

math

MAMMOTH

Grade 5-A Worktext

The four operations

Large numbers
and the
calculator

Problem solving

Decimals



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Foreword

Math Mammoth Grade 5-A and Grade 5-B worktexts comprise a complete math curriculum for the fifth grade mathematics studies that meets and exceeds the Common Core Standards.

Fifth grade is the time to focus on fractions and decimals and their operations in great detail. Students also deepen their understanding of whole numbers, get introduced to the calculator, learn more problem solving and geometry, and study statistical graphs.

The year starts out with a study of whole numbers and their operations. Students review multi-digit multiplication and learn long division with two-digit divisors. We also review divisibility and prime factorization from fourth grade.

In the second chapter, the focus is on large numbers and using a calculator. This is the first time a calculator is introduced in Math Mammoth complete curriculum—thus far, all calculations have been done with mental math or with paper and pencil. I want students to learn to be critical in their use of the calculator and use it with good judgment. Every exercise where calculator use is allowed is marked with a little picture of a calculator.

The third chapter is about equations and problem solving. We study simple equations with the help of a balance and bar models. The main goal is to get students used to the concept of an equation and what it means to solve an equation. Students also solve a fair amount of word problem with the help of the visual bar model.

The fourth chapter is about decimals and their operations. It is a long chapter because now it is time for students to learn all the basic operations with decimals. I assume that the student already understands decimal place value (for example from studying Math Mammoth Grade 4 curriculum), because that is the foundation for learning the concepts of decimal arithmetic and the means of preventing common misconceptions.

In part 5-B, students study common statistical graphs, operations with fractions, and geometry.

I wish you success with teaching math!

Maria Miller, the author

Chapter 1: The Four Operations

Introduction

We start fifth grade by studying the four basic operations. This includes studying the order of operations, simple equations and expressions, long multiplication, long division, divisibility, primes, and factoring.

The main line of thought throughout this chapter is that of a mathematical *expression*. In mathematics, an expression consists of numbers, letters, and operation symbols, but does not contain an equal sign (an equation does). Students write simple expressions for problems which they solve. They study the correct order of operations in an expression.

An *equation* in mathematics consists of an expression that equals another expression (expression = expression). We study simple equations, both with and without the help of visual bar models.

Next, we review multi-digit multiplication (multiplying in columns), starting with partial products (multiplying in parts) and how that can be visualized geometrically. Then it is time for long division, especially practicing long division with two-digit divisors. We also study why long division works, in the lesson *Long Division and Repeated Subtraction*. Throughout the lessons there are also word problems to solve.

Lastly, we study the topics of divisibility, primes, and factoring. Students learn the common divisibility rules for 2, 3, 4, 5, 6, 8, 9, and 10. In prime factorization, we use factor trees.

Although the chapter is named “The Four Operations,” please notice that the idea is not to practice each of the four operations separately, but rather to see how they are used together in solving problems and in simple equations. We are trying to develop the students’ *algebraic thinking*, including the abilities to: translate problems into mathematical operations, comprehend the many operations needed to yield an answer to a problem, “undo” operations, and so on. Many of the ideas in this chapter are preparing them in advance for algebra.

The Lessons in Chapter 1

	page	span
Warm Up: Mental Math	11	2 pages
The Order of Operations and Equations	13	3 pages
Review: Addition and Subtraction	16	3 pages
Review: Multiplication and Division	19	4 pages
Multiplying in Parts	23	6 pages
The Multiplication Algorithm	29	5 pages
More Multiplication	34	5 pages
Long Division	39	4 pages
A Two-Digit Divisor 1	43	4 pages
A Two-Digit Divisor 2	47	3 pages
Long Division and Repeated Subtraction	50	5 pages
Divisibility Rules	55	5 pages
Review: Factors and Primes	60	4 pages
Prime Factorization	64	5 pages
Chapter 1 Review	69	3 pages

Helpful Resources on the Internet

MENTAL MATH

Math Mahjong

A Mahjong game where you need to match tiles with the same value.

http://www.sheppardsoftware.com/mathgames/mixed_mahjong/mahjongMath_Level_3.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>

ORDER OF OPERATIONS

Interactive Order of Operations Practice

Click on the correct operation in the expression.

http://www.softschools.com/math/order_of_operations/games/

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>

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 the Order of Operations (Object Interactive)

Click on the correct operation to be done first in the given expression. The program then solves that operation, and you click on the *next* operation to be performed. Lastly the resource includes a game where you click on the falling blocks in the order that the order of operations would dictate.

http://www.learnalberta.ca/content/mejhm/html/object_interactives/order_of_operations/use_it.html

Choose Math Operation

Choose the mathematical operation(s) that make the equation true. Practice the role of zero and one in basic operations or operations with negative numbers. Helps develop number sense and logical thinking.

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

Quick Calculate

Practice your arithmetic with all four operations plus the order of operations.

http://www.mathplayground.com/quick_calculate.html

Free worksheets for the order of operations

Generate printable and customizable worksheets for the order of operations. Choose from five operations and parentheses. You can choose the number range used, the number of problems, and more.

http://www.homeschoolmath.net/worksheets/order_of_operations.php

BAR MODELS

Thinking Blocks: Addition and Subtraction

Model and solve addition and subtraction word problems using this interactive math tool.

http://www.mathplayground.com/tb_addition/thinking_blocks_addition_subtraction.html

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

Thinking Blocks: Multiplication and Division

Model and solve multiplication and division word problems using this interactive math tool.

http://www.mathplayground.com/tb_multiplication/thinking_blocks_multiplication_division.html

FUN WITH PROBLEM SOLVING

Calculator Chaos

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

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

SpeedMath Deluxe

Create an equation from the four given digits using addition, subtraction, multiplication and division. Make certain that you remember the order of operations. It sometimes includes negative numbers.

<http://education.jlab.org/smdeluxe/index.html>

Random Coins

Can you make \$1.00 from Random Coins? Drag and drop the coins.

<https://www.mathsisfun.com/money/random-coins.html>

LONG DIVISION & MULTIPLICATION

Amoeba Multiplication Game

Practice partial products, or multiplication by splitting numbers. Choose “Medium Level”.

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

Area and the Distributive Property

Practice the idea how partial products tie in with the area of a rectangle (the distributive property).

<https://www.khanacademy.org/math/cc-third-grade-math/cc-third-grade-measurement/cc-third-grade-area-distributive-property/e/area-and-the-distributive-property>

Multiply 2-Digit Numbers with Area Model

Use an area model to decompose factors and multiply.

<https://www.khanacademy.org/math/arithmetic/multiplication-division/area-models-multiplication/e/multiplying-2-digit-numbers-with-area-models>

Estimator Quiz

Practice your estimation skills in this customizable interactive quiz. Choose “multiplication”.

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

Interactive Multiplication Practice

Improve your multi-digit multiplication skills with this 10-question online quiz.

<https://www.thatquiz.org/tq-1/?-jg44-lf-p0>

Multiplication with Money

Spin the wheel. At the end of each spin, practice multiplying amounts of money.

<http://www.kidsmathtv.com/free/multiplication-with-money-values-game-for-5th-grade-spin-the-wheel-team-game>

Drag and Drop Math

An interactive tool to practice long division or long multiplication.

<http://mrnussbaum.com/drag-and-drop-math/>

Mr. Martini’s Classroom: Long Division

An interactive long division tool.

<http://www.thegreatmartinicompany.com/longarithmetic/longdivision.html>

Long Division

Solve long division problems interactively. Choose the levels with 2-digit divisors.

