
Math Mammoth Multiplication & Division 3

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Introduction

Math Mammoth Multiplication & Division 3 covers multiplication and division related topics, such as the multiplication algorithm, long division, estimation, divisibility, factoring, and ratios. This book also contains many lessons that aim to develop the student's algebraic thinking and get the student used to simple equations. The book is suitable for fifth grade but can be used in sixth grade as well.

One important line of thought throughout this book is that of *equations*. Students encounter the exact definition of an *equation* and an *expression*. They practice the order of operations with problems that also reinforce the idea of the equal sign (“=”) as denoting equality of the right and left sides of an equation. These kind of exercises are needed because children may think that an equal sign signifies the act of finding the answer to a problem such as $(134 + 23 = ?)$, which is not so.

Simple bar models are used to illustrate simple multiplication and division equations and mixture equations, such as $4x + 38 = 128$. The idea is see how the four operations are used together in solving problems and in simple equations. We are trying to develop the student's *algebraic thinking*, including the abilities to: translate problems into mathematical operations, comprehend the many operations needed to yield an answer to a problem, “undo” operations, and so on. Many of the ideas here are preparing for algebra in advance.

We study multiplying in parts (partial products) in detail: how the partial products can be seen in the algorithm itself, and how multi-digit multiplication can be visualized geometrically. Students also practice long division, including two-digit divisors. Then we study divisibility and factoring. The lesson *Introduction to Ratios* is also important as it shows the connection between fractional parts, ratios, and bar diagrams.

You can make additional free worksheets for most of the topics in this book on the following pages, in the sections on multiplication, division, and factoring:

- http://www.homeschoolmath.net/worksheets/grade_5.php
- http://www.homeschoolmath.net/worksheets/grade_6.php

I wish you success in teaching math!

Maria Miller, the author

Helpful Resources on the Internet

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

Long division & multiplication

Rectangle Multiplication

An interactive tool that illustrates multiplying in parts using the area model. Choose the “common” option for this grade level, to show multiplying in parts.

http://nlvm.usu.edu/en/nav/frames_asid_192_g_2_t_1.html

Snork’s Long Division Game

Interactive and guided long division practice that only accepts correct answers and truly guides the student step-by-step through long division problems. In the beginning, choose the highest number you want to work with (the divisor) to be a two-digit number, in order to practice with two-digit divisors.

<http://www.kidsnumbers.com/long-division.php>

Mr. Martini’s Classroom: Long Division

An interactive long division tool.

<http://www.thegreatmartinicompany.com/longarithmetic/longdivision.html>

Short Division

A page that explains short division in detail. Short division is the same algorithm as long division, but some steps are only done in one’s head, not written down.

<http://www.themathpage.com/ARITH/divide-whole-numbers.htm>

All four operations

Math Mahjong

A Mahjong game where you need to match tiles with the same value. It uses all four operations and has three levels.

http://www.sheppardsoftware.com/mathgames/mixed_mahjong/mahjongMath_Level_1.html

Pop the Balloons

Pop the balloons in the order of their value. You need to use all four operations.

<http://www.sheppardsoftware.com/mathgames/numberballoons/BalloonPopMixed.htm>

MathCar Racing

Keep ahead of the computer car by thinking logically, and practice any of the four operations at the same time.

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

Calculator Chaos

Most of the keys have fallen off the calculator but you have to make certain numbers using the keys that are left.

http://www.mathplayground.com/calculator_chaos.html

ArithmeTiles

Use the four operations and numbers on neighboring tiles to make target numbers.

<http://www.primarygames.com/math/arithmetiles/index.htm>

Sample worksheet from
www.mathmammoth.com

SpeedMath Deluxe

Create an equation from the four given digits using addition, subtraction, multiplication and division. Make certain that you remember the order of operations. Includes negative numbers sometimes.

<http://education.jlab.org/smdeluxe/index.html>

Order of operations

Choose Math Operation

Choose the mathematical operation(s) so that the number sentence is true. Practice the role of zero and one in basic operations or operations with negative numbers. Helps develop number sense and logical thinking.

<http://www.homeschoolmath.net/operation-game.php>

Connect-the-Four

Solve very simple math problems about the order of operations and get to play connect-the-four game. Requires Java.

<http://www.shodor.org/interactivate/activities/OrderOfOperationsFou/>

Order of Operations Quiz

A ten-question online quiz that includes two different operations and possibly parentheses in each question. You can also modify the quiz parameters yourself.

<http://www.thatquiz.org/tq-1/?-j8f-la>

The Order of Operations Millionaire

Answer multiple-choice questions that have to do with the order of operations, and win a million. Can be played alone or in two teams.

