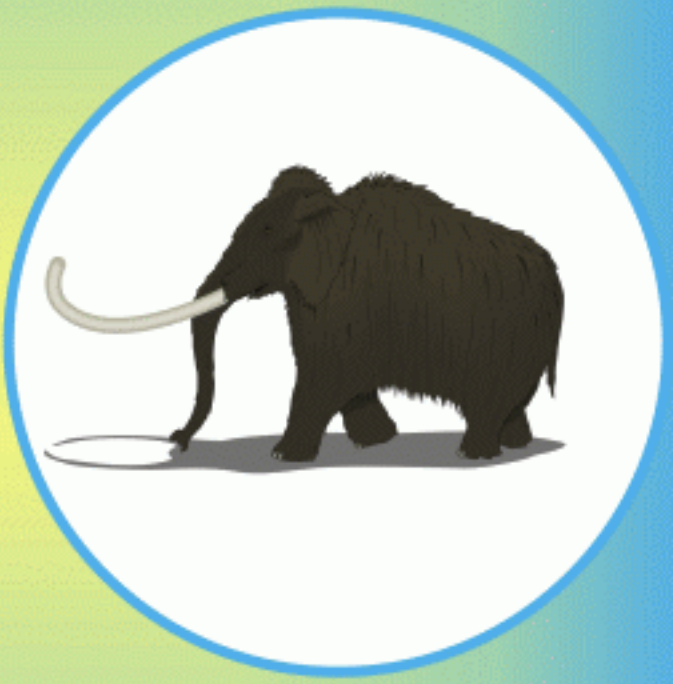
MATH MAMMOTH

Grade 3-A

Complete Worktext

- Addition and subtraction strategies
- Multiplication concept
- Multiplication tables
- Clock
- Money



By Maria Miller

www.MathMammoth.com

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Foreword

Math Mammoth Grade 3-A and Grade 3-B worktexts comprise a complete math curriculum for the third grade mathematics studies.

Third grade is a time for learning and mastering two (mostly new) operations: multiplication and division with single-digit numbers. The student also deepens his understanding of addition and subtraction, and uses those in many different contexts, such as with money, time, and measuring.

The first chapter in this book deals with addition and subtraction strategies. The student does a lot of mental math, learns addition and subtraction terminology, touches on algebraic problems in the lesson about addition/subtraction connection, practices borrowing, and more.

Then we tackle the multiplication concept in chapter 2. After that come multiplication tables in chapter 3, so multiplication does take a big part of book A. Then comes a chapter about reading the clock time (chapter 4) and a chapter about money (chapter 5).

In part B, we study place value with thousands (chapter 6), then measuring and geometry (chapters 7 and 8), followed by division in chapter 9. In chapter 10, we study a little about multiplying bigger numbers, and finally in chapter 11, it is time for some introductory fraction and decimal topics.

When you use these books as your only or main mathematics curriculum, they can be like a “framework”, but you do have some liberty in organizing the study schedule. Chapter 1 should be studied before chapter 8 (place value). Multiplication chapters need to be studied before the division chapter, and all of those need to be studied before the chapter about all four operations (chapter 10). You can go through the chapters about clock, money, geometry, measuring, and fractions/decimals in some other order, if you desire.

This curriculum aims to concentrate on a few major topics at a time and study them in depth. It is for this reason that you will not see some topics that might be present in other third grade books, such as long division, or the standard way of multiplying vertically. I wanted the student to get a very good foundation in basic multiplication and basic division by single-digit numbers. I did not want to hurry through measuring topics, yet I didn't want to make a 500-600 page book either. There is plenty of time in grades 4, 5, and 6 to master division and multiplication with bigger numbers.

This is totally opposite to the continually spiraling step-by-step curricula in which each lesson typically is about a different topic from the previous or next lesson, and includes a lot of review problems from past topics. This does not mean that your child wouldn't need occasional review. However, when each major topic is presented in its own chapter, this gives you more freedom to plan the course of study *and* choose the review times yourself. In fact, I totally encourage you to plan your mathematics school year as a set of certain topics, instead of a certain book or certain pages from a book.

For review, I have included an html page called Make_extra_worksheets_grade3.htm that you can use to make additional worksheets for computation or for number charts. You can also always simply reprint some already studied pages.

I wish you success in your math teaching!

Maria Miller, the author

Chapter 1: Addition and Subtraction
Introduction

This first chapter of *Math Mammoth Grade 3-A Complete Worktext* covers various addition and subtraction topics, ordinal numbers, and Roman numerals.

This chapter includes a lot of mental adding and subtracting. Some of it is review from second grade, but some lessons probably contain ideas and strategies that will be new to the student. Adding or subtracting in parts is a strategy that is emphasized a lot. With subtraction, the strategy of "adding up" is taught again. Children also get to notice how the sum or difference changes when the numbers in the problems change and how that can be used to solve problems mentally.

The connection between addition and subtraction should already be a familiar topic, but the lesson *Addition/Subtraction Connection* practices the conversions with bigger numbers. This lesson also aims to help children think algebraically.

We also practice subtracting in columns, borrowing from both hundreds and tens, and borrowing "over zeros." The lessons illustrate this last process with the help of pictures that relate to the hundreds, tens, and ones place values. The idea stressed is that a "borrowed" unit gets broken down into 10 smaller units, a hundred into 10 tens or a ten into 10 ones, and that is what lets you subtract. Make sure the student masters this topic. You can make more practice sheets using the "Make More Worksheets" file on the accompanying CD.

This chapter also introduces parentheses and order of operations. Students get to practice their adding and subtracting skills in a practical way through reading a mileage chart and other types of graphs

The Lessons in Chapter 1

	page	span
Addition Review	9	*3 pages*
Addition Terminology and Practice	12	*4 pages*
Ordinal Numbers and Roman Numerals	16	*3 pages*
Add in Columns	19	*2 pages*
Subtraction Review	21	*3 pages*
Subtraction Strategies and Terminology	24	*4 pages*
Subtracting in Columns	28	*4 pages*
Addition/Subtraction Connection	32	*3 pages*
Borrowing Over Zero Tens	35	*3 pages*
Mileage Chart	38	*1 pages*
Order of Operations	39	*2 pages*
Graphs	41	*2 pages*
Review	43	*2 pages*

Helpful Resources on the Internet

Use these free online resources to supplement the "bookwork" as you see fit.

Number Puzzles
Place the numbers to the puzzle so that each side adds up to a given sum. Practices mental addition and logical thinking.
http://nlvm.usu.edu/en/nav/frames_asid_157_g_2_t_1.html

Speedy Sums
Click on numbers that add to the target sum. The more numbers you use, the more you score.
http://www.mathplayground.com/speedy_sums.html

Thinking Blocks
Thinking Blocks is an interactive math tool that lets students build diagrams similar to the bar diagrams used in this chapter. Choose the Addition and Subtraction section.
http://www.mathplayground.com/thinkingblocks.html

Callum's Addition Pyramid
Add the pairs of numbers to get a number on the next level and finally the top number.
Three difficulty levels.
http://www.amblesideprimary.com/ambleweb/mentalmaths/pyramid.html

MathBlox
Click on two falling blocks that add up to the given number and they disappear. Try some of the harder levels, such as addition to 50.
http://www.iknowthat.com/com/L3?Area=Mathblox

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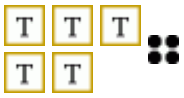
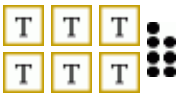
Subtraction Review

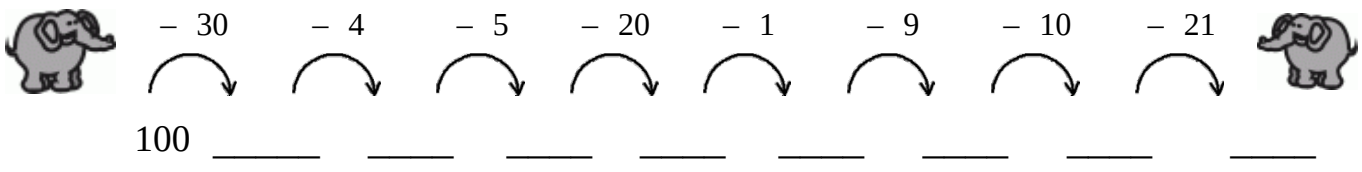
1. Let's review some easy subtraction problems!

a.	b.	c.	d.
10 − 7 = _____	70 − 5 = _____	50 − 2 = _____	12 − 2 − 5 = _____
10 − 4 = _____	70 − 2 − 2 = _____	50 − 5 − 2 = _____	25 − 5 − 8 = _____
20 − 4 = _____	70 − 8 = _____	50 − 7 = _____	73 − 3 − 5 = _____
e.	**f.**	**g.**	**h.**
70 − _____= 63	46 − 6 − 6 = _____	90 − 8 = _____	14 − ____ − 5 = 5
40 − _____ = 35	89 − 9 − 9 = _____	100 − 8 = _____	18 − ____ − 4 = 9
100 − _____ = 91	77 − 7 − 7 = _____	110 − 8 = _____	15 − ____ − 6 = 7

2. Subtract whole tens. The box with a "T" is a ten.

a.	b.	c.	d.
		84 − 40 = _____	_____ − 10 = 57
54 − 10 = _____	67 − 20 = _____	35 − 20 = _____	_____ − 10 = 83
54 − 30 = _____	67 − 50 = _____	51 − 30 = _____	_____ − 20 = 17
54 − 20 = _____	67 − 60 = _____	62 − 30 = _____	_____ − 40 = 43
		87 − 50 = _____	_____ − 60 = 3

3. Test yourself!



4. **Subtraction is used:**		
a. to find what's left Debbie had $45, and she spent $10. How much does she have left? $45 − $10 = _____. She has _____ left.	**b.** to find a difference A certain lawnmower costs $340 in one store and $360 in another. How much *more* does it cost in the second store? $360 − $340 = _____ It costs $_____ more.	**c.** to find a part of the whole In a package of 100 buttons, 50 of them are white, 25 are blue, and the rest are red. How many are red? 100 − 50 − 25 = _____ _____ buttons are red.

5. Fill in the missing numbers.

a. Ben has saved 22 dollars. He still needs $_____ to buy a bicycle that costs $30.	**b.** Jill earned $5 for raking the yard and another $5 for weeding. She had already saved $20, so now she has $_____.
c. Mom bought 28 bushes and planted eight of them. She still needs to plant _____ bushes.	**d.** The Smiths drank seven bottles of water. The Burns drank _____. All together they consumed 21 bottles.
e. Ann bought 18 candles and Jill bought 5. Ann has _____ more candles than Jill, and together they have _____ candles.	**f.** Dad ate 12 cookies, Mom ate five, little sister ate two, and there are still nine left. So originally the family had _____ cookies.
g. Meredith had $20, and she bought a gift for $_____. Now she has $13 left.	**h.** A box has 35 thumbtacks, and another has 42. The latter box has _____ more.

6. Subtract part-by-part: first to the previous whole ten, and then the rest.

a. 64 − 7 64 − 4 − 3 = _____	**b.** 72 − 8	**c.** 54 − 8	**d.** 45 − 9
e. 75 − 7 75 − 5 − 2 = _____	**f.** 27 − 9	**g.** 43 − 5	**h.** 51 − 5

7. Basic subtraction facts might need practice! Point to the problems, think of the answer, and drill them.

a.	b.	c.	d.	e.
12 − 5	13 − 8	14 − 5	15 − 6	16 − 7
12 − 7	13 − 4	14 − 7	15 − 8	16 − 9
12 − 8	13 − 5	14 − 9	15 − 9	16 − 8
12 − 6	13 − 6	14 − 6	15 − 7	
12 − 4	13 − 9	14 − 8		f.
12 − 9	13 − 7			17 − 8
12 − 3				17 − 9

8. Subtract and compare the results! What pattern do you notice?

a. 14 − 7 = _____	**b.** 12 − 8 = _____	**c.** 16 − 7 = _____	**d.** 15 − 7 = _____
34 − 7 = _____	42 − 8 = _____	56 − 7 = _____	75 − 7 = _____
64 − 7 = _____	82 − 8 = _____	156 − 7 = _____	105 − 7 = _____

9. Subtract in parts: Break the second number into tens and ones.

a.	b.	c.
89 – 26 89 – 20 – 6 69 – 6 = _____	56 – 35 56 – ___ – ___ _____ – ___ = _____	75 – 51 75 – ___ – ___ _____ – ___ = _____
d.	**e.**	**f.**
69 – 19 69 – ___ – ___ _____ – ___ = _____	67 – 36 =	64 – 33 =
g. 97 – 64 =	**h.** 55 – 34 =	**i.** 56 – 23 =

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Chapter 2: Multiplication Concept
Introduction

The second chapter of *Math Mammoth Grade 3-A Complete Worktext* covers the concept of multiplication. (However, memorizing and drilling "times tables" is postponed until chapter 3.)

The first lessons introduce the concept of multiplication as repeated addition of groups of the same size. Then the lesson *Multiplication as an Array* shows a different model for multiplication: objects arranged in rows and columns. This lesson teaches the student to think of the rows as groups, showing the fundamental unity of the two models. The whole lesson is presented in pictures.

Multiplication on a Number Line illustrates repeated addition as consecutive jumps or skips on a number line. The student learns to connect skip-counting with multiplication.

Multiplication in Two Ways concentrates on the fact that it does not matter in which order the factors appear (the *commutative property* of multiplication). Objects in an array illustrate this fact nicely: either the row or the column can be taken as the group being multiplied. This lesson also deals with jumping on the number line.

Multiplying By Zero is illustrated both with the group model (either several groups of zero size or zero groups of any size) and with the jump-on-a-number-line model (either several jumps of zero distance or zero jumps of any distance).

