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Foreword

Math Mammoth Grade 4 comprises a complete math curriculum for the fourth grade mathematics studies. The curriculum meets and exceeds the Common Core standards.

The main areas of study in Math Mammoth Grade 4 are:

1. Students develop understanding and fluency with multi-digit multiplication, and use efficient multiplication procedures to solve problems.
2. They develop understanding of division to find quotients involving multi-digit dividends (long division), and they solve word problems involving division, including division with a remainder.
3. Students develop an understanding of fraction equivalence and some operations with fractions. They learn to add and subtract fractions with same denominators, and to multiply a fraction by a whole number.
4. Students learn the concept of angle. They draw and identify lines and angles, and classify shapes by properties of their lines and angles.

Additional topics we study are place value, time, measuring, graphs, and decimals.

This book, 4-A, covers addition and subtraction and graphs (chapter 1), place value (chapter 2), multi-digit multiplication (chapter 3), and time and measuring (chapter 4). The rest of the topics are covered in the 4-B worktext.

Some important points to keep in mind when using the curriculum:

- The two books (parts A and B) are like a “framework”, but you still have a lot of liberty in planning the child’s studies. Chapters 1, 2, and 3 should be studied in order, and Chapter 3 (multiplication) should be studied before Chapter 5 (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.

Math Mammoth is mastery-based, which means it concentrates on a few major topics at a time, in order to study them in depth. However, you can still use it in a *spiral* manner, if you prefer. Simply have the child study in 2-3 chapters simultaneously. This type of flexible use of the curriculum enables you to truly individualize the instruction for the child.

- Don’t automatically assign all the exercises. Use your judgment, trying to assign just enough for the child’s needs. You can use the skipped exercises later for review. For most children, I recommend to start out by assigning about half of the available exercises. Adjust as necessary.
- For review, the curriculum includes a worksheet maker (Internet access required), mixed review lessons, additional cumulative review lessons, and the word problems continually require usage of past concepts. Please see more information about review (and other topics) in the FAQ at <https://www.mathmammoth.com/faq-lightblue.php>

I heartily recommend that you view the full user guide for your grade level, available at <https://www.mathmammoth.com/userguides/>

And lastly, you can find free videos matched to the curriculum at <https://www.mathmammoth.com/videos/>

I wish you success in teaching math!

Maria Miller, the author

Sample worksheet from
<https://www.mathmammoth.com>

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 simple expressions (number sentences) for word problems, which, again, practices algebraic thinking, and also 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.

Keep in mind that the specific lessons in the chapter can take several days to finish. They are not “daily lessons.” Instead, use the general guideline that fourth graders should finish about 2 pages daily or 9-11 pages a week. Also, I recommend not assigning all the exercises by default, but that you use your judgment, and strive to vary the number of assigned exercises according to the student’s needs.

Please see the user guide at <https://www.mathmammoth.com/userguides/> for more guidance on using and pacing the curriculum.

I also offer free videos matched to the curriculum at <https://www.mathmammoth.com/videos/>.

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	23	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
Comparing and Estimating Amounts	44	3 pages
Review	47	2 pages

Sample worksheet from
<https://www.mathmammoth.com>

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

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

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.

https://www.mathplayground.com/tb_addition/index.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 puzzle using logical thinking.

<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.

https://www.mathplayground.com/algebra_puzzle.html

Sample worksheet from

<https://www.mathmammoth.com>

Calculator Chaos

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

https://www.mathplayground.com/calculator_chaos.html

ORDER OF OPERATIONS

Addition Mystery Picture

Reinforce your addition skills while uncovering a hidden picture.

<https://www.mathmammoth.com/practice/mystery-picture#min=20&max=100>

Subtraction Mystery Picture

Practice subtraction of two-digit numbers while uncovering a hidden picture.

<https://www.mathmammoth.com/practice/mystery-picture-subtraction#min=11&max=100>

Choose Math Operation

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

<https://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.