<http://www.longdiv.co.uk/activity/>

Long Division Tic Tac Toe

Play Tic Tac Toe while solving long division problems. This exercise has multiple-choice answers.

<http://www.math-play.com/Tic-Tac-Toe-Long-Division-Game/Tic-Tac-Toe-Long-Division-Game.html>

Long Division by “Chunking”

Solve division problems by using the “chunking method” — also called division by repeated subtraction.

<http://www.chunkydivision.co.uk/activity/index.htm>

Short Division

A page that explains short division in detail. Short division is the same algorithm as long division, but some steps are only done in one’s head, not written down.

<http://www.themathpage.com/ARITH/divide-whole-numbers.htm>

FACTORS AND PRIMES

Divisibility Quiz Generator

Generate customized quizzes to practice the rules of divisibility.

<http://www.mathwarehouse.com/arithmetic/numbers/divisibility-quiz.php>

Arrays and factors

Drag rectangles to show the factorizations of a given number on a grid.

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

Octopus Factors

Move counters up the legs of an octopus but only when the number on the circle is a multiple of the number on the card.

<http://www.counton.org/games/map-numbers/octopus/>

Sliding Tile Factorization Game

Slide a number over another to capture it. You can only do this if the number you slide is a factor of the other. Number 1 is only supposed to be used to capture prime numbers.

http://www.visualmathlearning.com/Games/sliding_factors.html

Not a Factor

Choose a number that is *not* a factor of the given number.

http://www.helpingwithmath.com/resources/games/target_factors01/not_factor.html

Factor Game

Choose a number from the game board, and your opponent gets all the numbers that are its proper factors. Adjust the number of rows and columns on the game board to get a more challenging game. This game can easily be adapted to be played offline, with paper and colored pencils.

<http://illuminations.nctm.org/Activity.aspx?id=4134>

Factors and Remainders

An interactive animation that illustrates factors and remainders. Choose a number and its possible divisor. The animation shows boxes arranged into rows, and you can *see* if there is any remainder.

<http://www.absorblearning.com/media/item.action?quick=ml>

Product Game

The players choose factors and the product of those are colored in on the game board. The player who gets four products in a row wins. You can play against the computer or with a friend. This game can easily be adapted to be played offline, with paper and colored pencils.

<http://illuminations.nctm.org/Activity.aspx?id=4213>

Factorization Forest

A fun game where for each number you factorize, you will get to grow a tree in your forest!

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

Factor Trees at Math Playground

Factor numbers to their prime factors using an interactive factor tree.

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

MathGoodies Interactive Factor Tree Game

Type the missing number into the factor tree, and you will see the factor tree being drawn.

http://www.mathgoodies.com/factors/prime_factors.html

Prime Number Calculator

This calculator tests if a number is prime, and tells you its smallest divisor if it is not prime.

<http://www.basic-mathematics.com/prime-number-calculator.html>

FOR FURTHER STUDY

Unique Prime Factorization

A video explaining the fundamental theorem of arithmetic: that each composite number has a unique prime factorization.

<http://www.youtube.com/watch?v=5kl28hnhin0>

Primes, Factors and Divisibility—Explorer at CountOn.org

Explore and learn more about divisibility tests, primes, and factors.

<http://www.counton.org/explorer/primes>

The Prime Pages

Learn about the largest known primes, how primes are found, how many there are, and more.

<http://primes.utm.edu/>

The Cryptoclub. Using Mathematics to Make and Break Secret Codes (book)

Cryptoclub kids try to break the codes of secret messages, and at the same time learn more and more about encrypting and decrypting. The book contains problems to solve at the end of each chapter, little tips, and historical information on how cryptography has been used over the centuries.

<http://www.amazon.com/gp/product/156881223X?tag=mathmammoth-20>

Primality of 1 from Wikipedia

Discussing whether 1 should or should not be counted as a prime number.

http://en.wikipedia.org/wiki/Prime_number#Primality_of_one

<http://primefan.tripod.com/Prime1ProCon.html>

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More Multiplication

Now we will study the multiplication algorithm with a 3-digit number on the bottom. This means we have three partial products to do, so the multiplication process takes three lines.

$$\begin{array}{r}
 \\
 \underline{429} \\
 \times 227 \\
 \hline
 3003
 \end{array}$$

First multiply 7×429 , ignoring the 2 and 2 in 227.

$$\begin{array}{r}
 \\
 \underline{429} \\
 \times 227 \\
 \hline
 3003 \\
 \underline{8580}
 \end{array}$$

Next multiply 20×429 . Place a zero in the ones place, and then multiply as if it was just 2×429 .

$$\begin{array}{r}
 \\
 \underline{429} \\
 \times 227 \\
 \hline
 3003 \\
 8580 \\
 \underline{85800}
 \end{array}$$

Then, 200×429 . Since you are multiplying by 200, place a zero in the ones and in the tens places, and then multiply 2×429 .

$$\begin{array}{r}
 \\
 \\
 \\
 \underline{429} \\
 \times 227 \\
 \hline
 3003 \\
 8580 \\
 + 85800 \\
 \hline
 97383
 \end{array}$$

Lastly add.

1. Multiply. Remember: you will need to place *two zeros* in the third line.

a.

				1	9
				1	
		x	2	4	5
+					

b.

				4	0
				9	
		x	2	2	8
+					

c.

				2	4
				6	
		x	1	3	7
+					

d.

				8	1
				5	
		x	7	2	3
+					

e.

				2	0
				7	
		x	8	0	3
+					

f.

				1	2
				5	
		x	6	6	2
+					

2. First estimate. Then multiply. Lastly, check that your final answer is reasonably close to your estimate.

<p>a. Estimate:</p> <p>_____</p> <p>_____</p> $\begin{array}{r} 1491 \\ \times 27 \\ \hline \end{array}$	<p>b. Estimate:</p> <p>_____</p> <p>_____</p> $\begin{array}{r} 2085 \\ \times 35 \\ \hline \end{array}$	<p>c. Estimate:</p> <p>_____</p> <p>_____</p> $\begin{array}{r} 62704 \\ \times 45 \\ \hline \end{array}$
<p>d. Estimate:</p> <p>_____</p> <p>_____</p> $\begin{array}{r} 90516 \\ \times 82 \\ \hline \end{array}$	<p>e. Estimate:</p> <p>_____</p> <p>_____</p> $\begin{array}{r} 2144 \\ \times 381 \\ \hline \end{array}$	<p>f. Estimate:</p> <p>_____</p> <p>_____</p> $\begin{array}{r} 5529 \\ \times 336 \\ \hline \end{array}$

3. Let's review! Multiply mentally. Remember the shortcut? Multiply without the zeros, then tag as many zeros at the end of the answer as there are in the factors.

<p>a. $500 \times 200 =$</p>	<p>b. $30 \times 210 =$</p>
<p>c. $250 \times 40 =$</p>	<p>d. $2,000 \times 400 =$</p>
<p>e. $1,200 \times 800 =$</p>	<p>f. $30 \times 40 \times 50 =$</p>
<p>g. $20 \times 800 \times 200 =$</p>	<p>h. $50 \times 80 \times 300 =$</p>

When the factors end in zeros, we can take a shortcut! Study the examples carefully.

Example 1:

$$\begin{array}{r}
 11 \\
 956 \\
 \times 200 \\
 \hline
 191200
 \end{array}$$

Here, you can first place two zeros in the ones and tens places in the answer, and then just multiply 2×956 .

