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# Math Mammoth Percent

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# Introduction

*Math Mammoth Percent* teaches students how to understand the concept of percent, to calculate the percentage of a number, to figure discounts and sales tax, to draw circle graphs, to differentiate between a percentage of change and a percentage of comparison, and to know how to calculate both. The text is suitable for grades 6 through 8, in what is often termed “middle school.”

The concept of percent builds on the student’s understanding of fractions and decimals. Specifically, students should be very familiar with the idea of finding a fractional part of a whole (such as finding  $\frac{3}{4}$  of \$240). Students who have used Math Mammoth have been practicing that concept since 4th grade. One reason why I have emphasized finding a fractional part of a whole so much in the earlier grades is specifically to lay a groundwork for the concept of percent. Assuming the student has mastered how to find a fractional part of a whole, and can easily convert fractions to decimals, then studying the concept of percent should not be difficult.

The first lesson, *Percent*, practices the concept of percent as a hundredth part, and how to write fractions and decimals as percentages. Next, we study how to find a percentage, when the part and the whole are given (for example, if 15 out of 25 club members are girls, what percentage of them are girls?).

The following two lessons have to do with finding a certain percentage of a given number or quantity. First, we study how to do that using mental math techniques. For example, students find 10% of \$400 by dividing \$400 by 10. Next, students find a percentage of a quantity using decimal multiplication, including using a calculator. For example, students find 17% of 45 km by multiplying  $0.17 \times 45$  km.

I prefer teaching students to calculate percentages of quantities using decimals, instead of using percentage proportion or some other method (such as changing 17% into the fraction  $\frac{17}{100}$  for calculations). That is because using decimals is simpler: we simply change the percentage into a decimal, and multiply, instead of having to build a proportion or use fractions. Also, decimals will be so much easier to use later on for solving word problems that require the usage of equations.

Next is a lesson about discounts, which is an important application in everyday life. Then, we go on to the lesson *Practice with Percent*, which contrasts the two types of problems students have already studied: questions that ask for a certain percentage of a number (the percentage is given), and questions that ask for the percentage. For example, the first type of question could be “*What is 70% of \$380?*”, and the second type could be “*What percentage is \$70 of \$380?*”

*Finding the Total When the Percentage Is Known* lets students find the total when the percentage and the partial amount are known. For example: “Three-hundred twenty students, which is 40% of all students, take PE. How many students are there in total?” We solve these with the help of bar models.

After a review lesson in the middle of the book, we study some of the basics again in the lessons *Percentage* and *Solving Basic Percentage Problems*. While the concepts are the same as in the lessons in the beginning of this book, this time we include more decimal digits and the coverage is faster, as these two lessons were originally written for 7th grade.

*Percent Equations* is meant for pre-algebra students and covers how to solve basic percent problems using an equation. It also explains the usage of a percent proportion.

The next major topic is the percentage of change, which is covered in a two-lesson sequence. The concept of percentage of change deals with percentage increases and decreases in quantities (especially prices). For example: “If an airline ticket that costs \$120 now goes up by 10%, then what will the new price be?” Students will also learn how to find an unknown percentage of change when the original and new quantities are known. For example, “If a shirt cost \$24 and is now discounted to \$18, then what percentage was the discount?”

Tying in with percentage of change, there is one lesson on *Comparing Values Using Percentages*. Students learn to solve comparisons involving percent (such as how many percent more (or less) one thing is than another) through applying concepts that they learned in finding the percentage of change and to differentiate clearly among the various types of comparison questions that can be asked.

*Simple Interest* is a lesson on the important topic of interest, using as a context both loans and savings accounts. Students learn to use the formula  $I = prt$  in a great variety of problems and situations.

The text concludes with a thorough review lesson of all of the concepts taught in the other lessons.

I have made several videos to match the lessons from this book. You can watch them here:

<http://www.mathmammoth.com/videos/percent.php>

*Wishing you success in your endeavors to teach math,  
Maria Miller, the author*

## Helpful Resources on the Internet

### Percent videos by Maria

Videos on percent-related topics that match the lessons in this book.

<http://www.mathmammoth.com/videos/percent.php>

### Games & Tools

#### Virtual Manipulative: Percentages

Interactive tool where you fill in any two of the three 'boxes' (whole, part, and percent) and it will calculate the missing part and show the result visually in two ways.

[http://nlvm.usu.edu/en/nav/frames\\_asid\\_160\\_g\\_2\\_t\\_1.html](http://nlvm.usu.edu/en/nav/frames_asid_160_g_2_t_1.html)

#### Mission: Magnetite

Hacker tries to drop magnetite on Motherboard. To stop him, match up percentages, fractions, and images showing fractional parts.

<http://pbskids.org/cyberchase/media/games/percent/index.html>

#### Fractions and Percent Matching Game

A simple matching game: match fractions and percentages.

[http://www.mathplayground.com/matching\\_fraction\\_percent.html](http://www.mathplayground.com/matching_fraction_percent.html)

#### Fraction/Decimal/Percent Jeopardy

Answer the questions correctly, changing between fractions, decimals, and percentages.

<http://www.quia.com/cb/34887.html>

#### Flower Power

Grow flowers and harvest them to make money in this order-'em-up game. Practice ordering decimals, fractions, and percentages. The game starts with ordering decimals (daisies), and proceeds into fractions (tulips or roses).

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

#### Percent Shopping

Choose toys to purchase. In level 1, you find the sale price when the original price and percent discount are known. In level 2, you find the percent discount when the original price and the sale price are known.

[http://www.mathplayground.com/percent\\_shopping.html](http://www.mathplayground.com/percent_shopping.html)

#### Penguin Waiter

A simple game where you calculate the correct tip to leave the penguin waiter.

<http://www.funbrain.com/penguin/>

## *Worksheets*

### **Percent worksheets**

Create an unlimited number of free customizable percent worksheets to print.

<http://www.homeschoolmath.net/worksheets/percent-decimal.php>

<http://www.homeschoolmath.net/worksheets/percent-of-number.php>

<http://www.homeschoolmath.net/worksheets/percentages-words.php>

### **Worksheets and quizzes for percentages, ratios, and proportions**

Several online quizzes and a few PDF worksheets for these topics.

<http://www.math4children.com/Topics/Percentages>

## *Tutorials*

### **Percentages of Something**

See simple percentages illustrated in different ways.

<http://www.bbc.co.uk/skillswise/game/ma16perc-game-percentages-of-something>

### **Grid and Percent It**

Explanation of how to use a 10 x 10 grid to explain the basic concept of percent, AND solve various types of percent problems.

<http://illuminations.nctm.org/Lesson.aspx?id=960>

### **Meaning of Percent -- Writing Fractions as Percents**

Free percent lessons from Math Goodies.

[http://www.mathgoodies.com/lessons/vol4/meaning\\_percent.html](http://www.mathgoodies.com/lessons/vol4/meaning_percent.html)

[http://www.mathgoodies.com/lessons/vol4/fractions\\_to\\_percents.html](http://www.mathgoodies.com/lessons/vol4/fractions_to_percents.html)

### **Compare Fractions and Percentages Game**

Drag numbers to the blackboard to make percentages and fractions, and the program then colors that part of a quantity so you can compare them. You can choose between many different models to do this (pizza, group of people, pitcher, chocolate bar).

<http://www.bbc.co.uk/skillswise/game/ma18comp-game-percentages-and-fractions-side-by-side>