Understanding Word Problems shows how problems, including multiplication, have the idea of "each," "every," or "all." For example: *each* item does or has the same number of something. If students find these problems difficult, they can draw pictures to help, such as drawing flowers in pots, slices of pizza, *etc*.

The lesson *Order of Operations* teaches that multiplication is to be done before addition or subtraction and that addition and subtraction are to be done from left to right.

Understanding Word Problems, Part 2 gives more challenging problems. The word problems in traditional school texts are often so easy that students learn just to take the numbers in the problem and mechanically apply the operation that the lesson is about without really understanding what they're doing. If this lesson is too difficult, skip it for the time being and come back to it later. You can help your student to draw a picture for each problem.

The Lessons in Chapter 2

	page	span
Many Times the Same Group	47	*1 page*
Multiplication and Addition	48	*3 pages*
Multiplication as an Array	51	*2 pages*
Multiplication on a Number Line	53	*3 pages*
Multiplication in Two Ways	56	*4 pages*

Multiplication by Zero	60	*2 pages*
Word Problems	62	*2 pages*
Order of Operations	64	*2 pages*
Understanding Word Problems	66	*3 pages*
Practice with Parts	69	*3 pages*
Review	72	*1 pages*

Helpful Resources on the Internet

Use these free online resources to supplement the "bookwork" as you see fit.

Math Dice Game for Addition and Multiplication
Instructions for three simple games with dice: one to learn the concept of multiplication, another to practice the times tables, and one more for addition facts.
http://www.teachingwithtlc.blogspot.com/2007/09/math-dice-games-for-addition-and.html

Explore the Multiplication Table
This applet visualizes multiplication as a rectangle.
http://www.mathcats.com/explore/multiplicationtable.html

Multiplication Number Lines
First choose a tile from the 10×10 grid to pose a problem, then you will see it illustrated on a number line.
http://www.ictgames.com/multinumberlines.html

Multiplication Memory Game
Click on corresponding pairs (the problem and its answer).
http://www.dositey.com/2008/addsub/memorymult.html

Multiplication Mystery
Drag the answer tiles to right places in the grid as they are given, and a picture is revealed
http://www.harcourtschool.com/activity/mult/mult.html

Multiplication.com Interactive Games
A bunch of online games just for the times tables.
http://www.multiplication.com/interactive_games.htm

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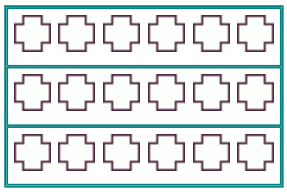
Multiplication as an Array

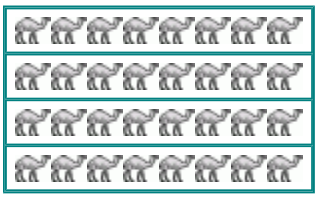
An **array** is an orderly arrangement of things in rows and columns. When things are aligned in an array, we can treat the *rows like groups*, so an array still pictures multiplication as repeated addition.



3 rows, 6 crosses in each row.

$6 + 6 + 6 =$

$3 \times 6 = 18$

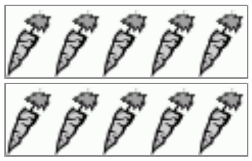


4 rows, 8 camels in each row.

$8 + 8 + 8 + 8 =$

$4 \times 8 = 32$

1. Fill in the missing numbers.



5

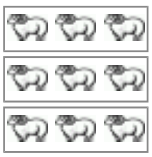
\+ 5

10

a. ____ rows, ____ carrots in each row.

_____+ _____ carrots

_____ × _____ carrots = _____



b. ____ rows, ____ rams in each row.

_____ + _____ + _____ rams

_____ ×_____ rams = _____

c. ____ rows, ____ bear in each row.

_____+ _____ bears

_____ × _____ bears = _____

d. ____ rows, ____ lightbulbs in each row.

_____+ _____+ _____ bulbs

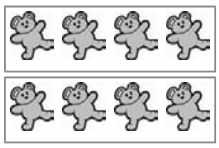
_____ × _____ lightbulbs = _____

2. Write the addition and multiplication facts that the pictures are illustrating.
The box with a "T" is a ten.

a.

$4 + 4 =$

$2 \times 4 =$ _____

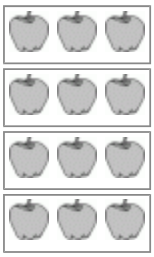


b.

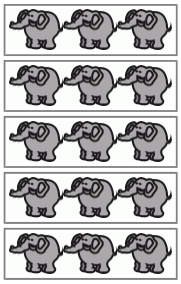
c.

d.

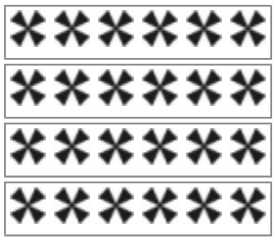
e.



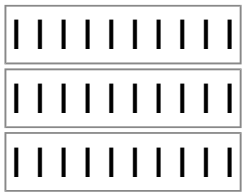
f.



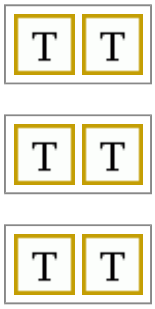
g.



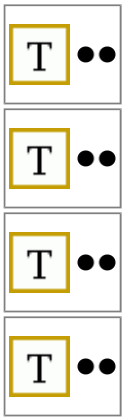
h.



i.



j.



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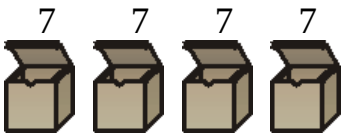
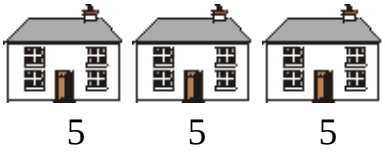
Word Problems



There are seven rocks in each box.
That is a total of $4 \times 7 = 28$ rocks.



Each house has five people living in it.
That is a total of $3 \times 5 = 15$ people.

The SAME amount of something IN EACH thing is solved with multiplication.

1. Write a multiplication sentence for each problem and solve it. You can draw pictures to help.

a. Four children are playing tennis together.
They each brought six balls.
How many tennis balls do they have all together?

b. There are five people in the Smith family. Each person keeps a hand towel and a bath towel in the bathroom.
How many towels are there hanging in their bathroom?

c. The Jones family ordered four pizzas.
Each pizza was sliced into four pieces.
How many slices of pizza were there?

d. A certain town has three post offices. Each post office has five workers. How many postal workers do the post offices have all together?

e. Mrs. Anderson has four flower pots, and in each pot there are five flowers.
How many flowers does she have?

f. An egg carton holds six eggs. A bottle of juice has two liters of juice in it. Mommy bought three cartons of eggs, and three bottles of juice.
How many eggs did she get?
How many liters of juice did she buy?

g. Mary has a jar of marbles, a jar of pretty stones, and a jar of pine cones. Each jar has 20 items in it. What is the total number of items that Mary has?

h. Twelve children each wore a pair of socks. What was the total number of socks worn?

How many toes do these children have all together?

i. Angela needs to memorize Spanish words. The five word boxes on the page all have six words in them. In each box, two of the words are in bold. How many words does she need to learn?

How many words are in bold?

j. Jerry bought two tangerines, five boxes of oats, and seven bananas. Each box of oats weighs 2 pounds.

What is the total number of pieces of fruit that he bought?

What was the total weight of the boxes of oats?

2. Multiply.

a. $4 \times 5 =$ ___ $0 \times 4 =$ ___ $10 \times 3 =$ ___	**b.** $10 \times 0 =$ ___ $6 \times 3 =$ ___ $1 \times 78 =$ ___
c. $25 \times 1 =$ ___ $2 \times 4 =$ ___ $2 \times 7 =$ ___	**d.** $0 \times 49 =$ ___ $10 \times 1 =$ ___ $2 \times 6 =$ ___

3. Fill in the multiplication table:

×	0	1	2	3	4	5
0						
1						
2						
3						
4						
5						

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Chapter 3: Multiplication Tables
Introduction

In the third chapter we concentrate on memorizing the times tables.

How to Do Effective Oral Drilling

When you are doing memorization drills, be sure to explain to the student that the goal is to *memorize* the facts—to recall them from memory—and not to get the answers by counting or any other method. Just like your child has probably already memorized your address and phone number, now she or he is going to memorize some math facts. You can easily see if the student is trying to count because producing the answer by counting takes much more time. You should expect the child to answer immediately when you are drilling. If he or she doesn't know the answer by heart (from memory), then tell him or her the right answer.

Short drill sessions are usually best. For example, you might drill for five or ten minutes at a time, depending on the attention span of the child.

However, try to have at least two sessions during the day as your schedule permits. Research on how the brain learns has shown that new memories are forgotten soon and that new information is best retained when it is reviewed *within 4-6 hours* of the time it is initially learned. (By the way, this principle applies to *anything* new a person is learning.)

Pencil and paper activities that the student completes alone don't work really well for memorizing facts because the child can get the answers by counting and not from memory. Proper drill requires an investment in time from the instructor. If you can, utilize older siblings, too, in the task of drilling. Moreover, computers are great drillmasters since they never get tired or bored and since you can usually choose a timed session in which the child must produce the answers quickly. Computer-based drilling can be very rewarding to children when they notice that they are truly learning the facts and are able to complete the drills successfully. They can actually come to enjoy the process of memorization. I've included a list of free online multiplication activities at the end of this introduction.

Here's a five-step method for memorization. Normally only a few of the steps would be included in any one session, depending on the child's concentration and ability.

Memorizing the table of 3 — in steps

Have the table to be learned already written on paper. Here we will use the table of three as an example. You can view a short video explaining the main points of the drill here: **http://www.youtube.com/watch?v=sZlBtMPrMyk**

1 x 3 = 3
2 x 3 = 6
3 x 3 = 9
4 x 3 = 12
5 x 3 = 15
6 x 3 = 18
7 x 3 = 21
8 x 3 = 24
9 x 3 = 27
10 x 3 = 30
11 x 3 = 33
12 x 3 = 36

1. The first task is to memorize the list of answers. Have your child study the first half of the skip-counting list (3, 6, 9, 12, 15, 18), saying the numbers aloud while pointing to the answers one by one with a finger or a pen. You may also use a number line. This technique uses the senses of seeing, hearing, and touch simultaneously to fix the information in the brain. After he has gone through the list a few times, ask him to repeat it from memory.

   Expect your child to answer, and don't give her the answers too easily, because ONLY by putting forth an effort will she memorize the facts. Just like the muscles, the mind needs exercise to become stronger.

   Require her to memorize the skip-counting list both forwards and backwards. Keep practicing until she can "rattle off" the first list of 3, 6, 9, 12, 15, 18. With some tables, like the tables of 2, 5, and 10, it helps to point out the pattern in them. The pattern in table of 9 is more subtle but still useful.

2. Tackle the last half of the list: 21, 24, 27, 30, 33, 36. Do the same things you did with the first half of the list.

3. Next, work with the whole list of answers. Practice the list going up *and* down until it goes smoothly and easily. These steps may be enough for one day. But *be sure to review* again later in the day.

4. Next, practice individual problems randomly. You can ask orally ("What is 5 times 3?"), point to the problems on the paper, or use flashcards. However, I would recommend reading the question aloud while simultaneously pointing to the problem or showing the flashcard because, again, using multiple senses helps to fix the information in the mind better.

   The goal at this stage is to associate each answer 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, with a certain multiplication fact (such as 7 x 3).

   You can also mix earlier tables that she already knows with these new problems, and drill both with flashcards.

5. The last step is to do this the other way around. Now *you* say the answer ("21"), and the student has to produce the problem ("3 × 7"). Keep the table handy, hide the problems, and point to the answers in random order. This technique can also work the other way around, where the student says the answers, and you produce the problems. Give wrong answers sometimes, too, to check her out.

   As an extension, you can say answers from several tables that you've studied, and the student gives the corresponding problem. Sometimes there are several answers. For example, 36, 30, 24, and 20 are in several different times tables. This is an especially good exercise as it prepares for the concepts of division and factoring.

The memorization probably won't happen overnight. On subsequent days, you can mix drills 1-5 (hopefully you won't need to concentrate on steps 1 and 2). This kind of drilling takes a little time and effort from the teacher, but it can be very effective. Homeschoolers can obviously do some of it while going about other tasks, while traveling in the car, *etc*.

While you are doing this table by table, you can also try to teach the process to your child, so that she will learn how to do the memorization herself. She can hide the answers and try to reproduce the list in her mind.

Other helpful ideas

- Hang a **poster** with the 12×12 or 10×10 table on the wall. Remind your child to glance at it a few times a day. It can work wonders for visual learners!
- Hang beside it another poster, with an empty grid, in which the child fills in those facts he has mastered.
- Recite the skip-counting lists or multiplication facts aloud just before going to bed. This can turn them into mastered facts by the next morning.

Are timed drills necessary?

I feel that timed drills are a tool among many, when it comes to learning math facts. Some kids will "thrive" on them; in other words learn quickly when they are used. Perhaps they like racing against the clock or like the challenge. There exist timed computer games that can work very well for drilling facts.

For example, Math Magician games has a simple 1-minute countdown, and if you answer 20 questions in that time, you get an award.
http://www.oswego.org/ocsd-web/games/Mathmagician/cathymath.html

Some of the games at the link below don't time you but give you more points the faster you go. That site is actually filled with several types of games just for math facts practice.
http://www.sheppardsoftware.com/math.htm

Yet for other kids timed drills may be counterproductive and end up in tears and frustration. The proof is in the pudding: just try it and see how it goes.