<https://mrnussbaum.com/order-ops-online-game>

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

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

Online Rounding Practice

Practice rounding to the nearest ten, hundred, or thousand.

<https://www.mathmammoth.com/practice/rounding#number-range=0to10000&round-to=ten,hundred,thousand>

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>

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>

Sample worksheet from

<https://www.mathmammoth.com>

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 level. Start the game from the circular button near the top.

<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.

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

MONEY

Change Maker

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

<https://www.funbrain.com/games/change-maker>

Cash Out

Give correct change by clicking on the bills and coins. It has three levels of difficulty.

<https://mrnussbaum.com/cash-out-online-game>

DATA AND GRAPHS

Bar Charts

Interactive questions about bar charts. First, choose a topic for the graph. Next, choose how the vertical axis is presented; for example, “20 intervals, 10 marked”. Lastly, choose the type of questions asked.

<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 input your own data or use or alter pre-made data sets.

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

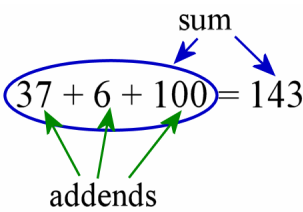
Graph Master

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.

<https://mrnussbaum.com/graphmaster>

Sample worksheet from
<https://www.mathmammoth.com>

Addition Review

<p>The numbers to be added are addends. The result is a sum.</p> 	<p>You can write any number as a sum of its different parts: whole thousands, whole hundreds, whole tens, and ones.</p> $5,248 = \underset{\text{thousands}}{5,000} + \underset{\text{hundreds}}{200} + \underset{\text{tens}}{40} + \underset{\text{ones}}{8}$ $2,019 = 2,000 + 0 + 10 + 9$	
<p>You can add in parts (hundreds, tens, ones):</p> $56 + 124$ $= 100 + 50 + 20 + 6 + 4$ $= 100 + 70 + 10 = 180$	<p>You can add in any order:</p> $7 + 90 + 91 + 3$ $= 7 + 3 + 90 + 91$ $= 10 + 90 + 91 = 191$	<p>Trick: first add a bigger but easier number, then subtract to correct the error:</p> $76 + 89$ $= 76 + 90 - 1$ $= 166 - 1 = 165$

1. Add mentally. Compare the problems in each box!

a.	b.	c.	d.
$70 + 80 = \underline{\hspace{2cm}}$	$140 + 50 = \underline{\hspace{2cm}}$	$50 + 60 = \underline{\hspace{2cm}}$	$80 + 90 = \underline{\hspace{2cm}}$
$77 + 80 = \underline{\hspace{2cm}}$	$141 + 50 = \underline{\hspace{2cm}}$	$54 + 65 = \underline{\hspace{2cm}}$	$82 + 93 = \underline{\hspace{2cm}}$
$77 + 82 = \underline{\hspace{2cm}}$	$144 + 55 = \underline{\hspace{2cm}}$	$58 + 62 = \underline{\hspace{2cm}}$	$88 + 91 = \underline{\hspace{2cm}}$

2. Write each number as a sum of its parts: thousands, hundreds, tens, and ones.

a. $487 =$	b. $2,103 =$
c. $8,045 =$	d. $650 =$

3. Solve.

a. Emma added three numbers. Two of them were 56 and 90. The sum was 190. What was the third number she added?

b. The sum of four numbers is 70 and the sum of five other numbers is 80. What is the sum of all nine numbers?

Sample worksheet from
<https://www.mathmammoth.com>

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Adding in Columns

1. Add in columns. Check by adding the numbers in each column in a different order (for example, starting at the bottom and working up).

