

math

# MAMMOTH

## Grade 4-A Worktext

**A**ddition, subtraction,  
patterns, and graphs

**L**arge numbers

**M**ulti-digit  
multiplication

**T**ime and measuring



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EDITION 7/2016

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## Foreword

*Math Mammoth Grade 4-A* and *Grade 4-B* worktexts comprise a complete math curriculum for the fourth grade mathematics studies, which meets and exceeds the Common Core Standards for grade 4.

In fourth grade, our main focus is on multi-digit multiplication, long division, and areas related to those. Students also practice solving multi-step word problems, learn to use large numbers, and are introduced to fractions and decimals. This is accompanied by studies in geometry and measuring.

The year starts out with a review of addition and subtraction, patterns and graphs. We illustrate word problems with bar models and study how to solve simple equations, all of which teaches algebraic thinking. Students also learn terminology related to addition and subtraction, the order of operations, and statistical graphs.

Next come the concept of place value and large numbers—up to millions. First, we review four-digit numbers and do some mental math with them. Next students learn numbers up to one million and calculate with them based on the concepts of place value. In the end of the chapter we find out about millions and an introduction to multiples of 10, 100, and 1000.

The third chapter is all about multiplication. After briefly reviewing the concept of multiplication and the times tables, the lessons focus on multi-digit multiplication. First, we explore partial products (multiplying in parts) and students learn an “easy way to multiply,” where they multiply numbers part-by-part and add last. This is followed by the standard algorithm. You can omit the lesson about the “easy way” if you so wish; however, it shows students what multi-digit multiplication is based on (the “why”) better than the standard algorithm, and that is why I’ve included it. We also study some related concepts, such as the order of operations and proportional reasoning, and problem solving in context of money and change.

The last chapter in part A is about time, temperature, length, weight, and volume. Students will learn to solve more complex problems using various measuring units and to convert between measuring units.

In part B, we first study division. The focus is on learning long division, using division in word problems, and studying factors and divisibility.

In the chapter on geometry, we first review area and perimeter, and then concentrate on the topic of angles. Students measure and draw angles, solve simple unknown angle problems, and classify triangles according to their angles. They also study parallel and perpendicular lines.

Fractions and decimals are presented last. These two chapters teach and practice only some of the operations with fractions and decimals. The focus is still on building conceptual understanding of these concepts as a foundation towards 5th grade, when fraction and decimal arithmetic will be in focus.

Math Mammoth curriculum provides you everything you need for a full year’s mathematics studies. Yet you still have liberty and can choose in which order some topics are studied. Chapters 1, 2, and 3 should be studied in order, and Chapter 3 (Multiplication) needs to come before Chapter 5 (long division). However, you can be flexible with chapters 4 (Time and Measuring) and 6 (Geometry) and schedule them earlier or later. Also, most lessons from chapters 7 and 8 (Fractions and Decimals) can be studied earlier; however the topic of finding parts with division should naturally be studied only after mastering division.

*I wish you success in teaching math!*

*Maria Miller, the author*

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# Chapter 1: Addition, Subtraction, Patterns, and Graphs

## Introduction

The first chapter of *Math Mammoth Grade 4* covers addition and subtraction, problem solving, patterns, graphs, and money.

At first, we review the “technical aspects” of adding and subtracting: mental math techniques and adding and subtracting in columns. We also study some patterns. The lesson on Pascal’s triangle is intended to be fun and fascinating—after all, Pascal’s triangle is full of patterns!

In the next lesson, students use bar models (visual models with one or more horizontal “bars”) to help them write addition and subtraction sentences with unknowns and to solve them. They are actually learning algebraic thinking and how to write and solve simple equations.

The lesson on the order of operations contains some review. We also connect this topic with real-life situations, such as shopping. The student writes expressions (number sentences) for word problems, which, again, practices algebraic thinking and helps students learn how to show their work in math problems.

As applications of math, the chapter then contains straightforward lessons on bar graphs, line graphs, rounding, estimating, and money problems.

### The Lessons in Chapter 1

	page	span
Addition Review .....	11	3 pages
Adding in Columns .....	14	1 page
Subtraction Review .....	15	3 pages
Subtract in Columns .....	18	3 pages
Patterns and Mental Math .....	21	2 pages
Patterns in Pascal's Triangle .....	22	2 pages
Bar Models in Addition and Subtraction .....	25	4 pages
Order of Operations .....	29	2 pages
Making Bar Graphs .....	31	2 pages
Line Graphs .....	33	3 pages
Rounding .....	36	3 pages
Estimating .....	39	2 pages
Money and Discounts .....	41	3 pages
Calculate and Estimate Money Amounts .....	44	3 pages
Review .....	47	2 pages

## Helpful Resources on the Internet

### THE BASIC OPERATIONS

#### Add Like Mad

Click on single-digit numbers that add up to the given sum as quickly as you can, clearing the board.

<http://www.mathnook.com/addlikemad.html>

#### Sum Tracks

The game board shows square and round tiles with numbers. Drag the square number tiles over the round tiles, so that the sum of the round tiles equals the number on the square tile.

<http://www.coolmath-games.com/0-sum-tracks>

#### A Maze'n Math

Move the red piece through the maze and use it to eliminate the other numbers, according to certain rules relating to addition and difference.

<http://www.hoodamath.com/games/amazenmath.html>

#### Minus Mission

Practice subtraction facts within your chosen range, such as 0-12 or 0-20 while destroying green slime.

[http://www.mathplayground.com/ASB\\_MinusMission.html](http://www.mathplayground.com/ASB_MinusMission.html)

#### Pop the Balloons

Pop the balloons in the order of their value. You need to use all four operations.

<http://www.sheppardsoftware.com/mathgames/numberballoons/BalloonPopMixed.htm>

#### Math Mahjong

Match tiles with the same value. The game uses all four operations and has three levels.

[http://www.sheppardsoftware.com/mathgames/mixed\\_mahjong/mahjongMath\\_Level\\_1.html](http://www.sheppardsoftware.com/mathgames/mixed_mahjong/mahjongMath_Level_1.html)

### PATTERNS AND PASCAL'S TRIANGLE

#### Crack the Code

Find the missing numbers in the patterns, and unlock the safe.

<http://www.sciencekids.co.nz/gamesactivities/math/numberpatterns.html>

#### Pascal's Triangle at Maths Is Fun

Learn fascinating facts and patterns in Pascal's triangle!

<http://www.mathsisfun.com/pascals-triangle.html>

#### Coloring Multiples

Color various multiples (such as multiples of 6 or 10) in Pascal's Triangle, and see the patterns!

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

### BAR MODELS AND PROBLEM SOLVING

#### Thinking Blocks - Addition and Subtraction

Model and solve word problems

[http://www.mathplayground.com/tb\\_addition/thinking\\_blocks\\_addition\\_subtraction.html](http://www.mathplayground.com/tb_addition/thinking_blocks_addition_subtraction.html)



### **Jugs Puzzle**

Fill and pour the water out of the two jugs until you get the desired quantity. Drag the jugs to empty or fill them. A logical thinking puzzle.

<https://www.mathsisfun.com/games/jugs-puzzle.html>

### **Algebra Puzzle**

Figure out the values of the objects so that they add up to the target numbers.

[http://www.mathplayground.com/algebra\\_puzzle.html](http://www.mathplayground.com/algebra_puzzle.html)

### **Calculator Chaos**

Most of the keys have fallen off the calculator. "Make" numbers using the keys that are left.

[http://www.mathplayground.com/calculator\\_chaos.html](http://www.mathplayground.com/calculator_chaos.html)

## **ORDER OF OPERATIONS**

### **Choose Math Operation**

Choose the operation(s) so that the given number sentence becomes true.

<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-la>

### **Order of Ops**

Choose the expression to be solved in each step, and solve it. The program uses a visual representation of steps to show how the expression gets shorter at each step.

<http://mrnussbaum.com/orderops/>

### **The Order of Operations Millionaire**

Answer multiple-choice questions that have to do with the order of operations, and win a million.

<http://www.math-play.com/Order-of-Operations-Millionaire/order-of-operations-millionaire.html>

### **Exploring Order of Operations (Object Interactive)**

Click on the operation to be done first in the given expression. The program then solves that, and you click on the *next* operation to be performed, etc., until it is solved. The resource also includes a game.

[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)

### **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>

## **ROUNDING AND ESTIMATING**

### **Brain Racer Rounding**

Round numbers as fast as you can to beat two other walkers in the walking race. Choose to round either to the nearest ten, nearest hundred, or nearest thousand.

<http://www.mathnook.com/math/brain-racer-rounding.html>

### **Rounding Sharks Game**

Round numbers to the nearest hundred by clicking the shark with the correct rounded number

<http://www.free-training-tutorial.com/rounding/sharks.html>

### **Ice Ice Maybe**

Fast estimation game. Help penguins migrate across a perilous ocean patrolled by hungry killer whales. The game uses all operations; addition and subtraction are most appropriate for this grade level. Start the game from the circular button near the top image.