The Lessons in Chapter 3

	page	span
Multiplication Table of 2	77	*2 pages*
Multiplication Table of 4	79	*2 pages*
Multiplication Table of 10	81	*3 pages*
Multiplication Table of 5	84	*3 pages*
More Practice and Review (Tables of 2, 4, 5, and 10)	87	*3 pages*
Multiplication Table of 3	90	*3 pages*
Multiplication Table of 6	93	*2 pages*
Multiplication Table of 11	95	*3 pages*
Multiplication Table of 9	98	*4 pages*
Multiplication Table of 7	102	*2 pages*
Multiplication Table of 8	104	*3 pages*
Multiplication Table of 12	107	*3 pages*
Review	110	*3 pages*

Helpful Resources on the Internet

You can use these free online resources to supplement the "bookwork" as you see fit. As you can see, there are many resources available for drilling and practicing the tables online.

Multiplication Grid
Drag the scrambled answer tiles into the right places in the grid as fast as you can!
http://www.mathcats.com/microworlds/multiplication_grid.html

Multiplication.com Interactive Games
A bunch of online games just for the times tables.
http://www.multiplication.com/interactive_games.htm

The Times Tables at Resourceroom.net
Fill in the multiplication chart—part of it or the whole thing—or take quizzes and get graded.
http://www.resourceroom.net/Math/1timestables.asp

Math Trainer - Multiplication
Multiplication table training online that responds to your answers and will train your weaknesses.
http://www.mathsisfun.com/games/math-trainer-multiply.html

Table Mountain
Climb the mountain with 20 questions from a selected table.
http://www.teachingtables.co.uk/tm/tmgame/tgame2.html

Multiplication Table Challenge
100 questions, timed.
http://www.programmingart.com/free/games/multiply/

Multiplication Mystery
Drag the answer tiles to right places in the grid as they are given, and a picture is revealed
http://www.harcourtschool.com/activity/mult/mult.html

Mr. Taylor's Multiplication Facts Drill
Simple practice (click on the right answer) for the easy ones, the hard ones, the monsters, or all of them.
http://www.geocities.com/multiplicationfacts

Multiplication Memory Game
Click on corresponding pairs (problem-answer).
http://www.dositey.com/2008/addsub/memorymult.html

Quiz Hub - Multiplication game
Click on corresponding pairs (problem-answer).
http://quizhub.com/quiz/f-multiplication.cfm

Times tables from BBC Skillswise
Has printable factsheets, online quizzes, two grid games, and five printable worksheets.
http://www.bbc.co.uk/skillswise/numbers/wholenumbers/multiplication/timestables/index.shtml

Math Dice Game for Addition and Multiplication
Instructions for three simple games with dice; one to learn multiplication concept, another to practice the times tables, and one more for addition facts.
http://www.teachingwithtlc.blogspot.com/2007/09/math-dice-games-for-addition-and.html

Product Game
A fun, interactive two-player game that exercises your skill with factors and multiples.
http://illuminations.nctm.org/ActivityDetail.aspx?ID=29

Two Minute Warning
Solve as many problems as you can in two minutes.
http://www.primarygames.com/flashcards/multiplication/start.htm

Button Beach Challenge
Figure out what number the various colored buttons represent.
http://www.amblesideprimary.com/ambleweb/mentalmaths/buttons.html

Multiplication Table of 2

1. Skip-count by twos. Practice this pattern until you can say it from memory. Also practice it backwards (up-down). You may practice one-half of it at first, and the other half later.

0, 2, ____, ____, ____, ____, ____, ____, ____, ____, ____, ____, 24

2. **a.** Fill in the table of 2. **b.** Fill in the missing factors. Then cover the answers. Choose problems in random order and practice. You may first practice only the part from 1 × 2 till 6 × 2, and the rest at a later time, such as the next day.

a.

1 × 2 = ____	7 × 2 = ____
2 × 2 = ____	8 × 2 = ____
3 × 2 = ____	9 × 2 = ____
4 × 2 = ____	10 × 2 = ____
5 × 2 = ____	11 × 2 = ____
6 × 2 = ____	12 × 2 = ____

b.

____ × 2 = 2	____ × 2 = 14
____ × 2 = 4	____ × 2 = 16
____ × 2 = 6	____ × 2 = 18
____ × 2 = 8	____ × 2 = 20
____ × 2 = 10	____ × 2 = 22
____ × 2 = 12	____ × 2 = 24

3. Don't write the answers down. Use these problems for random drill practice.

6 × 2	7 × 2	2 × 3	2 × 7	2 × 8
9 × 2	2 × 2	2 × 11	2 × 4	3 × 2
4 × 2	8 × 2	2 × 9	2 × 6	2 × 5
2 × 1	12 × 2	2 × 12	8 × 2	10 × 2

4. Don't write the answers down. Use these problems for random drill practice.

☐ × 2 = 14	☐ × 2 = 12	☐ × 2 = 6	☐ × 2 = 12	☐ × 2 = 22
☐ × 2 = 18	☐ × 2 = 16	☐ × 2 = 18	☐ × 2 = 8	☐ × 2 = 10
☐ × 2 = 8	☐ × 2 = 24	☐ × 2 = 14	☐ × 2 = 20	☐ × 2 = 24
☐ × 2 = 16	☐ × 2 = 2	☐ × 2 = 22	☐ × 2 = 4	☐ × 2 = 6

5. Solve the word problems.

a. There were seven birds in each of the two trees.
Then three of them flew away.
How many birds stayed in the trees?

b. John gets a weekly allowance of two dollars.
After saving money for six weeks,
John bought a book that cost eight dollars.
How much money did he have left?

c. Lisa also saved her weekly allowance of $2
for six weeks. Then, she earned $4 for helping
the neighbor who was sick.
How much money does she have now?

d. Right now Fred has $11 in his piggy bank.
He is going to save his weekly allowance of $2
for eight weeks. Then, he will have just enough money
to buy an expensive model airplane. How much does it cost?

6. Multiply.

a.	**b.**	**c.**	**d.**
$2 \times 12 =$ ____	$4 \times 6 =$ ____	$9 \times 2 =$ ____	$8 \times 2 =$ ____
$7 \times 1 =$ ____	$2 \times 5 =$ ____	$3 \times 0 =$ ____	$10 \times 2 =$ ____
$1 \times 8 =$ ____	$6 \times 2 =$ ____	$1 \times 2 =$ ____	$0 \times 7 =$ ____
e.	**f.**	**g.**	**h.**
$2 \times 1 =$ ____	$8 \times 0 =$ ____	$2 \times 11 =$ ____	$5 \times 3 =$ ____
$2 \times 5 =$ ____	$1 \times 9 =$ ____	$0 \times 0 =$ ____	$2 \times 8 =$ ____
$7 \times 2 =$ ____	$1 \times 0 =$ ____	$2 \times 4 =$ ____	$3 \times 8 =$ ____

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Chapter 4: Telling Time
Introduction

This chapter of *Math Mammoth Grade 3-A Complete Worktext* covers reading the clock to the minute, finding time intervals (elapsed time), using the calendar, and making simple conversions between units of time.

The lesson "Reading the Clock to the Minute" completes the topic, begun in earlier grades, of reading the clock because the student will now be able to tell the complete time. From that point on, the focus switches to finding time intervals and other time-related calculations.

The lessons about calculating elapsed time emphasize dividing the time interval into easily-calculated parts: For example, to find the time elapsed from 10:30 AM to 7:00 PM, the student learns to find the elapsed time from 10:30 AM to 12:00 noon and then from 12:00 noon to 7 PM. The same principle is followed when the time-interval looks more complex. This chapter does not yet introduce the idea of adding or subtracting hours and minutes vertically in columns.

The Lessons in Chapter 4

	page	span
Review: Reading the Clock	115	*2 pages*
Half and Quarter Hours	117	*2 pages*
Review Till and Past	119	*2 pages*
How Many Minutes Pass	121	*3 pages*
Practice	124	*1 page*
Clock to the Minute	125	*3 pages*
Elapsed Time	128	*2 pages*
More on Elapsed Time	130	*4 pages*
Using the Calendar	134	*2 pages*
Changing Time Units	136	*4 pages*
Review	140	*1 page*

Helpful Resources on the Internet

Use these free online resources to supplement the "bookwork" as you see fit.

Analog and Digital Clocks
These clocks show you the current time, side by side. Useful for illustration.
http://nlvm.usu.edu/en/nav/frames_asid_316_g_2_t_4.html

What Time Will it Be?
Move the hands on the clock to show what time it will be after certain amount of minutes.
http://nlvm.usu.edu/en/nav/frames_asid_318_g_2_t_4.html

Match Clocks
Make the digital clock to show the time given with the analog clock.
http://nlvm.usu.edu/en/nav/frames_asid_317_g_2_t_4.html

Flashcard Clock
Read the analog and type in the time in digital. Very clear clock and good fast response!
http://www.teachingtreasures.com.au/maths/FlashcardClock/flashcard_clock.htm

Telling Time Practice
Interactive online practice: you drag the hands of the clock to show the correct time.
http://www.worsleyschool.net/socialarts/telling/time.html

Teaching Time
Analogue/digital clock games and worksheets. Also an interactive "class clock" to demonstrate time.
http://www.teachingtime.co.uk/

Time-for-time
Resource site to learn about time: worksheets, games, quizzes, time zones.
http://www.time-for-time.com/default.htm

A Matter of Time
Lesson plans for telling time, interactive activities, and some materials to print.
http://www.fi.edu/time/Journey/JustInTime/contents.html

Clockwise
Plug in a time, and the clock runs till it, or clock runs to a time and you type it in.
http://www.shodor.org/interactivate/activities/clock2/index.html

The Right Time
A couple of interactive exercises about reading the clock.
http://www.pitara.com/activities/math/time/time.asp?QNum=3

What Time Is It?
Look at the analog clock and pick the digital clock that shows the same time.
http://www.primarygames.com/time/start.htm

Calculating Time from BBC SkillsWise
Factsheets, worksheets, and an online game to practice time calculations.
http://www.bbc.co.uk/skillswise/numbers/measuring/time/calculatingtime/

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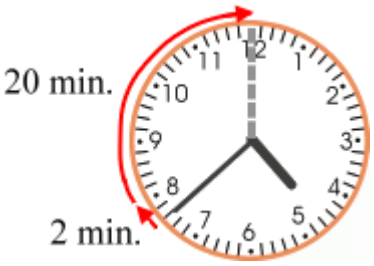
Elapsed Time

How many minutes is it till the next whole hour?

It is 4:38. The minute hand needs to go 2 minutes till the 40-minute point (number 8), and then 20 more minutes till the next whole hour. So it is 22 minutes till 5 o'clock.

Or, you can subtract 38 minutes from 60 minutes:
60 − 38 = 22. Remember, a complete hour is 60 minutes.



It is 2:34. How many minutes is it till 2:50?

The hour is the same (2 hours) in both times, you can simply subtract the minutes: 50 − 34 = 16 minutes.

Or, add up from 34 till 50:
34 + **6** = 40
40 + **10** = 50.
You added 16 minutes.

Or, imagine the minute hand moving on the clock face: it moves 1 minute, and then another 15 minutes — total 16 minutes.

1. How many minutes is it till the next whole hour?

 **a.** _____ minutes	 **b.** _____ minutes	 **c.** _____ minutes	 **d.** _____ minutes
 **e.** _____ minutes	 **f.** _____ minutes	 **g.** _____ minutes	 **h.** _____ minutes

2. How many minutes is it from the time on the clock face till the given time?

 till 12:40 **a.** _____ minutes	 till 7:30 **b.** _____ minutes	 till 10:45 **c.** _____ minutes	 till 3:58 **d.** _____ minutes
 till 1:00 **e.** _____ minutes	 till 5:55 **f.** _____ minutes	 till 12:50 **g.** _____ minutes	 till 4:55 **h.** _____ minutes

3. How many minutes is it?

a. From 5:06 till 5:28	**b.** From 2:05 till 2:54	**c.** From 3:12 till 3:47
d. From 12:11 till 12:55	**e.** From 7:27 till 7:48	**f.** From 9:06 till 10:00

4. **a.** The pie needs to bake half an hour. Marsha's clock showed 4:22 when she put it into the oven. When should she take it out?

b. Juan notices that, "In 14 minutes class will end." If the class ends at 2 PM, what time is it now?

c. The sun rises at 5:49 AM. Marge wants to wake up 15 minutes before that. When should she wake up?

d. Edward was 8 minutes late to math class, and came at 1:53 PM. When did the class start?

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Chapter 5: Money
Introduction

This chapter of *Math Mammoth Grade 3-A Complete Worktext* teaches counting coins, making change, and solving simple problems about money.

The first lesson, *Using the Half-Dollar*, reviews counting coins, including half-dollars. In the lesson *Dollars*, the student writes dollar amounts using the "$" symbol and the decimal point.

The lesson *Making Change* explains two basic ways of making change: (1) counting up and (2) subtracting (finding the difference). This is all done with mental math. The following lesson, *Mental Math and Money Problems*, also uses mental math, this time in solving simple money problems.

The lesson *Solving Money Problems* introduces the concept of adding and subtracting amounts of money vertically in columns.

The Lessons in Chapter 5

	page	span
Using the Half-Dollar	143	*2 pages*
Dollars	145	*3 pages*
Making Change	148	*4 pages*
Mental Math and Money Problems	152	*3 pages*
Solving Money Problems	155	*4 pages*
Review	159	*1 page*

Helpful Resources on the Internet

Use these free online resources to supplement the "bookwork" as you see fit.

