
Contents

Introduction	5
Place Value with Decimals	11
Comparing Decimals	13
Add and Subtract Decimals	15
Rounding Decimals	17
Review: Multiply and Divide Decimals Mentally	20
Review: Multiply Decimals by Decimals	22
Review: Long Division with Decimals	25
Problem Solving with Decimals	27
Fractions and Decimals	29
Multiply and Divide by Powers of Ten	32
Scientific Notation	34
Review: Divide Decimals by Decimals	37
Divide Decimals by Decimals 2	40
Convert Customary Measuring Units	42
Convert Metric Measuring Units	46
Convert Between Customary and Metric	49
Decimals Review	51
Simplifying Fractions Using Factoring	55
Fraction Terminology	58
Review: Fractions and Mixed Numbers	59
Review: Add and Subtract Fractions and Mixed Numbers	61
Add and Subtract Fractions: More Practice	65
Review: Multiplying Fractions 1	68
Review: Multiplying Fractions 2	71
Dividing Fractions: Reciprocal Numbers	74
Divide Fractions	79
Multiple Operations and Fraction Equations	83
Comparing Fraction and Decimal Division	86
Multiplication, Division, and Fractions	89

Problems with Fractional Parts	91
Ratio Problems Involving Fractions	95
Scaling in Maps	97
Fractions Review	100
Answers	104
More from Math Mammoth	134

Introduction

Math Mammoth Fractions and Decimals 3 continues the study of fraction and decimal topics on the 6th grade level. This book assumes the student already has studied fractions and decimals in the past, for example using *Math Mammoth Fractions 2* and *Math Mammoth Decimals 2*.

The goal of the book is to go through all of the fraction and decimal arithmetic using up to six decimal digits and larger denominators in fractions than in 4th and 5th grade materials. For some students, this may mean a lot of review, so if the student already has a good grasp of these topics, consider assigning only $\frac{1}{3}$ - $\frac{1}{2}$ of the problems. However, some students need to restudy these topics if they did not quite master them in earlier grades.

The book starts out with the study of decimals, the metric system, and using decimals in measuring units. We start out by studying place value with decimals and comparing decimals up to six decimal digits. The next several lessons contain mainly review, just using longer decimals than in 5th grade: adding and subtracting decimals, rounding decimals, using mental math for multiplying and dividing decimals, long division with decimals, fractions to decimals, and multiplying and dividing decimals by the powers of ten.

Scientific notation is a new topic. After that, we turn our attention one more time to dividing decimals by decimals. I have tried to explain the principle behind the common shortcut (“Move the decimal point in both the divisor and the dividend enough steps that the divisor becomes a whole number”). This shortcut actually has to do with the principle that when you multiply the divisor and the dividend by the same number (*any* number), the value of the quotient does not change. This even ties in with equivalent fractions. Many textbooks never explain this principle in connection with decimal division.

The last lessons in the decimals section deal with measuring units and the metric system, and nicely round up our study of decimals.

After decimals, the book covers all fraction arithmetic. The goal is that the student will become “fluent” with basic fraction operations if he or she is not already. I assume the student has already studied the four operations of fractions (in 5th grade), so the coverage of this book is slightly quicker and not so in-depth as in *Math Mammoth Fractions 1* and *Math Mammoth Fractions 2* books.

For example, the lessons do not always delve into the reasons *why* a certain shortcut works—a lot of that is explained in the two books already mentioned. While I consider it very important that the student understands fractions conceptually and why certain things are done the way they are done, the material here is building on the material from the earlier grades, where the students have been exposed to those thoughts and ideas.

The lesson *Comparing Fraction and Decimal Division* is optional. Often, you can solve the same division problem using either fractions or decimals. This lesson just examines the difference between the division of fractions and the division of decimals, and best suits advanced students who are interested in it. The lesson about fraction equations is also optional and can be omitted.

Besides fraction operations, students also study several problem-solving lessons. Many problems in these lessons review and reinforce already studied concepts, such as ratio and the usage of bar models in problem solving. As a new—and hopefully interesting—application, we study scaling in maps.

I wish you success in teaching math!

Maria Miller, the author

Helpful Resources and Games on the Internet

Use these free online resources to supplement the “bookwork” as you see fit.

Place Value Strategy

Place the 3 or 4 digits given by the spinner to make the largest number possible.

<http://www.decimalsquares.com/dsGames/games/placevalue.html>

Decimal Darts

Try to pop balloons with darts by estimating the balloons’ height.

