

math

MAMMOTH

Grade 3-A Worktext

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Foreword

Math Mammoth Grade 3-A and Grade 3-B worktexts comprise a complete math curriculum for third grade mathematics studies. This curriculum is aligned to the Common Core standards.

Third grade is a time for learning and mastering two (mostly new) operations: multiplication and division within 100. The student also deepens his understanding of addition and subtraction, and uses those in many different contexts, such as with money, time, and geometry.

The main areas of study in Math Mammoth Grade 3 are:

1. Students develop an understanding of multiplication and division of whole numbers through problems involving equal-sized groups, arrays, and area models. They learn the relationship between multiplication and division, and solve many word problems involving multiplication and division (chapters 2, 3, and 9).
2. Students develop an understanding of fractions, beginning with unit fractions. They use fractions along with visual fraction models and on a number line. They also compare fractions by using visual fraction models and strategies based on noticing equal numerators or denominators (chapter 10).
3. Students learn the concepts of area and perimeter. They relate area to multiplication and to addition, recognize perimeter as a linear measure (in contrast with area), and solve problems involving area and perimeter (chapter 7).
4. Students fluently add and subtract within 1,000, both mentally and in columns (with regrouping). They learn to add and subtract 4-digit numbers, and use addition and subtraction in problem solving (chapters 1 and 6).

Additional topics we study are time (chapter 4), money (chapter 5), measuring (chapter 8), and bar graphs and picture graphs (in various chapters).

This book, 3-A, covers addition and subtraction (chapter 1), multiplication concept (chapter 2), multiplication tables (chapter 3), time (chapter 4), and money (chapter 5). The rest of the topics are covered in the 3-B student worktext.

When you use these two books as your only or main mathematics curriculum, they are like a “framework,” but you still have a lot of liberty in planning your child’s studies. While multiplication and division chapters are best studied in the order they are presented, feel free to go through the geometry, clock, measuring, and fraction sections in a different order. For geometry chapter, the child should already know the multiplication tables.

This might even be advisable if your child is “stuck” on some concept, or is getting bored. Sometimes the brain “mulls it over” in the background, and the concept he/she was stuck on can become clear after a break.

Math Mammoth aims to concentrate on a few major topics at a time, and study them in depth. 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 would not 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, the download version includes 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 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* covers a lot of territory. We review and learn more about mental addition and subtraction strategies, review regrouping in addition and subtraction, learn to regroup twice in subtraction, and then study Roman numerals, rounding, the order of operations, and graphs.

Through it all, students solve lots of word problems and practice some algebra in disguise, where they use a symbol or a ? for the unknown thing in the problem.

I have included several lessons on mental math, including review of many of the strategies from second grade, so that even students who perhaps did not study mental math strategies in earlier grades can now catch up.

Students also learn and practice regrouping in addition and subtraction. In subtraction, the focus is on regrouping twice and regrouping with zero tens when subtracting three-digit numbers. The lessons illustrate the processes with the help of pictures that relate to base-ten blocks. You can also use physical manipulatives if you prefer. The basic idea of regrouping in subtraction is that a unit gets broken into 10 smaller units: a hundred into 10 tens or a ten into 10 ones, and that is what allows you to subtract. Make sure the student masters this topic.

This chapter also introduces rounding to the nearest ten, and parentheses with the order of operations as new topics. Then we study the connection between addition and subtraction with bigger numbers, which also aims to help children think algebraically.

Lastly, 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
Mental Addition	10	3 pages
Review: Mental Subtraction	13	3 pages
More Mental Subtraction	16	3 pages
Ordinal Numbers and Roman Numerals	19	3 pages
More Mental Addition	22	3 pages
Mental Subtraction with Three-Digit Numbers.....	25	3 pages
Regrouping in Addition	28	4 pages
Review: Regrouping in Subtraction	32	3 pages
Regrouping Twice in Subtraction	35	4 pages
Regrouping Twice in Subtraction, Part 2	39	3 pages
Regrouping with Zero Tens	42	3 pages
Regrouping with Zero Tens, Part 2	45	3 pages

Rounding 2-Digit Numbers to the Nearest Ten	48	2 pages
Rounding 3-Digit Numbers to the Nearest Ten	50	3 pages
The Connection with Addition and Subtraction	53	4 pages
Mileage Chart	57	2 pages
Order of Operations	59	2 pages
Graphs	61	3 pages
Review	64	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 in 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

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>

Button Beach Challenge

Figure out what number the various colored buttons represent.