<p>a.</p> $\begin{array}{r} 384 \\ 2912 \\ 2008 \\ 209 \\ + 26 \\ \hline \end{array}$	<p>b.</p> $\begin{array}{r} 245 \\ 139 \\ 30 \\ 2931 \\ 594 \\ 4593 \\ + 526 \\ \hline \end{array}$	<p>c.</p> $\begin{array}{r} 1738 \\ 2390 \\ 1078 \\ 364 \\ 2803 \\ 211 \\ + 99 \\ \hline \end{array}$
--	--	--

2. Add. Write the numbers under each other, carefully aligning the ones, tens, hundreds, and thousands. You may use a separate piece of paper if you prefer.

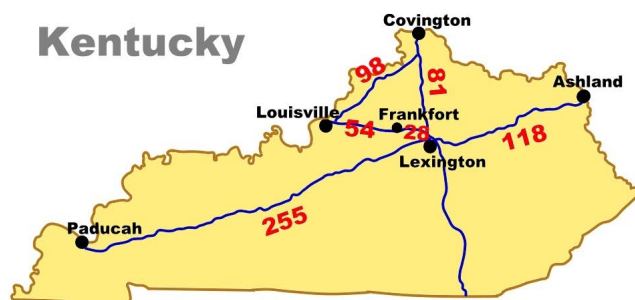
a. $5,609 + 1,388 + 89 + 402 + 837$

b. $67 + 504 + 1,298 + 492 + 3,288 + 8$

3. The map shows some Kentucky cities and distances between them.

The two distances that may be hard to read are:
 from Louisville to Frankfort is 54 miles;
 from Frankfort to Lexington is 28 miles.

Calculate the total driving distance, if a family goes on a trip like this:



- a. Covington - Lexington - Paducah - Lexington - Covington
- b. A trip from Lexington via Covington, Louisville, and Frankfort, and back to Lexington.

Subtraction Review

Compare the methods.

Marie: "I subtract in parts: first to the previous whole ten, then the rest."

$$\begin{aligned} & 35 - 7 \\ &= (35 - 5) - 2 \\ &= 30 - 2 = 28 \end{aligned}$$

John: "I use a helping problem."

$15 - 7 = 8$ is the helping problem for $35 - 7$.

The answer to $35 - 7$ also ends in "8" and is in the previous ten (the twenties). So, $35 - 7$ is 28.

1. Subtract.

a.	b.	c.	d.
$13 - 7 = \underline{\hspace{2cm}}$	$12 - 6 = \underline{\hspace{2cm}}$	$15 - 9 = \underline{\hspace{2cm}}$	$16 - 8 = \underline{\hspace{2cm}}$
$63 - 7 = \underline{\hspace{2cm}}$	$82 - 6 = \underline{\hspace{2cm}}$	$150 - 90 = \underline{\hspace{2cm}}$	$1,600 - 800 = \underline{\hspace{2cm}}$

2. Subtract from whole hundreds. You can subtract in parts.

a.	b.	c.	d.
$100 - 2 = \underline{\hspace{2cm}}$	$200 - 4 = \underline{\hspace{2cm}}$	$500 - 5 = \underline{\hspace{2cm}}$	$400 - 7 = \underline{\hspace{2cm}}$
$100 - 20 = \underline{\hspace{2cm}}$	$200 - 40 = \underline{\hspace{2cm}}$	$500 - 50 = \underline{\hspace{2cm}}$	$400 - 70 = \underline{\hspace{2cm}}$
$100 - 22 = \underline{\hspace{2cm}}$	$200 - 45 = \underline{\hspace{2cm}}$	$500 - 56 = \underline{\hspace{2cm}}$	$400 - 71 = \underline{\hspace{2cm}}$

3. Subtract and compare the results. The problems are "related" — can you see how?

a. $12 - 8 = \underline{\hspace{2cm}}$	b. $15 - 9 = \underline{\hspace{2cm}}$	c. $13 - 7 = \underline{\hspace{2cm}}$
$42 - 8 = \underline{\hspace{2cm}}$	$75 - 9 = \underline{\hspace{2cm}}$	$73 - 7 = \underline{\hspace{2cm}}$
$120 - 80 = \underline{\hspace{2cm}}$	$150 - 90 = \underline{\hspace{2cm}}$	$1,300 - 700 = \underline{\hspace{2cm}}$
$520 - 80 = \underline{\hspace{2cm}}$	$650 - 90 = \underline{\hspace{2cm}}$	$430 - 70 = \underline{\hspace{2cm}}$

4. Write here four different subtraction problems that are "related" to the problem $14 - 8 = 6$.
See the examples above!