<https://www.mangahigh.com/en/games/iceicemaybe>

### **Estimation Games**

Find the answer fast ... you also get points for being close! Choose “Add 100s” or “Add Tens” “Subtract Tens”, or “Subtract 100s” for 4th graders.

<http://www.mathsisfun.com/numbers/estimation-game.php>

## **MONEY**

### **Change Maker**

Determine how many of each denomination you need to make the exact change. Good and clear pictures! Choose the “hard” level for 4th graders. Playable in US, Canadian, Mexican, UK, or Australian money.

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

### **Cash Out**

Give correct change by clicking on the bills and coins. Options include three levels of difficulty, and showing hints or not.

<http://www.mrnussbaum.com/cashd>

## **DATA AND GRAPHS**

### **Bar Charts**

Interactive questions about bar charts. First, choose a topic for the bar graph. Next, choose how the vertical axis is presented for appropriate difficulty level - for example, “20 intervals, 10 marked”. Lastly, you choose the type of question the program asks.

<http://www.topmarks.co.uk/Flash.aspx?f=barchartv2>

### **Graphs Quiz**

A 10-question online quiz that involves a variety of types of questions on line graphs, bar graphs, and pictograms. You can also easily change the quiz parameters to your liking.

<http://www.thatquiz.org/tq-5/?-j50f15-l5-p0>

### **Line Graphs at Maths Is Fun**

A simple tutorial on line graphs, followed by ten interactive practice questions.

<https://www.mathsisfun.com/data/line-graphs.html>

### **An Interactive Bar Grapher**

Graph data sets in bar graphs. The color, thickness and scale of the graph are adjustable. You can put in your own data, or you can use or alter pre-made data sets.

<http://illuminations.nctm.org/Activity.aspx?id=4091>

### **Graph Master**

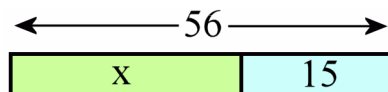
Create a graph from your own data (you can even make it up). The interactive activity creates the graph, and also makes up multiple-choice questions from your data for you to answer.

<http://mrnussbaum.com/graphmaster-ipad.html>

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# Bar Models in Addition and Subtraction

Think of this **bar model** as a long board, cut into two pieces. It is 56 units long in total, and the two parts are 15 and  $x$  units long.



From the bar model, we can write two addition and two subtraction sentences—a **fact family**.

$$x + 15 = 56$$

$$56 - x = 15$$

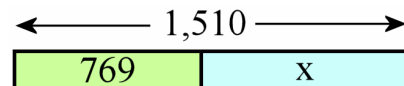
$$15 + x = 56$$

$$56 - 15 = x$$

The  $x$  stands for a number, too. We just don't know what it is yet. It is an **unknown**.

From this bar model, we can write a **missing addend** problem. It means that a number to be added is “missing” or unknown:

$$769 + x = 1,510$$

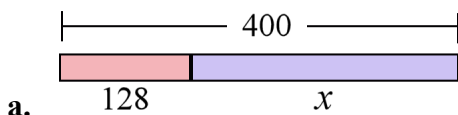


$$769 + x = 1,510$$

We can solve it by subtracting the one part (769) from the total (1,510).

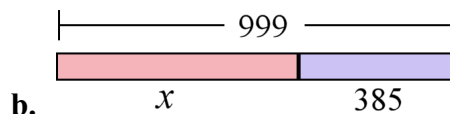
$$x = 1,510 - 769 = 741$$

1. Write a missing addend problem that matches the bar model. Then solve it by subtracting.



$$\underline{\hspace{2cm}} + \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

$$x = \underline{\hspace{2cm}} - \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$



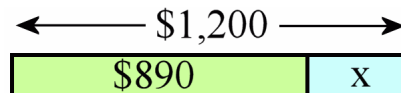
$$\underline{\hspace{2cm}} + \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

$$x = \underline{\hspace{2cm}} - \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

c. A car costs \$1,200. Dad has \$890.  
How much more does he need to buy it?

$$\underline{\hspace{2cm}} + \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

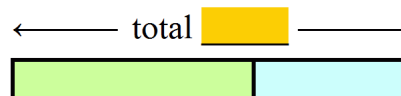
$$x = \underline{\hspace{2cm}} - \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$



d. The school has 547 students, of which 265 are girls. How many are boys?

$$\underline{\hspace{2cm}} + \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

$$x = \underline{\hspace{2cm}} - \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$



2. Add the given numbers *and* the unknown  $x$  to the bar model. Note,  $x$  is the unknown, or what the problem asks for. Then write an addition (a missing addend problem) and solve it.

- a. Of their 1,200-mile trip, the Jones family traveled 420 miles yesterday and 370 miles today. How many miles do they have left to travel?



Addition:

Solution:  $x =$  \_\_\_\_\_

- b. The store is expecting a shipment of 4,000 blank CDs. Three boxes of 400 arrived. How many CDs are yet to come?



Addition:

Solution:  $x =$  \_\_\_\_\_

- c. A 250-cm board is divided into three parts: two 28-cm parts at the ends and a part in the middle. How long is the middle part?



Addition:

Solution:  $x =$  \_\_\_\_\_

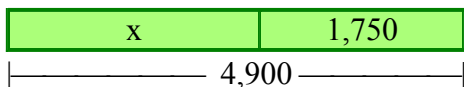
- d. After traveling 56 miles, Dad said, "Okay, in 9 miles we will be at Kensville, and from there we will have 118 miles left." How many miles in total is the trip?



Addition:

Solution:  $x =$  \_\_\_\_\_

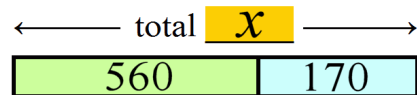
3. Make a word problem that matches the model. Then solve for  $x$ .



$x =$  \_\_\_\_\_

In this subtraction problem,  $x - 170 = 560$ , the *total* is unknown. Remember, subtraction problems start with the total.

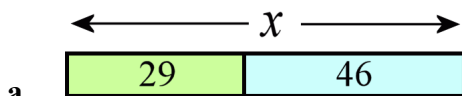
Look at the bar model. We can solve  $x$  by adding.



$$x - 170 = 560$$

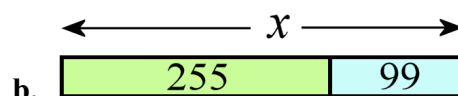
$$x = 170 + 560 = 730$$

4. Write a subtraction problem that matches the bar model. Then solve it by adding.



$$x - 29 = 46$$

$$x = \underline{\quad\quad} + \underline{\quad\quad} = \underline{\quad\quad}$$



$$x - \underline{\quad\quad} = \underline{\quad\quad}$$

$$x = \underline{\quad\quad} + \underline{\quad\quad} = \underline{\quad\quad}$$

5. The number you subtract from is missing! Solve.

a.  $\underline{\quad\quad} - 4 = 20$

b.  $\underline{\quad\quad} - 15 = 17$

c.  $\underline{\quad\quad} - 22 - 7 = 70$

Still, the number you subtract from is missing. But this time, it is denoted by  $x$ , not by an empty line.

d.  $x - 8 = 7$

$$x = \underline{\quad\quad}$$

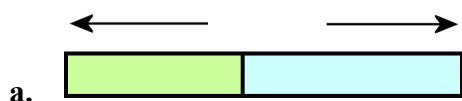
e.  $x - 24 = 48$

$$x = \underline{\quad\quad}$$

f.  $x - 300 - 50 = 125$

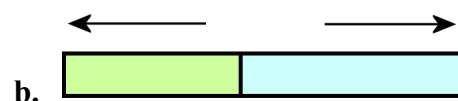
$$x = \underline{\quad\quad}$$

6. Here, the number you subtract is the unknown. Write the numbers and  $x$  into the bar model. Notice carefully which number is the *total*. Then write a subtraction that helps you solve  $x$ .



$$52 - x = 28$$

$$x = \underline{\quad\quad} - \underline{\quad\quad} = \underline{\quad\quad}$$



$$97 - x = 54$$

$$x = \underline{\quad\quad} - \underline{\quad\quad} = \underline{\quad\quad}$$

7. The number you subtract is still the unknown. Solve.

a.  $20 - \underline{\quad\quad} = 12$

b.  $55 - \underline{\quad\quad} = 34$

c.  $234 - \underline{\quad\quad} = 100$

d.  $61 - x = 43$

$$x = \underline{\quad\quad}$$

e.  $100 - x = 72$

$$x = \underline{\quad\quad}$$

f.  $899 - x = 342$

$$x = \underline{\quad\quad}$$

8. Circle the number sentence that fits the problem. Then solve for  $x$ .

<p><b>a.</b> Jane had \$15. After Dad gave Jane her allowance (<math>x</math>), Jane had \$22.</p> <p><math>\\$15 + x = \\$22</math>   OR   <math>\\$15 + \\$22 = x</math></p> <p><math>x =</math> _____</p>	<p><b>b.</b> Mike had many drawings. He put 24 of them in the trash. Then he had 125 left.</p> <p><math>125 - 24 = x</math>   OR   <math>x - 24 = 125</math></p> <p><math>x =</math> _____</p>
<p><b>c.</b> Jill had 120 marbles, but some of them got lost. Now she has 89 left.</p> <p><math>120 - x = 89</math>   OR   <math>120 + 89 = x</math></p> <p><math>x =</math> _____</p>	<p><b>d.</b> Dave gave 67 of his stickers to a friend and now he has 150 left.</p> <p><math>150 - 67 = x</math>   OR   <math>x - 67 = 150</math></p> <p><math>x =</math> _____</p>