<http://www.amblesideprimary.com/ambleweb/mentalmaths/buttons.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>

Base Blocks Addition

A virtual manipulative that shows regrouping in addition. You can either solve addition problems that are provided, or create your own. “Lasso” with a mouse ten units, ten tens, or ten hundreds to regroup them. Choose “Columns = 2” to restrict the work to two-digit numbers.

http://nlvm.usu.edu/en/nav/frames_asid_154_g_1_t_1.html?from=category_g_1_t_1.html

Base Blocks Subtraction

A virtual manipulative that helps teach borrowing in subtraction. Choose "Create Problem", then click on the red and blue blocks to create a problem. The number to be subtracted (the subtrahend) is illustrated by the RED blocks whereas the minuend is by the BLUE blocks. Click BEGIN problem to start solving. Drag a red block on top of a blue to “subtract” —they cancel each other. Drag bigger place values to the column on their right to “break them up”—in other words regroup or borrow.

http://nlvm.usu.edu/en/nav/frames_asid_155_g_1_t_1.html?from=category_g_1_t_1.html

Mr. Martini's Classroom: Long Addition

Practice regrouping in addition online. Click the x's to set the number of digits in the problems.

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

Sample worksheet from

www.mathmammoth.com

Speed Grid Addition

Find numbers on the grid that add up to the given number. This uses both single-digit and two-digit numbers.

<http://www.oswego.org/ocsd-web/games/SpeedGrid/Addition/urikares.html>

Roman Numerals Tutorial

Good explanations of how numbers are formed using Roman numerals, such as when to "add" or "subtract" the symbols. The page allows interactivity where the student can self-check his/her understanding.

<http://www.beaconlearningcenter.com/weblessons/romannumerals/default.htm>

Roman Matching Game

Drag the Roman numerals to the corresponding Arabic numerals. If you win the next game will be faster. See if you can beat the clock!

<http://sln.fi.edu/time/keepers/Silverman/html/RomanMatch.html>

Roman Numerals Worksheets

Generate worksheets for converting Roman numerals to normal (Arabic) ones, or normal numbers to Roman numerals, or do easy addition and subtraction problems with Roman numerals.

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

Roman Numerals - Wikipedia

An article explaining the usage, origin, and a chart of Roman numerals.

http://en.wikipedia.org/wiki/Roman_numerals

Quia: Easy Roman Numerals

Translate Roman numerals into Arabic (covers I, V, and X only). Matching game, concentration, or word search.

<http://www.quia.com/jg/66123.html>

Roman Numerals - A Maths Webquest

A set of web pages where you can learn all about Roman numerals: how they originated, how to read and write the numerals, and places we still use the Roman number system today.

www.greatmathsgames.com/roman_numerals/roman_numerals.htm

Roman Sequence Game

See how fast you can put these Roman numerals in the correct sequence.

<http://www.fi.edu/time/keepers/Silverman/html/RomanSequence.html>

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Review: Mental Subtraction

1. Practice basic subtraction facts with this drill! Point to the problem and think of the answer.

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

Strategy 1: Use known subtraction facts

Since $14 - 6 = 8$, we know that the answer to $74 - 6$ will end in 8, but it will be in the sixties (sixty-something). So it is 68.

Since $15 - 8 = 7$, we know that the answer to $55 - 8$ will end in 7, but it will be in the forties (forty-something). So it is 47.

