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# 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 what is commonly encountered in 4th and 5th grade materials. For some students, this may mean a lot of review, but 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. If the student already has a good grasp of decimals, consider assigning only  $\frac{1}{3}$  -  $\frac{1}{2}$  of the problems, and he/she should be able to go through those lessons quickly.

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. It is also covered by most 7th grade math curricula. 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 or rule (“Move the decimal point in both the divisor and the dividend so many steps that the divisor becomes a whole number”). The principle here has to do with multiplying the divisor and the dividend by a power of ten, and it even ties in with equivalent fractions. Many school books never explain this principle in connection with decimal division.

The last lessons in the section with decimals 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 isn't 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 understands why certain things are done the way they are done, the material here is building on the material for the earlier grades, where the students have been exposed to those thoughts and ideas.

If the student has a good grasp of fractions already, consider assigning only  $\frac{1}{3}$  -  $\frac{1}{2}$  of the calculation exercises. However, many students may need the thorough review if they have forgotten these topics since 5th grade, so use your judgment.

The lesson “Comparing Fraction and Decimal Division” is optional. Often, you can solve the same division problem using either fraction or decimal division, if you can convert the numbers from decimals to fractions or vice versa. This lesson just examines the difference between fraction division and decimal division, and best suits advanced students who are interested in it.

The page about fraction equations is also optional and can be omitted.

Besides re-studying fraction operations, students also have several problem-solving lessons to study. A lot of the problems in these lessons review and reinforce already studied concepts, such as ratio and using bar diagrams to solve problems with fractional parts. As a new—and hopefully interesting—application, we study scaling in maps.

*I wish you success in your math teaching!*

*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.

[www.decimalsquares.com/dsGames/games/placevalue.html](http://www.decimalsquares.com/dsGames/games/placevalue.html)

### Decimal Darts

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

[www.decimalsquares.com/dsGames/games/darts.html](http://www.decimalsquares.com/dsGames/games/darts.html)

### Estimate

Estimate the decimal number that the arrow is pointing to on the number line. The game has the words “Evaluation version” across the screen, but it’s still playable.

[www.interactiveresources.co.uk/mathspack1/estimate/estimate.html](http://www.interactiveresources.co.uk/mathspack1/estimate/estimate.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.

[www.interactivestuff.org/sums4fun/decchall.html](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.

[www.decimalsquares.com/dsGames/games/beatclock.html](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.

[www.interactivestuff.org/sums4fun/scales.html](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.

[www.interactivestuff.org/sums4fun/switch.html](http://www.interactivestuff.org/sums4fun/switch.html)

## **Decimal and Whole Number Jeopardy**

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

[www.quia.com/cb/8142.html](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.

[www.themathgames.com/arithmetic-games/place-value/decimal-place-value-math-game.php](http://www.themathgames.com/arithmetic-games/place-value/decimal-place-value-math-game.php)

## **Sock**

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

[www.interactivestuff.org/sums4fun/sock.html](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.

[www.decimalsquares.com/dsGames/games/blackjack.html](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.html?open=instructions&from=category\\_g\\_2\\_t\\_1.html](http://nlvm.usu.edu/en/nav/frames_asid_187_g_2_t_1.html?open=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**

Use a square to explore the products of two numbers with one decimal digit. The product is shown as an area.

[www.hbschool.com/activity/elab2004/gr6/1.html](http://www.hbschool.com/activity/elab2004/gr6/1.html)

## **Decimal Speedway**

Practice decimal multiplication in this fun car-racing game.

[www.decimalsquares.com/dsGames/games/speedway.html](http://www.decimalsquares.com/dsGames/games/speedway.html)

## **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>

## ***Fractions and Mixed Numbers***

### **Clara Fraction's Ice Cream Shop**

A game in which you convert improper fractions to mixed numbers and scoop the right amount of ice cream flavors on the cone.

[www.mrnussbaum.com/icecream/index.html](http://www.mrnussbaum.com/icecream/index.html)

## ***Simplifying & Equivalent Fractions***

### **Equivalent Fractions**

Draw two other, equivalent fractions to the given fraction. Choose either square or circle for the shape.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=80>

### **Fraction Frenzy**

Click on pairs of equivalent fractions, as fast as you can. See how many levels you can get!

<http://www.learningplanet.com/sam/ff/index.asp>

### **Fresh Baked Fractions**

Practice equivalent fractions by clicking on a fraction that is not equal to others.

<http://www.funbrain.com/fract/index.html>

### **Fraction Worksheets: Simplifying and Equivalent Fractions**

Create custom-made worksheets for fraction simplification and equivalent fractions.

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

### **Equivalent Fractions video**

### **Fraction Videos for Math Mammoth Fractions 1 book**

A set of videos by the author that tie in with the lessons in this book.

[http://www.mathmammoth.com/videos/fractions\\_1.php](http://www.mathmammoth.com/videos/fractions_1.php)

### **Equivalent Fractions from National Library of Virtual Manipulatives (NLVM)**

See the equivalency of two fractions as the applet divides the whole into more pieces.