<http://www.math-play.com/Order-of-Operations-Millionaire/order-of-operations-millionaire.html>

Exploring Order of Operations (Object Interactive)

The program shows an expression, and you click on the correct operation (either +, —, ×, ÷ or exponent) to be done first. The program then solves that operation, and you click on the *next* operation to be performed, etc., until it is solved. Lastly, the resource includes a game where you click on the falling blocks in the order that order of operations would dictate.

http://www.learnalberta.ca/content/mejhm/html/object_interactives/order_of_operations/use_it.html

Order of Operations Practice

A simple online quiz of ten questions. Uses parentheses and the four operations.

<http://www.onlinemathlearning.com/order-of-operations-practice.html>

Quick Calculate

Practice your arithmetic of all four operations plus the order of operations.

<http://themathtgames.com/arithmetic-games/addition-subtraction-multiplication-division/quick-calculate-game.php>

Free worksheets for the Order of Operations

Generate printable and customizable worksheets for the order of operations. Choose from five operations and parentheses. You can choose the number range used, number of problems, and more.

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

My Dear Aunt Sally

A fun game you can play online for free, or purchase as an app. Choose whole numbers, integers, fractions, decimals, or rational numbers, and then which of the five operations to use. In the game, you need to place the given numbers into two expressions so that the operations make the two expressions have the same value.

<http://www.mydearauntsally.com>

Sample worksheet from

www.mathmammoth.com

Factors

Factor Game

Interactive game to practice divisibility among numbers 1-100. Compete with the computer or a friend.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=12>

Factor Feeder

Eat factors of the given number, and avoid numbers that are not factors of the given number in this Pacman-style game. Use Arrow Keys to move.

<http://hoodamath.com/games/factorfeeder.php>

Primes, Factors and Divisibility - Explorer at CountOn.org

Lessons explaining divisibility tests, primes, and factors.

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

Sliding Tile Factorization Game

Slide a number over another to capture it, if it is a factor of the other. Number 1 is only supposed to be used to capture a prime number.

http://www.visualmathlearning.com/Games/sliding_factors.html

Factors and Remainders

An interactive animation demonstrating factors and remainders. Choose a number and its possible divisor. The animation shows boxes (as given by the number) arranged into rows of (possible divisor), and you can SEE if there is any remainder.

<http://www.absorblearning.com/media/item.action?quick=ml>

Octopus Factors

Move counters up the legs of an octopus but only when the number on the circle is a multiple of the number on the card.

<http://www.counton.org/games/map-numbers/octopus/>

Factors Millionaire Game

A millionaire game where the questions have to do with factors, prime numbers, and the greatest common factor.

<http://www.math-play.com/Factors-Millionaire/Factors-Millionaire.html>

Not a Factor

Choose a number that is NOT a factor of the given number.

http://www.helpingwithmath.com/resources/games/target_factors01/not_factor.html

MathGoodies Interactive Factor Tree Game

Type in a missing number to the factor tree, and the program will find the other factor, and continue drawing the tree as needed.

http://www.mathgoodies.com/factors/prime_factors.html

Factors and Remainders

An interactive animation demonstrating factors and remainders. Choose a number and its possible divisor. The animation shows boxes (as given by the number) arranged into rows of (possible divisor), and you can SEE if there is any remainder.

<http://www.absorblearning.com/media/item.action?quick=ml>

Snake

Eat factors, multiples, and prime numbers in this remake of the classic game.

<http://www.arcadediner.com/Snake>

Product game

For two players; each selects a factor, the computer colors the product - whoever gets four in a row wins.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=29>

Primes

An Interactive Sieve of Eratosthenes

To find all prime numbers below a given number, use a sieve of Eratosthenes to “weed out” all the composite numbers.

<http://www.cut-the-knot.org/Curriculum/Arithmetic/Eratosthenes.shtml>

An Another Interactive Sieve of Eratosthenes

Click on a number to remove its multiples from the grid.

http://nlvm.usu.edu/en/nav/frames_asid_158_g_3_t_1.html?open=instructions

Primes, Factors and Divisibility - Explorer at CountOn.org

Lessons explaining divisibility tests, primes, and factors.

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

Prime Number Calculator

This calculator tests if a number is a prime, and tells you its smallest divisor if it is not a prime.

<http://www.basic-mathematics.com/prime-number-calculator.html>

Prime Numbers as Building Blocks - Euclid’s Greatest Discovery

A short video about the fundamental theorem of arithmetic: that each composite number has a unique prime factorization.

<http://www.youtube.com/watch?v=5kl28hnhin0>

The Prime Pages

Learn more about primes on this site: the largest known primes, finding primes, how many are there, and more.