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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, as understanding place value with four-digit numbers is crucial before moving on to larger numbers. 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 briefly study the multiples of 10, 100, and 1000. This lesson prepares the way for some very important ideas in the next chapter (multi-digit multiplication).

Please recall that it is not recommended to assign all the exercises by default. Use your judgment, and strive to vary the number of assigned exercises according to the student's needs.

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 with Large Numbers	69	4 pages
Multiples of 10, 100, and 1000	73	3 pages
Mixed Review Chapter 2	76	2 pages
Review Chapter 2	78	2 pages

Helpful Resources on the Internet

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

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 Payoff

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

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

Base Ten Blocks

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

<http://www.mathmammoth.com/logans/basetenblocks.html>

Sample worksheet from
<http://www.mathmammoth.com>

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.

<https://www.funbrain.com/games/place-value>

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>

ROUNDING AND ESTIMATING

Online Rounding Practice

Reinforce your rounding skills with this interactive online exercise

<https://www.mathmammoth.com/practice/rounding#number-range=0to1000000&round-to=any-place>

Online Addition Practice

Practice adding large numbers in expanded form with this interactive online exercise.

<https://www.mathmammoth.com/practice/place-value#mode=write-number&max-digits=6&question-number=10>

Missing Addend Addition Practice

Find the missing number in each addition problem in this interactive online exercise.

<https://www.mathmammoth.com/practice/place-value#mode=missing-part&max-digits=6&question-number=10>

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 Quiz

Practice rounding large numbers with this interactive 10-question quiz.

<https://www.thatquiz.org/tq-c/?-jg020-l5-mpnv600-p0>

Money Word Problems Worksheets: Addition and Subtraction

Practice addition and subtraction of various amounts of money with these printable worksheets.

<https://www.dadsworksheets.com/worksheets/money-word-problems-addition-and-subtraction.html>

Rounding to Thousands, Ten Thousands, or Hundred Thousands

Practice your rounding skills with this online multiple-choice quiz.

https://www.tutorialspoint.com/ordering_rounding_and_order_of_operations/rounding_to_thousands_ten_thousand_or_hundred_thousand_1

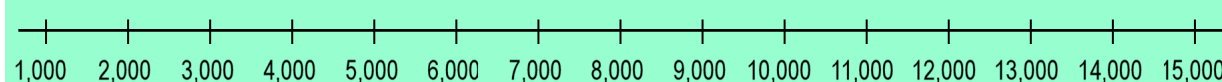
Place Value Worksheets, Riddles, and Challenges

Sample worksheet from <https://www.mathmammoth.com/printable-activities-that-practice-place-value-on-a-fourth-grade-level>.

<https://www.mathmammoth.com/printable-activities-that-practice-place-value-on-a-fourth-grade-level>

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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.

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

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

a. 164,453 <u>164</u> thousand <u>453</u>	b. 92908 _____ thousand _____	c. 329033 _____ thousand _____	d. 14004 _____ thousand _____
e. 550053 _____ thousand _____	f. 72001 _____ thousand _____	g. 800004 _____ thousand _____	h. 30036 _____ 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. $1,000,000 - 200,000 =$

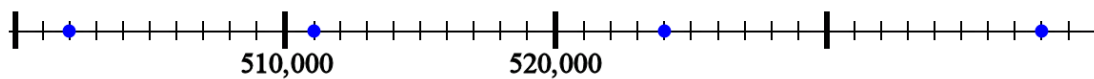
g. $30,000 - 5,000 =$

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. This is one of the focus areas of 4th grade math. For further help in teaching these topics, check out the free videos matched to the curriculum at <https://www.mathmammoth.com/videos/>.