Change Maker
Determine how many of each denomination you need to make the exact change. Good and clear pictures! Playable in US, Canadian, Mexican, UK, or Australian money.
http://www.funbrain.com/cashreg/index.html

Using Money
Drag the right amount of coins and bills (US) to the answer space to match a given amount. The pictures look a little fuzzy.
http://www.mathcats.com/microworlds/usingmoney.html

Counting Money Activity from Harcourt
Count the coin value, type it in the box, and click 'Check' to verify your answer.
http://www.hbschool.com/activity/counting_money/

Cash Out
Make the correct change by clicking on the bills and coins.
http://www.mrnussbaum.com/cashd.htm

Piggy bank
When coins fall from the top of the screen, choose those that add up to the given amount to fill up the piggy bank.
http://fen.com/studentactivities/Piggybank/piggybank.html

Coins and Medals from U.S. Mint
History and pictures of the circulating coins, commemorative coins, Native American $1 Coin Program, and the Presidential $1 Coin Program. Learn also how coins are made and take a virtual tour around the mint.
www.usmint.gov/kids/coinsMedals

Money Instructor
Exercises and worksheets for checkbook math. Includes a checkbook to print, a worksheet for writing dollars and cents, checking account deposits, checkbook transactions, and word problems.
http://www.moneyinstructor.com/checks.asp

Money Activities at the National Library of Virtual Manipulatives
Count the money shown, or make the given change, or make one dollar.
http://nlvm.usu.edu/en/nav/frames_asid_325_g_2_t_1.html

Making Change Game at MathPlayground.com
An interactive game where you figure out the change and then make it using the fewest possible bills and coins.
http://www.mathplayground.com/making_change.html

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Dollars

One dollar.

$1 or $1.00

Five dollars.
$5 or $5.00.

Write "$" symbol in front of dollar amounts.

Write first the dollars, then a decimal point, and then the cents.

$1.51

$5.30

1. How much money? Write the amount.

a. $_____

b. $_____

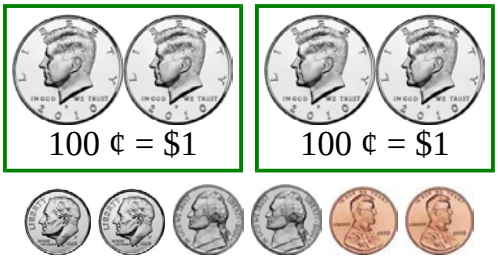
c. $_____

d. $_____

e. $_____

f. $_____

If you have more than 100 cents, those 100 make a dollar.



Total $2.32

Total $2.10

2. How much money? Write the amount.

a. $_____

b. $_____

c. $_____

Remember to put 0 into the dollar's place if you have a total cent amount that is less than 100.

40 cents = $0.40 82 cents = $0.82 9 cents = $0.09

3. Write as dollar amounts.

a. $_____

b. $_____

three nickels
and a dime

c. $_____

eight dimes

d. $_____

seven pennies
and a nickel

e. $_____

three quarters
and two dimes

f. $_____

4. Write the cent amounts as dollar amounts, and vice versa.

a. 56 ¢ = $_____	**b.** 6 ¢ = $_____	**c.** 425 ¢ = $_____	**d.** 209 ¢ = $_____
e. _____ ¢ = $5.69	**f.** _____ ¢ = $0.30	**g.** _____ ¢ = $3.06	**h.** _____ ¢ = $0.79

5. The picture shows how much money you have. Write how much you will have left if you buy the items listed.

If I buy:	I will have left:
a. a puzzle for $5.20	$
b. a book for $7.35	$
c. a pineapple for $3.52	$

6. Add the money amounts. You can add the cents and dollars separately in your head.

a. $0.37 + $0.40 = $_____ **b.** $1.25 + $4.00 = $_____ **c.** $5.43 + $1.20 = $_____

7. The picture shows how much money you have. Write how much you will have left if you buy the items listed.

If I buy:	I will have left:
a. a book for $4.20 and a magazine for $1.50	$
b. two brushes for $3.35 each	$
c. candles for $4.09 and paper cups for $2.07	$

If I buy:	I will have left:
d. a pen ($0.60) and an eraser ($0.50)	$
e. three pencils for $0.40 each	$
f. a notebook for $1.12 and loose paper for $0.90	$

MATH MAMMOTH

Grade 3-B

Complete Worktext

- Place value with thousands
- Geometry
- Measuring
- Division
- More on multiplication
- Fractions

By Maria Miller

www.MathMammoth.com

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Chapter 6: Place Value with Thousands
Introduction

This chapter of *Math Mammoth Grade 3-B Complete Worktext* covers 4-digit numbers (thousands). First we study place value. The emphasis is on trying to get familiar with numbers that have thousands and visualize them on a number line. Then we learn addition and subtraction with these numbers.

To aid understanding, the lesson about mental math stresses the similarities between adding and subtracting thousands and adding and subtracting smaller numbers. Practicing mental math also helps to build number sense. For additional practice, you can make more mental math worksheets using the accompanying worksheet maker (the html file).

Adding and subtracting in columns should be relatively easy now, assuming the student has grasped them well earlier, when studying 2-and 3-digit numbers. If your student needs more practice for these, don't hesitate to use the worksheet maker.

Then there are several lessons about rounding and estimating, which are very important skills needed in everyday life.

The Lessons

	page	span
A Thousand and Beyond	7	*4 pages*
More Practice with Place Value	11	*5 pages*
Which Number is Greater?	16	*3 pages*
Mental Adding and Subtracting	19	*3 pages*
Adding and Subtracting in Columns	22	*4 pages*
Rounding to the Nearest Hundred	26	*2 pages*
Rounding to the Nearest Thousand	28	*2 pages*
Estimating Sums and Differences	30	*3 pages*
Review	33	*2 pages*

Helpful Resources on the Internet

Base Blocks from National Library of Virtual Manipulatives
Place enough thousand cubes, hundred-flats, ten-sticks, and one-blocks to the work area to show given numbers. Choose "Columns = 4" to restrict the program to four-digit numbers.
http://nlvm.usu.edu/en/nav/frames_asid_152_g_1_t_1.html?from=category_g_1_t_1.html

Cookie Dough
Practice naming big numbers.
http://www.funbrain.com/numwords/index.html

Arithmetic Workshop Place Values Tool
Drag models of ones, tens, hundreds, or thousands to the workarea, group them, break them up, or practice any of the four operations using the same visual models.
http://www.iknowthat.com/com/L3?Area=EarlyMathWorkbench

Can you say really big numbers?
Enter a really big number, try say it out loud, and see it written.
http://www.mathcats.com/explore/reallybignumbers.htm

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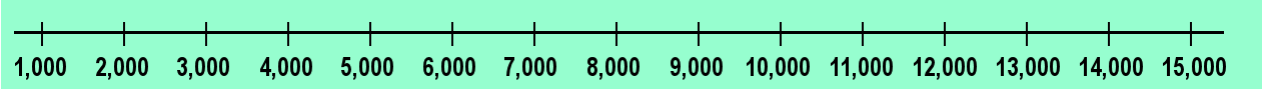
More Practice with Place Value

On this number line you see tick marks at every thousand. After 9000 (nine thousand) the next thousand is 10,000 (ten thousand). A little comma is separating the thousands digit from the other three digits. That makes for easier reading.



1. Fill in the table.

a. Two thousand one thou-sands | hund-reds | tens | ones 2 | 0 | 0 | 1	**b.** Two thousand twenty-five thou-sands | hund-reds | tens | ones | | |	**c.** Two thousand one hundred thirty-two thou-sands | hund-reds | tens | ones | | |
d. Three thousand four hundred five T | H | T | O 3 | 4 | 0 | 5	**e.** Five thousand nine hundred fifteen T | H | T | O | | |	**f.** Five thousand eight hundred T | H | T | O | | |
g. five thousand nine hundred ninety T | H | T | O | | |	**h.** Six thousand sixteen T | H | T | O | | |	**i.** Six thousand three hundred three T | H | T | O | | |
j. Eight thousand seven hundred T | H | T | O | | |	**k.** Nine thousand two hundred forty-five T | H | T | O | | |	**l.** Ten thousand ten thou-sands | T | H | T | O 1 | 0 | 0 | 0 | 0

2. Fill in the blanks, and write the numbers as a sum of its thousands, hundreds, tens, and ones.

a. 9,074 = __ thousand __ hundreds __ tens __ ones = 9000 + 0 + 70 + 4	**b.** 5,570 = __ thousand __ hundreds __ tens __ ones = 5000 + ____ + ___ + __
c. 3,707 = __ thousand __ hundreds __ tens __ ones = _____ + _____ + ____ + ___	**d.** 2,099 = __ thousand __ hundreds __ tens __ ones = _____ + _____ + ____ + ___
e. 8,009 = __ thousand __ hundreds __ tens __ ones = _____ + _____ + ____ + ___	**f.** 5,623 = __ thousand __ hundreds __ tens __ ones = _____ + _____ + ____ + ___
g. 2,090 = __ thousand __ hundreds __ tens __ ones = _____ + _____ + ____ + ___	**h.** 9,060 = __ thousand __ hundreds __ tens __ ones = _____ + _____ + ____ + ___
i. 1,009 = __ thousand __ hundreds __ tens __ ones = _____ + _____ + ____ + ___	**j.** 6,706 = __ thousand __ hundreds __ tens __ ones = _____ + _____ + ____ + ___

3. Write in normal form.

a. 4000 + 500 + 90 + 3

b. 2000 + 90

c. 3000 + 200

d. 8000 + 5

e. 1000 + 80 + 7

f. 5000 + 600 + 9

g. 6 hundred 4 thousand

h. 8 tens 4 thousand

i. 3 ones 7 thousand 2 hundred

j. 4 hundred 5 ones 1 thousand

4. Write in normal form. Be careful! You need zeros a lot.

a. 9000 + 90 + 800 = _____ 6000 + 7 = _____ 6 + 7000 = _____	**b.** 1000 + 90 + 900 + 3 = _____ 7000 + 80 + 9 = _____ 7000 + 800 + 9 = _____
c. 5000 + 40 + 4 + 500 = _____ 3000 + 50 + 900 + 5 = _____ 2000 + 30 + 6 = _____	**d.** 4 + 9000 + 70 = _____ 600 + 3000 + 5 = _____ 10 + 200 + 3000 = _____
e. 5000 + 80 = _____ 500 + 8000 = _____ 4000 + 900 + 7 = _____	**f.** 400 + 9000 + 7 = _____ 40 + 6000 + 500 = _____ 80 + 500 + 8000 + 6 = _____
g. 2 thousand 7 ones 4 tens	**h.** 2 tens 6 hundred 4 thousand
i. 7 thousand 8 hundred 8 ones	**j.** 5 thousand 6 tens
k. 3 thousand 4 ones	**l.** 5 hundred 9 thousand

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Chapter 7: Geometry
Introduction

The seventh chapter of *Math Mammoth Grade 3-B Complete Worktext* deals with some elementary geometry topics, such as parallel lines, right angles, shapes, area, perimeter and volume.

In the first lesson, the student reviews the names of various shapes, and learns about parallel lines and parallelograms in more detail.

Then, we study the concept of right angles in detail. The lesson is quite long, so you probably will cover it over several days. It shows how to draw perpendicular lines (lines at a right angle) using a protractor, or a triangle-shaped ruler, and lets the student practice drawing right angles or shapes that have right angles. In continuation, the lesson also shows how to draw parallel lines.

Tilings is a simple lesson that lets students also design their own tilings. Then follow lessons on symmetry, area, perimeter, and three-dimensional figures. Most of these are on the introductory level.

When studying the *solids*, such as cube, rectangular prism, pyramids, cone, and cylinder, you can make paper models for them from the PDF printouts provided in the /cutouts/ folder. Just print them out, cut out the shapes, fold the sides, and glue or tape the figures together.

Alternatively you can buy them, usually made in plastic. Search on the internet for “geometric solids”.

The Lessons

	page	span
Shapes and Parallelograms	38	*3 pages*
Right Angles	42	*5 pages*
Tilings	47	*2 pages*
Line Symmetry	49	*2 pages*
Mirror Points	51	*2 pages*
Getting Started with Area	53	*3 pages*
Perimeter	56	*2 pages*
Solids	58	*2 pages*
Geometry Review	60	*1 page*

Helpful Resources on the Internet

Use the online resources as you see fit to supplement the main text.