Example 2:

$$\begin{array}{r}
 411 \\
 950 \\
 \times 820 \\
 \hline
 000 \\
 19000 \\
 + 76000 \\
 \hline
 779000
 \end{array}$$

Be careful... the first "line" consists totally of zeros. On the second line, first place a zero, then multiply. On the third line, first place TWO zeros, then multiply.

$$\begin{array}{r}
 411 \\
 95 \\
 \times 82 \\
 \hline
 190 \\
 + 7600 \\
 \hline
 77900
 \end{array}$$

It is easier to multiply 82×95 and tag two zeros to the final answer to get 779,000.

4. Multiply.

a. $500 \times 29 =$ _____

Simply multiply 5×29 , then tag _____ zeros to the final answer.

b. $340 \times 210 =$ _____

Multiply _____ \times _____, then tag _____ zeros to the final answer.

c. $280 \times 700 =$ _____

Multiply _____ \times _____, then tag _____ zeros to the final answer.

d. $99 \times 9,900 =$ _____

e. $600 \times 1,800 =$ _____

f. $24,500 \times 30 =$ _____

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A Two-Digit Divisor 2

1. Divide. Use the space on the left to write a multiplication table of the divisor. Lastly check.

$2 \times 37 = 74$	a. $37 \overline{) 4107}$	$\begin{array}{r} \times 37 \\ \hline \end{array}$
	b. $58 \overline{) 4408}$	$\begin{array}{r} \times 58 \\ \hline \end{array}$
	c. $96 \overline{) 9792}$	$\begin{array}{r} \times 96 \\ \hline \end{array}$

2. Divide. Use the space on the left to write a multiplication table of the divisor. Lastly check.

	a. $48 \overline{) 6011}$	
	b. $92 \overline{) 8712}$	
	c. $55 \overline{) 6745}$	

3. Angela is going to borrow money so she can purchase three beds for \$156 each. She will pay back the loan in 12 equal payments, over one year. How much is one payment?

4. Mark paid $\frac{4}{15}$ of his \$3,600 salary in taxes.

- a. How much did Mark pay in taxes?
(Hint: First find $\frac{1}{15}$ of his salary.)

- b. How much does Mark have left after taxes?

5. If you need more practice, solve the problems below and fill in the cross-number puzzle. Use your notebook for long divisions.

- | | |
|---|--|
| <p>Down</p> <ul style="list-style-type: none"> a. $3,762 \div 66$ b. $19,750 \div 5$ c. $9,960 \div 12$ d. $27,339 \div 13$ e. $9,384 \div 23$ f. $9,135 \div 15$ | <p>Across</p> <ul style="list-style-type: none"> a. $2,295 \div 45$ b. $2,870 \div 82$ c. $9,240 \div 11$ d. $9,660 \div 35$ e. $9,306 \div 22$ f. $15,243 \div 3$ |
|---|--|

			b.						
a.						d.		f.	
			f.						
	c.								
				e.					

Puzzle Corner

Check if you can solve these long divisions with a 3-digit divisor!
These may have a remainder. Use your notebook.

<p>a. $12,408 \div 118$</p>	<p>b. $70,854 \div 235$</p>
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Chapter 2: Large Numbers and the Calculator

Introduction

In this chapter, we study large numbers and place value up to billions—that is, up to 12-digit numbers. We study adding, subtracting, rounding, exponents, and using a calculator.

This is the first time a calculator is introduced in the Math Mammoth complete curriculum. I have delayed introducing the use of a calculator (as compared to many other math curricula) for good reasons. I have received numerous comments on the harm that indiscriminate calculator usage can cause. If children are allowed to use calculators freely, their minds get “lazy,” and they will start relying on calculators even for simple things such as 6×7 or $320 + 50$. It is just human nature!

As a result, students may enter college without even knowing their multiplication tables by heart. Then they have trouble if they are required to use mental math to solve simple problems.

Therefore, we educators need to *limit* calculator usage until the students are much older. Children *cannot* decide this for themselves, and definitely not in fifth grade.

However, I realize that the calculator is extremely useful, and students do need to learn to use it. In this curriculum, I try to not only show the students how to use a calculator, but also *when* to use it and when *not* to use it.

This chapter includes many problems where calculator usage is appropriate. We also practice estimating the result before using a calculator to find the exact answer. In the last lesson, students need to choose whether mental math or a calculator is the best “tool” for the calculation.

The Lessons in Chapter 2

	page	span
A Little Bit of Millions	75	3 pages
Place Value Up to Billions	78	4 pages
Exponents and Powers	82	3 pages
Adding and Subtracting Large Numbers	85	3 pages
Rounding 2	88	3 pages
The Calculator and Estimating	91	3 pages
When to Use the Calculator	94	2 pages
Mixed Review	96	2 pages
Review	98	3 pages

Helpful Resources on the Internet

Expanded Form Quiz

Practice addition in expanded form with this 10-question quiz.

<https://www.thatquiz.org/tq-c/?-j28-19-p0>

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>

Fruit Splat Compare Numbers

Compare numbers by choosing $<$, $>$, or $=$. Choose level six.

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

Place Value Quiz

Practice identifying the place values of the digits in large numbers with this 10-question quiz.

<https://www.thatquiz.org/tq-c/?-j21-19-p0>

Quiz on Large Numbers

Test your knowledge about numbers with this 10-question multiple choice quiz.

<http://www.proprofs.com/quiz-school/story.php?title=NTczNDc3>

Megapenny Project

This page visualizes big numbers with pictures of pennies.

<http://www.kokogiak.com/megapenny/default.asp>

Powers of Ten

A 9-minute movie that illustrates the dramatic changes of scale when zooming in or out by powers of ten (40 powers of ten), starting from a picnic blanket and ending in the universe, and then starting from a hand, all the way to a proton inside an atom.

<http://www.youtube.com/watch?v=0fKBhvDjuy0>

Free Exponent Worksheets

Create a variety of customizable and printable worksheets to practice exponents.

<http://www.homeschoolmath.net/worksheets/exponents.php>

Exponents Quiz from ThatQuiz.org

A 10-question quiz, fairly easy, and not timed. You can change the parameters as you like.

<http://www.thatquiz.org/tq-2/?-j1-14-p0>

Pyramid Math

Choose “POW” to practice exponents. Drag the triangle with the right answer to the vase.

<http://www.mathnook.com/math/pyramidmath.html>

Picture Matching - Exponent Values

Match the powers with their values and reveal a pretty picture.

<http://www.studystack.com/picmatch-275044>

Exponent Game

A card game to practice exponents. Limit the cards to small numbers, instead of using the whole deck.

<http://www.learn-with-math-games.com/exponent-game.html>

Otter Rush

Choose the correct value for “x” in exponent expressions (such as $2x = 16$) in this racing game.

<http://mathgames4children.com/fun-board-games/6th-grade/pirate/exponents-pirate-waters-grade-6-game.html>

Adding and Subtracting Powers of Ten

This interactive quiz practices adding and subtracting powers of ten with numbers up to 1,000,000.

<http://snappymaths.com/addsub/addsub10/interactive/addsubpowers10/addsubpowers10.htm>

ROUNDING AND ESTIMATING

Rounding Quiz

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

<http://www.softschools.com/quizzes/math/rounding/quiz837.html>

Home Run Derby Math

Reinforce number sense and estimating sums, differences, and products of four and five-digit numbers with this math baseball game.

<http://mrnuussbaum.com/derby>

Estimation Valley Game

Practice estimation with this math golf game. The better you estimate, the more accurate your shot!