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 20×4 or 500×6). After this, students learn multiplication part-by-part (also called partial products) — a very important concept. It means that we calculate, for example, 4×63 in two parts: first we solve 4×60 and 4×3 , and then we add the two results ($240 + 12 = 252$).

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. Additionally, multiplying in parts is tied in with an area model — which also is important to learn.

Before learning the traditional form of the 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 estimation, the order of operations, and multiplying with money. These lessons have numerous 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 (in middle school math). In this lesson, students fill in values for two quantities in tables (for example, the quantity of the items and the total cost).

Nearing the end of the chapter, we study 2-digit by 2-digit multiplication (e.g. 52×63). Again, we first use partial products, including in the context of an area model. The lesson *Multiplying in Parts: Another Way* presents an alternate way to multiply and is optional. After that we end the chapter with the standard algorithm for multiplying a two-digit number by a two-digit number.

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	2 pages
Multiply in Parts—Area Model	103	2 pages
Multiplying Money Amounts	105	2 pages

Sample worksheet from
<https://www.mathmammoth.com>

	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	2 pages
Order of Operations Again	121	3 pages
Money and Change	124	3 pages
So Many of the Same Thing	127	3 pages
Multiplying Two-Digit Numbers in Parts.....	130	5 pages
Multiply by Whole Tens in Columns	135	2 pages
Multiplying in Parts: Another Way	137	2 pages
The Standard Multiplication Algorithm with a Two-Digit Number Multiplier	139	4 pages
Mixed Review Chapter 3	143	2 pages
Review Chapter 3	145	3 pages

Helpful Resources on the Internet

Multiplication tables — online practice

Ad-free online practice of the multiplication tables at MathMammoth.com website. Also works as an offline program in most browsers. Includes the option for both timed and non-timed practice.

<https://www.mathmammoth.com/practice/multiplication.php>

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>

Stable Scales Quiz

In each picture, the scales are balanced. Can you find the weight of the items on the scales?

https://www.transum.org/Software/SW/Starter_of_the_day/Students/Stable_Scales_Quiz.asp

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. 30×400 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>

Sample worksheet from
<https://www.mathmammoth.com>

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>

Partial Products Finder App

An interactive app that illustrates multiplication (up to 30×30) with an area model.

<https://apps.mathlearningcenter.org/partial-product-finder/>

Amoeba Multiplication Game (Choose Beginner or Medium Level)

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

<http://www.bbc.co.uk/skillswise/game/ma12pape-game-written-multiplication>

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://prongo.com/baseball-multiply/>

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

Multiplication Quiz

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

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

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>

Sample worksheet from
<https://www.mathmammoth.com>

Math Computation Practice: Multiply Two digits by Two Digits

Practice two-digit multiplication in columns.

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

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.

<https://mrnussbaum.com/order-ops-online-game>

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

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>

MISCELLANEOUS

Multiplication Matching Game

Practice the multiplication tables while also uncovering a hidden picture in this fun matching game!

<https://www.mathmammoth.com/practice/multiplication-matching>

Matching Rates

Match each rate to its unit rate. Get a 1,000 point bonus for each round in which 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

Mental Math Tricks for Multiplication

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

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

Sample worksheet from
<https://www.mathmammoth.com>

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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. $10 \times 315 =$ _____	b. $100 \times 6,200 =$ _____	c. $1,000 \times 250 =$ _____
$3,560 \times 10 =$ _____	$10 \times 1,200 =$ _____	$38 \times 1,000 =$ _____
$35 \times 100 =$ _____	$100 \times 130 =$ _____	$10 \times 5,000 =$ _____

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

What is 20×14 ?