Shape Cutter
Draw any shape (polygon), cut it, and manipulate the cut pieces. You can have the computer mix them up, and then try to recreate the original shape.
http://illuminations.nctm.org/ActivityDetail.aspx?ID=72

Patch Tool
An online activity where the student designs a pattern using geometric shapes.
http://illuminations.nctm.org/ActivityDetail.aspx?ID=27

Polygon Matching Game
http://www.mathplayground.com/matching_shapes.html

Polygon Sort
Drag and drop the polygons in the correct place in the diagram.
http://www.crickweb.co.uk/assets/resources/flash.php?&file=quad

Polygon Playground
Drag various colorful polygons to the workarea to make your own creations!
http://www.mathcats.com/explore/polygons.html

Interactive Tangram Puzzle
Place the tangram pieces so they form the given shape.
http://nlvm.usu.edu/en/nav/frames_asid_112_g_2_t_1.html
Tangram set
Cut out your Tangram set by folding paper
http://tangrams.ca/inner/foldtan.htm

Shape Explorer
Find the perimeter and area of odd shapes on rectangular grid.
http://www.shodor.org/interactivate/activities/ShapeExplorer/

Area of Rectangle
Drag the corners of the rectangle and see the calculated side lengths and areas change.
http://illuminations.nctm.org/ActivityDetail.aspx?ID=46

Symmetry Game
Tell how many lines of symmetry a shape has.
http://www.innovationslearning.co.uk/subjects/maths/activities/year3/symmetry/shape_game.asp

Online Kaleidoscope
Create your own kaleidoscope creation with this interactive tool.
http://www.zefrank.com/dtoy_vs_byokal/

Primary Resources: Mirror Images
See images mirrored in a line.
http://www.primaryresources.co.uk/online/symmetry.swf

Primary Resources: Reflection
Color the squares and reflect the given pattern in a line.
http://www.primaryresources.co.uk/online/reflection.swf

Make Your Own Mandala
A mandala is a circular symmetrical design based on eights. Make your own and experiment with symmetry.
http://www.girlsgotech.org/world_around_us.html

Geometric Solids
Manipulate various geometric solids. Color the solid to investigate properties such as the number of faces, edges, and vertices.
http://illuminations.nctm.org/ActivityDetail.aspx?ID=70

Cubes
Fill a box with cubes, rows of cubes, or layers of cubes, and then fold in the sides of the box. Illustrates the concept of volume.
http://illuminations.nctm.org/ActivityDetail.aspx?ID=6

Cuboid Exploder and **Isometric Shape Exploder**
These interactive demonstrations let you see either various cuboids (a.k.a. boxes or rectangular prisms) or various shapes made of unit cubes, and then "explode" them to the unit cubes, illustrating volume.
www.teacherled.com/resources/cuboidexplode/cuboidexplodeload.html and
www.teacherled.com/resources/isoexplode/isoexplodeload.html

Space Blocks
Build with blocks to illustrate three-dimensional shapes.
http://nlvm.usu.edu/en/nav/frames_asid_195_g_2_t_2.html

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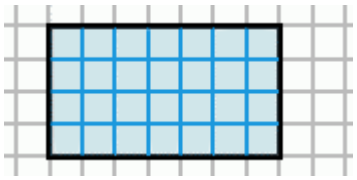
Getting Started with Area

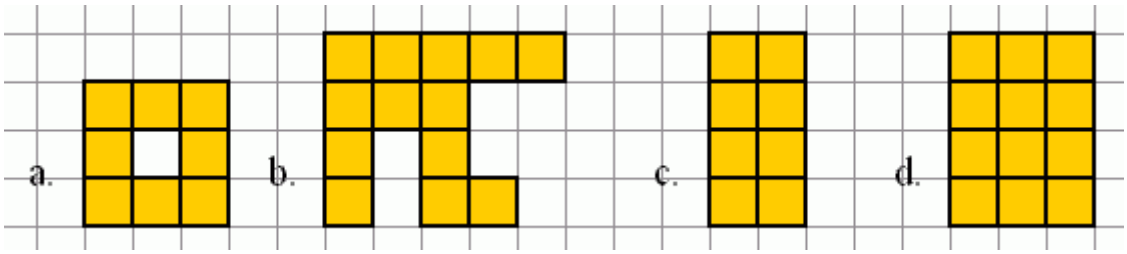
How many little squares do you need to cover this rectangle?

How many little squares is the area?

The area is _____ squares.



1. Find how many squares is the area of the shaded figures.



a. The area is _____ squares.

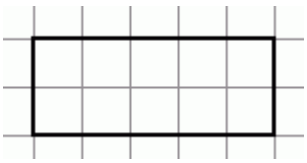
b. The area is _____ squares.

c. The area is _____ squares.

d. The area is _____ squares.

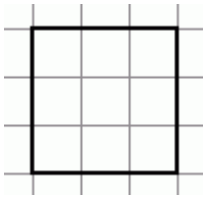
2. Find how many squares are the areas. Use MULTIPLICATION.

a.



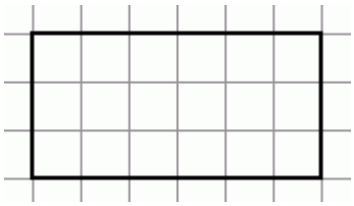
The area is _____ squares.

b.



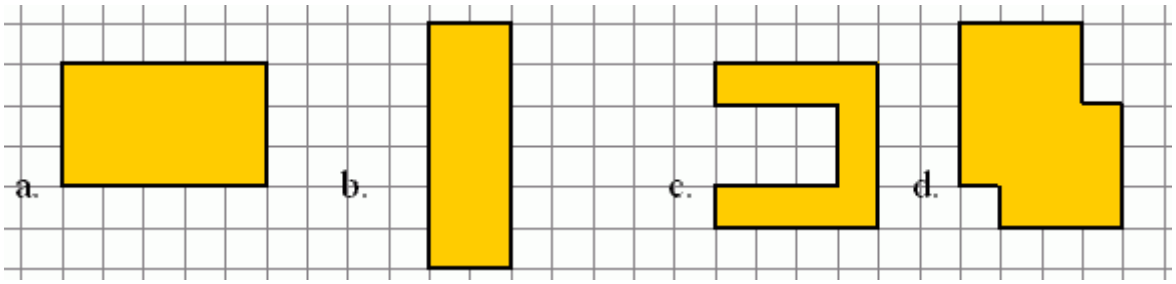
The area is _____ squares.

c.



The area is _____ squares.

3. Cover the shaded shapes with little squares. How many do you need?



a. The area is _____ squares.

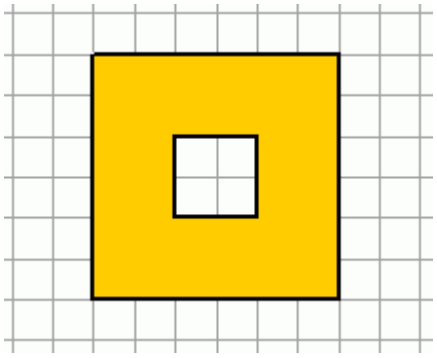
b. The area is _____ squares.

c. The area is _____ squares.

d. The area is _____ squares.

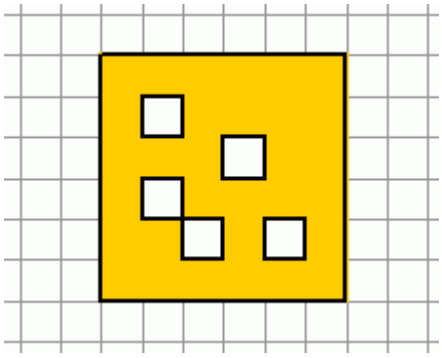
4. How many squares do you need to cover the shaded area?

a.



The area is _____ squares.

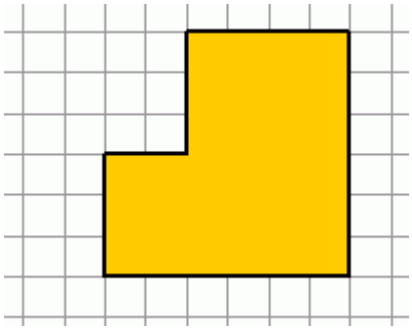
b.



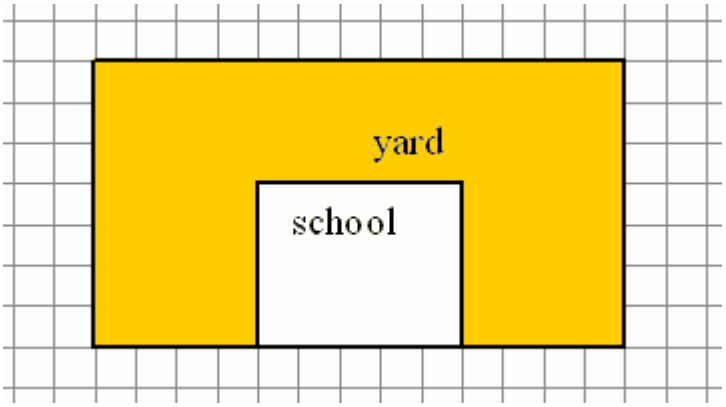
The area is _____ squares.

5. **a.** Divide this shape below into TWO rectangles.

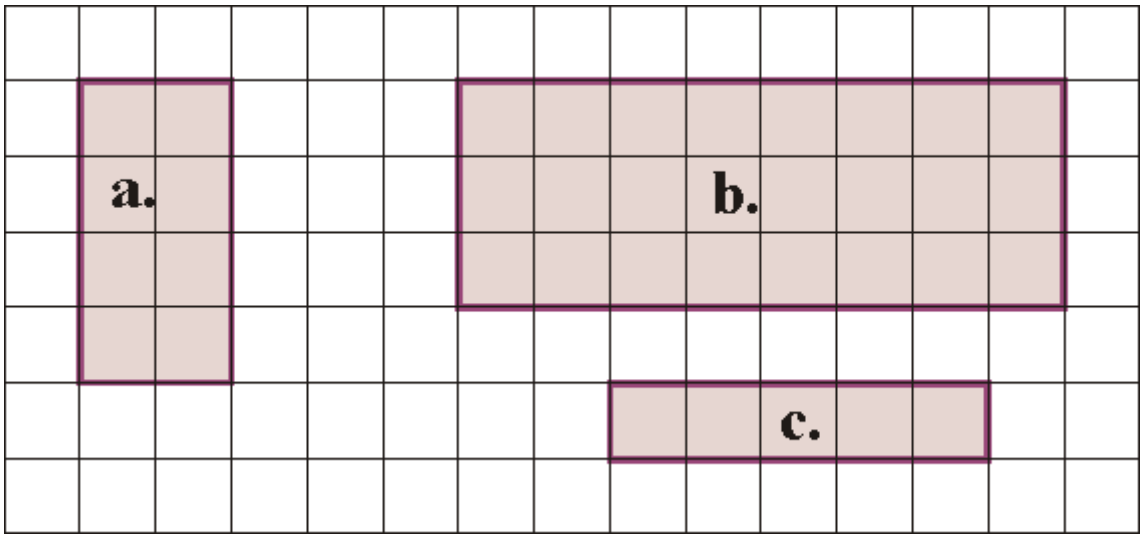
b. Use multiplication to find the area.



c. What is the area of the shaded yard?



6. Draw rectangles (and squares): two with an area of 16, and two with an area of 24.



7. Measure the side of a few little squares on this grid, using a centimeter ruler.

   Each square's side is ____ cm long.

   Each little square has the area of *1 square centimeter*.

   Then find the areas of the rectangles a, b, and c.

   a. The area is _____ square centimeters. **b.** The area is _____ square centimeters.

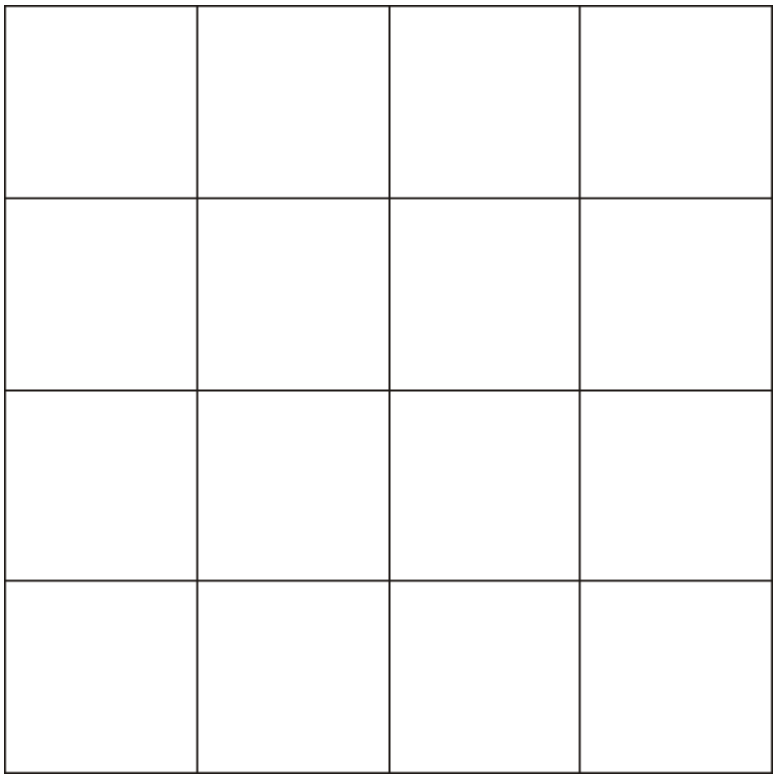
   c. The area is _____ square centimeters.

8. In this grid, each square's side is

   _____ long.

   Each little square has the area of *1 square inch*.

   Draw a rectangle with an area of 3 square inches.



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Chapter 8: Measuring
Introduction

The eighth chapter of *Math Mammoth Grade 3-B Complete Worktext* covers measuring-related topics. Both metric system and customary system units are covered. The lessons still contain plenty of hands-on exercises, but the emphasis is shifting to the abstract conversions between different measuring units. The later grades will practice the unit conversion even more, of course.

The student will first learn to measure short distances to the nearest quarter inch, and using centimeters and millimeters. Then, the lessons cover units used for longer distances: First, the customary system of units feet, yards, and miles, and then the metric system of ones meters and kilometers.

Next, comes measuring weight. The student learns how to measure the weight of light objects using ounces and then grams. The lessons also practice the conversion between units.

After that we study measuring volume. Here the student is expected to know the units cup, pint, quart, and gallon from the second grade. The lesson practices them further, and introduces fluid ounces. Then comes a lesson about the metric system units for volume: milliliters and liters.

The last two lessons deal with measuring temperature, using Fahrenheit or Celsius scale.

We all use various measuring units in our everyday life, and using them is the key to remembering what they are and what the conversion factors are. Naturally, people in the United States often do not use the metric system a lot, while people elsewhere do not use the customary system. The units your child is not using are likely to be forgotten easily. So encourage the student(s) to have free play time with measuring devices such as a scale, measuring cups, a measuring tape, and rulers.