<http://mrnuussbaum.com/estimationvalley/>

Estimation at AAA Math

Exercises about rounding whole numbers and decimals, front-end estimation, estimating sums and differences. Each page has an explanation, interactive practice, and games.

<http://www.aaamath.com/B/est.htm>

CALCULATOR

Using a Calculator

Practice your calculator skills with this challenging quiz! Note: Some of the questions use concepts not studied in this grade.

http://www.transum.org/software/SW/Starter_of_the_day/Students/Using_A_Calculator.asp?Level=1

Powers Puzzle

This exploratory math exercise will get students to exploring numbers with the use of a calculator.

<http://www.dr-mikes-math-games-for-kids.com/powers-puzzle.html>

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Adding and Subtracting Large Numbers

Just like $25 \text{ marbles} + 54 \text{ marbles} = 79 \text{ marbles}$, so will $25 \text{ million} + 54 \text{ million} = 79 \text{ million}$.

Just keep in mind: **a thousand thousands makes a million, and a thousand millions makes a billion.**

<p style="text-align: center;">$800,000 + 200,000$</p> <p>Think of it as 800 thousand + 200 thousand. The answer is 1,000 thousand or 1,000,000.</p>	<p style="text-align: center;">Half a million</p> <p>Think of it as half of a thousand thousands, or 500 thousands = 500,000.</p>
<p style="text-align: center;">$34,999,000 + 1,000$</p> <p>This is 34 million 999 thousand + 1 thousand, making 34 million 1000 thousand or 35 million.</p>	<p style="text-align: center;">2 billion – 300 million</p> <p>Think of it as 2,000 million – 300 million, which makes 1,700 million or 1,700,000,000.</p>

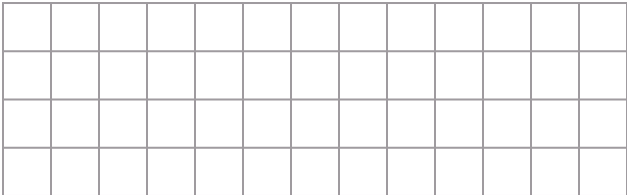
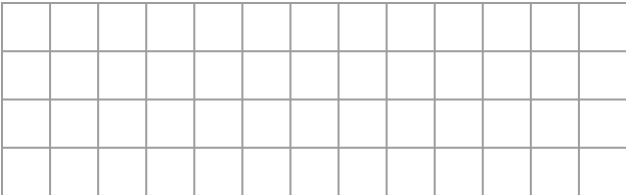

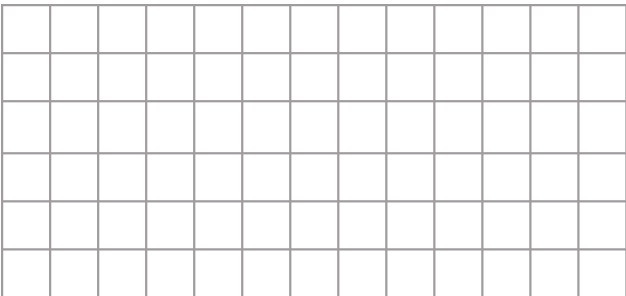
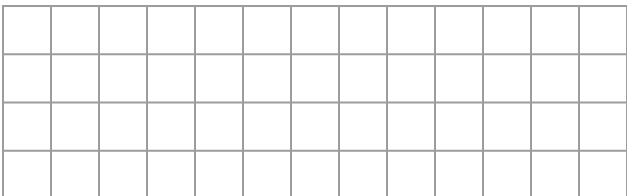
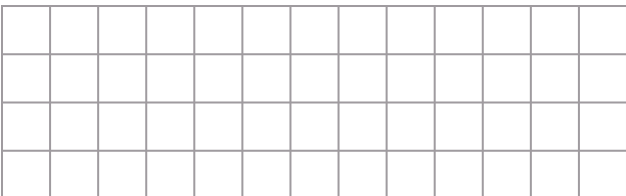
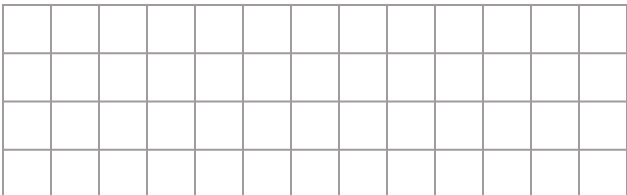
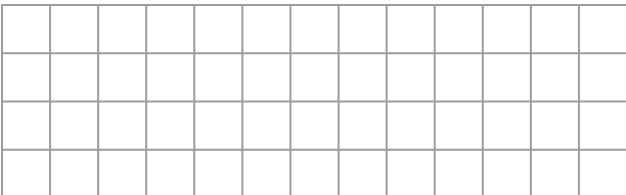
1. Add.

	a. 90,000	b. 99,000,000	c. 999,000
+ 1,000			
+ 10,000			
+ 100,000			
+ 1,000,000			

2. Match.

	a.		b.
1/2 million	750,000	1 million – 50,000	100,000,000
a hundred hundreds	100,000	1 million – 500,000	500,000
1/10 million	10^6	10^8	950,000,000
1/4 million	500,000	1 billion – 500 million	1/2 billion
3/4 million	10^4	1 billion – 50 million	950,000
a thousand thousands	200,000	1 million – 5,000	995,000
2/10 million	250,000	1 billion – 5 million	995,000,000

3. Add or subtract. Simply write the numbers under each other, lining up the digits in the same places .
Use the usual addition or subtraction algorithm, regrouping the same way as you have learned before.

<p>a. $329,145,000 + 2,809,125,093$</p> 	<p>b. $5,049 + 45,390,000 + 5,483,700$</p> 
<p>c. $45,700 + 90,567,000 + 2,560 + 2,300,560$</p> 	<p>d. $290,800 + 254,000,230 + 56,391 + 2,381$</p> 
<p>e. $480,560,000 - 23,980,000$</p> 	<p>f. $1,000,000 - 156,990$</p> 
<p>g. $22,300,000 - 4,431,190$</p> 	<p>h. $7,014,289,000 - 3,103,559,391$</p> 

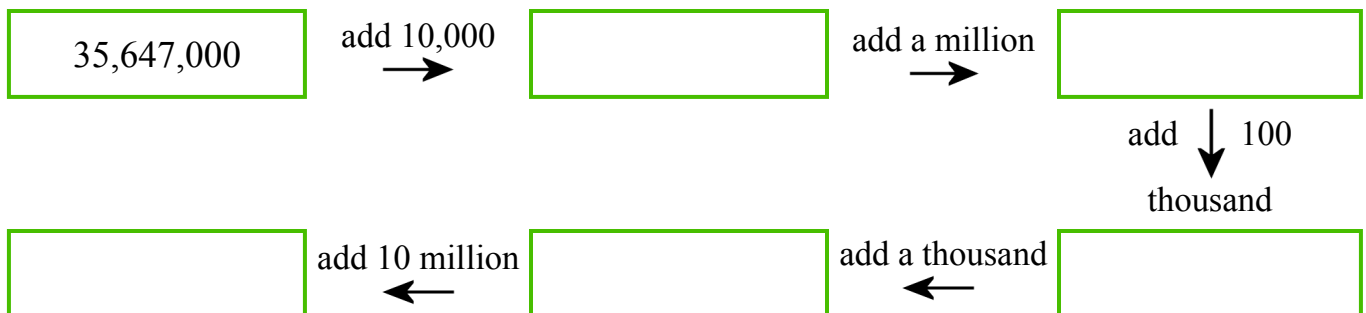
4. Subtract and compare.

