathematical thinking on the part of our students. We especially welcome and invite feedback from the students as well as staff. Submit any suggestions to mathofcourse@gmail.com.

—Mary Saltus, Diane Neison, and Chet Delani

Contents

Introduction/Notes to Teachers	iv–vii
Hundred Chart	viii
Division Chart	ix
PART I	
Division Graph Activities	1–13
Table Completion Activities	15–32
Chart Activities:	
Four in a Row, Square Off, Cross Over	33–46
Tic-Tac-Toe/	
Four-Grid Tic-Tac-Toe Activities	47–72
PART II	
Factoring Activities	73–79
Remainder Activities	81–99
About the Authors	100

Notes to Teachers

Conceptualizing Division in Three Words: “Has How Many”

Attaching the term “has how many” to the \div sign creates a vivid image of the division process. “Has how many” makes sense to students in the context of their language, whereas “divided by” implies a procedure or process.

When $20 \div 10$ becomes “20 has how many (sets of) 10?” or $100 \div 25$ becomes “100 has how many (sets of) 25?” students can mentally make sense of the question and often successfully solve division problems without relying on memory, skip counting, or manipulatives.

With $27 \div 3$ (“27 has how many [sets of] three?”), some students may need to skip count by three to 27, or take 27 tokens and divide 27 into sets of 3 tokens each.

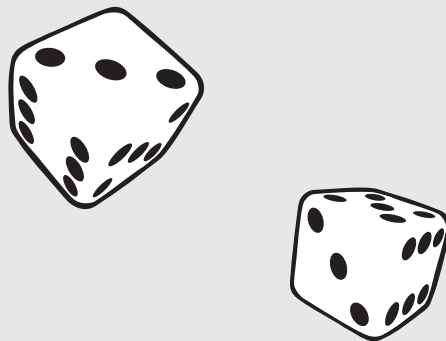
The equation $3 \div 5 = ?$ is oftentimes confusing. Students might say it is not possible. Using the term “has how many” and tokens will easily clarify the confusion. Three has how many sets of 5? None. What’s left over? 3. So what is the solution? 0 remainder 3.

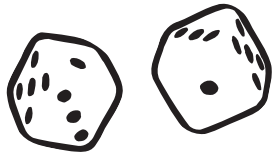
Conceptualizing Multiplication in Two Words: “Of The”

Reading the multiplication sign (\times) as “of the” enables students to make sense of what the problem is asking—for example, 5×3 is really asking for “5 of the 3s.” The term “of the” invites students to mentally construct meaning from their experience rather than rely on memory.

Strategies for Arriving at a Solution

- Skip count, using fingers to keep track of the skips.
- Use the Hundred Chart (page *viii*) to aid in skip counting.
- As a last resort, use the Division Chart (page *ix*). For a student with recall issues, the Division Chart is a useful tool. The student can focus on the concepts of division, factors, and remainders rather than struggle with recall, enabling the student to further develop number sense and a conceptual base for reducing fractions.





Correlation to the Common Core Standards

The activities in this book address the following Common Core State Standards for Mathematics.

Grade 3

Operations and Algebraic Thinking [3.OA]

Represent and solve problems involving multiplication and division.

1. Interpret products of whole numbers.
2. Interpret whole-number quotients of whole numbers.
3. Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities.
4. Determine the unknown whole number in a multiplication or division equation relating three whole numbers.

Understand properties of multiplication and division and the relationship between multiplication and division.

5. Apply properties of operations as strategies to multiply and divide.
6. Understand division as an unknown-factor problem.

Multiply and divide within 100.

7. Fluently multiply and divide within 100.

Grade 4

Operations and Algebraic Thinking [4.OA]

Use the four operations with whole numbers to solve problems.

1. Interpret a multiplication problem as a comparison. (Ex: “35 is 5 times as many as 7, and 7 is 5 times as many as 5.”)
2. Multiply or divide to solve word problems involving multiplicative comparison.
3. Solve multistep word problems with whole numbers including problems in which the remainder must be interpreted.

