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# Contents

|  |            |
|--|------------|
| <b>Introduction</b> .....                                | <b>4</b>   |
| <b>Terminology for the Four Operations</b> .....         | <b>10</b>  |
| <b>The Order of Operations 1</b> .....                   | <b>14</b>  |
| <b>The Order of Operations 2</b> .....                   | <b>17</b>  |
| <b>Expressions</b> .....                                 | <b>21</b>  |
| <b>Writing and Simplifying Expressions 1:</b>            |            |
| <b>Length and Perimeter</b> .....                        | <b>24</b>  |
| <b>More on Writing and Simplifying Expressions</b> ..... | <b>27</b>  |
| <b>Writing and Simplifying Expressions 2: Area</b> ..... | <b>30</b>  |
| <b>Expressions and Equations</b> .....                   | <b>35</b>  |
| <b>Simplifying Expressions</b> .....                     | <b>38</b>  |
| <b>Multiplying and Dividing in Parts</b> .....           | <b>42</b>  |
| <b>The Distributive Property 1</b> .....                 | <b>46</b>  |
| <b>The Distributive Property 2</b> .....                 | <b>50</b>  |
| <b>Properties of the Four Operations</b> .....           | <b>55</b>  |
| <b>Equations</b> .....                                   | <b>59</b>  |
| <b>More Equations</b> .....                              | <b>63</b>  |
| <b>Inequalities</b> .....                                | <b>67</b>  |
| <b>Growing Patterns</b> .....                            | <b>71</b>  |
| <b>Using Two Variables</b> .....                         | <b>74</b>  |
| <b>Review 1</b> .....                                    | <b>78</b>  |
| <b>Review 2</b> .....                                    | <b>82</b>  |
| <b>Answers</b> .....                                     | <b>84</b>  |
| <b>More from Math Mammoth</b> .....                      | <b>109</b> |

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# Introduction

*Math Mammoth Expressions and Equations* is a compilation of lessons taken from *Math Mammoth Grade 6* and *Math Mammoth Grade 7 worktexts*. The main topics are the order of operations, equations, expressions, and simplifying expressions in several different ways. The main principles are explained and practiced both with visual models and in abstract form, and the lessons contain varying practice problems that approach the concepts from various angles. We also touch on inequalities and graphing on a very introductory level. In order to make the learning of these concepts easier, the expressions and equations in this book do not involve negative numbers (as they typically do when studied in pre-algebra and algebra).

We start out by learning some basic vocabulary used to describe mathematical expressions verbally—terms such as the sum, the difference, the product, the quotient, and the quantity. Next, we study the order of operations.

Then, we get into studying expressions in definite terms: students encounter the exact definition of an expression, a variable, and a formula, and practice writing expressions in many different ways.

In the lesson *More On Writing and Simplifying Expressions* students encounter more terminology: term, coefficient, and constant. In exercise #3, they write an expression for the perimeter of some shapes in two ways. This exercise is once again preparing them to understand the distributive property.

The concepts of equivalent expressions and simplifying expressions are important. If you can simplify an expression in some way, the new expression you get is equivalent to the first. We study these ideas first using lengths—it is a concrete example, and hopefully easy to grasp.

Next, students write and simplify expressions for the area of rectangles and rectangular shapes. After that, the lesson *Multiplying and Dividing in Parts* leads up to the lessons, *The Distributive Property 1* and *The Distributive Property 2*, which concentrate on the symbolic aspect and tying it in with area models.

After studying *Properties of the Four Operations*, the next topic is equations. Students learn some basics, such as, the solutions of an equation are the values of the variables that make the equation true. They use properties of operations and the idea of maintaining the equality of both sides of an equation to solve simple one-step equations. I have also included a few two-step equations as an optional topic.

Lastly, students get to solve and graph simple inequalities, and study the usage of two variables and graphing.

*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.

### *Order of operations*

#### **Otter Rush**

Practice exponents in this otter-themed math game.

[http://www.mathplayground.com/ASB\\_Otter\\_Rush.html](http://www.mathplayground.com/ASB_Otter_Rush.html)

#### **Choose A 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>

#### **Order of Operations Quiz**

A 10-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-lk-p0>

#### **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 sequence that the order of operations would dictate.

[http://www.learnalberta.ca/content/mejhm/html/object\\_interactives/order\\_of\\_operations/use\\_it.html](http://www.learnalberta.ca/content/mejhm/html/object_interactives/order_of_operations/use_it.html)

#### **Make 24 Game**

Arrange the number cards, the operation symbols, and the parentheses, so that the expression will make 24.