<p>a. 1 million – 100 thousand =</p> <p>1 million – 10 thousand =</p> <p>1 million – 1 thousand =</p>	<p>b. 7 million – 500 thousand =</p> <p>7 million – 50 thousand =</p> <p>7 million – 5 thousand =</p>
--	--

5. Continue counting for seven more numbers in each set:

a. 458,000,000 468,000,000 478,000,000	b. 79,650,000 79,800,000 79,950,000	c. 450,996,000 450,997,000 450,998,000
Each difference is _____	Each difference is _____	Each difference is _____

6. Complete the addition path.



7. Solve for x .

a. $x + 400,000 = 4,000,000$ $x =$ _____	b. $x - 350,000 = 2,000,000$ $x =$ _____
c. $200,000 + x + 600,000 = 7,000,000$ $x =$ _____	d. $2x = 3,000,000$ $x =$ _____

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Chapter 3: Problem Solving

Introduction

First in this chapter, students solve some equations, presented as pan balance puzzles. Then we study mixture equations, such as $4x + 38 = 128$, once again using the bar model as a visual model.

The bulk of this chapter is spent on problem solving. We use the bar model a lot. The problems include a fractional part of a whole, a fractional part more, the total is known, one part is more than the other, and so on.

Encourage the student to draw the bar model for the problems, as it is such a helpful tool. Some of the problems here could even be found in regular Algebra 1 textbooks where they would be solved with algebra. However, the bar model enables us to solve them without algebra; yet, it helps the students' algebraic thinking! Essentially, one block in the bar model corresponds to the unknown x in an equation.

The Lessons in Chapter 3

	page	span
Balance Problems and Equations	103	5 pages
More Equations	108	4 pages
Problem Solving with Bar Models 1	112	3 pages
Problem Solving with Bar Models 2	115	2 pages
Problem Solving with Bar Models 3	117	2 pages
Problem Solving with Bar Models 4	119	4 pages
Mixed Review	123	2 pages
Chapter 3 Review	125	3 pages

Helpful Resources on the Internet

Pan Balance - Numbers

Enter a numerical expression in one pan and then in the other. The pans will raise or lower depending on which expression is “heavier” (has a greater value). When the expressions are equivalent, the pans will balance and the full equation will be entered into the *Balanced Equations* table.

This tool strengthens students' understanding of EQUALITY as a relationship, not as an operation. Many students view the equals sign as an operation of “find the answer,” which is incorrect. These students find it difficult to understand equations such as $11 = 4 + 7$ or $3 \times 5 = 17 - 2$.

<https://illuminations.nctm.org/Activity.aspx?id=3530>

Pan Balance - Shapes

This is an interactive balance that builds algebraic thinking. Find the unknown weight of each shape by placing shapes on the two pans, and trying to find situations where the weights are equal. One square always weighs 1 unit.

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

Thinking Blocks

An interactive math tool developed to help students learn how to solve multi-step word problems with the help of bar models. Choose “Find a Fraction of a Number” to practice the topic of the lesson *Problem Solving with Bar Models 1*.

http://www.mathplayground.com/tb_fractions/thinking_blocks_fractions.html

Thinking Blocks

An interactive math tool developed to help students learn how to solve multi-step word problems with the help of bar models. Choose “Compare Quantities” to practice the topic of the lesson *Problem Solving with Bar Models 3*.

http://www.mathplayground.com/tb_multiplication/thinking_blocks_multiplication_division.html

Thinking Blocks

Choose “Find the Total or Part” to practice the topic of the lesson *Problem Solving with Bar Problems 4*.

http://www.mathplayground.com/tb_fractions/thinking_blocks_fractions.html

Algebraic Reasoning

Find the value of an object based on two scales.

http://www.mathplayground.com/algebraic_reasoning.html

Algebra Puzzle

Find the value of each of the three objects presented in the puzzle. The numbers given represent the sum of the objects in each row or column.

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

Calculator Chaos

Most of the keys have fallen off the calculator and you have to make certain numbers using the keys that are left.

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

ArithmeTiles

Use the four operations and numbers on neighboring tiles to make the target numbers. This game uses Shockwave.

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

SpeedMath Deluxe

Create an equation from the four given digits using addition, subtraction, multiplication and division. Make sure that you remember the order of operations. It includes negative numbers sometimes.

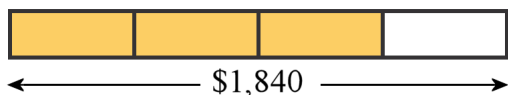
<http://education.jlab.org/smdeluxe/>

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Problem Solving with Bar Models 1

A fractional part of a whole

Problem. Jackie earns \$1,840 monthly and Jessie earns $\frac{3}{4}$ as much. How much does Jessie earn?



Solution. In the model, Jackie's salary is divided into four equal parts (blocks). To find $\frac{3}{4}$ of it, first find $\frac{1}{4}$ of it, which is **one block** in the model.

$$\$1,840 \div 4 = \$460$$

Then multiply that result by three: $3 \times \$460 = \$1,380$.
So, Jessie earns \$1,380.

Solve. Draw a bar model. Write an expression (number sentence) for each calculation you do.

1. A camera that cost \$125 was discounted by $\frac{1}{5}$ of its price. What is the new price?



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

2. A pizza that weighs 680 g is divided into five equal pieces. How much do two pieces weigh?

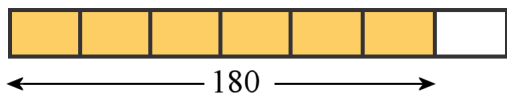
$$\underline{\hspace{2cm}} \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

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

3. A bottle of water costs $\frac{2}{3}$ as much as a bottle of juice that costs \$1.50. How much do *two* bottles of water and *two* bottles of juice cost?

A Fractional Part More

Problem. The school year in country A is 180 days long. In country B it is $\frac{1}{6}$ part longer than that. How long is the school year in country B?



Solution. First, we divide the 180-day school year into 6 parts, to find how much one “block” is in the model:

$180 \div 6 = 30$. So, one block is 30 days.

Then we *add* one-sixth more to the whole bar model, and that is how long the school year is in country B.

$$180 + 30 = 210$$

So, the school year in country B is 210 days long.

Solve. Draw a bar model. Write an expression (number sentence) for each calculation you do.

4. The price of a train ride is \$12. It went up by $\frac{1}{6}$.

What is the new price?

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

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

5. A cafeteria lunch used to cost \$4.50 but the price was increased by $\frac{1}{5}$. What is the price now?

6. A one-way bus ride from Helen’s home to town costs \$1. The bus company will raise the price by $\frac{1}{10}$ in June.

a. How much will a one-way ride cost in June?

b. How much more will a two-way ride (home to town to home) cost Helen in June than in May?

7. A T-shirt cost \$10.50, but now it is discounted by $\frac{2}{5}$ of its price.
Annie buys *ten* shirts with the discounted price. What is the total cost?

8. Duckville has 3,687 inhabitants, which is $\frac{3}{5}$
of the number of inhabitants in Eagleby.
How many people *in total* live in Eagleby and Duckville?

9. A package of 10 small envelopes costs \$2.50,
and a package of 10 large ones costs $\frac{2}{5}$ more.
Find the total cost of buying 50 envelopes of each kind.

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Chapter 4: Decimals

Introduction

In this chapter, students study place value with decimals and learn to perform the four basic operations with decimal numbers.