9. Write a number sentence (addition or subtraction) with  $x$ . Solve it.

<p><b>a.</b> The 43 teachers and all the students of a school filled a 450-seat auditorium. How many students does the school have?</p>	<p>_____ + _____ = _____</p> <p><math>x =</math> _____</p>
<p><b>b.</b> Mom went shopping with \$250 and came back home with \$78. How much did she spend?</p>	<p>originally – spent = left</p> <p>_____ – _____ = _____</p> <p><math>x =</math> _____</p>
<p><b>c.</b> Janet had \$200. Then she bought an item for \$54 and another for \$78. How much money does she have left now?</p>	<p>_____ – _____ – _____ = _____</p> <p><math>x =</math> _____</p>
<p><b>d.</b> Jean bought one item for \$23 and another for \$29, and she had \$125 left. How much did she have initially?</p>	<p>_____ – _____ – _____ = _____</p> <p><math>x =</math> _____</p>

### Puzzle Corner

Find the missing numbers.

<p><b>a.</b> <math>200 - 45 - \underline{\hspace{2cm}} - 70 = 25</math></p>	<p><b>b.</b> <math>\underline{\hspace{2cm}} - 5 - 55 - 120 = 40</math></p>
<p><b>c.</b> <math>23 + 56 + x = 110</math></p> <p><math>x =</math> _____</p>	<p><b>d.</b> <math>x + 15 + 15 + 15 + 15 = 97</math></p> <p><math>x =</math> _____</p>

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## Chapter 2: Large Numbers and Place Value

### Introduction

The second chapter of *Math Mammoth Grade 4* covers large numbers (up to 1 million) and place value.

The first lessons only deal with thousands or numbers with a maximum of four digits. These are for review and for deepening the student's understanding of place value. It is crucial that the student understand place value with four-digit numbers before moving on to larger numbers. Then, larger numbers will be very easy to study.

After that we go on to numbers with five and six digits (numbers till one million). Students write them in expanded form, compare them, add and subtract them, and learn more about rounding.

Lastly we study briefly the multiples of 10, 100, and 1000. This lesson prepares the way for some very important ideas in the next chapter (multi-digit multiplication).

### The Lessons in Chapter 2

	page	span
Thousands .....	51	3 pages
At the Edge of Whole Thousands .....	54	2 pages
More Thousands .....	56	2 pages
Practicing with Thousands .....	58	2 pages
Place Value with Thousands .....	60	2 pages
Comparing with Thousands .....	62	3 pages
Adding and Subtracting Big Numbers .....	65	4 pages
Rounding and Estimating Large Numbers .....	69	4 pages
Multiples of 10, 100, and 1000 .....	73	3 pages
Mixed Review .....	76	2 pages
Review .....	78	2 pages

### Helpful Resources on the Internet

#### Base Ten Blocks

Click on buttons to make blocks appear. Show problem to challenge yourself to match the correct number of blocks with a written number. The level of difficulty can be adjusted.

<http://www.hoodamath.com/mobile/games/basetenblocks.html>

#### Place Value Payoff

Match numbers written in standard form with numbers written in expanded form in this game.

<http://www.quia.com/mc/279741.html>

#### Teaching Place Value

What is the value of the red underlined digit? Answer the questions in this online quiz.

[http://www.softschools.com/math/place\\_value/teaching\\_place\\_value/TeachingPlaceValue.swf](http://www.softschools.com/math/place_value/teaching_place_value/TeachingPlaceValue.swf)

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

### **Can you say really big numbers?**

Enter a really big number, try to say it out loud, and see it written.

<http://www.mathcats.com/explore/reallybignumbers.html>

### **Place value puzzler**

Place value or rounding game. Click on the asked place value in a number, or type in the rounded version of the number.

<http://www.funbrain.com/tens/index.html>

### **Fruit Splat – Compare Numbers (Choose Level 3)**

Compare numbers by picking  $>$ ,  $<$ , or  $=$ .

<http://www.sheppardsoftware.com/mathgames/placevalue/FSCompareNumbers.htm>

### **Balloon Pop Math – Order Numbers**

Pop the balloons in order from the smallest one to the largest one. Choose the number range 1-10,000.

<http://www.sheppardsoftware.com/mathgames/placevalue/BPOrder1000.htm>

### **Addition Quiz**

Practice adding in columns in this 10-question online quiz.

<http://www.thatquiz.org/tq-1/?-jg41-l34-p0>

### **Complements of 1,000 Interactive Mad Maths**

Answer as many questions as you can in this interactive timed addition quiz.

<http://www.snappymaths.com/addition/make1000/interactive/make1000imin/make1000imin.htm>

### **Adding and Subtracting Powers of Ten**

Practice adding and subtracting powers of ten up to 1,000,000 in this interactive online quiz.

<http://www.snappymaths.com/addsub/addsubp10/interactive/addsubpowers10/addsubpowers10.htm>

### **Multiply by 10, 100, 1,000 (Log Jumper)**

Help the log jumper jump across the river by clicking on the correct answers.

[http://kids.britannica.com/lm/games/GM\\_5\\_5/GM\\_5\\_5.htm](http://kids.britannica.com/lm/games/GM_5_5/GM_5_5.htm)

## **ROUNDING AND ESTIMATING**

### **Rounding Sharks**

Round numbers to the nearest hundred. Click on the shark that has the correctly rounded number.

<http://www.free-training-tutorial.com/rounding/sharks.html>

### **Rounding Master Math Millionaire**

A Mathionaire-type game where you answer rounding questions.

<http://www.mrnussbaum.com/roundingmaster.htm>

### **Maximum Capacity**

Drag as many gorillas as you can into the elevator without exceeding the weight capacity. You will have to use your quick addition, estimation, and number sense skills.

<http://www.mrnussbaum.com/maximumcapacity.htm>

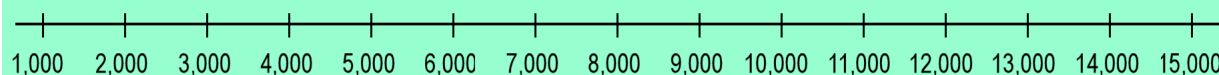
### **Home Run Derby Math**

Estimate answers to math problems. The closer you get, the further your ball will fly at-bat. In addition and subtraction, the numbers are in the thousands. In multiplication, the numbers are in the hundreds.

<http://mrnussbaum.com/derby>

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# More Thousands



On this number line we see whole thousands marked from one thousand to fifteen thousand.

In the numbers on the right, the colored digits tell us the number of whole thousands. A comma separates those digits from the rest of the number.

**78**,000 Read: 78 thousand

**153**,000 Read: 153 thousand

**802**,000 Read: 802 thousand

Read the colored digits as a number by itself, and when you come to the comma, say the word “thousand.”

**990**,000 Read: 990 thousand

We continue with whole thousands until we reach *a thousand* thousands. That number has a new name: **one million**.

**999**,000 Read: 999 thousand

**1,000**,000 Thousand thousand  
= 1 million

The rest of the digits (not colored) tell us the hundreds, tens, and ones just like you have learned in the past.

**17**,544 Read: 17 thousand five hundred forty four

**609**,230 Read: 609 thousand two hundred thirty

**70**,080 Read: 70 thousand eighty

**902**,005 Read: 902 thousand five

1. Place a comma in the number to separate the thousands. Fill in the missing parts.

<b>a. 164000</b> _____ thousand	<b>b. 92000</b> _____ thousand	<b>c. 309000</b> _____ thousand	<b>d. 34000</b> _____ thousand	<b>e. 780000</b> _____ thousand
------------------------------------	-----------------------------------	------------------------------------	-----------------------------------	------------------------------------

2. Place a comma in the number. Fill in missing parts. Read the numbers aloud.

<b>a. 164453</b> <u>164</u> thousand <u>453</u>	<b>b. 92908</b> _____ thousand _____	<b>c. 329033</b> _____ thousand _____	<b>d. 14004</b> _____ thousand _____
<b>e. 550053</b> _____ thousand _____	<b>f. 72001</b> _____ thousand _____	<b>g. 800004</b> _____ thousand _____	<b>h. 30036</b> _____ thousand _____

3. Read these numbers aloud.

a. 456,098

b. 950,050

c. 23,090

d. 560,008

e. 78,304

f. 266,894

g. 1,000,000

h. 306,700

4. Think in whole thousands and add!

a.  $30,000 + 5,000 =$   
*think: 30 thousand + 5 thousand*

b.  $200,000 + 1,000 =$

c.  $400,000 + 30,000 =$

d.  $710,000 + 40,000 =$

e.  $300,000 + 700,000 =$

f.  $700,000 + 70,000 =$

5. Add and subtract, thinking in whole thousands.

a.  $35,000 + 5,000 =$

b.  $711,000 + 10,000 =$

c.  $420,000 + 30,000 =$

d.  $700,000 - 70,000 =$

e.  $300,000 - 60,000 =$

f.  $1,000,000 - 200,000 =$

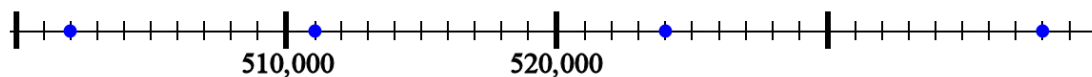
g.  $30,000 - 5,000 =$

h.  $200,000 - 6,000 =$

i.  $723,000 - 400,000 =$

j.  $500,000 - 1,000 =$

6. The numbers 510,000 and 520,000 are marked on the number line below (at the “posts”). Write the numbers that correspond to the dots.