The Lessons

	page	span
Measuring to the Nearest Fourth-Inch	63	*5 pages*
Centimeters and Millimeters	68	*4 pages*
Feet, Yards and Miles.....	72	*2 pages*
Measuring Length in the Metric System: Meters, Kilometers and More.....	74	*2 pages*
Using Ounces	76	*5 pages*
Using Grams	81	*3 pages*
Estimate Weight 2	84	*3 pages*
Practicing with Units of Volume.....	85	*3 pages*
Millileters and Liters	88	*2 pages*
Measuring Temperature: Fahrenheit.....	90	*2 pages*
Measuring Temperature: Celsius.....	92	*2 pages*
Review	94	*2 pages*

Helpful Resources on the Internet

Measure It!
Practice measuring lines with either centimeters or inches. Multiple choice questions.
http://onlineintervention.funbrain.com/measure/index.html

Bunny Balance
Place bunnies on the balance until it is even.
http://www.peepandthebigwideworld.com/games/bunnybalance.html

Measurements
Online lessons with interactive exercises on metric prefixes, symbols, number values, metric mass, length, volume, US length and volume, and temperature conversions.
http://www.aaamath.com/B/mea.htm

Reading a Tape Measure Worksheets
Worksheet generator - you can choose to which accuracy to measure, inches, or inches & feet.
http://themathworksheetsite.com/read_tape.html

Measures
Activities, revision bites, and quizzes about measuring time, weight, and capacity (in metric units).
http://www.bbc.co.uk/schools/ks2bitesize/maths/shape_space_measures.shtml

Reading Scales
Helps teachers to illustrate a variety of measuring devices and how to read them.
http://www.teacherled.com/2009/02/18/reading-scales-2/

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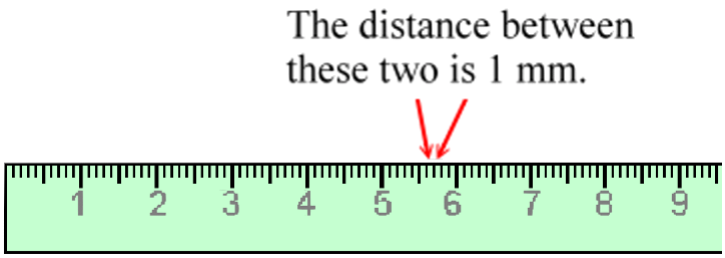
Centimeters and Millimeters

This ruler measures in centimeters. The numbers signify whole centimeters. All the little lines between those are for millimeters.

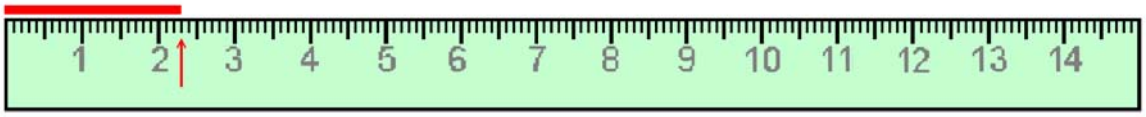


The distance from one little line to the next line is 1 millimeter. We write 1 mm. Millimeters are pretty tiny!

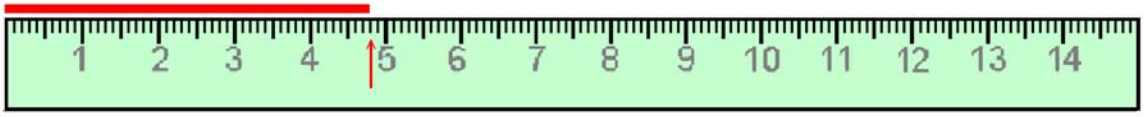
Look at the ruler: there are 10 millimeters in each centimeter.

Measuring lines

First see how many whole centimeters long the line is. Then count how many little millimeter-lines beyond that it reaches.



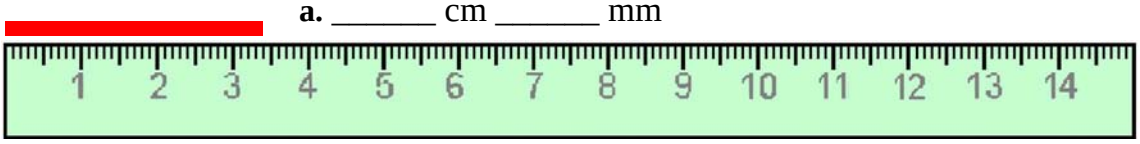
This line is 2 cm 3 mm long.



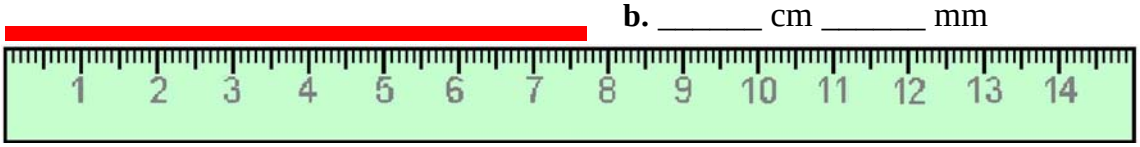
This line is 4 cm 8 mm long.

1. Measure the lines using the ruler.

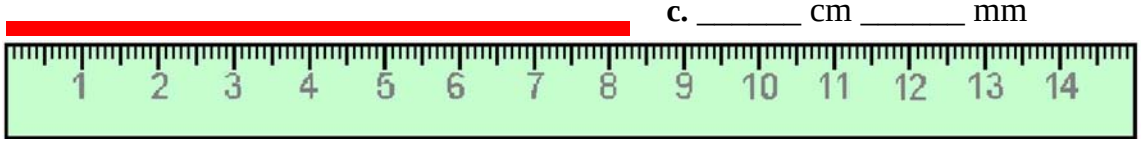
a. _____ cm _____ mm



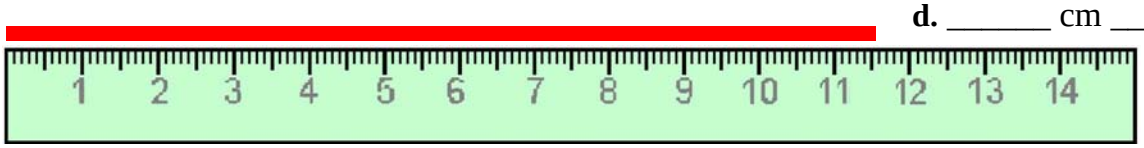
b. _____ cm _____ mm



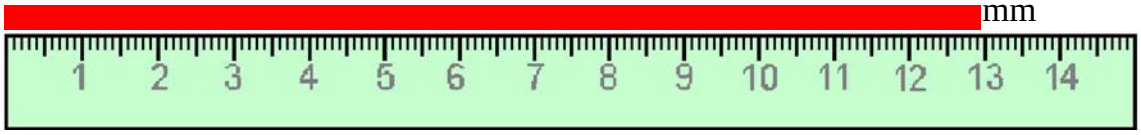
c. _____ cm _____ mm



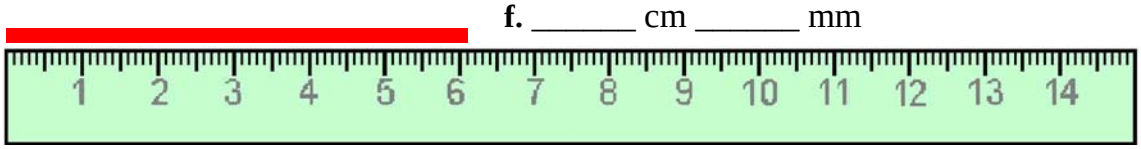
d. _____ cm _____ mm



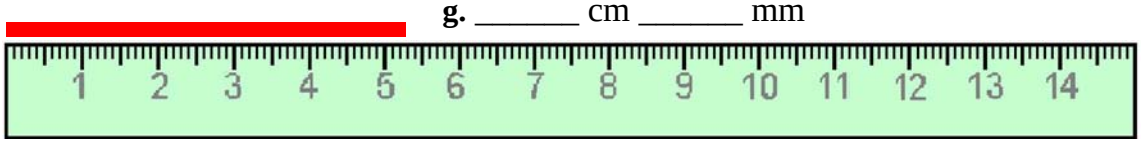
e. _____ cm _____ mm



f. _____ cm _____ mm



g. _____ cm _____ mm



2. Draw lines using a ruler.

a. 7 cm 8 mm

b. 10 cm 5 mm

c. 1 cm 4 mm

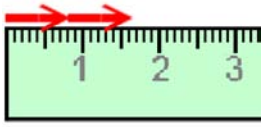
d. 12 cm 6 mm

3. Measure items you can find at home, using a centimeter-millimeter ruler.
If the item is not exactly as long as the markers on the ruler, choose the nearest mark.

Item	Length
	_____ cm _____ mm

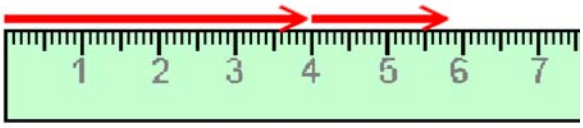
The first arrow is 8 mm. The second arrow is 8 mm too.
End-to-end, they measure together 16 mm *OR* 1 cm 6 mm.

8 mm + 8 mm = 16 mm = 1 cm 6 mm



The first arrow is 4 cm. The second arrow is
1 cm 8 mm. Together they measure 5 cm 8 mm.

4 cm + 1 cm 8 mm = 5 cm 8 mm



You can add centimeters with centimeters, and millimeters with millimeters, but whenever you have 10 or more millimeters, remember that 10 millimeters makes 1 centimeter.

9 mm + 6 mm = 15 mm = 1 cm 5 mm

8 cm 4 mm + 3 cm 7 mm = 11 cm 11 mm = 12 cm 1 mm

4. Figure out these "line additions".

a.	**b.**
1 cm 5 mm + 5 mm = ___ cm ___ mm 8 mm + 9 mm = ___ cm ___ mm	5 cm 2 mm + 7 cm 4 mm = ___cm ___mm 10 cm 8 mm + 7 cm 7 mm = ___ cm ___ mm
c.	**d.**
5 mm + 25 cm 8 mm = ___ cm ___ mm 15 mm + 14 mm = ___ cm ___ mm	13 cm 9 mm + 50 cm 2 mm = ___ cm ___ mm 9 mm + 17 mm + 2 cm 2 mm = ___ cm ___ mm

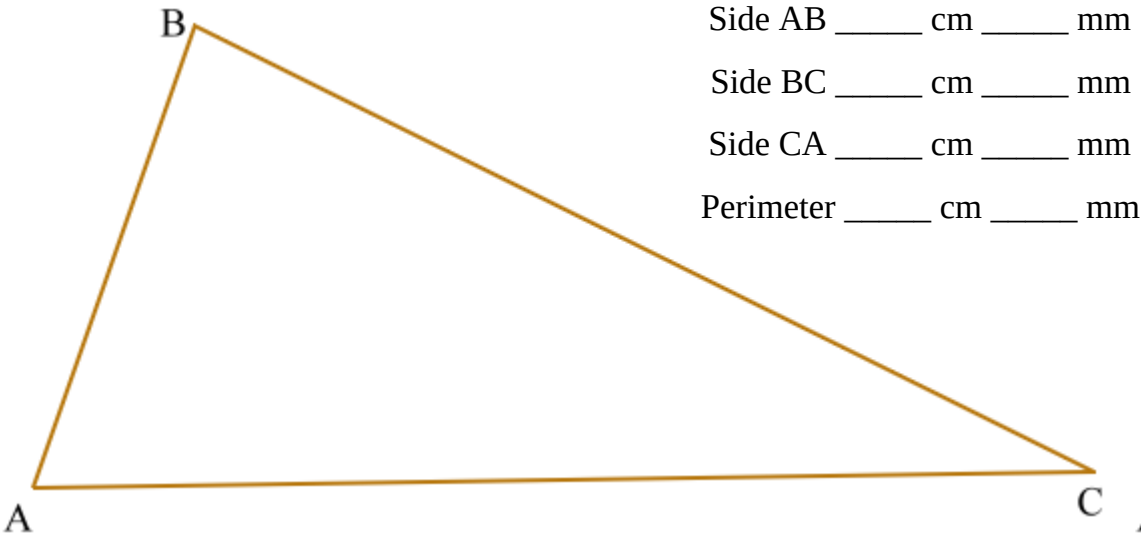
5. Change between centimeters and millimeters.

a.	b.	c.
1 cm = ____ mm	1 cm 1 mm = *11* mm	4 cm 5 mm = ____ mm
2 cm = ____ mm	1 cm 2 mm = ____ mm	2 cm 5 mm = ____ mm
5 cm = ____ mm	1 cm 8 mm = ____ mm	7 cm 8 mm = ____ mm
8 cm = ____ mm	2 cm 3 mm = ____ mm	10 cm 4 mm = ____ mm

6. Change between millimeters and centimeters.

a.	b.	c.
10 mm = ____ cm	17 mm = *1* cm *7* mm	102 mm = ____ cm ____ mm
90 mm = ____ cm	22 mm = ____ cm ____ mm	267 mm = ____ cm ____ mm
100 mm = ____ cm	48 mm = ____ cm ____ mm	859 mm = ____ cm ____ mm
270 mm = ____ cm	67 mm = ____ cm ____ mm	450 mm = ____ cm ____ mm

7. Measure the sides of this triangle, and find the perimeter ("all the way around").



Side AB _____ cm _____ mm

Side BC _____ cm _____ mm

Side CA _____ cm _____ mm

Perimeter _____ cm _____ mm

8. The sides of a triangle are: 5 cm 2 mm, 7 cm 9 mm, and 6 cm 6 mm.
What is the perimeter?

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Chapter 9: Division
Introduction

The ninth chapter of *Math Mammoth Grade 3-B Complete Worktext* covers basic single-digit division, and the concepts of remainder and divisibility.

The division concept in itself is not very difficult - after all, it is like backwards multiplication. However, children can have difficulties in related concepts, such as the remainder, divisibility, and later in factoring and long division (the latter two are not dealt with in third grade).

The aim of in this chapter is to lay a good foundation in basic division, cementing the link between multiplication and division, and then to solidly study the concepts of the remainder and divisibility. Understanding these is required when studying (later) factoring and long division.

