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Introduction

Math Mammoth Ratios, Proportions & Problem Solving is a worktext that concentrates, first of all, on two important concepts: ratios and proportions, and then has lessons on problem solving.

The book starts out with the basic concepts of ratio, rate, and unit rate. The lessons on unit rates show how to calculate them and have exercises for practicing calculations. They also include practice with unit rates that have complex fractions.

The two lessons on equivalent rates allow students to solve a variety of word problems involving ratios and rates. We also connect the concept of rates (specifically, tables of equivalent rates) with ordered pairs, use equations (such as $y = 3x$) to describe these tables, and plot the ordered pairs in the coordinate plane.

Then, students encounter the concept of aspect ratio, which is simply the ratio of a rectangle's width to its height, and solve a variety of problems involving aspect ratio.

Next, students learn how rates can be used to convert measurement units. This is another method for converting measurement units in addition to those that are explained in Math Mammoth books on decimals. It does not mean that students should "change over" and forget what they learned earlier—it is simply a different method for doing the conversions. Some students may choose one method over another; some may be able to master all of the methods. Most will probably choose one method they prefer for doing these conversions.

After this, we turn our attention to proportions (which is an equation of two ratios). The lessons show how to solve proportions using cross-multiplying and how to set up proportions the correct way. We also study briefly what cross-multiplying is based on (it's not a magic trick!).

The concept of direct variation is introduced in the lesson *Proportional Relationships*. Writing and graphing equations gives a visual understanding of proportionality. In two following lessons on proportions, students also practice solving rate problems in different ways, using the various methods that they have learned throughout the book.

The lessons *Scaling Figures, Floor Plans*, *and Maps* give useful applications and more practice to master the concepts of proportions. There is also an optional lesson, *Significant Digits*, that deals with the concept of the accuracy of a measurement and how it limits the accuracy of the solution.

Lastly, we study various kinds of word problems involving ratios and use a bar model to solve these problems. These lessons tie ratios in with the student's previous knowledge of bar models as a tool for problem solving.

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.

Practice with Ratios
An online quiz from Regents Exam Prep Center that includes both simple and challenging questions and word problems concerning ratios.
http://www.regentsprep.org/Regents/math/ALGEBRA/AO3/pracRatio.htm

Ratio Stadium
A multi-player online racing game for matching equivalent ratios. The student with the fastest rate of correct answers will win the race.
http://www.arcademicskillbuilders.com/games/ratio-stadium/

Dirt Bike Proportions
A racing game where you need to find the unknown in a simple proportion. This game would actually work equally well for practicing equivalent fractions because the proportions are quite simple.
http://www.arcademicskillbuilders.com/games/dirt-bike-proportions/dirt-bike-proportions.html

Rate lesson from BrainingCamp
A comprehensive interactive lesson on the concepts of ratio, rate, and constant speed (for 6th and 7th grades). Includes an animated lesson, a virtual manipulative, and questions and problems to solve.
http://www.brainingcamp.com/content/rates/

Challenge Board
Choose questions from the challenge board about rates, ratios, and proportions.
http://www.quia.com/cb/158527.html

Ratio and Proportion Game From BBC Skillswise
Write the simplified ratio of red to black marbles. Answer simple questions about ratios and marbles.
http://www.bbc.co.uk/skillswise/numbers/wholenumbers/ratioandproportion/ratio/game.shtml

Ratio Pairs Matching Game
Match cards representing equivalent ratios.
Easy: **http://nrich.maths.org/4824** Challenge: **http://nrich.maths.org/4821**

Equivalent Ratios Workout
10 online practice problems.
http://www.math.com/school/subject1/practice/S1U2L1/S1U2L1Pract.html

All About Ratios - Quizzes
Online quizzes about the same and different ratios.
http://math.rice.edu/~lanius/proportions/index.html

Similar Triangles Quiz from ThatQuiz.org
This quiz has 10 questions and asks you to provide a missing side length when two similar triangles are shown. You can also modify the quiz parameters to your liking.
http://www.thatquiz.org/tq-A/?-jg-l1i-m2kc0-na-p0

Free Ride
An interactive activity about bicycle gear ratios. Choose the front and back gears, which determines the gear ratio. Then choose a route, pedal forward, and make sure you land exactly on the five flags.
http://illuminations.nctm.org/ActivityDetail.aspx?ID=178

Thinking Blocks
An interactive math tool developed to help students learn how to solve multi-step word problems. Using brightly colored blocks, students model the relationships among the components of each word problem. The website has addition/subtraction problems, multiplication/division problems, and ratio problems. This block model corresponds to the bar model used in this book.
http://www.thinkingblocks.com/