7. Make a number line from 320,000 to 340,000 with tick-marks at every whole thousand, similar to the one above. Then mark the following numbers on the number line:  
323,000 328,000 335,000 329,000 330,000

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## Chapter 3: Multi-Digit Multiplication

### Introduction

The third chapter of *Math Mammoth Grade 4* covers multi-digit multiplication and some related topics.

The first lessons briefly review the multiplication concept and the times tables. The next lesson, where students solve scales or pan balance problems, is intended to be somewhat fun and motivational. The balance problems are actually equations in disguise.

The focus of the chapter is multi-digit multiplication. We start out by multiplying numbers by whole tens and hundreds (such as  $20 \times 4$  or  $500 \times 6$ ). After this, students learn how to multiply numbers in parts (also called partial products), which is a very important concept. It means that we calculate, for example,  $4 \times 63$  in two parts: first we solve  $4 \times 60$  and  $4 \times 3$ , and then we add the results of those ( $240 + 12 = 252$ ).

This principle underlies the standard multiplication algorithm and it also allows us to calculate the result of a multiplication mentally, so it is very important to master. Multiplying in parts is also tied in with an area model, which, again, is very important to understand.

Before learning the traditional form of multiplication algorithm, students encounter a simplified form of that algorithm in the lesson *Multiply in Columns—the Easy Way*. At your discretion, you may skip that lesson or skim through it quickly if your student is ready to understand the standard form of the algorithm, which is taught next.

Students also study estimating, the order of operations, and multiplying with money. These lessons abound with word problems. Students are instructed to write a number sentence or several for each word problem, which helps them learn how to show their work for math problems.

The idea in the lesson *So Many of the Same Thing* is very simple, yet it actually prepares students to study proportions (which happens in 7th grade). In this lesson, students simply fill in values for two quantities in tables (for example, the quantity of items and the total cost).

Nearing the end of the chapter, we study multiplying two-digit numbers by two-digit numbers. Again, we start by using partial products, including in the context of an area model. The lesson *Multiplying in Parts: Another Way* presents a different way to multiply two-digit numbers and is optional. After that, students learn the standard algorithm for multiplying a two-digit number by a two-digit number, and the chapter ends.

#### The Lessons in Chapter 3

	page	span
Understanding Multiplication .....	84	3 pages
Multiplication Tables Review .....	87	3 pages
Scales Problems .....	90	4 pages
Multiplying by Whole Tens and Hundreds .....	94	4 pages
Multiply in Parts, 1 .....	98	3 pages
Multiply in Parts, 2 .....	101	4 pages
More Practice .....	105	2 pages

	page	span
Estimating in Multiplication .....	107	2 pages
Multiply in Columns - the Easy Way .....	109	3 pages
Multiply in Columns - the Easy Way, Part 2 .....	112	3 pages
Multiplying in Columns - the Standard Way .....	115	4 pages
Multiplying in Columns, Practice .....	119	3 pages
Order of Operations Again .....	122	3 pages
Money and Change .....	125	3 pages
So Many of the Same Thing .....	128	3 pages
Multiplying Two-Digit Numbers in Parts.....	131	5 pages
Multiply by Whole Tens in Columns .....	136	2 pages
Multiplying in Parts: Another Way .....	138	2 pages
The Standard Multiplication Algorithm with a Two-Digit Number Multiplier .....	140	4 pages
Mixed Review .....	144	2 pages
Review .....	146	3 pages

## Helpful Resources on the Internet

### Multiplication games for the multiplication tables

Improve your multiplication skills with these fun games!

<http://www.multiplication.com/games/all-games>

<http://www.hoodamath.com/games/multiplication.html>

### Interactive Pan Balance

Each of the four shapes is assigned a certain (unknown) weight. You need to figure out their weights by placing them on the two sides of the pan balance in different configurations.

<http://illuminations.nctm.org/Activity.aspx?id=3531>

### Math Playground

Learn how to think algebraically with these clever weighing scales.

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

## MULTIPLYING IN PARTS (PARTIAL PRODUCTS)

### Mental Multiplication of Multiples of 10 and 100

This activity allows you to rehearse the mental multiplication of multiples of 10 and 100, e.g.  $30 \times 400$  etc. Play against the clock and see what level you can get up to before you run out of time!

<https://www.studyzone.tv/game86-code3dc5617c60ff2ca509aabc60944162d1>

### Multiply by Multiples of 10 Bicycle Race

Answer the multiplication problems correctly to help the bicycle rider win the race.

<https://www.studyladder.com/games/activity/multiply-by-multiples-of-10-22221>



### **Open Array Multiplication Tool**

This interactive tool shows the partial products algorithm and an area model for multi-digit multiplication, allowing students to easily link the two. The model accommodates 2 digit  $\times$  2 digit problems and 1 digit  $\times$  1, 2, 3, or 4 digit problems.

<https://www.conceptuamath.com/app/tool/open-array-multiplication>

### **Amoeba Multiplication Game (Choose Beginner or Medium Level)**

Practice multiplication by splitting numbers. Choose Beginner or Medium Level for this chapter.

<http://downloads.bbc.co.uk/skillswise/maths/ma12pape/game/ma12pape-game-written-multiplication/multiplication.swf>

## **MULTIPLICATION ALGORITHM**

### **One-Digit by Two-Digits Multiplication Game**

Students will multiply one-digit numbers by two-digit whole numbers, then get to try to shoot a basket.

<http://www.math-play.com/one-digit-by-two-digit-multiplication-game.html>

### **Multiplication Jeopardy Game**

You get to solve multi-digit multiplication questions of 1-digit by 1-digit, 1-digit by 2-digit, and 1-digit by 3-digit numbers in this game.

<http://www.math-play.com/Multiplicaton-Jeopardy/Multiplication-Jeopardy.html>

### **Canoe Penguins**

Answer the multiplication problems quickly and correctly to help your penguins win the race!

<http://www.arcademics.com/games/canoe-penguins/canoe-penguins.html>

### **Batter's Up Baseball**

Answer the multiplication problems correctly to help the home team beat the visiting team. Choose "Double" or "Homerun" level.

<http://www.prongo.com/math/multiplication.html>

### **Multi-Digit Multiplication Number Battle Card Game (page 18 of PDF file)**

Arrange your cards to make the highest product possible.

[http://www.pepnonprofit.org/uploads/2/7/7/2/2772238/acing\\_math.pdf](http://www.pepnonprofit.org/uploads/2/7/7/2/2772238/acing_math.pdf)

### **Multiplication Quiz**

Practice multiplying by one digit in this 10-question online quiz.

<http://www.thatquiz.org/tq-1/?-jg24-la-p0>

### **QuickQuiz: One and Four-Digit Multiplication**

Practice multiplying four-digit numbers by a one-digit number with this 10-question online quiz.

<http://primarygamesarena.com/Play/Multiplication-Activity-3028>

### **Math FROG MultipliACTION**

Practice 2 by 2 digit multiplication online. Enter one digit in each box.

<http://cemc2.math.uwaterloo.ca/mathfrog/english/kidz/mult5.shtml>

### **Math Computation Practice: Multiply Two digits by Two Digits**

Practice two-digit multiplication in columns.

<http://www.mathplayground.com/multiplication05.html>

## MISCELLANEOUS

### Matching Rates

Match each rate to its unit rate. Get a 1,000 point bonus for each round that you don't make mistakes!

<http://www.sheppardsoftware.com/mathgames/ratios/MatchingRates.htm>

### Thinking Blocks

Thinking Blocks is an engaging, interactive math tool that helps students learn how to solve multi-step word problems. Scroll down to Multiplication and Division.

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

### Multiplication Word Problem Quiz

This 10-question quiz focuses on using multiplication to solve word problems.

[http://www.softschools.com/quizzes/math/multiplication\\_word\\_problems/quiz1059.html](http://www.softschools.com/quizzes/math/multiplication_word_problems/quiz1059.html)

### Mental Math Tricks for Multiplication

Includes some very basic common-sense ones such as multiplying by 9 or multiplying by doubling and halving.