2. Subtract.

a. $14 - 5 =$ _____ $54 - 5 =$ _____	b. $12 - 8 =$ _____ $92 - 8 =$ _____	c. $15 - 6 =$ _____ $35 - 6 =$ _____
--	--	--

3. Subtract and compare the results!

a. $14 - 7 =$ _____ $34 - 7 =$ _____ $64 - 7 =$ _____	b. $12 - 8 =$ _____ $42 - 8 =$ _____ $82 - 8 =$ _____	c. $16 - 7 =$ _____ $56 - 7 =$ _____ $156 - 7 =$ _____	d. $15 - 7 =$ _____ $75 - 7 =$ _____ $675 - 7 =$ _____
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Strategy 2: First subtract to the <i>previous whole ten</i>, then subtract the rest.	
$ \begin{aligned} &62 - \underline{8} \\ &= 62 - \underline{2} - \underline{6} \\ &= 60 - 6 = 54 \end{aligned} $ Subtract 8 in two parts: first 2, then 6.	$ \begin{aligned} &72 - \underline{6} \\ &= 72 - \underline{2} - \underline{4} \\ &= 70 - 4 = 66 \end{aligned} $ Subtract 6 in two parts: first 2, then 4.

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

a. $64 - 7$ $64 - 4 - 3 = \underline{\hspace{2cm}}$	b. $72 - 8$	c. $54 - 8$
d. $75 - 7$	e. $27 - 9$	f. $43 - 5$

Strategy 3: Subtract in parts: tens and ones	
Break the number being subtracted into its tens and ones. Subtract in parts.	
$ \begin{aligned} &75 - \underline{21} \\ &= 75 - \underline{20} - \underline{1} \\ &= 55 - 1 = 54 \end{aligned} $ First subtract 20, then 1.	$ \begin{aligned} &87 - \underline{46} \\ &= 87 - \underline{40} - \underline{6} \\ &= 47 - 6 = 41 \end{aligned} $ First subtract 40, then 6.

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

a. $89 - \underline{26}$ $89 - \underline{20} - \underline{6}$ $= \underline{\hspace{2cm}}$	b. $56 - \underline{35}$ $56 - \underline{\hspace{1cm}} - \underline{\hspace{1cm}}$ $= \underline{\hspace{2cm}}$	c. $75 - \underline{51}$ $75 - \underline{\hspace{1cm}} - \underline{\hspace{1cm}}$ $= \underline{\hspace{2cm}}$
d. $69 - \underline{19}$	e. $67 - \underline{36}$	f. $64 - \underline{33}$

Strategy 4: Add.

You can “add backwards”. This works well if the two numbers are close to each other.

Instead of subtracting, think how much you need to add to the number being subtracted (the subtrahend) in order to get the number you are subtracting from (the minuend).

$71 - 67 = ??$

Think: $67 + \underline{\quad} = 71$

$558 - 556 = ??$

Think: $556 + \underline{\quad} = 558$

6. Subtract.

a. $78 - 75 = \underline{\quad}$

$61 - 58 = \underline{\quad}$

b. $112 - 108 = \underline{\quad}$

$692 - 688 = \underline{\quad}$

c. $505 - 499 = \underline{\quad}$

$1000 - 994 = \underline{\quad}$

7. You had \$50. You purchased two bouquets of roses for \$13 each.

How much do you have left after the purchase?

8. What if you bought three bouquets of roses for \$13 each with your \$50?

How much would you have left after the purchase?

9. Fifteen children were playing on the playground. Seven of them left.

Then, ten more children came. How many are playing on the playground now?

10. A lion chased an antelope for 400 feet, then another 200 feet, and lastly 200 feet more. Then the lion pounced on the antelope.

What was the total number of feet that the lion chased the antelope?

What is this three-digit number? The tens digit is half of 10.
The hundreds digit is double the ones digit. And the ones digit is half the amount of letters in the word “June.”

That was the easy puzzle. Now comes the real one.

What is this three-digit number?

Here are the clues for the digits: September, October, November.