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 200×31 ?

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.	b.	c.	d.
$20 \times 8 =$ _____	$200 \times 7 =$ _____	$20 \times 12 =$ _____	$20 \times 16 =$ _____
$4 \times 20 =$ _____	$5 \times 200 =$ _____	$35 \times 20 =$ _____	$42 \times 200 =$ _____
$20 \times 5 =$ _____	$11 \times 200 =$ _____	$200 \times 9 =$ _____	$54 \times 20 =$ _____

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 10×2 . 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 10×28 , which equals 280. Notice again how we did it:

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

Let's try the same idea with 200. We will write 200 as 100×2 . 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 100×62 , which is 6,200. Notice again how it was done:

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

3. Try it yourself! Fill in.

a. 20×7	b. 20×5	c. 200×8	d. 200×25
$= \underline{\hspace{2cm}} \times 2 \times 7$	$= \underline{\hspace{2cm}} \times 2 \times 5$	$= \underline{\hspace{2cm}} \times 2 \times 8$	$= \underline{\hspace{2cm}} \times 2 \times 25$
$= 10 \times \underline{\hspace{2cm}}$	$= 10 \times \underline{\hspace{2cm}}$	$= 100 \times \underline{\hspace{2cm}}$	$= 100 \times \underline{\hspace{2cm}}$
$= \underline{\hspace{2cm}}$	$= \underline{\hspace{2cm}}$	$= \underline{\hspace{2cm}}$	$= \underline{\hspace{2cm}}$

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

A = _____

Hint: To calculate the area of a rectangle, multiply its two sides.

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 40×70 , simply multiply 4×7 , and tag two zeros to the result:

$$40 \times 70 = 2,800$$

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

$$600 \times 40 = 24,000$$

To multiply 700×800 , simply multiply 7×8 , 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 an 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 40×70 is indeed 2,800 by breaking the multiplication into smaller parts. He wrote 40 as 4×10 and 70 as 7×10 , and then multiplied in a different order:

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



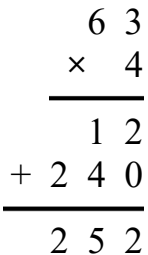
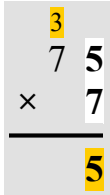
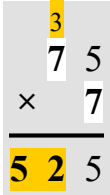
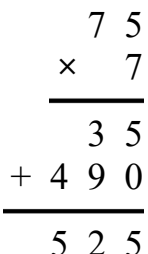
Do the same, and prove that 600×50 is indeed 30,000.

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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;">  </div> <div style="text-align: center;">  </div> </div> <p>Multiply the ones: $4 \times 3 = 12$. 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> <p>Then multiply the tens, <i>adding</i> the 1 ten that was regrouped: $4 \times 6 + 1 = 25$ Write 25 in front of the 2. <u>Note:</u> This 25 means 25 tens or 250!</p>	<div style="text-align: center;">  </div> <p>In the “easy way,” we multiply in parts, and the adding is done separately.</p>
The standard way to multiply	“The easy way”
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> </div> <p>Multiply the ones: $7 \times 5 = 35$ Regroup the 3 tens.</p> <p>Multiply & add the tens: $7 \times 7 + 3 = 52$</p>	<div style="text-align: center;">  </div>

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

a.

	5	3
x		8

	5	3
x		8

b.