<http://wildaboutmath.com/2007/11/11/impress-your-friends-with-mental-math-tricks>

## ORDER OF OPERATIONS

### Choose Math Operation

Choose the operation(s) so that the number sentence is true. Helps develop number sense and logical thinking.

<http://www.homeschoolmath.net/operation-game.php>

### Order of Ops

Save seven members of a Royal Family from prison by using your order of operation skills. Choose the expression to be solved in each step, and solve it. The program uses a visual representation of a stairway to show how the expression gets shorter at each step.

<http://mrnussbaum.com/orderops/>

### 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-la>

### Exploring Order of Operations (Object Interactive)

Click on the operation to be done first in the given expression. The program then solves that, and you click on the *next* operation to be performed, etc., until it is solved. The resource also includes a game.

[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)

### 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>

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# Multiplying by Whole Tens and Hundreds

We have studied the SHORTCUTS for multiplying any number by 10, 100, or 1,000:

To multiply any number by **10**, just tag **ONE zero** to the end.

To multiply any number by **100**, just tag **TWO zeros** to the end.

To multiply any number by **1,000**, just tag **THREE zeros** to the end.

$$1\text{0} \times 481 = 4,81\text{0}$$

$$1\text{00} \times 47 = 4,7\text{00}$$

$$1\text{000} \times 578 = 578,\text{000}$$

Note especially what happens when the number you multiply already ends in a zero or zeros. The rule works the same way, and you *still* have to tag the zero or zeros.

$$1\text{0} \times 800 = 800\text{0}$$

$$1\text{00} \times 6,600 = 660,0\text{00}$$

$$1\text{000} \times 40 = 40,\text{000}$$

1. Multiply.

a.  $10 \times 315 = \underline{\hspace{2cm}}$

b.  $100 \times 6,200 = \underline{\hspace{2cm}}$

c.  $1,000 \times 250 = \underline{\hspace{2cm}}$

$3,560 \times 10 = \underline{\hspace{2cm}}$

$10 \times 1,200 = \underline{\hspace{2cm}}$

$38 \times 1,000 = \underline{\hspace{2cm}}$

$35 \times 100 = \underline{\hspace{2cm}}$

$100 \times 130 = \underline{\hspace{2cm}}$

$10 \times 5,000 = \underline{\hspace{2cm}}$

**Shortcut for multiplying by 20 or 200** (You can probably guess this one!)

**What is  $20 \times 14$ ?**

First solve the problem without the zero in 20:  
 $2 \times 14 = 28$ . Next, tag a zero to the answer,  
 28, and you get 280. So,  $20 \times 14 = 280$ .

**What is  $200 \times 31$ ?**

First solve the problem without the zeros:  
 $2 \times 31 = 62$ . Next, just *two* zeros to the  
 result, 62, to get 6,200. In other words,  
 $200 \times 31 = 6,200$ .

2. Now try it! Multiply by 20 and 200.

a.

$20 \times 8 = \underline{\hspace{2cm}}$

$4 \times 20 = \underline{\hspace{2cm}}$

$20 \times 5 = \underline{\hspace{2cm}}$

b.

$200 \times 7 = \underline{\hspace{2cm}}$

$5 \times 200 = \underline{\hspace{2cm}}$

$11 \times 200 = \underline{\hspace{2cm}}$

c.

$20 \times 12 = \underline{\hspace{2cm}}$

$35 \times 20 = \underline{\hspace{2cm}}$

$200 \times 9 = \underline{\hspace{2cm}}$

d.

$20 \times 16 = \underline{\hspace{2cm}}$

$42 \times 200 = \underline{\hspace{2cm}}$

$54 \times 20 = \underline{\hspace{2cm}}$

**Why does the shortcut work?** It is based on the fact that we can multiply numbers in any order.

When multiplying any number by 20, we can write the 20 as  $10 \times 2$ . For example:

$$\underline{20} \times 14 = \underline{10 \times 2} \times 14$$

In that problem, first multiply  $2 \times 14 = 28$ . Then the problem becomes  $10 \times 28$ , which equals 280. Notice again how we did it:

$$\begin{aligned} & \underline{20} \times 14 \\ &= \underline{10} \times \underline{2} \times 14 \\ &= 10 \times \underline{28} \\ &= 280 \end{aligned}$$

Let's try the same idea with 200. We will write 200 as  $100 \times 2$ . For example:

$$\underline{200} \times 31 = \underline{100 \times 2} \times 31$$

In that problem, first multiply  $2 \times 31 = 62$ . The problem now becomes  $100 \times 62$ , which is 6,200. Notice again how it was done:

$$\begin{aligned} & \underline{200} \times 31 \\ = & \underline{100} \times \underline{2} \times 31 \\ = & 100 \times \underline{62} \\ = & 6,200 \end{aligned}$$

### 3. Try it yourself! Fill in.

**a.**  $20 \times 7$   
 $=$  \_\_\_\_\_  $\times 2 \times 7$   
 $= 10 \times$  \_\_\_\_\_  
 $=$  \_\_\_\_\_

**b.**  $20 \times 5$   
 $=$  \_\_\_\_\_  $\times 2 \times 5$   
 $= 10 \times$  \_\_\_\_\_  
 $=$  \_\_\_\_\_

c.  $200 \times 8$   
 $=$  \_\_\_\_\_  $\times 2 \times 8$   
 $= 100 \times$  \_\_\_\_\_  
 $=$  \_\_\_\_\_

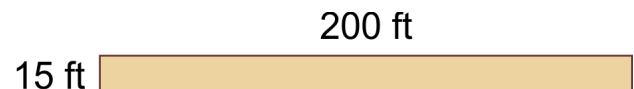
d.  $200 \times 25$   
 $=$  \_\_\_\_\_  $\times 2 \times 25$   
 $= 100 \times$  \_\_\_\_\_  
 $=$  \_\_\_\_\_

4. Mark's shed measures 20 ft by 15 ft. Write a number sentence for its area and solve it. "A" means area.

A = \_\_\_\_\_

5. Write a number sentence to find the area of Mark's driveway, and solve it.

A = \_\_\_\_\_



6. Mark was told he needed four truckloads of gravel to cover his driveway. *One* truckload costs  $5 \times \$20$  plus \$30 for the delivery. How much will it cost him to cover the driveway with gravel?

**SHORTCUT for multiplying by whole tens and whole hundreds**

The same principle works if you multiply by whole tens (30, 40, 50, 60, 70, 80, or 90): simply multiply by 3, 4, 5, 6, 7, 8, or 9, and then tag a zero to the result.

Similarly, if you multiply by some whole hundred, first solve the multiplication without the two zeros of the hundreds, and then tag two zeros to the result.

$50 \times 8 = 400$

$90 \times 11 = 990$

$300 \times 8 = 2,400$

$12 \times 800 = 9,600$

7. Multiply.

a. $40 \times 3 =$ _____ $8 \times 20 =$ _____	b. $70 \times 6 =$ _____ $50 \times 11 =$ _____	c. $80 \times 9 =$ _____ $30 \times 15 =$ _____
d. $60 \times 11 =$ _____ $12 \times 40 =$ _____	e. $200 \times 9 =$ _____ $7 \times 400 =$ _____	f. $700 \times 6 =$ _____ $600 \times 11 =$ _____
g. $200 \times 12 =$ _____ $15 \times 300 =$ _____	h. $3 \times 1100 =$ _____ $8 \times 900 =$ _____	i. $11 \times 120 =$ _____ $8 \times 300 =$ _____

**It even works this way:**

To multiply  $40 \times 70$ , simply multiply  $4 \times 7$ , and tag two zeros to the result:

$40 \times 70 = 2,800$

To multiply  $600 \times 40$ , simply multiply  $6 \times 4$ , and tag three zeros to the result:

$600 \times 40 = 24,000$

To multiply  $700 \times 800$ , simply multiply  $7 \times 8$ , and tag four zeros to the result.

$700 \times 800 = 560,000$

8. Multiply.

a. $20 \times 90 =$ _____ $70 \times 300 =$ _____	b. $60 \times 80 =$ _____ $30 \times 900 =$ _____	c. $400 \times 50 =$ _____ $200 \times 200 =$ _____
d. $80 \times 800 =$ _____ $200 \times 500 =$ _____	e. $100 \times 100 =$ _____ $40 \times 30 =$ _____	f. $800 \times 300 =$ _____ $90 \times 1100 =$ _____

Write a number sentence for each question.

9. One hour has \_\_\_\_\_ minutes.

How many minutes are in 12 hours? \_\_\_\_\_

How many minutes are in 24 hours? \_\_\_\_\_

10. One hour has \_\_\_\_\_ minutes, and one minute has \_\_\_\_\_ seconds.

How many seconds are there in one hour? \_\_\_\_\_

11. Ed earns \$30 per hour.

a. How much will he earn in a 8-hour workday? \_\_\_\_\_

b. How much will he earn in a 40-hour workweek? \_\_\_\_\_

c. How many days will he need to work in order to earn more than \$1,000?