The chapter starts with a short review of tenths and hundredths, after which we study numbers with three decimal digits (thousandths). Students also compare and round numbers with up to three decimal digits.

The rest of the chapter is spent studying the four basic operations with decimals. We start with addition and subtraction, which are familiar to students from fourth grade, and then spend a considerable amount of time with multiplication and division of decimals.

With all four operations, I emphasize mental calculations because they help students understand the concepts of decimal arithmetic and of place value. For that reason, the text often includes little “tricks” for mental math. Of course, we also study the paper-and-pencil methods such as long multiplication and long division.

Problems accompanied by a small picture of a calculator are meant to be solved with the help of a calculator. Otherwise, a calculator should not be allowed.

We also study using decimal numbers in measuring units, the metric system, and conversions between the customary units of measurement. I have tried to emphasize sensible and intuitive methods for converting measuring units within the metric system, instead of relying on mechanical formulas.

You might wonder why *Math Mammoth Grade 5* presents decimals before fractions. The traditional way is to teach fractions first because fractions are more general, and then, to show that decimals are simply a specific type of fractions with denominators that are powers of ten (for example, 0.45 is simply the fraction $45/100$).

There are several reasons I present decimals before fractions. First, students have studied some about both decimals and fractions in earlier grades, so they should have the necessary background to comprehend that decimals are fractions. Therefore, I see no need to study all fraction arithmetic in 5th grade before decimal arithmetic.

Secondly, I feel that decimal arithmetic is somewhat easier than fraction arithmetic and students already know more about it than they know about all the fraction arithmetic that is studied in 5th grade (in 5-B). Thus, studying decimal arithmetic first may be easier for some students.

The Lessons in Chapter 4

	page	span
Review: Tenths and Hundredths.....	135	3 pages
More Decimals: Thousandths	138	5 pages
Comparing Decimals	143	2 pages
Rounding 2	145	2 pages
Add and Subtract Decimals	147	4 pages
Multiplying Decimals by Whole Numbers	151	4 pages
Multiplying Decimals in Columns	155	2 pages
Multiplying Decimals by Decimals	157	4 pages

More Decimal Multiplication	161	3 pages
Long Multiplication	164	1 page
Dividing Decimals—Mental Math	165	5 pages
Long Division with Decimals	170	4 pages
More Long Division with Decimals	174	3 pages
Multiply and Divide by Powers of Ten	177	5 pages
Divide Decimals by Decimals 1	182	3 pages
Divide Decimals by Decimals 2	185	4 pages
Decimals in Measuring Units and More	189	4 pages
Rounding and Estimating	193	2 pages
The Metric System	195	3 pages
Converting Between Customary Units of Measurement	198	4 pages
Number Rule Puzzles	202	1 page
Problem Solving	203	4 pages
Mixed Review	207	2 pages
Review	209	5 pages

Helpful Resources on the Internet

Decimal Arithmetic - Videos by Maria

These are my videos where I explain all about decimal arithmetic: adding, subtracting, multiplying, dividing, comparing and rounding decimals, plus some problem solving. Suitable for grades 5-6.

<https://www.youtube.com/watch?v=rQCUJxb9p50&list=PLCCFD68119A0DA3E8>

CONCEPT OF DECIMAL

Decimal Demonstrator

An interactive visual model that uses cups to demonstrate decimal numbers up to two decimal digits.

<http://www.ictgames.com/decimalDemonstrator/index.html>

Zoomable Decimal Number Line

Click on this interactive number line to zoom in more and more and explore decimal numbers.

<https://www.mathsisfun.com/numbers/number-line-zoom.html>

Locating Decimals on a Number Line

Create a number. As you move the sliders, notice how the arrow moves around on the number line.

<http://www.mathvillage.info/node/50>

Scales

Move the pointer on the scale to match the decimal number given to you. Refresh the page from your browser to get another problem to solve.

<http://www.interactivestuff.org/sums4fun/scales.html>

Puppy Pull Game: Fractions to Decimals

Help your team win the tug contest by converting fraction words to decimal numbers!

http://www.mathplayground.com/ASB_Puppy_Pull_Decimals.html

Sample worksheet from
www.mathmammoth.com

Decimals and Fractions Matching Game

Click on the cards to match the decimal number to its equivalent fraction or vice versa.

<http://www.turtlediary.com/game/convert-between-decimals-and-fractions.html>

PLACE VALUE

Decimals in Expanded Form

Practice converting decimals between standard form and expanded form in this interactive exercise.

<https://www.khanacademy.org/math/arithmetic/decimals/decimal-place-value/e/writing-and-interpreting-decimals>

Place Value Strategy

Organize the digits given by the spinner to make the largest number possible.

<http://www.decimalsquares.com/dsGames/games/placevalue.html>

Decimal Place Value Card Game

Try to form the highest decimal number using playing cards in this quick and easy card game for 2-4 players.

<http://games4gains.com/blogs/teaching-ideas/41379652-decimal-place-value-with-playing-cards>

Decimal Darts

Practice estimation and decimal numbers while trying to pop balloons with darts. Requires Shockwave.

<http://www.decimalsquares.com/dsGames/games/darts.html>

Decimal Challenge

Guess a secret decimal number between 0 and 10. Each time the computer tells you whether your guess was too high or too low.

<http://www.interactivestuff.org/sums4fun/decchall.html>

Decimal Detective

Identify the decimal numbers digit-by-digit with the help of given hints.

<http://www.turtlediary.com/game/guess-the-decimal-using-clues.html>

COMPARING AND ORDERING

Switch

Put the sequence of decimal numbers in ascending order by switching them around. Refresh the page from your browser to get another problem to solve.

<http://www.interactivestuff.org/sums4fun/switch.html>

Smaller and Smaller Maze

Practice ordering decimal numbers to find your way through the maze.

<http://www.counton.org/magnet/kaleidoscope/smaller/>

Decimals in Space

An Asteroids-style game where you first answer a question about the smallest decimal and then get to shoot asteroids, earning points based on the numbers on them.

<http://www.mathwarehouse.com/games/our-games/decimal-games/decimal-place-value-math-game>

Order Decimals Quiz

Place the decimal numbers in the correct order in this 10-question online quiz.

<https://www.thatquiz.org/tq-6/?-j20-lc-p0>

Compare Decimals Quiz

Practice comparing decimal numbers in this 10-question online quiz.

<https://www.thatquiz.org/tq-B/?-jk-la-p0>

ROUNDING

Round Decimals Using the Number Line

Practice using the number line to round decimals in this interactive online activity.

<https://www.khanacademy.org/math/cc-fifth-grade-math/cc-5th-place-value-decimals-top/cc-5th-rounding-decimals/e/rounding-decimals-using-a-number-line>

Rounding Decimals Game

Learn rounding decimals to the nearest tenths, nearest hundredths, and to the nearest whole number in this game where you need to shoot the “bottle” displaying the correct answer.

<http://www.turtlediary.com/game/rounding-decimals-up-to-thousandths.html>

ADDITION & SUBTRACTION

Sock

Push the green blocks into the holes, and add the numbers on them, to make the target number.

<http://www.interactivestuff.org/sums4fun/sock.html>

Number Conundrum

Can you solve the conundrum? Each number is the sum of the two numbers directly beneath it. Select “Hard” from the settings icon.

http://www.mathplayground.com/number_conundrum/number_conundrum_decimal_numbers.htm

Add and Subtract Decimals Quiz

Practice adding and subtracting decimals with up to three decimal digits in this 10-question online quiz.