	8	8
x		3

	8	8
x		3

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

<p>a.</p> <table style="margin: 10px auto; border-collapse: collapse;"> <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; text-align: center;">7</td><td style="border: 1px solid black; text-align: center;">9</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; text-align: center;">3</td></tr> <tr><td colspan="3" style="border-top: 1px solid black; 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> <tr><td style="border: 1px solid black;"></td><td style="border: 1px solid black;"></td><td style="border: 1px solid black;"></td></tr> </table>					7	9	x		3										<p>b.</p> <table style="margin: 10px auto; border-collapse: collapse;"> <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; text-align: center;">1</td><td style="border: 1px solid black; text-align: center;">8</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; text-align: center;">5</td></tr> <tr><td colspan="3" style="border-top: 1px solid black; 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> <tr><td style="border: 1px solid black;"></td><td style="border: 1px solid black;"></td><td style="border: 1px solid black;"></td></tr> </table>					1	8	x		5									
	7	9																																			
x		3																																			
	1	8																																			
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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>a. What is the cost of buying three chairs for \$48 each?</p> <p>_____</p> <p>And the cost for six chairs? _____</p>	<table style="margin: 10px auto; border-collapse: collapse;"> <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 colspan="3" style="border-top: 1px solid black; 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> <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. You earn \$77 a day. How much do you earn in five days?</p> <p>_____</p> <p>How much in ten days? _____</p>	<table style="margin: 10px auto; border-collapse: collapse;"> <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 colspan="3" style="border-top: 1px solid black; 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> <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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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.

We start out studying clock and time, with a focus on elapsed time. In contrast to third grade, the time intervals can now include the change from AM to PM, and the given times do not follow five-minute increments. The lessons give several strategies for finding the elapsed time. Students also make schedules and solve a variety of word problems involving time.

Conversions between measurement units is a big focus point of the chapter. Students may have difficulties with this, and that is why this topic 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 fourth 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 fourth 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 dealing 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:

1 L = 1,000 ml	10	liter	L	for larger amounts of liquid
	10	deciliter	dl	(for medium amounts of liquid)
	10	centiliter	cl	(for small amounts of liquid)
	10	milliliter	ml	for small amounts of liquid

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
Elapsed Time 1.....	156	3 pages
The 24-Hour Clock	159	2 pages
Elapsed Time 2	161	3 pages
Elapsed Time 3	164	3 pages
Measuring Temperature: Celsius	167	4 pages
Measuring Temperature: Fahrenheit	171	2 pages
Temperature Line Graphs	173	2 pages
Measuring Length	175	3 pages
More Measuring in Inches and Centimeters	178	2 pages
Feet, Yards and Miles	180	5 pages
Metric Units for Measuring Length	185	3 pages
Customary Units of Weight	188	4 pages
Metric Units of Weight	192	3 pages
Customary Units of Volume	195	3 pages
Metric Units of Volume	198	3 pages
Mixed Review Chapter 4	201	2 pages
Review Chapter 4	203	2 pages

Helpful Resources on the Internet

ELAPSED TIME

Elapsed Time

Find how much time passes between two different given times (elapsed time or time intervals) in this customizable online exercise.

<https://www.mathmammoth.com/practice/clocks>

Elapsed Time

Click “New Time”. Then click the buttons that advance the time on the clock, until the time matches the “End” time. Choose difficulty levels 1 and 2 for this grade level.

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

Elapsed Time Worksheets

Generate printable worksheets for elapsed time. You can practice the elapsed time, finding the starting time, or finding the ending time.

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

Sample worksheet from

<https://www.mathmammoth.com>

Find the Start Time

Word problems about starting times with multiple-choice answers. Choose “full screen”, then “Find the start time”. Next, choose option 4 or 5.

http://mathsframe.co.uk/en/resources/resource/119/find_the_start_time

Time for Crime—Elapsed Time Mystery

A single mystery problem which can be solved by thinking of the elapsed time: who is the thief?

<http://teacher.scholastic.com/maven/timefor/index.htm>

ThatQuiz—Elapsed time

A ten-question quiz on Elapsed Time

<http://www.thatquiz.org/tq-g/?-j4-l4-p0>

Adding Time Word Problems

Read the time and then answer a word problem involving adding a given time.

http://mathsframe.co.uk/en/resources/resource/118/adding_time_word_problems

Converting Units of Time Quiz

Practice converting between various units of time with this multiple-choice quiz.