There are basically two ways of illustrating division with concrete objects. The first method has to do with dividing objects between a certain number of persons. For example, the problem 12:3 would be, “If you have 12 bananas and 3 people, how many bananas does each one get?”

The second method has to do with grouping. The problem 12:3 would be: “If you have 12 people, how many groups of 3 people can you make?” These two interpretations of division are important to understand so that your child can solve problems of everyday life.

The chapter at hand provides plenty of practice and stresses understanding of concepts. I don't wish the student to memorize procedures without understanding the “why” (rote memorization).

For example, when studying the remainder, the student first finds the remainder with the help of pictures - which is equivalent to using manipulatives. Then he explores the pattern found in dividing sequential numbers by the same number, such as 25 ÷ 3, 26 ÷ 3, 27 ÷ 3, 28 ÷ 3, etc. After that, it is explained that you can find the remainder by looking at a certain difference, and finally the typical school-book method is presented.

The prerequisite for this chapter is knowing the times tables fairly well. The child can start studying division even if he still needs some practice with the multiplication tables, but he should finish mastering the tables before advancing very much with the lessons of this chapter.

The Lessons

	page	span
Division as Making Groups	98	*4 pages*
Division and Multiplication	102	*4 pages*
Division and Multiplication Facts	106	*4 pages*
Dividing Evenly into Groups	110	*4 pages*
Zero and One Division	114	*4 pages*
When Division is not Exact	118	*4 pages*
Checking Division with a Remainder	122	*3 pages*

Fraction - Division Connection..... 125 *2 pages*
Review of Division ..... 127 *2 pages*

Helpful Resources on the Internet

Rectangle Division
Practice division with remainders using a rectangle model.
http://nlvm.usu.edu/en/nav/frames_asid_193_g_2_t_1.html

Mr. Martini's Classroom: Multiplication and Division Inequalities
Compare expressions involving basic multiplication and division.
http://www.thegreatmartinicompany.com/inequalities/multiplicationdivinequality.html

Mystery Picture Game
Using division and addition.
http://www.dositey.com/2008/math/m/mystery2AD.htm

Exuberant Eye games
Practice your basic facts with these kid-appealing simple games.
http://www.games.exuberanteye.com/

Math Magician games
Flashcard problems in all 4 operations. Answer 20 questions in 1 minute.
http://www.oswego.org/ocsd-web/games/Mathmagician/cathymath.html

Simple Kids Math
Online practice of the four operations.
http://www.simplekidsmath.com/

ArithmeTiles
Use the four operations and numbers on neighboring tiles to make target numbers.
http://www.primarygames.com/math/arithmetiles/index.htm

MathCar Racing
Keep ahead of the computer car by thinking logically, and practice any of the four operations at the same time.
http://www.funbrain.com/osa/index.html

Math Mountain
Climb to the top of the mountain by answering simple math questions faster than your opponent (computer or human).
http://www.spacetime.us/arcade/play.php?game=23

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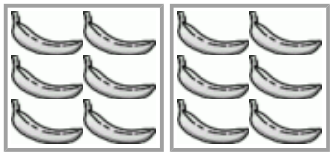
Dividing Evenly into Groups

Sally's Joe's



12 ÷ 2 = __

If you divide 12 bananas evenly between Joe and Sally, how many does each one get?

Joe and Sally both get ___ bananas.

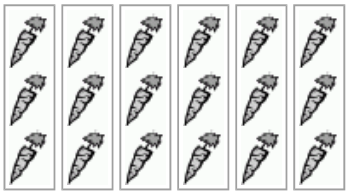
You can use DIVISION to solve this problem.

Division gives the answer to TWO different problems:

- Making certain size groups - how many groups? OR
- Making certain amount of groups - how many in each group?

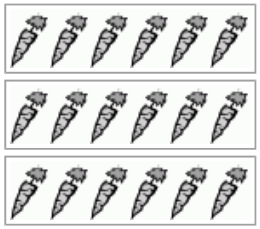
18 ÷ 3 = ?

Make ***groups of 3***.
How many groups?



OR

Divide 18 evenly ***into three groups***
(or between three people).
How many in each group?
(How many does each person get?)



1. Divide things evenly into groups.

a.
Divide into two groups.

8 ÷ 2 = ___

b.
Divide into two groups.

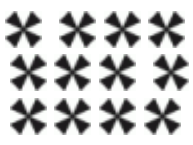
___ ÷ 2 = ___

c.
Divide into three groups.

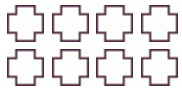
___ ÷ 3 = ___

d.
Divide into three groups.

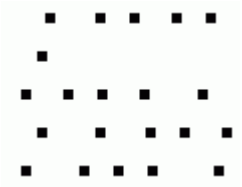
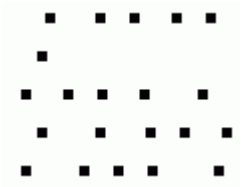
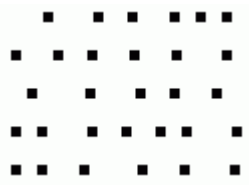
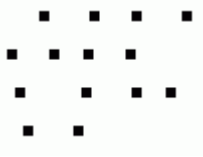
___ ÷ 3 = ___



2. Divide evenly into groups and write a division sentence.

a. Divide into four groups.  ___ ÷ ___ = ___	**b.** Divide into four groups.  ___ ÷ ___ = ___
c. Divide into five groups.  ___ ÷ ___ = ___	**d.** Divide into five groups.  ___ ÷ ___ = ___
e. Divide into one group.  ___ ÷ ___ = ___	**f.** Divide into six groups.  ___ ÷ ___ = ___

3. Divide evenly into groups and write a division sentence.

a. Make 3 groups  21 ÷ 3 = ___	**b.** Make 1 group  ___ ÷ 1 = ___	**c.** Make 10 groups  ___ ÷ 10 = ___	**d.** Make 2 groups  ___ ÷ 2 = ___

4. Divide. Remember to think about the multiplication problem.

a. 40 ÷ 8 =	**b.** 48 ÷ 12 =	**c.** 36 ÷ 9 =
6 ÷ 3 =	60 ÷ 6 =	36 ÷ 6 =
16 ÷ 2 =	25 ÷ 5 =	56 ÷ 7 =
d. 30 ÷ 5 =	**e.** 99 ÷ 9 =	**f.** 100 ÷ 10 =
24 ÷ 3 =	72 ÷ 6 =	80 ÷ 10 =
64 ÷ 8 =	27 ÷ 3 =	45 ÷ 9 =

5. Is it asking for total? Or do you know the total already and you are asked "how many groups/parts" or "how many in each group/part"? Write a division or multiplication sentence for each problem. Try to "see" each situation in your mind - or you can even draw a picture of the situation.

a. Sally, Joe, and Tammy equally divided 36 cherries. How many did each one get?

b. The teacher wanted to make 5 groups out of a class of 25 students. How many students were in each group?

c. How many people do you have in seven vans if each van has five people in it?

d. Joe divided a plank 27 inches long into three parts. How long was each part?

e. The class has 30 students. You can fit 5 students into a van. How many vans are needed?

f. One foot is 12 inches. Jack's board was 3 feet and 5 inches long, but how long was it in inches?

g. Ken placed 40 marbles in rows. He made 5 rows. How many marbles were in each row?

h. There were 10 chairs in each row, and a total of seven rows PLUS one additional row with 8 chairs. How many chairs were there?

i. Oh no! Kenny dropped the box that the groceries were in. All of the eggs in two cartons broke, and all except one egg from a third carton broke. How many eggs broke if each carton holds 12 eggs?

j. Mom has 24 eggs. It takes 8 eggs to make an omelet for the family. How many omelets can she make?

k. You can fit 12 crayons into a box. How many boxes do you need for 60 crayons?

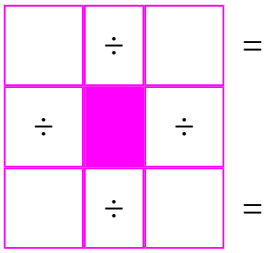
l. How many crayons are in 4 full boxes and in one box with only five crayons?

6. Make two division sentences from one multiplication sentence.

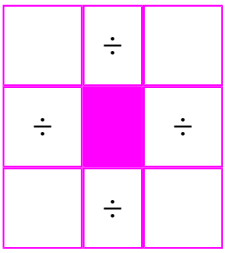
a. $3 \times 12 =$ ___ __ ÷ 12 = __ __ ÷ 3 = __	**b.** $7 \times 6 =$ __ ___ ÷ ___ = ___ ___ ÷ ___ = ___	**c.** $5 \times 10 =$ __ ___ ÷ ___ = ___ ___ ÷ ___ = ___	**d.** $9 \times 8 =$ __ ___ ÷ ___ = ___ ___ ÷ ___ = ___
e. $10 \times 12 =$ ___ ___ ÷ ___ = ___ ___ ÷ ___ = ___	**f.** $7 \times 4 =$ __ ___ ÷ ___ = ___ ___ ÷ ___ = ___	**g.** $6 \times 8 =$ __ ___ ÷ ___ = ___ ___ ÷ ___ = ___	**h.** $11 \times 12 =$ __ ___ ÷ ___ = ___ ___ ÷ ___ = ___
i. $1 \times 11 =$ ___ ___ ÷ ___ = ___ ___ ÷ ___ = ___	**j.** $7 \times 8 =$ __ ___ ÷ ___ = ___ ___ ÷ ___ = ___	**k.** $9 \times 6 =$ __ ___ ÷ ___ = ___ ___ ÷ ___ = ___	**l.** $7 \times 1 =$ __ ___ ÷ ___ = ___ ___ ÷ ___ = ___

Puzzle Corner

What numbers can go into the puzzles?
The first one is totally empty so you can make one puzzle of your own!

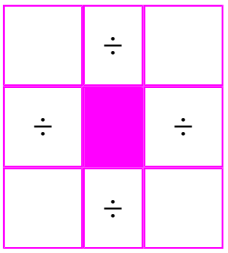


= =



= 6
= 2

= =
9 3



= 5
= 5

= =
4 4

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Chapter 10: More on Multiplication
Introduction

The tenth chapter of *Math Mammoth Grade 3-B Complete Worktext* deals with multiplying by whole tens, by 100, multiplying in parts, and using those skills to multiply vertically using an "easy way" - a variation of the standard algorithm.

The lesson *Multiplying by Whole Tens and Hundreds* does not give the rule for multiplying by whole tens or hundreds outright, but first asks the student to think based on examples. Multiplying a number by ten of course means just appending a zero to it: $10 \times 24 = 240$. If the student does not notice it, you can point it out. Similarly, if you multiply a number by 20, you can multiply it by 2 and append a zero, because multiplying by 20 is the same as multiplying by 2 and by 10. Continuing on, multiplying by 100 means appending two zeros to the number.

Later on in the lesson *Multiplying in Parts.* we study a very important principle that is normally called the distributive property. The lesson does not use that name but talks about "multiplying in parts". Basically, you multiply 6×17 by first multiplying 6×10, then 6×7, and adding the results. This principle is the basis for the procedure of multiplying vertically (in columns).

In the lesson *Multiplying in Columns - the Easy Way* we use this exact idea to multiply numbers in parts and adding the partial results. This way to multiply is just a variation of the common multiplication algorithm. Children will get plenty of practice of the more common way during fourth grade, but if you feel your child can grasp it, nothing prevents you from presenting it to your child now. The "easy way" just shows more plainly what the procedure is based on, and it is easier to understand why it works.

The Lessons

	page	span
Multiplying by Whole Tens and Hundreds	135	*4 pages*
Multiplying in Parts	139	*4 pages*
Multiplying in Columns - the Easy Way	143	*3 pages*
Multiplying in Columns - the Easy Way, Part 2	146	*2 pages*
Order of Operations	148	*3 pages*
Problem Solving	151	*2 pages*
Review	153	*1 page*

Helpful Resources on the Internet

Rectangle Multiplication
An interactive tool that illustrate multiplying in parts using the area model. Choose the "common" option for multiplying in parts.
http://nlvm.usu.edu/en/nav/frames_asid_192_g_2_t_1.html

Math Playground
Learn how to think algebraically with these clever weighing scales.
http://www.mathplayground.com/algebraic_reasoning.html

Thinking Blocks
Thinking Blocks is an engaging, interactive math tool that helps students learn how to solve multistep word problems. Scroll down to Multiplication and Division.
http://www.mathplayground.com/thinkingblocks.html

Interactive Pan Balance
Each of the four shapes is assigned a certain weight. Place shapes on either side of the pan balance and figure out their relationships.
http://illuminations.nctm.org/ActivityDetail.aspx?ID=131

Multiplication Tool
This online tool lets you illustrate and/or practice multi-digit multiplication using the standard algorithm, partial products algorithm, or the lattice method.
www.multiplicationtool.org

Mental Math Tricks for Multiplication
Includes some very basic common-sense ones such as multiplying by 9 or multiplying by doubling and halving.
http://wildaboutmath.com/2007/11/11/impress-your-friends-with-mental-math-tricks

Multiplication Games
A list of online games and activities to practice multiplication facts.
http://www.homeschoolmath.net/online/multiplication.php

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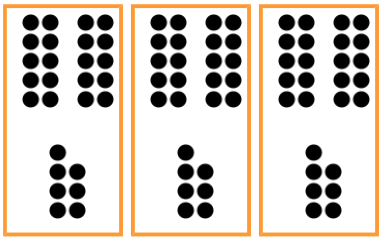
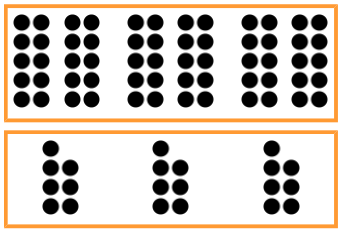
Multiplying in Parts

Look carefully how we can solve 3 × 27.