[http://www.mathplayground.com/make\\_24.html](http://www.mathplayground.com/make_24.html)

#### **Order of Operations Practice**

A simple online quiz of 10 questions. Uses parentheses and the four operations.

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

#### **ArithmeTiles**

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

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

### *Writing expressions*

#### **Algebraic Symbolism Matching Game**

Match each verbal statement with its algebraic expression.

<http://www.quia.com/mc/319817.html>

### **Algebraic Expressions Millionaire**

For each question you have to identify the correct mathematical expression that models a given word expression.

<http://www.math-play.com/Algebraic-Expressions-Millionaire/algebraic-expressions-millionaire.html>

### **Expressions: Expressions and Variables Quiz**

Choose an equation to match the word problem or situation.

[http://www.softschools.com/quizzes/math/expressions\\_and\\_variables/quiz815.html](http://www.softschools.com/quizzes/math/expressions_and_variables/quiz815.html)

### **Words into Equations Battleship Game**

Practice expressions such as quotient, difference, product, and sum.

<http://www.quia.com/ba/210997.html>

### **Rags to Riches - Verbal and Algebraic Expressions**

Translate between verbal and algebraic expressions in this quest for fame and fortune.

<http://www.quia.com/rr/520475.html>

### **Algebra Noodle**

Play a board game against the computer while modeling and solving simple equations and evaluating simple expressions. Choose level 2 (level 1 is too easy for 7th grade).

<http://www.free-training-tutorial.com/math-games/algebra-noodle.html>

### **Matching Algebraic Expressions with Word Phrases**

Five sets of word phrases to match with expressions.

<http://www.mrmaisonet.com/index.php?/Algebra-Quizzes/Matching-Algebraic-Expressions-With-Word-Phrases.html>

### **Practice with Algebraic Representation**

Practice problems with self-check answer keys about translating algebraic expressions into verbal expressions and vice versa.

<http://www.regentsprep.org/Regents/math/ALGEBRA/AV1/PAIlgRep.htm>

### *Properties of the operations*

#### **Properties of Operations at Quizlet**

Includes explanations, online flashcards, and a test for the properties of operations (commutative, associative, distributive, inverse, and identity properties). The inverse and identity properties are not covered in this chapter of Math Mammoth but can be learned at the website. The identity property refers to the special numbers that do not change addition or multiplication results (0 and 1).

<http://quizlet.com/2799611/properties-of-operation-flash-cards/>

#### **Commutative/associative/distributive properties matching game**

Match the terms and expressions in the two columns.

[http://www.quia.com/cm/61114.html?AP\\_rand=1554068841](http://www.quia.com/cm/61114.html?AP_rand=1554068841)

#### **Properties of Multiplication**

Simple online practice about the commutative, associative, distributive, and identity properties of multiplication.

<http://www.aaamath.com/pro74b-propertiesmult.html>

#### **Properties of Multiplication**

Simple online practice about the commutative, associative, distributive, and identity properties of multiplication.

<http://www.aaamath.com/pro74ax2.htm>

#### **Properties of the Operations Scatter Game**

Drag the corresponding items to each other to make them disappear.

<http://quizlet.com/763838/scatter>

**Sample worksheet from**  
[www.mathmammoth.com](http://www.mathmammoth.com)

### **Associative, Distributive and Commutative Properties**

Examples of the various properties followed by a simple self-test.

<http://www.mathwarehouse.com/properties/associative-distributive-and-commutative-properties.php>

### *Simplifying expressions*

#### **Simplifying Algebraic Expressions Quiz**

An online quiz of 15 questions.

<http://www.quia.com/quiz/1200540.html>

#### **BBC Bitesize - Simplifying Algebraic Terms**

A 10-question online quiz on simplifying expressions.

<http://www.bbc.co.uk/bitesize/quiz/q14530139>

#### **BuzzMath Practice - Algebraic Expressions**

Online practice for simplifying different kinds of algebraic expressions.

<http://www.mathplayground.com/practice.php?topic=algebraic-expressions>

### *The distributive property*

#### **Factor the Expressions Quiz**

Factor expressions such as  $3x + 15$  into  $3(x + 5)$ .