<https://www.turtlediary.com/quiz/converting-units-of-time.html>

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/>

Elapsed Time Quiz

A 10-question online quiz that practices elapsed time in hours and minutes.

<https://www.thatquiz.org/tq-g/?-j4-l3-mpnv600-p0>

TEMPERATURE

Thermo Quiz

Select the box that contains the temperature 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.

<https://funphysics.jpl.nasa.gov/adventures/temperature-game.html>

Hot Stuff

Practice estimating temperatures in Fahrenheit.

<http://www.beaconlearningcenter.com/WebLessons/HotStuff/default.htm>

Be a Scientist

Practice estimating temperatures in Celsius.

<http://www.beaconlearningcenter.com/WebLessons/BeAScientist/default.htm>

Sample worksheet from

<https://www.mathmammoth.com>

Temperature

Practice reading thermometers with different scales.

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

Temperature Quiz

Answer questions about reasonable temperatures in Fahrenheit and Celsius in this interactive multiple-choice quiz.

http://www.softschools.com/quizzes/math/temperature_measurement/quiz2112.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.rulergame.net/>

Reading a Ruler by Eighths

Practice reading a ruler by eighths with a matching exercise and a game of Concentration.

<https://www.quia.com/jg/1364429.html>

Measure It!

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

<https://www.funbrain.com/games/measure-it>

Sal's Sub Shop

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

<https://mrnussbaum.com/sal-s-sub-shop-online-game>

Reading a Tape Measure Worksheets

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

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>

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>

Sample Worksheet from

<https://www.mathmammoth.com>

Ounces, Pounds, and Tons

Answer questions about customary units of weight in this jeopardy-style game.

<https://www.quia.com/cb/426998.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!

<https://mrnussbaum.com/artie-ounces-soda-jerk-online-game>

Standard Liquid Volume Matching Game

Match standard liquid volumes with equivalent volumes

<https://www.quia.com/mc/126277.html>

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://flash.topmarks.co.uk/674>

A Dictionary of Units of Measurement

This resource explains the common measuring systems and their history.

<http://www.ibiblio.org/units/>

Measuring

Worksheets, fact sheets, and quizzes that practice various measuring concepts in both metric and imperial units.

<http://www.bbc.co.uk/skillswise/topic-group/measuring>

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/>

Sample worksheet from
<https://www.mathmammoth.com>

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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.

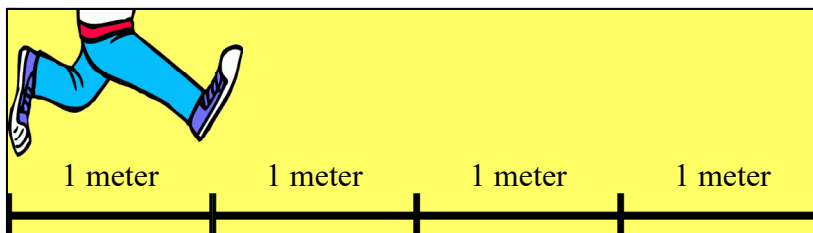
Units of length in the metric system

10	kilometer	km	“Kilo” means 1,000.
10	hectometer	hm	(not used)
10	dekameter	dam	(not used)
10	meter	m	the basic unit
10	decimeter	dm	(not used much)
10	centimeter	cm	This is 1/100 of a meter.
10	millimeter	mm	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.

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

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



- 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?



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

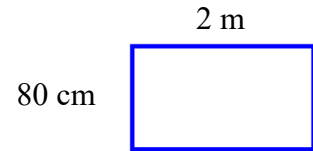
b. $3 \text{ km } 600 \text{ m} + 2 \text{ km } 800 \text{ m}$

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

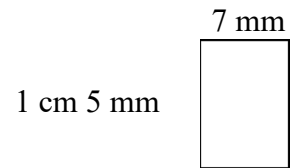
d. $6 \times 700 \text{ m}$

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?

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?

Puzzle Corner

