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Introduction

Math Mammoth Linear Equations presents the student with the basics of solving linear equations, including equations that involve a variable on both sides and equations that require the usage of the distributive property to eliminate parentheses. We also briefly study inequalities and graphing. This book best suits pre-algebra or grades 7-8 mathematics studies.

The first lesson reviews the concept of an equation and how to model equations using a pan balance (scale). The basic principle for solving equations is that, when you perform the same operation on both sides of an equation, the two sides remain equal.

The book presents two alternatives for keeping track of the operations to be performed on an equation. The one method, writing the operation under each side of the equation, is common in the United States. The other method, writing the operation in the right margin, is common in Finland. Either way is correct, and the choice is just a matter of the personal preference of the teacher.

The introduction to solving equations is followed by a lesson on addition and subtraction equations and another on multiplication and division equations. All the equations are easily solved in only one step of calculations. The twofold goal is to make the student proficient in manipulating negative integers and also to lay a foundation for handling more involved equations that are studied later on in the book.

In the next lesson, students write equations to solve simple word problems. Even though they could solve most of these problems without using the equations, the purpose of the lesson is to make the student proficient in writing simple equations before moving on to more complex equations from more difficult word problems.

The next topic, in the lesson *Constant Speed*, is solving problems with distance (d), rate or velocity (v), and time (t). Students use the equivalent formulas $d = vt$ and $v = d/t$ to solve problems involving constant or average speed. They learn an easy way to remember the formula $v = d/t$ from the unit for speed that they already know, “miles per hour.”

In later lessons, we delve deeper into our study of equations. Now the equations require two or more steps to solve and may contain parentheses. The variable may appear on both sides of the equation. Students will also write equations to solve simple word problems.

There is also a lesson on patterns of growth, which may seem to be simply a fascinating topic, but in reality presents the fundamentals of a very important concept in algebra — that of linear functions (although they are not mentioned by that name)—and complements the study of lines in the subsequent lessons.

After the section about equations, the text briefly presents the basics of inequalities and how to graph them on a number line. Students apply the principles for solving equations to solve simple inequalities and word problems that involve inequalities.

The last major topic is graphing. Students begin the section by learning to graph linear equations and continue on to the concept of slope, which in informal terms is a measure of the inclination of a line. More formally, slope can be defined as the ratio of the change in y -values to the change in x -values. The final lesson applies graphing to the previously-studied concepts of speed, time, and distance through graphs of the equation $d = vt$ in the coordinate plane.

I wish you success in teaching math!

Maria Miller, the author

Helpful Resources on the Internet

Simplifying Expressions

Factor the Expressions Quiz

Factor expressions. For example, $-4x + 16$ factors into $-4(x - 4)$.

<http://www.thatquiz.org/tq-0/?-jh00-l4-p0>

Simplifying Algebraic Expressions Practice Problems

Practice simplifying expressions such as $4(2p - 1) - (p + 5)$ with these 10 questions. Answer key included.

<http://www.algebra-class.com/algebraic-expressions.html>

Simplifying Algebraic Expressions (1)

Eight practice problems that you can check yourself about combining like terms and using the distributive property.

http://www.algebra-lab.org/lessons/lesson.aspx?file=Algebra_BasicOpsSimplifying.xml

Simplifying Algebraic Expressions (3)

You can check this five-question quiz from Glencoe yourself.

<http://www.glencoe.com/sec/math/studytools/cgi-bin/msgQuiz.php4?isbn=0-07-825200-8&chapter=3&lesson=2&&headerFile=4>

Equations

Practice Translating and Solving Equations

Translate verbal sentences into an equation and solve algebraically. Includes a self-check answer key.

<http://www.regentsprep.org/Regents/math/ALGEBRA/AE2/PTransSolvEq.htm>

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.

<http://www.mangahigh.com/en/games/algebrameltdown>

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.

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

Exploring Equations E-Lab

Choose which operation to do to both sides of an equation in order to solve one-step multiplication and division equations.

<http://www.harcourtschool.com/activity/elab2004/gr6/12.html>

Balance when Adding and Subtracting Game

The interactive balance illustrates simple equations. Your task is to add or subtract x 's and 1's until you leave x alone on one side.

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

Algebra Balance Scales

Model the given equation on a balance. Then choose an operation to perform on both sides of the equation, and the computer will show the result. Continue until the equation is solved.

http://nlvm.usu.edu/en/nav/frames_asid_324_g_4_t_2.html

Equation Buster

Choose an operation to perform on both sides of the given equation, and the computer will show the result. Continue until the equation is solved. The equations involve a variable on both sides, occasionally with a fractional coefficient (such as $y/2$).

http://mathsnet.net/l4_equation.html

Equation Match

A matching game with a hidden picture. Click on the two equations that have the same root. Choose level 2 to practice 7th grade concepts.

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

Solve Equations Quiz

A 10-question online quiz where you need to solve equations with an unknown on both sides.