Puzzle Corner

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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 that involve 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	68	1 page
Multiplication and Addition	69	3 pages
Multiplication on a Number Line	72	3 pages
Multiplication as an Array	75	2 pages
Order of Operations	77	1 page
Understanding Word Problems, Part 1	78	3 pages
Understanding Word Problems, Part 2	81	2 pages
Multiplication in Two Ways	82	4 pages

Sample worksheet from

www.mathmammoth.com

Order of Operations	87	2 pages
Multiplying by Zero	89	2 pages
Mixed Review	91	2 pages
Review	93	2 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.teachingwithtltc.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

Button Beach Challenge

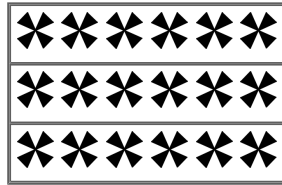
Figure out what number the various colored buttons represent.

<http://www.amblesideprimary.com/ambleweb/mentalmaths/buttons.html>

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Multiplication as an Array

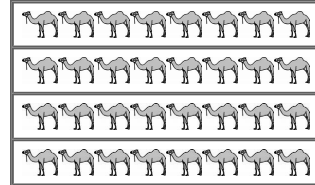
An **array** is an orderly arrangement of things in rows and columns. When things are neatly aligned in an array, we can think of the rows as groups, so an array still pictures multiplication as repeated addition.



3 rows, 6 crosses in each row.

$$6 + 6 + 6$$

$$3 \times 6 = 18$$

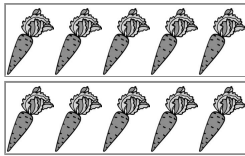


4 rows, 8 camels in each row.

$$8 + 8 + 8 + 8$$

$$4 \times 8 = 32$$

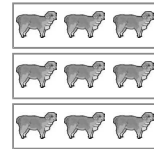
1. Fill in the missing numbers.



a. _____ rows, _____ carrots in each row.

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

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



b. _____ rows, _____ rams in each row.

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

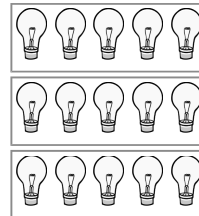
$$\underline{\hspace{2cm}} \times \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \text{ rams}$$



c. _____ rows, _____ bear in each row.

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

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

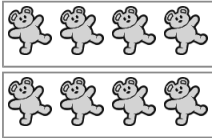
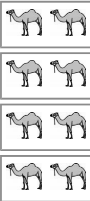
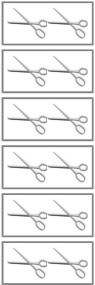
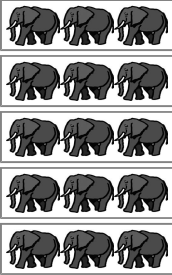
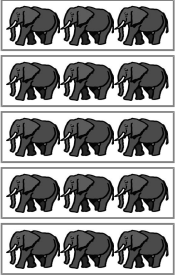
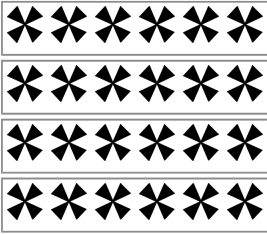
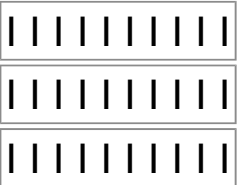
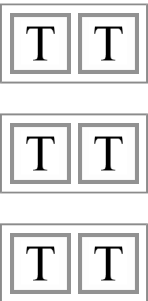
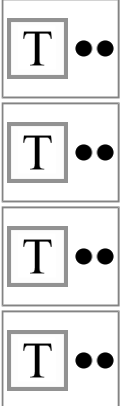


d. _____ rows, _____ bulbs in each row.

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

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

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

a. $4 + 4 = \underline{\hspace{2cm}}$ $2 \times 4 = \underline{\hspace{2cm}}$ 	b. 
c. 	d. 
e. 	f. 
g. 	h. 
i. 	j. 

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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 alone that the student completes do not work 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 have included a list of free online multiplication activities at the end of this introduction.