<https://www.thatquiz.org/tq-3/?-j123-lk-p0>

Decimal Plus

Practice mental and written methods for adding and subtracting decimal numbers in this online exercise.

<http://www.transum.org/Maths/Activity/Decimals/Add.asp?Level=2>

Decimals Workshop

Practice adding, subtracting, multiplying, or dividing decimals with this customizable interactive exercise.

<http://mrnussbaum.com/decimals-workshop/>

Decimal Squares Blackjack

Play cards with decimals, trying to get as close to 2 as possible without going over. Requires Shockwave.

<http://www.decimalsquares.com/dsGames/games/blackjack.html>

MULTIPLICATION

Exploring Multiplication of Decimals

Enter two numbers with one decimal digit, and you will see the product as a rectangular area.

<http://www.hbschool.com/activity/elab2004/gr6/1.html>

Decimals Workshop

Practice adding, subtracting, multiplying, or dividing decimals with this customizable interactive exercise.

<http://mrnuessbaum.com/decimals-workshop/>

Multiply Decimals by Whole Numbers

Polish your decimal multiplication skills with this interactive online exercise.

<https://www.khanacademy.org/math/cc-fifth-grade-math/cc-5th-arith-operations/cc-5th-mult-decimals/e/multiplying-decimals-without-the-standard-algorithm-2>

Decimal Times - Mental Multiplication

Practice mental and written methods for multiplying and dividing decimal numbers in this interactive online exercise.

<http://www.transum.org/Maths/Activity/Decimals/>

Multiply with Decimals: Simple Word Problems

Practice multiplying decimals by whole numbers with these interactive word problems.

<https://www.studyladder.com/games/activity/multiply-decimals-by-whole-numbers-22247>

DIVISION (AND MULTIPLICATION)

Divide Decimals by Whole Numbers In Your Head

Practice mental division of decimals by whole numbers in this interactive exercise.

<https://www.khanacademy.org/math/cc-fifth-grade-math/cc-5th-arith-operations/cc-5th-dividing-decimals/e/dividing-decimals-without-the-standard-algorithm-3>

Divide Decimals by Decimals in Your Head

Practice mental division of tenths by tenths in this online exercise.

<https://www.khanacademy.org/math/cc-fifth-grade-math/cc-5th-arith-operations/cc-5th-dividing-decimals/e/dividing-decimals-without-the-standard-algorithm-6>

Long Division to Decimal Places

This is a short tutorial about dividing whole numbers to decimal digits. At the bottom of the page you will find a short online quiz.

https://www.mathsisfun.com/long_division3.html

Dividing Decimals

This is a short tutorial about dividing decimals, whether by whole numbers or by decimals. At the bottom of the page you will find a short online quiz.

<https://www.mathsisfun.com/dividing-decimals.html>

Divide and Multiply Decimals Quiz

Practice multiplying and dividing decimals by whole numbers in this 10-question quiz.

<https://www.thatquiz.org/tq-3/?-j12c-15-p0>

Multiply and Divide Decimals Quiz

Use this interactive exercise to polish your decimal multiplication and division skills.

<https://campus.mangahigh.com/en/px/38/0/0>

Long Division - choose “Decimal division”

Enter the numbers that you want to divide and click on the button “Do division” to see a step-by-step illustration of the solution.

<http://www.mathsonline.org/pages/longdiv.html>

Decimal Long Division Worksheets

Use these randomly generated worksheets for extra practice.

http://www.homeschoolmath.net/worksheets/decimal_division.php#long

Multiply and Divide Decimals by Powers of Ten

Practice multiplying and dividing by powers of ten with this multiple-choice quiz.

<http://www.mathgames.com/skill/6.46-multiply-and-divide-decimals-by-powers-of-ten>

UNITS OF MEASUREMENT

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/>

Horrendous Soup Game

Make a recipe for the most disgusting soup you can imagine in this fun game that practices conversion between metric units of measurement.

<http://mrnussbaum.com/soup>

Metric System Conversions Quiz

Practice converting between different units of measurement in the metric system with this 10-question online quiz.

<https://www.thatquiz.org/tq-n/?-j17v-l4-p0>

Matthew Metric Bubble Gum Game

Practice metric and standard units of measurement while filling the customers' bubble gum orders.

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

Word Problems Involving Measurement Conversions

Solve word problems that involve converting between metric measures of distance, volume, and mass, as well as measures of time.

<https://www.khanacademy.org/math/on-sixth-grade-math/on-measurement/on-unit-conversion/e/converting-measurements-word-problems>

Common Conversion Factors Practice

Practice memorizing the common conversion factors in this interactive exercise.

<http://www.sporcle.com/games/12121/measurement-conversion>

Convert Mixed Customary Units

Practice converting customary units of measurement in this interactive online exercise.

<http://www.mathgames.com/skill/5.10-convert-mixed-customary-units>

Convert Customary Units

Fill in the tables to convert between US customary measures of distance, volume, and mass.

<https://www.khanacademy.org/math/cc-fifth-grade-math/cc-5th-measurement-topic/cc-5th-unit-conversion/e/converting-units--us-customary->

Customary Unit Conversion Printable Worksheets

Use these randomly generated worksheets for extra practice. Refresh the page (F5) to get a different worksheet.

<http://www.homeschoolmath.net/worksheets/measuring-customary.php#grade5>

Converting Units - Word Problems

Solve word problems that involve converting between US customary measures of distance, volume, and mass in this interactive exercise from Khan Academy.

<https://www.khanacademy.org/math/cc-fifth-grade-math/cc-5th-measurement-topic/cc-5th-unit-word-problems/e/converting-units-word-problems--us-customary->

PROBLEM SOLVING

Burnside's Billions Game

Mr. Burnside is leaving you his fortune, but under one condition... You need to buy up his 27 favorite world landmarks in the next 40 days! This game involves foreign currency, exchange rates, and large-scale calculations involving decimals.

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

FOR REVIEW

Decimals Challenge Board

Click on the the numbers on the "Challenge Board" to get questions and earn points by answering them correctly.

<https://www.quia.com/cb/95593.html>

Decimal and Whole Number Jeopardy

Review place value, comparing, and rounding decimals. Also, practice number patterns.

<http://www.quia.com/cb/8142.html>

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Long Division with Decimals

<p>It is very easy to use long division to divide a decimal by a whole number.</p> <p>During the division process, divide normally, as if there were no decimal point. Then, simply put the decimal point in the quotient in the same place as it is in the dividend.</p> <p>Study the example on the right. Finish the check by multiplication yourself and verify you get the dividend, 41.51.</p>	$ \begin{array}{r} 05.93 \\ 7 \overline{)41.51} \\ \underline{-35} \\ 65 \\ \underline{-63} \\ 21 \\ \underline{-21} \\ 0 \end{array} $	<p>Check:</p> $ \begin{array}{r} 5.93 \\ \times 7 \\ \hline 41.51 \end{array} $
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1. Divide. Check each division result with multiplication.

<p style="text-align: right;">Check:</p> <p>a. $5 \overline{)5.30}$</p>	<p style="text-align: right;">Check:</p> <p>b. $3 \overline{)0.72}$</p>
<p style="text-align: right;">Check:</p> <p>c. $7 \overline{)6.23}$</p>	<p style="text-align: right;">Check:</p> <p>d. $6 \overline{)2.388}$</p>

2. Divide. Check each division result with multiplication.

<p style="text-align: right; margin-right: 50px;">Check:</p> <p>a. $19 \overline{) 23.94}$</p>	<p style="text-align: right; margin-right: 50px;">Check:</p> <p>b. $23 \overline{) 57.638}$</p>
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3. a. Fill in the explanation and find the price of one roll.