<http://www.thatquiz.org/tq-0/?-j102-l4-p0>

Algebra Four

This is a connect-the-four game from Shodor. To practice the types of equations we study in this chapter, choose “Level 1,” and tick the boxes “Variable on both sides,” “Distributive Property,” and “Two-Step Problems” (don’t check “Quadratic Equations”).

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

One-Step Equation Game

Choose the correct root for the given equation (multiple-choice), and then you get to attempt to shoot a basket. The game can be played alone or with another student. The equations in the first game involve addition and subtraction, and in the second game (down the page) multiplication and division.

<http://www.math-play.com/One-Step-Equation-Game.html>

Two-Step Equations Game

Choose the correct root for the given equation (multiple-choice), and then you get to attempt to shoot a basket. The game can be played alone or with another student.

<http://www.math-play.com/Two-Step-Equations-Game.html>

Two-Step Equations

Here’s another five-question quiz from Glencoe that you can check yourself.

<http://www.glencoe.com/sec/math/studytools/cgi-bin/msgQuiz.php?isbn=0-07-825200-8&chapter=3&lesson=5&&headerFile=4>

Solving Two-Step Equations

Type the answer to two-step-equations such as $-4y + 9 = 29$, and the computer checks it. If you choose “Practice Mode,” it is not timed.

<http://www.xpmath.com/forums/arcade.php?do=play&gameid=64>

Rags to Riches Equations

Choose the correct root to a linear equation.

<http://www.quia.com/rr/4096.html>

Model Algebra Equations

Model an equation on a balance using algebra tiles (tiles with numbers or the unknown x). Then, solve the equation according to instructions by placing -1 tiles on top of $+1$ tiles or vice versa. Includes one-step and two-step equations.

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

Inequalities

Inequality Quiz

A 10-question multiple choice quiz on linear inequalities (like the ones studied in this book).

<http://www.mrmaisonet.com/index.php?/Inequality-Quiz/Inequality-Quiz.html>

Inequalities

Here's another five-question quiz from Glencoe that you can check yourself.

<http://www.glencoe.com/sec/math/studytools/cgi-bin/msgQuiz.php4?isbn=0-07-825200-8&chapter=7&lesson=3&&headerFile=4>

Speed, Time, and Distance

Solving Distance Problems Practice

Five word problems about constant speed with solutions.

<http://www.studyzone.org/mttestprep/math8/g/distancep1.cfm>

Understanding Distance, Speed, and Time

An interactive simulation of two runners. You set their starting points and their speeds and observe their positions as the tool runs the simulation. It graphs the position of both runners in relation to time.

<http://illuminations.nctm.org/Activity.aspx?id=6378>

“Representing Motion” from GCSE BiteSize

An interactive quiz with various questions about speed, time, and distance.

http://www.bbc.co.uk/schools/gcsebitesize/science/add_aqa_pre_2011/forces/represmotionrev1.shtml

Distance, Speed, and Time from BBC Bitesize

Instruction, worked out exercises, and an interactive quiz relating to constant speed, time, and distance. A triangle with letters D, S, and T helps students remember the formulas for distance, speed, and time.

http://www.bbc.co.uk/bitesize/standard/maths_i/numbers/dst/revision/1/

Speed - a lesson from Absorb

A comprehensive tutorial with interactive simulations and questions to check your understanding.

<http://www.absorblearning.com/advancedphysics/demo/units/010101.html#Describingmotion>

Speed problems from Slider Math

Click on the correct speed from three choices when a distance and time are given. Often, you need to convert units in your head in order to find the correct answer.

<http://www.slidermath.com/probs/Problem2.shtml>

Absorb Advanced Physics - Speed

An online tutorial that teaches the concept of average speed with the help of interactive simulations and exercises.

<http://www.absorblearning.com/advancedphysics/demo/units/010101.html#Describingmotion>

Graphing and Slope

Graph Linear Equations

A ten-question online quiz where you click on three points on the coordinate grid to graph the given equation.

<http://www.thatquiz.org/tq-0/?-j10g-l4-p0>

Find the Slope

A ten-question online quiz that asks for the slope of the given line.

<http://www.thatquiz.org/tq-0/?-j300-l4-p0>

Slope Slider

Use the sliders to change the slope and the y -intercept of a linear equation to see what effect they have on the graph of the line.

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

Line Plotter

Practice drawing lines through a given point with a specified slope.

http://nlvm.usu.edu/en/nav/frames_asid_332_g_3_t_2.html

Graphing Equations Match

Match the given equations to their corresponding graphs.

<http://www.math.com/school/subject2/practice/S2U4L3/S2U4L3Pract.html>

General**Algebra Quizzes**

A variety of online algebra quizzes from MrMaisonet.com.

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

Pre-algebra Quizzes

Pearson provides a variety of online algebra quizzes to support their *Algebra Readiness* textbook.

<http://www.phschool.com/webcodes10/index.cfm?fuseaction=home.gotoWebCode&wcprefix=bjk&wcsuffix=0099>