\_\_\_\_\_

12. Find the missing factor. Think “backwards”: how many zeros do you need?

a. _____ $\times$ 3 = 360 _____ $\times$ 50 = 450	b. $40 \times$ _____ = 320 $5 \times$ _____ = 600	c. _____ $\times$ 40 = 400 _____ $\times$ 2 = 180
d. _____ $\times$ 30 = 4,800 _____ $\times$ 200 = 1,800	e. $40 \times$ _____ = 2,000 $6 \times$ _____ = 4,200	f. _____ $\times$ 800 = 56,000 _____ $\times$ 20 = 12,000

### Puzzle Corner

John wanted to prove that  $40 \times 70$  is indeed 2,800 by breaking the multiplication into smaller parts. He wrote 40 as  $4 \times 10$  and 70 as  $7 \times 10$ , and then multiplied in a different order:

$$\begin{aligned} 40 \times 70 &= 4 \times 10 \times 7 \times 10 \\ &= 10 \times 10 \times (4 \times 7) = 100 \times 28 = 2,800. \end{aligned}$$

Do the same, and prove that  $600 \times 50$  is indeed 30,000.

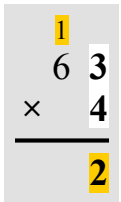
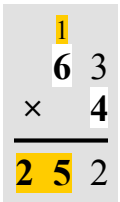
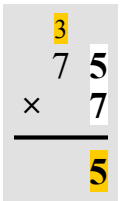
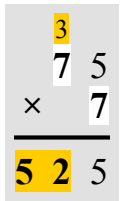
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# Multiplying in Columns, the Standard Way

The standard algorithm of multiplication is based on a principle you already know: multiplying in parts (partial products). We simply multiply ones, tens, and hundreds of the number separately, and then add.

However, in the standard algorithm, the additions are done *at the same time* as the multiplications—not afterwards. That way, the calculation looks more compact and takes less space.

The standard way to multiply	“The easy way”
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Multiply the ones: <math>4 \times 3 = 12</math>. Place 2 in the ones place, but write the tens digit (1) above the tens column as a little memory note. You are <i>regrouping</i> (carrying).</p> </div> <div style="text-align: center;">  <p>Then multiply the tens, <i>adding</i> the 1 ten that was regrouped: <math>4 \times 6 + 1 = 25</math> Write 25 in front of the 2. <u>Note:</u> This 25 means 25 tens or 250!</p> </div> </div>	<div style="text-align: center;"> <math display="block">\begin{array}{r} 63 \\ \times 4 \\ \hline 12 \\ + 240 \\ \hline 252 \end{array}</math> <p>In the “easy way,” we multiply in parts, and the adding is done separately.</p> </div>
The standard way to multiply	“The easy way”
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Multiply the ones: <math>7 \times 5 = 35</math> Regroup the 3 tens.</p> </div> <div style="text-align: center;">  <p>Multiply &amp; add the tens: <math>7 \times 7 + 3 = 52</math></p> </div> </div>	<div style="text-align: center;"> <math display="block">\begin{array}{r} 75 \\ \times 7 \\ \hline 35 \\ + 490 \\ \hline 525 \end{array}</math> </div>

1. Multiply using both methods: the standard way and the easy way.

<p><b>a.</b></p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <table border="1" style="border-collapse: collapse; width: 100px; height: 100px;"> <tr><td></td><td></td><td></td></tr> <tr><td></td><td>5</td><td>3</td></tr> <tr><td>x</td><td></td><td>8</td></tr> <tr><td></td><td></td><td></td></tr> </table> </div> <div style="text-align: center;"> <table border="1" style="border-collapse: collapse; width: 100px; height: 100px;"> <tr><td></td><td></td><td></td></tr> <tr><td></td><td>5</td><td>3</td></tr> <tr><td>x</td><td></td><td>8</td></tr> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> </table> </div> </div>					5	3	x		8								5	3	x		8									
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2. Multiply using both methods: the standard way and the easy way.

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3. Multiply. Be careful with the regrouping.

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4. Write number sentences (additions, subtractions, multiplications) on the lines, and solve.

<p><b>a.</b> What is the cost of buying three chairs for \$48 each?</p> <p>_____</p> <p>And the cost for six chairs? _____</p>	<table style="border-collapse: collapse; margin: 0 auto;"> <tr><td style="border: 1px solid black; width: 30px; height: 30px;"></td><td style="border: 1px solid black; width: 30px; height: 30px;"></td><td style="border: 1px solid black; width: 30px; height: 30px;"></td></tr> <tr><td style="border: 1px solid black;"></td><td style="border: 1px solid black;"></td><td style="border: 1px solid black;"></td></tr> <tr><td style="border: 1px solid black; text-align: center;">x</td><td style="border: 1px solid black;"></td><td style="border: 1px solid black;"></td></tr> <tr><td style="border: 1px solid black;"></td><td style="border: 1px solid black;"></td><td style="border: 1px solid black;"></td></tr> </table>							x					
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<p><b>b.</b> You earn \$77 a day. How many days do you need to work in order to have \$600 or more? Guess and check.</p> <p>_____</p> <p>_____</p>	<table style="border-collapse: collapse; margin: 0 auto;"> <tr><td style="border: 1px solid black; width: 30px; height: 30px;"></td><td style="border: 1px solid black; width: 30px; height: 30px;"></td><td style="border: 1px solid black; width: 30px; height: 30px;"></td></tr> <tr><td style="border: 1px solid black;"></td><td style="border: 1px solid black;"></td><td style="border: 1px solid black;"></td></tr> <tr><td style="border: 1px solid black; text-align: center;">x</td><td style="border: 1px solid black;"></td><td style="border: 1px solid black;"></td></tr> <tr><td style="border: 1px solid black;"></td><td style="border: 1px solid black;"></td><td style="border: 1px solid black;"></td></tr> </table>							x					
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With a 3- or 4-digit number you have to regroup several times.

$$\begin{array}{r} \phantom{0}2\phantom{0}3\overset{3}{8} \\ \times \phantom{0}4 \\ \hline \phantom{0}2 \end{array}$$

Multiply the ones first.

$$4 \times 8 = 32$$

Write 2 in the ones place and regroup the 3 tens to the tens column.

$$\begin{array}{r} \overset{1}{2}\overset{3}{3}\phantom{0}8 \\ \times \phantom{0}4 \\ \hline \phantom{0}5\phantom{0}2 \end{array}$$

Then multiply the tens, adding the 3 regrouped tens:

$$4 \times 3 + 3 = 15$$

Write 5 in the tens place and regroup the 1 hundred.

$$\begin{array}{r} \overset{1}{2}\overset{3}{3}\overset{1}{8} \\ \times \phantom{0}4 \\ \hline \phantom{0}9\phantom{0}5\phantom{0}2 \end{array}$$

Then multiply the hundreds, adding the regrouped hundred:

$$4 \times 2 + 1 = 9$$

Write 9 in the hundreds place.

$$\begin{array}{r} \phantom{0}7\phantom{0}6\phantom{0}5\overset{1}{2} \\ \times \phantom{0}5 \\ \hline \phantom{0}0 \end{array}$$

Multiply the ones:

$$5 \times 2 = 10$$

Write 0 in the ones place and regroup the 1 ten.

$$\begin{array}{r} \phantom{0}7\phantom{0}6\overset{2}{5}\overset{1}{2} \\ \times \phantom{0}5 \\ \hline \phantom{0}6\phantom{0}0 \end{array}$$

Then the tens. Add the regrouped ten:

$$5 \times 5 + 1 = 26$$

Write 6 in the tens place and regroup the 2 hundreds.

$$\begin{array}{r} \overset{3}{7}\overset{2}{6}\overset{1}{5}\phantom{0}2 \\ \times \phantom{0}5 \\ \hline \phantom{0}2\phantom{0}6\phantom{0}0 \end{array}$$

Multiply the hundreds:

$$5 \times 6 + 2 = 32$$

Write 2 in the hundreds place, and regroup the 3 thousands.

$$\begin{array}{r} \overset{3}{7}\overset{2}{6}\overset{1}{5}\phantom{0}2 \\ \times \phantom{0}5 \\ \hline 3\phantom{0}8\phantom{0}2\phantom{0}6\phantom{0}0 \end{array}$$

Multiply the thousands:

$$5 \times 7 + 3 = 38$$

Write 38 in front of the 260.

5. Multiply using both methods: the standard way and the easy way.

a.

$$\begin{array}{r} \phantom{0}1\phantom{0}2\phantom{0}3 \\ \times \phantom{0}8 \\ \hline \end{array}$$

$$\begin{array}{r} \phantom{0}1\phantom{0}2\phantom{0}3 \\ \times \phantom{0}8 \\ \hline \end{array}$$

b.

$$\begin{array}{r} \phantom{0}2\phantom{0}7\phantom{0}9 \\ \times \phantom{0}3 \\ \hline \end{array}$$

$$\begin{array}{r} \phantom{0}2\phantom{0}7\phantom{0}9 \\ \times \phantom{0}3 \\ \hline \end{array}$$

c.

$$\begin{array}{r} \phantom{0}4\phantom{0}6\phantom{0}3 \\ \times \phantom{0}5 \\ \hline \end{array}$$

$$\begin{array}{r} \phantom{0}4\phantom{0}6\phantom{0}3 \\ \times \phantom{0}5 \\ \hline \end{array}$$

d.

$$\begin{array}{r} \phantom{0}1\phantom{0}5\phantom{0}6 \\ \times \phantom{0}6 \\ \hline \end{array}$$

$$\begin{array}{r} \phantom{0}1\phantom{0}5\phantom{0}6 \\ \times \phantom{0}6 \\ \hline \end{array}$$

6. Multiply using the standard method.

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7. Solve the word problems. Also, write number sentences (additions, subtractions, multiplications) on the empty lines to show what you calculate.