<http://www.thatquiz.org/tq-0/?-jh00-l3-p0>

#### **Distributive Property Practice**

Guided practice for applying the distributive property, such as writing  $-8(-7a + 10)$  as  $56a - 80$ .

<http://www.hstutorials.net/dialup/distributiveProp.htm>

#### **Distributive Property Battleship**

Practice simplifying expressions using the distributive property while playing battleship game against the computer.

<http://www.quia.com/ba/15357.html>

### *Evaluate expressions*

#### **Late Delivery**

Help Postie the postman deliver letters while evaluating simple expressions.

<http://www.bbc.co.uk/schools/mathsfile/shockwave/games/postie.html>

#### **Escape Planet**

Choose the equation that matches the words.

[http://www.harcourtschool.com/activity/escape\\_planet\\_6/](http://www.harcourtschool.com/activity/escape_planet_6/)

#### **Evaluating Expressions Quiz**

Includes ten multiple-choice questions.

<http://www.mrmaisonet.com/index.php?/Algebra-Quizzes/Evaluating-Expressions.html>

#### **Writing & Evaluating Expressions Quiz**

This quiz has 12 multiple-choice questions and tests both evaluating and writing expressions.

<http://www.quibblo.com/quiz/aWAUlc6/Writing-Evaluating-Expressions>

## *Terms/constant/coefficient*

### **Coefficients, Like Terms, and Constants**

How to find and name the coefficients, like terms, and constants in expressions.

<http://mathcentral.uregina.ca/qq/database/qq.09.07/h/maddie1.html>

### **Identifying Variable Parts and Coefficients of Terms**

After the explanations, you can generate exercises by pushing the button that says “new problem.” The script shows you a multiplication expression, such as  $-(3e)(3z)m$ , and you need to identify its coefficient and variable part, effectively by first simplifying it.

[http://www.onemathematicalcat.org/algebra\\_book/online\\_problems/id\\_var\\_part\\_coeff.htm#exercises](http://www.onemathematicalcat.org/algebra_book/online_problems/id_var_part_coeff.htm#exercises)

### **Tasty Term Treats**

A lesson followed by a simple game where you drag terms into Toby's bowl and non-terms into the trash can.

[http://mathstar.lacoe.edu/lessonlinks/menu\\_math/var\\_terms.html](http://mathstar.lacoe.edu/lessonlinks/menu_math/var_terms.html)

### **Algebra - basic definitions**

Clear definitions with illustrations of basic algebra terminology, including term, coefficient, constant, and expression.

<http://www.mathsisfun.com/algebra/definitions.html>

## *General*

### **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](http://nlvm.usu.edu/en/nav/frames_asid_273_g_2_t_4.html)

### **Balance Beam Activity**

A virtual balance that poses puzzles where the student must think algebraically to find the weights of various figures. Includes three levels.

<http://mste.illinois.edu/users/pavel/java/balance/index.html>

### **Algebraic Reasoning**

Find the value of an object based on two scales.

[http://www.mathplayground.com/algebraic\\_reasoning.html](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](http://www.mathplayground.com/algebra_puzzle.html)

### **Algebra Balance Scales**

Model the given equation on a balance. Then choose which operation is done to both sides, until the equation is solved. This version of the activity involves only positive whole numbers.

[http://nlvm.usu.edu/en/nav/frames\\_asid\\_201\\_g\\_4\\_t\\_2.html](http://nlvm.usu.edu/en/nav/frames_asid_201_g_4_t_2.html)

### **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.

<http://www.mathsisfun.com/algebra/add-subtract-balance.html>

### **Algebraic Expressions - Online Assessment**

During this online quiz you must simplify expressions, combine like terms, use the distributive property, express word problems as algebraic expressions and recognize when expressions are equivalent. Each incorrect response will allow you to view a video explanation for that problem.

<http://www.mrmaisonet.com/index.php?/Algebra-Quizzes/Online-Assessment-Algebraic-Expressions.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/games/algebrameltdown>

### **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](http://www.mathplayground.com/calculator_chaos.html)

### **Equation Match**

Match simple equations that have the same solution.

<http://www.bbc.co.uk/schools/mathsfile/shockwave/games/equationmatch.html>

### **Battleship**

An interesting game where the student must choose the right solution to a 1-step equation every time he or she hits an enemy ship. Although some of the equations involve negative solutions, the game is multiple-choice, so it's possible to guess the solution, even if the student isn't familiar with negative numbers.

<http://www.quia.com/ba/36544.html>