<http://primes.utm.edu/>

Primality of 1 from Wikipedia

Discussing whether 1 should or should not be counted as a prime number.

http://en.wikipedia.org/wiki/Prime_number#Primality_of_one

Arguments for and Against the Primality of 1

<http://primefan.tripod.com/Prime1ProCon.html>

Prime factorization

Factorization Forest

For each number you factorize, you will get to grow a tree in your forest! You can also choose from 6 different trees.

<http://mrnussbaum.com/forest/>

Factor Trees at Math Playground

Factor numbers to their prime factors using an interactive factor tree, or find the GCF and LCM of numbers.

<http://www.mathplayground.com/factortrees.html>

MathGoodies Interactive Factor Tree Game

Type in a missing number to the factor tree, and the program will find the other factor, and continue drawing the tree.

http://www.mathgoodies.com/factors/prime_factors.html

Free Worksheets for Prime Factorization

Generate free, printable worksheets for prime factorization or for finding all the factors of a given number. Customize the worksheets in various ways (difficulty level, spacing, font size, number of problems.)

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

The Cryptoclub. Using Mathematics to Make and Break Secret Codes (book)

Cryptoclub kids try to break the codes of secret messages, and at the same time learn more and more about encrypting and decrypting. The book contains problems to solve at the end of each chapter, little tips, and historical information how cryptography has been used over the centuries. By solving the problems you can actually learn to do all of it yourself.

<http://www.amazon.com/gp/product/156881223X?tag=homeschoolmat-20>

The greatest common factor and the least common multiple

Fruit Shoot - Greatest Common Factor

Shoot the fruit that has the greatest common factor of two given numbers. Three levels and two speeds.

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

Fruit Shoot - Least Common Multiple

Shoot the fruit that has the least common multiple of two given numbers. Three levels and two speeds.

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

Factors and Multiples Jeopardy Game

A jeopardy game with questions about factors, multiples, prime factorization, GCF, and LCM.

<http://www.math-play.com/Factors-and-Multiples-Jeopardy/Factors-and-Multiples-Jeopardy.html>

Factors, LCM, and GCF - Activity from Math Playground

Choose “Find the prime factorization of 2 numbers, GCF, and LCM.” First, you find the prime factorization of two different numbers using the factor tree. Then the activity shows you a Venn diagram. Drag the factors of the two numbers in the correct areas. Lastly, figure out their GFC and LCM.

<http://www.mathplayground.com/factortrees.html>

Sample worksheet from
www.mathmammoth.com

Free Worksheets for the Greatest Common Factor and Least Common Multiple

Generate free, printable worksheets for GCF and LCM. Customize the worksheets in various ways (choose number range, font size, etc.)

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

Least Common Multiple Tutorial

An animated tutorial and exercises for the Least common multiple from e-learning for Kids.

<http://e-learningforkids.org/Courses/EN/M1105>

Factors Millionaire Game

A millionaire game where the questions have to do with factors, prime numbers, and the greatest common factor.

<http://www.math-play.com/Factors-Millionaire/Factors-Millionaire.html>

Greatest Common Factor - That Quiz

A 10-question quiz, not timed, difficulty level 5 (medium). You can also change the parameters to your liking.

<http://www.thatquiz.org/tq-r/?-j2-l5-p0>

Least Common Multiple - That Quiz

A 10-question quiz, not timed, difficulty level 5 (medium). You can also change the parameters to your liking.

<http://www.thatquiz.org/tq-r/?-j4-l5-p0>

GCF and LCM Quiz

A 10-question quiz, not timed, difficulty level 5 (medium). You can also change the parameters to your liking.

<http://www.thatquiz.org/tq-r/?-j4-l5-p0>

Math Problems with LCM and GCF

A quiz of 10 word problems involving the usage of the greatest common factor and the least common multiple.

<http://www.funtrivia.com/playquiz/quiz2715661f17598.html>

Greatest Common Factor - Activity from Glencoe

First, the activity asks you to click on all the factors of two numbers (which represent how many apples and oranges there are to bag). Then you find the GFC of them. Next, it gives you practice problems for finding all the factors of a number, finding common factors of two numbers, and finding the GCF of two numbers.

http://www.glencoe.com/sites/common_assets/mathematics/mc1/cim/chapter_04/M1_06/M1_06_dev_100.html

Snowball Fight! - Least Common Multiple (LCM)

Multiple-choice questions on the LCM of two numbers - when you click the right answer, a snowball is thrown and splats on one of the children.

<http://www.fun4thebrain.com/beyondfacts/lcmsnowball.html>

Pyramid Math

This includes games for GCF, LCM, exponents, and square roots. The question to solve appears in the right, under "example". Choose the triangular tile with the correct answer, and drag it to the solution vase. Includes easy and hard levels, timed and non-timed versions.

<http://www.mathnook.com/math/pyramidmath.html>

Sample worksheet from

www.mathmammoth.com