<http://www.decimalsquares.com/dsGames/games/darts.html>

Decimal Challenge

Try to guess a decimal number between 0 and 10. Each time feedback tells you whether your guess was too high or too low.

<http://www.interactivestuff.org/sums4fun/decchall.html>

Beat the Clock

Type in the decimal number for the part of a square that is shaded in this timed game.

<http://www.decimalsquares.com/dsGames/games/beatclock.html>

Scales

Move the pointer to match the decimal number given to you. Refresh the page from your browser to get another problem to solve.

<http://www.interactivestuff.org/sums4fun/scales.html>

Switch

Put the sequence of decimal numbers into ascending order by switching them around. Refresh the page from your browser to get another problem to solve.

<http://www.interactivestuff.org/sums4fun/switch.html>

Smaller and Smaller Maze

Practice ordering decimal numbers to find your way through the maze.

<http://www.counton.org/magnet/kaleidoscope/smaller/index.html>

Decimal and Whole Number Jeopardy

Review place value and comparing and rounding numbers. Also, practice number patterns.

<http://www.quia.com/cb/8142.html>

Decimals in Space

An Asteroids-style game where you first answer a question about the smallest decimal and then get to shoot asteroids, earning points based on the numbers on them.

<http://www.mathwarehouse.com/games/our-games/decimal-games/decimal-place-value-math-game>

Sock

Push the green blocks into the holes to make the target number.

<http://www.interactivestuff.org/sums4fun/sock.html>

Decimal Squares Blackjack

Play cards with decimals, trying to get as close to 2 as possible without going over.

<http://www.decimalsquares.com/dsGames/games/blackjack.html>

A Decimal Puzzle

Make every circle add up to 3.

http://nlvm.usu.edu/en/nav/frames_asid_187_g_2_t_1.htmlsopen=instructions&from=category_g_2_t_1.html

FunBrain Decimal Power Football

Simple games for addition, subtraction, multiplication, and division of decimals, including some with a missing factor or divisor. Solve a problem, and the football player moves down the field.

<http://www.funbrain.com/cgi-bin/getskill.cgi?A1=choices&A2=fb&A3=6&A4=0&A7=0>

Exploring Division of Decimals

Explore the products of two numbers with one decimal digit. The product is shown as an area.

<http://www.hbschool.com/activity/elab2004/gr6/1.html>

Decimal Speedway

Practice decimal multiplication in this fun car-racing game.

<http://www.decimalsquares.com/dsGames/games/speedway.html>

The Metric Units Tutorial—Metric Number line

A tutorial of the common metric unit prefixes and a way to convert between metric units using a “metric unit number line,” which visually shows you how many steps you need to move the decimal point.

<http://www.dmac.edu/medmath1/METRIC/Metric%20Number%20Line%20HTML/sld001.htm>

Fractions - Decimals Calculator

Convert fractions to decimals, or decimals to fractions, including repeating (recurring) decimals to any decimal places, which normal calculators don't do.

<http://www.maths.surrey.ac.uk/hosted-sites/R.Knott/Fractions/FractionsCalc.html>

General

Fraction Models

Explore improper fractions, mixed numbers, decimals, and percentages. The activity includes several models: bar graphs, area models, pie charts, and set diagrams. Adjust the numerators and denominators to see how it changes the representations of the fractions in the models.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=11>

Visual Fractions

Great site for studying all aspects of fractions: identifying, renaming, comparing, adding, subtracting, multiplying, and dividing. Each topic is illustrated by either a number line or a circle with a Java applet. There are also a couple of games, for example: Make cookies for Grampy.

<http://www.visualfractions.com>

Conceptua Math Fractions Tools

Free and interactive fraction tools for fractions: identify them, add or subtract them, estimate with them, compare them, find equivalent fractions, multiply or divide them, find common denominators, and more. Each activity uses several fraction models such as fraction circles, horizontal and vertical bars, number lines, *etc.* that allow students to develop a conceptual understanding of fractions. A free registration is required.

<http://www.conceptuamath.com/app/tool-library>

Fraction Games at Sheppard Software

Games for practicing adding and subtracting fractions, simplifying fractions, and finding equivalent fractions, and the fraction of a set.

<http://www.sheppardsoftware.com/mathgames/menus/fractions.htm>

Fraction Lessons at MathExpression.com

Tutorials, examples, and videos to explain all of the basic topics in fractions.