Twenty-four wheat rolls and one loaf of rye bread cost \$10.70.
If the bread costs \$2.30, find the cost of one roll.

First subtract \$_____ from \$_____.

Then _____ that result by _____.

One roll costs \$_____.

b. Write a *single* expression to match the explanation above.

4. Seven muffins and one drink cost \$7.11. If the drink costs \$1.23, find the cost of one muffin.

You know that when dividing whole numbers with long division, there can be a remainder. For example, $24 \div 5 = 4 \text{ R}4$. But, we can continue such divisions into decimal digits, and sometimes the quotient comes out even! To do that, add decimal zeros to the dividend.

Example 1. Let's write 24 as 24.0 and use long division to do $24.0 \div 5$. It is actually an even division now with a quotient of 4.8. Study the calculations on the right.

$$\begin{array}{r} 04.8 \\ 5 \overline{)24.0} \\ \underline{20} \\ 40 \\ \underline{40} \\ 0 \end{array}$$

Check:

$$\begin{array}{r} 4 \\ 4.8 \\ \times 5 \\ \hline 24.0 \end{array}$$

5. Divide in two ways: first by indicating a remainder, then by long division. Check by multiplying.

a. $31 \div 4 = \underline{\quad} \text{ R } \underline{\quad}$

$$4 \overline{)31.00}$$

Check:

b. $56 \div 5 = \underline{\quad} \text{ R } \underline{\quad}$

$$5 \overline{)56.0}$$

Check:

c. $15 \div 8 = \underline{\quad} \text{ R } \underline{\quad}$

$$8 \overline{)15.000}$$

Check:

d. $45 \div 20 = \underline{\quad} \text{ R } \underline{\quad}$

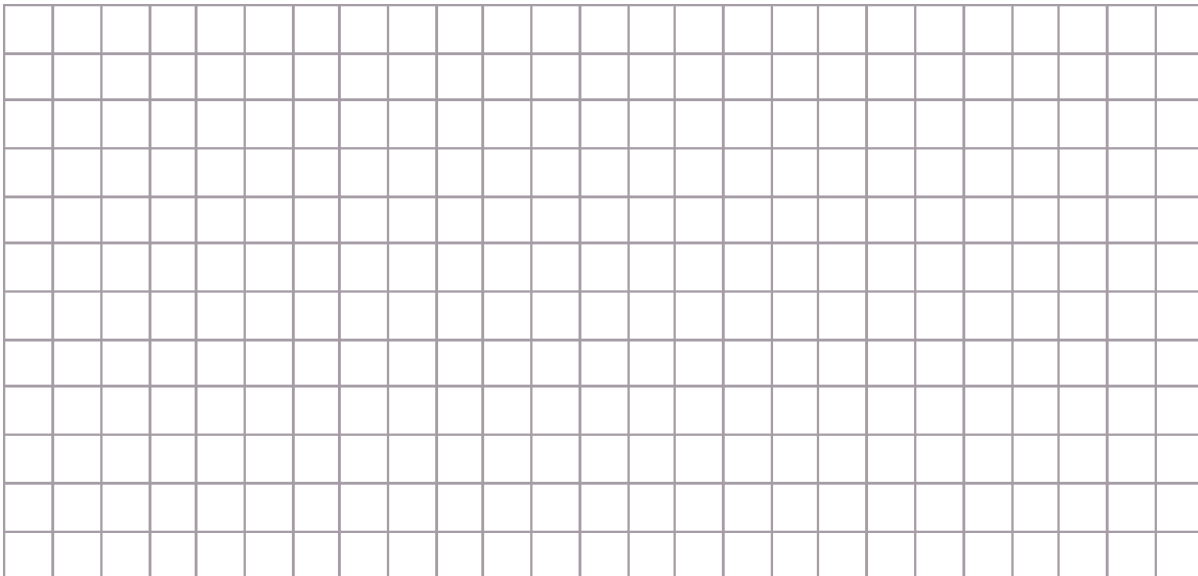
$$20 \overline{)45.00}$$

Check:

<p>Sometimes a decimal division is not even. In that case, stop the division at some point, and give the answer as a rounded number.</p> <p>Round to the digit just before the last digit you found for the quotient. That way, the last digit will tell you whether to round up or down.</p>	$\begin{array}{r} 12.666 \\ 3 \overline{) 38.000} \\ \underline{- 6} \\ 20 \\ \underline{- 18} \\ 20 \\ \underline{- 18} \\ 20 \\ \underline{- 18} \\ 2 \end{array}$
<p>Example 2. Three girls shared evenly the cost of a \$38 meal. How much did each girl pay?</p> <p>We calculate the answer to <u>three</u> decimal digits so that we can round it to <u>two</u> decimal digits: $\\$12.666 \approx \\12.67.</p> <p>But, if each girl pays \$12.67, they would pay 1 cent too much. So in reality, two girls would pay \$12.67 and one girl \$12.66.</p>	

Use the grid below and your notebook for calculations.

- The PE teacher divided a 2-mile track into seven equal parts. How long are the parts? Give your answer to two decimal digits, in miles.
Remember to write 2 as 2.000 before you divide.
- A recipe calls for 1.5 kg of beef and it makes six servings. How much beef is in one serving?
- Mary checked the prices of four different hot sauces: \$2.55, \$2.69, \$2.95, and \$2.75. Calculate the average price.
- Now you will need both division and multiplication.
 - Find $\frac{3}{4}$ of 0.130 kg.
 - Find $\frac{3}{5}$ of 23 seconds.



More Long Division with Decimals

Fractions and division

Remember? **The fraction line is also a division symbol.** So $\frac{1}{8}$ can mean both one-eighth (a fraction) and a division problem $1 \div 8$. This gives us a means of writing fractions as decimals!

Example 1. Write $\frac{8}{9}$ as a decimal, to three decimal digits.

We simply divide 8 by 9, but writing 8 as 8.0000—with lots of decimal zeros. Look at the division on the right. We need to find *four* decimal digits for the quotient before we can round it to *three* decimal digits:

$$\frac{8}{9} = 8 \div 9 \approx 0.889.$$

$$\begin{array}{r} 0.8888 \\ 9 \overline{)8.0000} \\ \underline{72} \\ 80 \\ \underline{-72} \\ 80 \\ \underline{-72} \\ 80 \\ \underline{-72} \\ 8 \end{array}$$

1. Write the fractions as decimals, to three decimal digits.

a. $\frac{5}{8} =$

)									

b. $\frac{6}{7} =$

)									

c. $\frac{1}{6} =$

)									

d. $\frac{7}{20} =$

)									

2. Calculate. You will need to add decimal zeros to the dividend.

a. $250 \div 6$ to two decimal digits

)									

b. $37.5 \div 11$ to three decimal digits

)									

3. a. Fill in the explanation as to how to solve the problem.

Three packs of transistors and seven packs of capacitors cost a total of \$8.70. One capacitor pack costs \$0.60. Find the cost of one transistor pack.

First _____ the cost of seven capacitor packs from _____. Then divide that result by _____.

b. Write a *single* expression to match the explanation above.

c. Solve the problem.

4. Three friends shared equally the cost of a taxi fare, \$35.40, and the cost of a meal, \$128.95. How much did each person pay?

5. Write a word problem that matches each calculation below. *You don't have to calculate anything.*

a. $(\$50 - \$26) \div 3 = \$8$

b. $25 \times \$1.40 \div 2 = \17.50