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Introduction

*Math Mammoth The Four Operations (with a Touch of Algebra)* is a mathematics worktext meant primarily for fifth and sixth grades. Some of the lessons can also be used in seventh grade.

A worktext means that the book is a textbook and workbook together: the lessons include both the explanations of the concepts, as well as practice exercises.

The lessons in this worktext have been taken from the Math Mammoth complete curriculum for fifth and sixth grades. For this reason, they may not always flow smoothly from one lesson to the next with a perfect continuity, though I have tried to present them here in the most logical order.

The main topics studied in this book are simple equations, expressions that involve a variable, the order of operations, long multiplication, long division, and graphing simple linear functions.

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 kinds 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.

Students solve addition and subtraction equations both with the help of diagrams (a.k.a. bar models) and also without. Diagrams are also used for simple multiplication and division equations and for mixture equations, such as $4x + 38 = 128$.

We also present lessons on multi-digit multiplication (multiplying in columns). These lessons go farther than just reviewing the well-known algorithm. We study in detail: multiplying in parts (partial products), how those 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, as a review from fourth grade.

Although the book is named, “The Four Operations,” please notice that the idea is not to practice each of the four operations separately, but rather to see how they 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 in this chapter are preparing them in advance for algebra.

*I wish you success in teaching math!*

* Maria Miller, the author

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Sample worksheet from www.mathmammoth.com
Helpful Resources on the Internet

**Rectangle Multiplication**
An interactive tool that illustrates multiplying in parts using the area model. Choose the “common” option for multiplying in parts.
http://nlvm.usu.edu/en/nav/frames_asid_192_g_2_t_1.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/arithmetic_tiles/

**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

**Fill and Pour**
Fill and pour liquid with two containers until you get the target amount. A logical thinking puzzle.
http://nlvm.usu.edu/en/nav/frames_asid_273_g_2_t_4.html

**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

**Division and Order of operations** and **Division and Addition - Order of Operations**
Two mystery picture games.
http://www.dositey.com/2008/math/m/mystery2MD.htm and
http://www.dositey.com/2008/math/m/mystery2AD.htm

**Order of Operations Quiz**
A 10-question online quiz that includes two different operations and possibly parenthesis 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.

**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

Sample worksheet from
www.mathmammoth.com
Order of Operations Practice
A simple online quiz of 10 questions. Uses parenthesis and the four operations.

Free worksheets for order of operations
Generate printable & customizable worksheets for 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

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

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

Algebraic Reasoning
Find the value of an object based on two scales.
http://www.mathplayground.com/algebraic_reasoning.html

Algebra Puzzle
Find the value of each of the three objects presented in the puzzle. The numbers given represent the sum of the objects in each row or column.
http://www.mathplayground.com/algebra_puzzle.html

Equation Match
Playing on level 1, you need to match simple equations based on them having the same solution.
http://www.bbc.co.uk/education/mathsfiler/shockwave/games/equationmatch.html

Battleship
Choose the right solution for a 1-step equation every time you hit the enemy's ship. Some of the equations involve negative solutions; however since the game is interesting, some students might be willing to play it anyway (you can always guess at the right solution since it is a multiple choice game).
http://www.quia.com/ba/36544.html

Algebra Meltdown
Solve simple equations using function machines to guide atoms through the reactor. But don't keep the scientists waiting too long or they blow their tops. Again, includes negative numbers.
http://www.mangahigh.com/en_gb/games/algebrameltdown

Words into Equations Battleship Game
Practice expressions such as quotient, difference, product, and sum.
http://www.quia.com/ba/210997.html

Sample worksheet from
www.mathmammoth.com
Balance when Adding and Subtracting Game
The interactive balance illustrates simple equations. Your task is to add or subtract x's, and add or subtract 1’s until you have x alone on one side.

Algebra Balance Scales
Similar to the one above, but you need to first put the x's and 1’s in the balance to match the given equation.
http://nlvm.usu.edu/en/nav/frames_asid_201_g_4_t_2.html — only positive numbers
http://nlvm.usu.edu/en/nav/frames_asid_324_g_4_t_2.html — includes negative numbers

Co-ordinate Game
You will see a red circle on the grid. Enter the co-ordinates and click “check.”

Graph Mole
A fun game about plotting points in the coordinate plane. Plot the points before the mole eats the vegetables.
http://funbasedlearning.com/algebra/graphing/default.htm

Graphit
A graphing tool that plots both functions and ordered pairs.
http://www.shodor.org/interactivate/activities/Graphit/

Algebra Puzzle
Find the value of each of the three (or four) objects presented in the puzzle. The numbers given are the sum in each row or column.
http://www.mathplayground.com/algebra_puzzle.html

Algebraic Reasoning - Math Playground
Find the value of a given object based on information provided by two scales. Levels 1 and 2 contain two scales. Level 3 is more difficult and has three scales.
http://www.mathplayground.com/algebraic_reasoning.html

Balance Beam Activity
A virtual balance that provides balance puzzles where student is to find the weights of various figures, practicing algebraic thinking. Includes three levels.
http://mste.illinois.edu/users/pavel/java/balance/index.html

Factorization Forest
For each number you factorize, you'll get to grow a tree in your forest! You can choose between 6 different trees, also.
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

Looking for the Top Quark Game
Each player receives six quarks that they hide on a grid. The players use coordinates to find their opponent's hidden quarks.
http://education.jlab.org/topquarkgame/index.html

Catch the Fly
Wait for the fly to land on the coordinate grid, then type its coordinates, and a frog will eat it.
http://hotmath.com/hotmath_help/games/ctf/ctf_hotmath.swf

Sample worksheet from
www.mathmammoth.com