Three groups of 27...



...but let's group them differently →



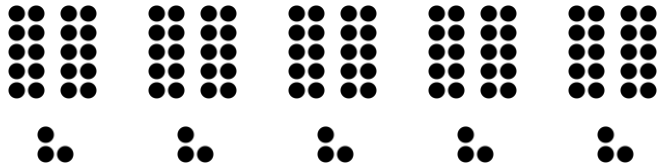
three groups of 20 = 60

three groups of 7 = 21

Each 27 is 20 + 7. We multiply the tens and ones separately and then add:

3 × 27 = 60 + 21 = 81

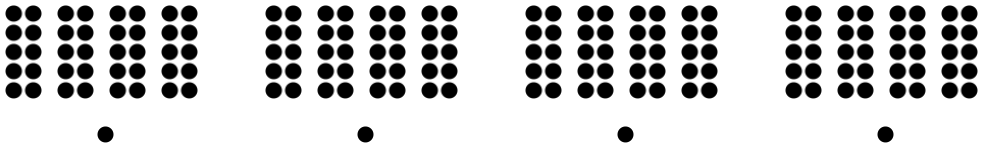
1. Your turn! Multiply the tens and ones separately. Then add.



five groups of 20 = _____

five groups of 3 = _____

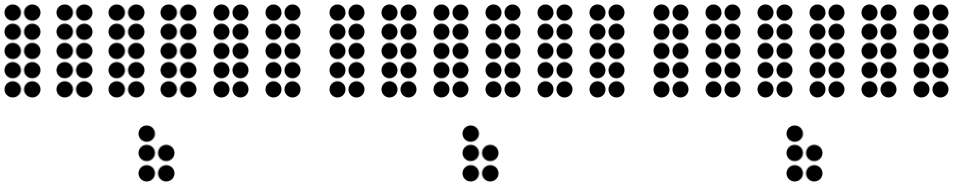
a. 5 × 23 = _____ + _____ = _____



4 × 40 = _____

4 × 1 = _____

b. 4 × 41 = _____ + _____ = _____



3 × 60 =_____

3 × 5 = _____

c. 3 × 65 = _____ + _____ = _____

Example. Let's solve 7 × 32.

1. We break 32 into its tens and ones. 32 is 30 + 2.

2. We multiply the tens and the ones separately by 7: 7 × 30 = 210 and 7 × 2 = 14.

3. Lastly, we add. The answer is 224.

```
  2 1 0
+   1 4
-------
  2 2 4
```

Study these examples, too!	**6 × 18** 18 is 10 + 8 6 × 10 = 60 6 × 8 = + 48 108	**5 × 51** 51 is 50 + 1 5 × 50 = 250 5 × 1 = + 5 255

2. Break the second number into tens and ones. Multiply separately, and add.

a. 5 × 17	**b.** 8 × 41	**c.** 5 × 37
17 is ____ + ____ 5 × 10 = 5 × 7 = + _____	41 is ____ + ____ 8 × 40 = 8 × 1 = + _____	37 is ____ + ____ 5 × 5 × + _____
d. 4 × 17	**e.** 7 × 54	**f.** 4 × 93
17 is ____ + ____ 4 × 4 × + _____	54 is ____ + ____ + _____	93 is ____ + ____ + _____

3. Now break the second number into three parts: hundreds, tens, and ones. Multiply separately, and add.

a. 5 × 123	**b. 8 × 115**	**c. 3 × 257**
5 × 100 = 5 × 20 = 5 × 3 = + _____	8 × 100 = 8 × 10 = 8 × 5 = + _____	3 × 3 × 3 × + _____
d. 3 × 317	**e. 4 × 231**	**f. 6 × 128**
+ _____	+ _____	+ _____

4. Continue the patterns. Think: *What multiplication table can I use?*

a.	**b.**	**c.**
3 × 80 = 4 × 80 = 5 × 80 =	30 × 6 = 40 × 6 = 50 × 6 =	1 × 10 = 2 × 20 = 3 × 30 =

5. Write a number sentence(s) for the problems.

a. Mom bought five sheets and a blanket. The sheets cost $15 each, and the blanket cost $7. How much was her total bill?

b. Liz bought four jars of Vitamin C for the price of $26 each, and three bottles of Multivitamin, each costing $14. How much was her total bill?

c. Bill gets 20 books out of the library each month, *but* in May he only got 12 books. How many books did he read in total from January through December?

d. A haircut costs 13 dollars. How much do six haircuts cost?

If you can get six haircuts for a discounted price of $65, how much money do you save?

e. Jack studied for an exam 75 minutes each day for one week. How many minutes did he study in all?

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Chapter 11: Fractions
Introduction

The 11th and last chapter of Math Mammoth Grade 3-B deals with a few elementary fraction concepts: fractions, a part of a whole, mixed numbers, and adding and subtracting like fractions.

First, the student learns to name fractions and to draw "pie models" for the most common fractions. The CD contains cutout pie models for common fractions that you can print out and use to illustrate fractions. They are especially useful when studying fraction addition and subtraction in this chapter.

The lesson *Part of a Whole Group* is very important, and this concept has been touched on previously as well (see the lesson *Fraction/Division Connection* in chapter 9).

The lesson about mixed numbers only contains picture exercises, along with some number lines. I feel strongly about letting children do fraction operations with pictures or manipulatives until they thoroughly understand the concept, and not introducing the various fraction calculation rules too soon. That is why this lesson does not mention the rule that "to change a mixed number to a fraction, multiply the whole number part by the denominator, and add the numerator."

For the same reason, the next lesson on adding and subtracting fractions also does not spell out the "rule" for adding and subtracting like fractions. The student works with pictures and writes addition and subtraction sentences, thus building his understanding of the process. We can leave the various rules for 5th grade.

This chapter also contains a very introductory lesson on decimal numbers with one decimal digit - or those with tenths.

The Lessons

	page	span
Understanding Fractions	156	*3 pages*
Part of a Whole Group	159	*3 pages*
Mixed Numbers	162	*4 pages*
Add and Subtract Fractions with the Same Kind of Parts	166	*3 pages*
Decimal Numbers - Tenths	169	*2 pages*
Fractions Review	171	*1 page*

Helpful Resources on the Internet

Visualizing Fractions
The other way around as in the previous activity: the computer shows a fraction, and you divide the pie and color the pieces.
http://nlvm.usu.edu/en/nav/frames_asid_103_g_2_t_1.html

Pattern Blocks - Parts as Wholes
Click on the "Activities" in the top menu, and click on arrows until you find Parts as Wholes activity.
http://nlvm.usu.edu/en/nav/frames_asid_170_g_2_t_3.html

Visual Fractions
Great site for studying all aspects of fractions: identifying, renaming, comparing, addition, subtraction, multiplication, division. Each topic is illustrated by either a number line or a circle with a Java applet. Also couple of games, for example: make cookies for Grampy.
http://www.visualfractions.com/

Who Wants pizza?
Explains the concept of fraction, addition and multiplication with a pizza example, then has some interactive exercises.
http://math.rice.edu/~lanius/fractions/index.html

Fraction Model
Adjust the the numerator and the denominator, and the applet shows the fraction as a pie/rectangle/set model, as a decimal and as a percent.
http://illuminations.nctm.org/ActivityDetail.aspx?ID=44

Clara Fraction's Ice Cream Shop
Convert improper fractions to mixed numbers and scoop the right amount of ice cream flavors on the cone.
http://www.mrnussbaum.com/icecream/index.html

Fractioncity
Make "fraction streets" and help kids with comparing fractions, equivalent fractions, addition of fractions of like and unlike denominators while they drive toy cars on the streets. This is not an online activity but has instructions of how to do it at home or at school.
http://www.teachnet.com/lesson/math/fractioncity.html

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Add and Subtract Fractions with Same Kind of Parts

$\frac{1}{4} + \frac{2}{4} = \frac{3}{4}$

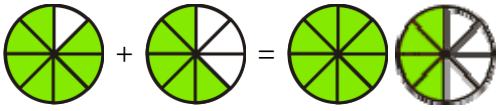
It is easy to add fractions that have the same kind of parts.

To add $\frac{1}{4}$ and $\frac{2}{4}$, simply add the slices.

You can do this because all the slices are fourth parts.

$\frac{2}{9} + \frac{4}{9} = \frac{6}{9}$

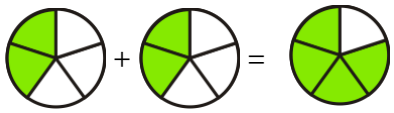
Add two slices and four slices. All slices are ninth parts.



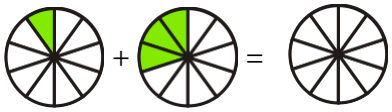
$\frac{7}{8} + \frac{5}{8} = \frac{12}{8} = 1\frac{4}{8}$

Add seven slices and five slices. All slices are eighth parts. We get more than one whole pie, so we write the answer as a mixed number.

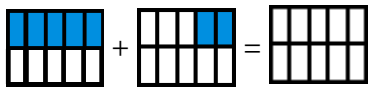
1. Write an addition sentence. Shade the slices in the answer picture. If your answer is more than 1 whole pie, give your answer as a mixed number.



a. $\frac{2}{5} + \frac{2}{5} = \frac{4}{5}$

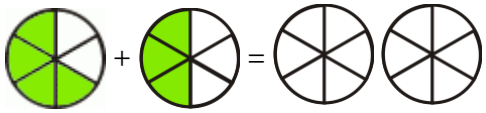


b.

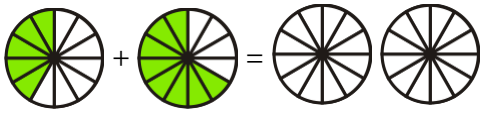


c.

d.

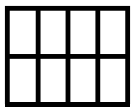


e.



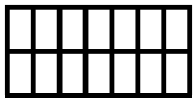
f.

2. Shade parts and write an addition sentence for each problem.



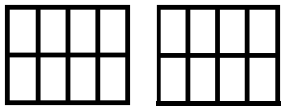
a. Shade $\frac{1}{8}$. Shade another $\frac{5}{8}$.

b. Shade $\frac{3}{12}$. Shade another $\frac{6}{12}$.

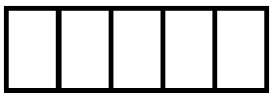


c. Shade $\frac{6}{14}$. Shade another $\frac{6}{14}$.

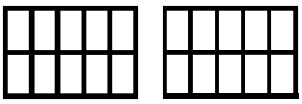
d. Shade $\frac{1}{12}$. Shade another $\frac{9}{12}$.



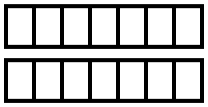
e. Shade $\frac{5}{8}$. Shade another $\frac{7}{8}$.



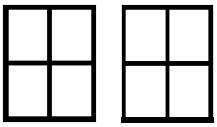
f. Shade $\frac{3}{5}$. Shade another $\frac{1}{5}$.



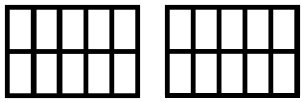
g. Shade $\frac{6}{10}$. Shade another $\frac{7}{10}$.



h. Shade $\frac{2}{7}$. Shade another $\frac{6}{7}$.



i. Shade $\frac{3}{4}$. Shade another $\frac{2}{4}$.



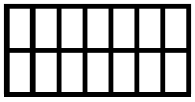
j. Shade $\frac{9}{10}$. Shade another $\frac{3}{10}$.

3. Add the fractions. You can shade the parts in the picture, if you need help.

a. $\frac{3}{5} + \frac{1}{5} =$

b. $\frac{4}{7} + \frac{2}{7} =$

c. $\frac{5}{10} + \frac{3}{10} =$

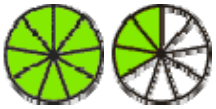
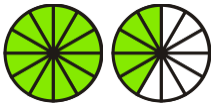
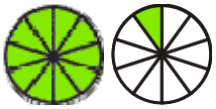


d. $\frac{2}{14} + \frac{5}{14} =$

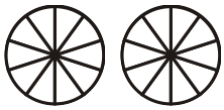
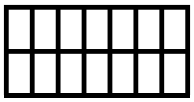
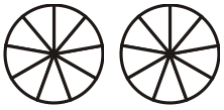
e. $\frac{4}{9} + \frac{3}{9} =$

f. $\frac{7}{12} + \frac{5}{12} =$

4. Subtract the fractions. Cross out the parts in the picture.

 **a.** $\frac{9}{10} - \frac{1}{10} =$	 **b.** $\frac{9}{12} - \frac{2}{12} =$
 **c.** $1\frac{3}{9} - \frac{5}{9} =$	 **d.** $1\frac{5}{12} - \frac{8}{12} =$
 **e.** $1\frac{1}{10} - \frac{7}{10} =$	 **f.** $2\frac{3}{8} - 1\frac{7}{8} =$

5. Subtract the fractions. You can shade parts in the picture and then cross some out.

 **a.** $\frac{3}{6} - \frac{1}{6} =$	 **b.** $\frac{7}{8} - \frac{2}{8} =$	 **c.** $1\frac{3}{10} - \frac{5}{10} =$
 **d.** $\frac{11}{14} - \frac{5}{14} =$	 **e.** $1\frac{2}{9} - \frac{8}{9} =$	 **f.** $2\frac{7}{12} - 1\frac{11}{12} =$

6. Add. Give your answer as a mixed number.

a. $\frac{4}{5} + \frac{3}{5} =$	**b.** $\frac{7}{10} + \frac{6}{10} =$	**c.** $\frac{5}{8} + \frac{4}{8} =$

7. Write one matching subtraction problem for each addition in problem (6).

a. **b.** **c.**