<b>a.</b> A school with 304 students hired buses to take the students to a museum. Each bus could seat 43 passengers. How many buses did they need? <i>Hint: Guess and check.</i>  <div style="border-bottom: 1px solid black; height: 20px; margin-bottom: 5px;"></div> <div style="border-bottom: 1px solid black; height: 20px; margin-bottom: 5px;"></div> <div style="border-bottom: 1px solid black; height: 20px;"></div>	<table style="width: 100%; border-collapse: collapse;"> <tr><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td></tr> <tr><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td></tr> <tr><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td></tr> <tr><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td></tr> </table>																																
<b>b.</b> This school has 24 teachers. How many seats were left empty in those buses when all the students and all the teachers joined the trip?  <div style="border-bottom: 1px solid black; height: 20px; margin-bottom: 5px;"></div> <div style="border-bottom: 1px solid black; height: 20px; margin-bottom: 5px;"></div> <div style="border-bottom: 1px solid black; height: 20px;"></div>	<table style="width: 100%; border-collapse: collapse;"> <tr><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td></tr> <tr><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td></tr> <tr><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td></tr> <tr><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td><td style="border: 1px solid black; height: 20px;"></td></tr> </table>																																

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## Chapter 4: Time and Measuring

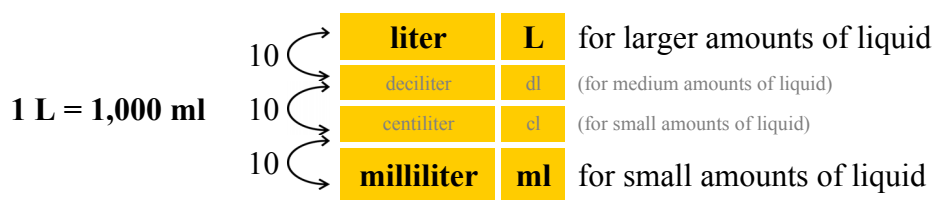
### Introduction

The fourth chapter of *Math Mammoth Grade 4* includes lessons on time, temperature, length, weight, and volume. The focus is no longer on the actual act of measuring, but on conversions between the units and on word problems that involve conversions.

Students may have difficulty with the conversions, and that is why they will also be studied in 5th grade. At this point, students should be able to easily convert a bigger unit into a smaller unit (such as converting 3 feet into 36 inches or 2 kg into 2,000 grams).

While the Common Core standards do not include them for 4th grade, I have also included some problems where we convert from a smaller unit to a bigger unit (such as 4,500 ml into 4 L 500 ml or 12 feet into 4 yards) because I feel most children are capable of doing these in 4th grade. If you feel your child has difficulty with converting from a smaller unit to a bigger one, feel free to omit those particular exercises. They are intermixed though, and not marked in any special way.

The chapter includes separate lessons for customary and metric units. Each lesson that deals with measuring units includes a table that lists the units we are studying and the conversion factors. For metric units, those tables always include all the units, even when they are not in common usage. For example, for metric units of volume, the chart looks like this:



The lesson deals only with milliliters and liters. However, the chart also shows the other two units (deciliters and centiliters) in order to help students become familiar with those basic units of the metric system:

1. The units always differ by a factor of ten;
2. The units are named consistently with the same prefixes (milli-, centi-, deci-, deka-, hecto-, and kilo-). These prefixes and their meanings are not yet studied in detail in fourth grade. You may, at your discretion, explain them to the student.

### The Lessons in Chapter 4

	page	span
Time Units .....	153	3 pages
The 24-Hour Clock .....	156	2 pages
Elapsed Time or How Much Time Passes .....	158	5 pages
Measuring Temperature: Celsius .....	163	4 pages
Measuring Temperature: Fahrenheit .....	167	2 pages
Temperature Line Graphs .....	169	2 pages

Measuring Length .....	171	3 pages
More Measuring in Inches and Centimeters ....	174	2 pages
Feet, Yards and Miles .....	176	5 pages
Metric Units for Measuring Length .....	181	3 pages
Customary Units of Weight .....	184	4 pages
Metric Units of Weight .....	188	3 pages
Customary Units of Volume .....	191	3 pages
Metric Units of Volume .....	194	3 pages
Mixed Review .....	197	2 pages
Review .....	199	2 pages

## Helpful Resources on the Internet

### TIME

#### Hours versus Minutes Game BBC SkillsWise

An online quiz. For example, you have to tell which is more, 76 minutes or 1 hour.

<http://www.bbc.co.uk/skillswise/game/ma25time-game-hours-vs-minutes>

#### 24-hour Snap Game

Snap together the matching times, one given with the 24-hour clock, and another with AM/PM.

<http://www.bbc.co.uk/skillswise/game/ma25time-game-24-hour-snap>

#### Interactivate: Elapsed Time

Practice calculating elapsed time with analog or digital clocks.

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

#### RoboClock 3: Elapsed Time

How much time has passed in hours and minutes? Help RoboClock solve the problems.

<http://www.primarygames.com/math/roboclock3/>

#### Time Slice

Solve word problems involving time and elapsed time.

<http://www.mathslice.com/time-slice.html>

### TEMPERATURE

#### Thermo Quiz

Select the box that contains the temperature that the thermometer is showing.

<http://www.mathnook.com/math/thermo-quiz.html>

#### Fun Physics from NASA: Temperature

Practice matching different things to their temperature. You can choose Celsius, Fahrenheit, or Kelvin degrees (the Kelvin scale is not studied in this curriculum). When you are done, you can compare the temperature scales, learn more about temperature, or click on one of the objects to learn more about it.

<http://funphysics.jpl.nasa.gov/adventures/FPSTemperature.swf>

## **Temperature**

Practice reading thermometers with different scales.

<http://www.topmarks.co.uk/Flash.aspx?f=Temperaturev2>

## **Temperature Quiz - Celsius**

Practice reading the thermometer and answer questions in this interactive quiz.

<http://www.bbc.co.uk/skillswise/quiz/ma27temp-l1-quiz>

## **Estimating Reasonable Temperature**

Click and “drop” the objects to match their temperature. You can choose to practice Celsius, Fahrenheit, or Kelvin (the Kelvin scale is not studied in this curriculum).

<http://www.turtlediary.com/game/estimating-temperature-third-grade.html>

## **Line Graph Quiz**

Read the line graph and answer 5 questions in this simple quiz.

<http://www.mcwn.org/Graphs/LineGraphQuiz.html>

## **LENGTH**

### **The Ruler Game**

Click on the measurements on the ruler that correspond with the measurements that appear.

<http://www.rickyspears.com/rulergame>

### **Measuring**

Practice measuring in centimeters or in inches in this interactive exercise.

<http://www.abcya.com/measuring.htm>

### **Measure It!**

Practice measuring lines with either centimeters or inches. Multiple choice questions.

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

### **Sal's Sub Shop**

Cut the subs to the given measurements—sometimes in metric units, sometimes in inches.

<http://www.mrnussbaum.com/sal.htm>

### **Reading a Tape Measure Worksheets**

Worksheet generator—choose to measure in inches, or inches and feet.

[http://themathworksheetsite.com/read\\_tape.html](http://themathworksheetsite.com/read_tape.html)

### **Feet to Yards and Feet**

Match the correct conversions. Get a 1,000-point bonus per round if you get all correct.

<http://www.sheppardsoftware.com/mathgames/measurement/MeasurementYards.htm>

### **Metric Length Matching**

Match the conversions as fast as you can!

<http://www.sheppardsoftware.com/mathgames/measurement/MeasurementMeters.htm>

### **Quiz on metric units of length**

Practice converting between metric units of length in this 10-question quiz.

<http://www.thatquiz.org/tq-n/?-j147-l2-p0>



## WEIGHT

### Matching Math: Customary Weight

Practice converting between pounds and ounces in this matching game.

<http://www.sheppardsoftware.com/mathgames/measurement/MeasurementOunces.htm>

### Ounces, Pounds, and Tons Matching Game

Match the equivalent amounts of weight.

<http://www.oswego.org/ocsd-web/match/matchgeneric.asp?filename=ccarrollweight>

### Reading Scales

Illustrate how to read a variety of measuring devices, such as scales, measuring cup, thermometer. You can generate examples using different scales on different devices.

<http://www.teacherled.com/resources/dials/dialsload.html>

## VOLUME

### Artie Ounces Soda Jerk

Practice standard units of volume with this fun soda jerk game. Fill the client orders as fast as you can!