<http://www.mathexpression.com/learning-fractions.html>

Visual Math Learning

Free tutorials with some interactivity about all the fraction operations. Emphasizes visual models and lets students interact with those.

http://www.visualmathlearning.com/pre_algebra/chapter_9/chap_9.html

Online Fraction Calculator

Add, subtract, multiply, or divide fractions and mixed numbers.

http://www.homeschoolmath.net/worksheets/fraction_calculator.php

Fraction Worksheets: Addition, Subtraction, Multiplication, and Division

Create custom-made worksheets for the four operations with fractions and mixed numbers.

<http://www.homeschoolmath.net/worksheets/fraction.php>

Fraction Worksheets: Equivalent Fractions, Simplifying, Convert to Mixed Numbers

Create custom-made worksheets for some other fraction operations.

<http://www.homeschoolmath.net/worksheets/fraction-b.php>

Addition and Subtraction

Fraction Videos 1: Addition and Subtraction

My own videos that cover equivalent fractions and addition and subtraction of like and unlike fractions and of mixed numbers.

http://www.mathmammoth.com/videos/fractions_1.php

MathSplat

Click on the right answer to addition problems involving like fractions or the bug splats on your windshield!

<http://fen.com/studentactivities/MathSplat/mathsplat.htm>

Adding Fractions

Illustrates how to find the common denominator when adding two unlike fractions using interactive pie models.

http://nlvm.usu.edu/en/nav/frames_asid_106_g_3_t_1.html

Adding and Subtracting Fractions with Uncommon Denominators Tool at Conceptua Fractions

A tool that links a visual model to the procedure for adding two unlike fractions. A free registration is required.

<https://www.conceptuamath.com/app/tool/adding-fractions-with-uncommon-denominators>

<https://www.conceptuamath.com/app/tool/subtracting-fractions-with-uncommon-denominators>

Old Egyptian Fractions

Puzzles to solve: Add fractions like a true Old Egyptian Math Cat!

<http://www.mathcats.com/explore/oldegyptianfractions.html>

Fraction Bars Blackjack

The computer gives you two fraction cards. You have the option of getting more or “holding.” The object is to get as close as possible to 2, without going over, by adding the fractions on your cards.

http://fractionbars.com/Fraction_Bars_Black_Jack/

Multiplication and Division

Fraction Videos 2: Multiplication and Division

My own videos that cover multiplying and dividing fractions.

http://www.mathmammoth.com/videos/fractions_2.php

Multiply Fractions Jeopardy

A Jeopardy-style game. Choose a question by clicking on the tile that shows the number of points you will win.

<http://www.quia.com/cb/95583.html>

Fractions Mystery Picture Game

Solve problems where you find a fractional part of a quantity to uncover a picture.

<http://www.dositey.com/2008/math/mistery2.html>

Math Basketball - Dividing Fractions Game

First make a basket, and then you get to solve a fraction division problem with multiple-choice answers.

<http://www.math-play.com/math-basketball-dividing-fractions-game/math-basketball-dividing-fractions-game.html>

Soccer Math - Dividing Fractions Game

In order to kick the ball and score points, you first have to answer math problems correctly.

<http://www.math-play.com/soccer-math-dividing-fractions-game/soccer-math-dividing-fractions-game.html>

Number Line Bars

Fraction bars that illustrate visually how many times a fraction “fits into” another fraction .

http://nlvm.usu.edu/en/NAV/frames_asid_265_g_2_t_1.html?open=activities&from=category_g_2_t_1.html

Fraction Worksheets: Addition, Subtraction, Multiplication, and Division

Create custom-made worksheets for fraction addition, subtraction, multiplication, and division.

<http://www.homeschoolmath.net/worksheets/fraction.php>

Comparing Fractions

Comparison Shoot Out

Choose level 2 or 3 to compare fractions and shoot the soccer ball into the goal.

<http://www.fuelthebrain.com/Game/play.php?ID=47>

Comparing Fractions—XP Math

Simple timed practice with comparing two fractions.

<http://xpmath.com/forums/arcade.php?do=play&gameid=8>

Comparing Fractions Tool at Conceptua Fractions

An interactive tool where students place numbers, visual models, and decimals on a number line.

<http://www.conceptuamath.com/app/tool/comparing-fractions>

Fractional Hi Lo

The computer has selected a fraction. You make guesses and it tells you if your guess was too high or too low.

<http://www.theproblemsite.com/games/hilo.asp>

Comparing/Ordering Fractions Worksheets

Create free worksheets for comparing two fractions or ordering 3-8 fractions. Compare fractions with the same numerator or with the same denominator or compare a fraction to $\frac{1}{2}$, to 1, or to another number. You can also include images (fraction pies).

http://www.homeschoolmath.net/worksheets/comparing_fractions.php