[http://nlvm.usu.edu/en/nav/frames\\_asid\\_105\\_g\\_2\\_t\\_1.html](http://nlvm.usu.edu/en/nav/frames_asid_105_g_2_t_1.html)

## ***Addition and Subtraction***

### **MathSplat**

Click on the right answer to addition problems (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](http://nlvm.usu.edu/en/nav/frames_asid_106_g_3_t_1.html)

### **Old Egyptian Fractions**

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

[www.mathcats.com/explore/oldegyptianfractions.html](http://www.mathcats.com/explore/oldegyptianfractions.html)

### **Fraction Bars Blackjack**

Computer deals 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/](http://fractionbars.com/Fraction_Bars_Black_Jack/)

### **Action Fraction**

A racing game with several levels where you answer questions about adding and subtraction fractions. The levels advance from using like fractions to using unlike fractions and eventually subtraction.

[http://funschool.kaboose.com/formula-fusion/number-fun/games/game\\_action\\_fraction.html](http://funschool.kaboose.com/formula-fusion/number-fun/games/game_action_fraction.html)

### **Fishy Fractions**

Select the correct answer and the pelican catches the fish. Options for fraction addition or subtraction, like or unlike denominators, simplifying, comparing, and more.

[www.iknowthat.com/com/L3?Area=FractionGame](http://www.iknowthat.com/com/L3?Area=FractionGame)

### ***Comparing Fractions***

#### **Comparison Shoot Out**

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

[www.fuelthebrain.com/Game/play.php?ID=47](http://www.fuelthebrain.com/Game/play.php?ID=47)

#### **Order Fractions**

On each round, you drag five given fractions in the correct order.

<http://www.bbc.co.uk/schools/ks2bitesize/maths/activities/fractions.shtml>

#### **Comparing Fractions - XP Math**

Simple timed practice with comparing two fractions.

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

#### **Fractional Hi Lo**

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

[www.theproblemsite.com/games/hilo.asp](http://www.theproblemsite.com/games/hilo.asp)

### ***Multiplication and Division***

#### **Division of Fractions Conceptually, part 1**

A video by the author that ties in with the division lessons in this book. The first part explains about “easy” divisions that can be solved mentally.

<http://www.youtube.com/watch?v=41FYaniy5f8>

#### **Division of Fractions Conceptually, part 2**

A video by the author that ties in with the division lessons in this book. This second part explains about reciprocal numbers and the general “shortcut” for fraction division.

[http://www.youtube.com/watch?v=RaT1mDd0\\_6w](http://www.youtube.com/watch?v=RaT1mDd0_6w)

#### **Multiply Fractions Jeopardy**

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

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

#### **Multiply and Reduce Fractions Battleship Game**

When you hit the enemy’s battleship, you need to solve a fraction multiplication problem.

<http://www.quia.com/ba/57713.htm>

#### **Fractions Mystery Picture Game**

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

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

### ***Fractions vs. Decimals (and Percents)***

#### **Fraction Pie**

The user selects the numerator and denominator, and the applet shows the fraction as a pie/rectangle/set model, as a decimal and as a percent.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=45>

#### **Comparing Fractions, Decimals, and Percentages**

This site has fact sheets, a nice matching pairs game, online quiz, and printable worksheets.

<http://www.bbc.co.uk/skillswise/numbers/fractiondecimalpercentage/comparing/comparingall3/>

#### **Fraction Decimal Conversion**

Practice fractions vs. decimal numbers online with a matching game, concentration, or flash cards.

[www.quia.com/jg/65724.html](http://www.quia.com/jg/65724.html)

#### **Fraction/Decimal Worksheets**

Change fractions to decimal numbers or decimal numbers to fractions.

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

#### **Fractions Vs. Decimals Calculator**

<http://www.counton.org/explorer/fractions/>

#### **Fraction Model**

Adjust the numerator and the denominator, and the applet shows the fraction as a pie/rectangle/set model, as a decimal and as a percent.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=44>

#### **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>

### ***All Aspects***

#### **Visual Fractions**

Great site for studying all aspects of fractions: identifying, renaming, comparing, addition, subtraction, multiplication, division. Each topic is illustrated by either a number line or a circle with a Java applet. Also couple of games, for example: make cookies for Grampy.

[www.visualfractions.com](http://www.visualfractions.com)

#### **Conceptua Math**

Conceptua Math has free, interactive fraction tools and activities that are very well made. The activities include identifying fractions, adding and subtracting, estimating, finding 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 conceptual understanding of fractions.

[www.conceptuamath.com](http://www.conceptuamath.com)



**Who Wants Pizza?**

Explains the concept of fraction, addition and multiplication with a pizza example, then has some interactive exercises.

<http://math.rice.edu/~lanius/fractions/index.html>

**Fraction lessons at MathExpression.com**

Tutorials, examples, and videos explaining all the basic fraction math topics. Look for the lesson links in the left sidebar.

[www.mathexpression.com/understanding-fractions.html](http://www.mathexpression.com/understanding-fractions.html)

**Visual Math Learning**

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

[www.visualmathlearning.com/pre\\_algebra/chapter\\_9/chap\\_9.html](http://www.visualmathlearning.com/pre_algebra/chapter_9/chap_9.html)

**Online Fraction Calculator**

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

[www.homeschoolmath.net/worksheets/fraction\\_calculator.php](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.

[www.homeschoolmath.net/worksheets/fraction.php](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.

[www.homeschoolmath.net/worksheets/fraction-b.php](http://www.homeschoolmath.net/worksheets/fraction-b.php)