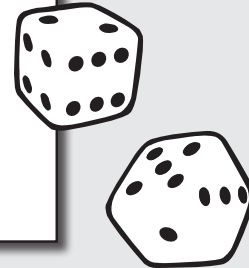
Gain familiarity with factors and multiples.

4. Find all factor pairs for a whole number in the range 1–100.

Directions for Division Graph Activities

Objectives

- Develop a working knowledge of the mathematical concepts of division.
- Practice division facts 2 through 12.
- Recognize and reinforce factors.
- Quick recognition of all possible sum combinations on two dice.
- Practice directionality on the x and y axes.



The **Graph** activities are an introductory lesson to familiarize students with division facts. The simplicity of these activities makes them a tool for diversifying learning. Some students may find it beneficial to stay with the Graph activities to develop recognition and fluency, while others are ready for more challenging involvement with division facts.

Introduce the **Division Graphs** by demonstrating on an overhead or interactive whiteboard.

How to Play

- Toss two dice and find the sum.
- The sum is the **quotient** of a division equation on the chart. Fill in the box above the equation with the quotient.
- The first team to fill in a column wins.

Suggestions

- Have students use the term “has how many” instead of “divided by” when reading the division sign (\div).
- If students are struggling to recall division facts, suggest they skip count by the divisor until they reach the quotient (die toss) to find the multiple (dividend) or, if necessary, refer to the Division Chart (page ix).

Variations

- First team to fill a column wins.

- First team to fill three columns wins.
- First team to fill a column stops the activity. Teams find the total of all the numbers entered on the graph to determine the highest score.
- Toss dice 10 times. Team with the highest sum wins. Keep a record of tosses and use as a probability lesson.
- Team tosses two dice and finds the sum. Instead of recording the quotient, teacher instructs students to perform another calculation to the quotient and record the answer on the graph, such as:
 - Double or triple the quotient
 - Halve the quotient
 - Add 5 to the quotient and halve the result
 - Add 7, 8, 9, 10, or 11 to the quotient
 - Subtract 7, 8, 9, 10, or 11 from the quotient (possible to result in a negative number)
 - After 5, 10, or 15 tosses, tally the answers to see which team has the highest or lowest score.

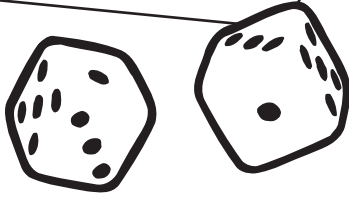
Discussion

- How do you figure out a division solution if you cannot recall the division fact?
- How do the multiplication facts help with division?
- How can skip counting help in solving division problems?

÷ 2 Table Completion

How to Play

- Each team tosses a die.
- Higher number goes first.



- Toss two dice. Find the sum. The sum equals the **quotient**.
- Circle the equation on the chart whose solution is the sum of the dice. Record the quotient next to the equation.
- Remember that \div means "has how many." Example: "12 has how many sets of 2?"
- If no quotient is available, lose a turn.
- First team to complete their table wins.

Team: _____

Equation	Quotient
$20 \div 2 =$	
$14 \div 2 =$	
$10 \div 2 =$	
$8 \div 2 =$	
$4 \div 2 =$	
$16 \div 2 =$	
$24 \div 2 =$	
$22 \div 2 =$	
$12 \div 2 =$	
$18 \div 2 =$	
$6 \div 2 =$	

Team: _____

Equation	Quotient
$14 \div 2 =$	
$10 \div 2 =$	
$20 \div 2 =$	
$18 \div 2 =$	
$12 \div 2 =$	
$22 \div 2 =$	
$8 \div 2 =$	
$6 \div 2 =$	
$16 \div 2 =$	
$24 \div 2 =$	
$4 \div 2 =$	