<http://mrnussbaum.com/soda/>

### Standard System Measurement Game

Help Raleigh refill his water tank. Be careful not to overfill the tank, or it will leak into space!

[http://www.sjrwmd.com/odyssey/flash/standard\\_measurement.swf](http://www.sjrwmd.com/odyssey/flash/standard_measurement.swf)

## GENERAL

### Matching Math: Customary Measuring Units

Match each item with its best estimate of capacity, weight, or length.

<http://www.sheppardsoftware.com/mathgames/measurement/BestMeasure2.htm>

### Measures

An online activity about metric measuring units and how to read scales, a measuring cup, and a ruler.

Note: you will need to use the British spellings “centimetres” and “millilitres” in the activity.

[http://www.bgfl.org/bgfl/custom/resources\\_ftp/client\\_ftp/ks2/maths/measures](http://www.bgfl.org/bgfl/custom/resources_ftp/client_ftp/ks2/maths/measures)

### A Dictionary of Units of Measurement

This resource explains the common measuring systems and their history.

<http://www.unc.edu/~rowlett/units/>

### Bitesize Measures

Facts, problems, and quizzes about measuring length, mass, and capacity (in metric units).

[http://www.bbc.co.uk/bitesize/ks2/maths/shape\\_space/measures/read/1/](http://www.bbc.co.uk/bitesize/ks2/maths/shape_space/measures/read/1/)

### Conversion Quizzes - ThatQuiz.org

A customizable online quiz about conversions between measuring units. The options include both metric and customary systems and six different difficulty levels.

<http://www.thatquiz.org/tq-n/science/metric-system/>

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# Metric Units for Measuring Length

The basic unit for measuring length in the metric system is **the meter**. All the other units are based on the meter, and in fact, have the word “meter” in them.

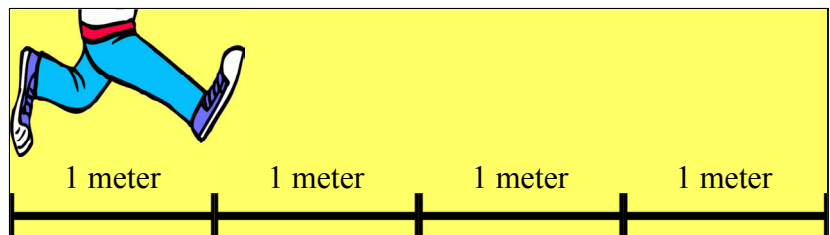
**Each unit in the metric system is 10 times the smaller unit.** For example, 1 kilometer is 10 hectometers and 1 centimeter is 10 millimeters. However, we don’t commonly use hectometers, dekameters, or decimeters. You need to learn only the units that are bolded in the chart.

<u>Units of length in the metric system</u>			
10 →	<b>kilometer</b>	<b>km</b>	“Kilo” means 1,000.
10 →	hectometer	hm	(not used)
10 →	dekameter	dam	(not used)
10 →	<b>meter</b>	<b>m</b>	the basic unit
10 →	decimeter	dm	(not used much)
10 →	<b>centimeter</b>	<b>cm</b>	This is 1/100 of a meter.
10 →	<b>millimeter</b>	<b>mm</b>	This is 1/10 of a centimeter.

Remember also that **1 meter is very close to 1 yard**. One meter is just a bit longer than one yard.

1. Draw two lines at least 4 m long that start at the same place (outside, in a hallway, or a large room).

- a. On the one line, make marks for 1 m, 2 m, 3 m, and 4 m. Then try to take “hops” 1 meter long.



- b. On the second line make marks at each foot, from 1 to 13 feet. Then take 1-yard hops.

Do the two kinds of hops feel about the same?



2. Measure how tall you and other people are in centimeters. Write it also using whole meters and centimeters.

Name	Height
	_____ cm = <u>1</u> m _____ cm.

### Conversions between units

Remember what millimeters look like on a ruler. They are tiny! **Ten millimeters make 1 cm.**

Then verify from a measuring tape that **100 centimeters makes one meter.** “Centi” means one hundred (from the Latin word *centum*). That is why 1 dollar has 100 *cents*, and 1 meter has 100 *centimeters*.

Lastly, **1 kilometer is 1,000 meters**, because “kilo” means one thousand.

$$1 \text{ km} = 1,000 \text{ m}$$

$$1 \text{ m} = 100 \text{ cm}$$

$$1 \text{ cm} = 10 \text{ mm}$$

3. One meter is 100 cm. Convert between meters and centimeters.

a.  $5 \text{ m} = \underline{\hspace{2cm}} \text{ cm}$

b.  $4 \text{ m } 6 \text{ cm} = \underline{\hspace{2cm}} \text{ cm}$

c.  $800 \text{ cm} = \underline{\hspace{2cm}} \text{ m}$

$8 \text{ m} = \underline{\hspace{2cm}} \text{ cm}$

$9 \text{ m } 19 \text{ cm} = \underline{\hspace{2cm}} \text{ cm}$

$239 \text{ cm} = \underline{\hspace{1cm}} \text{ m } \underline{\hspace{1cm}} \text{ cm}$

$12 \text{ m} = \underline{\hspace{2cm}} \text{ cm}$

$10 \text{ m } 80 \text{ cm} = \underline{\hspace{2cm}} \text{ cm}$

$407 \text{ cm} = \underline{\hspace{1cm}} \text{ m } \underline{\hspace{1cm}} \text{ cm}$

4. One centimeter is 10 mm. Convert between centimeters and millimeters.

a.  $5 \text{ cm} = \underline{\hspace{2cm}} \text{ mm}$

b.  $2 \text{ cm } 8 \text{ mm} = \underline{\hspace{2cm}} \text{ mm}$

c.  $50 \text{ mm} = \underline{\hspace{1cm}} \text{ cm } \underline{\hspace{1cm}} \text{ mm}$

$8 \text{ cm} = \underline{\hspace{2cm}} \text{ mm}$

$7 \text{ cm } 5 \text{ mm} = \underline{\hspace{2cm}} \text{ mm}$

$72 \text{ mm} = \underline{\hspace{1cm}} \text{ cm } \underline{\hspace{1cm}} \text{ mm}$

$14 \text{ cm} = \underline{\hspace{2cm}} \text{ mm}$

$10 \text{ cm } 4 \text{ mm} = \underline{\hspace{2cm}} \text{ mm}$

$145 \text{ mm} = \underline{\hspace{1cm}} \text{ cm } \underline{\hspace{1cm}} \text{ mm}$

5. One kilometer is 1,000 m. Convert between kilometers and meters.

a.  $5 \text{ km} = \underline{\hspace{2cm}} \text{ m}$

b.  $2 \text{ km } 800 \text{ m} = \underline{\hspace{2cm}} \text{ m}$

c.  $2,000 \text{ m} = \underline{\hspace{2cm}} \text{ km}$

$23 \text{ km} = \underline{\hspace{2cm}} \text{ m}$

$6 \text{ km } 50 \text{ m} = \underline{\hspace{2cm}} \text{ m}$

$4,300 \text{ m} = \underline{\hspace{1cm}} \text{ km } \underline{\hspace{1cm}} \text{ m}$

$1 \text{ km } 200 \text{ m} = \underline{\hspace{2cm}} \text{ m}$

$13 \text{ km } 579 \text{ m} = \underline{\hspace{2cm}} \text{ m}$

$18,700 \text{ m} = \underline{\hspace{1cm}} \text{ km } \underline{\hspace{1cm}} \text{ m}$

6. Calculate. Give your answer using whole kilometers and meters.

a.  $5 \text{ km } 200 \text{ m} + 8 \text{ km } 900 \text{ m}$

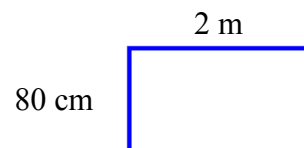
b.  $3 \text{ km } 600 \text{ m} + 2 \text{ km } 800 \text{ m}$

c.  $1,500 \text{ m} + 2 \text{ km } 600 \text{ m}$

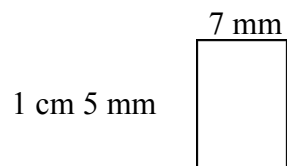
d.  $6 \times 700 \text{ m}$

7. Solve.

a. Find the perimeter of this rectangle.



b. Find the perimeter of this rectangle.



c. One side of a square measures 5 cm 6 mm. What is its perimeter?

d. *A challenge.* A square has a perimeter of 6 cm. How long is its side?

8. Solve the problems.

a. How many millimeters are in a *meter*?

b. John jogs around a track 1 km 800 m long twice a day, five days a week.  
How long a distance does he jog in a day?

In a week?

c. Gary is 1 m 34 cm tall and Jared is 142 cm tall.  
How much taller is Jared?

d. Kathy's wallpaper has butterflies that are 8 cm wide. She will  
put the wallpaper in her room. How many complete butterflies  
can she have on a wall that is 1 meter long?

How about if the wall is 3 meters long?