Here is 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=sZlBtMPMyk>

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 him the answers too easily, because **ONLY** by putting forth an effort will he memorize the facts. Just like the muscles, the mind needs exercise to become stronger.

Require him to memorize the skip-counting list both forwards and backwards. Keep practicing until he 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 the table of 9 is more subtle but still useful.

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

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 counting 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 7×3).

You can also mix earlier tables that he 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 a 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 him out.

As an extension, you can say answers from several tables that you have 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 will not happen overnight. On subsequent days, you can mix drills 1-5 (hopefully you will not 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 he will learn how to do the memorization himself. He can hide the answers and try to reproduce the list in his 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 students!
- 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 children 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 are 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 do not 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 children, 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	99	3 pages
Multiplication Table of 4	102	2 pages
Multiplication Table of 10	104	2 pages
Multiplication Table of 5	106	3 pages
More Practice and Review (Tables of 2, 4, 5, and 10)	109	3 pages
Multiplication Table of 3	112	3 pages
Multiplication Table of 6	115	2 pages
Multiplication Table of 11	117	3 pages
Multiplication Table of 9	120	4 pages
Multiplication Table of 7	124	2 pages
Multiplication Table of 8	126	3 pages
Multiplication Table of 12	129	2 pages
Mixed Review	131	2 pages
Review	133	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 Tables Structured Drill - video

This video of mine explains how to do a “structured drill” for multiplication tables, which is much more effective than a random drill.

www.youtube.com/watch?v=4bpq3Mqbww0

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

Raging Rectangles and Multiple Madness (PDF)

Two fun printable board games for multiplication; Raging Rectangles is on page 2 and Multiple Madness is on page 6 of the download.

http://mathlearnnc.sharpschool.com/UserFiles/Servers/Server_4507209/File/Instructional%20Resources/G3WW21-24.pdf

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>

Sample worksheet from

www.mathmammoth.com

Math Trainer - Multiplication

Multiplication table training online that responds to your answers and will improve your skills.

<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 the 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 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>

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 (counting up and down). Notice these are the even numbers!

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.

$1 \times 2 = \underline{\quad}$	$7 \times 2 = \underline{\quad}$
$2 \times 2 = \underline{\quad}$	$8 \times 2 = \underline{\quad}$
$3 \times 2 = \underline{\quad}$	$9 \times 2 = \underline{\quad}$
$4 \times 2 = \underline{\quad}$	$10 \times 2 = \underline{\quad}$
$5 \times 2 = \underline{\quad}$	$11 \times 2 = \underline{\quad}$
$6 \times 2 = \underline{\quad}$	$12 \times 2 = \underline{\quad}$

b.

$\underline{\quad} \times 2 = 2$	$\underline{\quad} \times 2 = 14$
$\underline{\quad} \times 2 = 4$	$\underline{\quad} \times 2 = 16$
$\underline{\quad} \times 2 = 6$	$\underline{\quad} \times 2 = 18$
$\underline{\quad} \times 2 = 8$	$\underline{\quad} \times 2 = 20$
$\underline{\quad} \times 2 = 10$	$\underline{\quad} \times 2 = 22$
$\underline{\quad} \times 2 = 12$	$\underline{\quad} \times 2 = 24$

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.

$\square \times 2 = 14$	$\square \times 2 = 12$	$\square \times 2 = 6$	$\square \times 2 = 12$	$\square \times 2 = 22$
$\square \times 2 = 18$	$\square \times 2 = 16$	$\square \times 2 = 18$	$\square \times 2 = 8$	$\square \times 2 = 10$
$\square \times 2 = 8$	$\square \times 2 = 24$	$\square \times 2 = 14$	$\square \times 2 = 20$	$\square \times 2 = 24$
$\square \times 2 = 16$	$\square \times 2 = 2$	$\square \times 2 = 22$	$\square \times 2 = 4$	$\square \times 2 = 6$

5. Multiply.

a. $2 \times 12 = \underline{\hspace{2cm}}$	b. $8 \times 2 = \underline{\hspace{2cm}}$	c. $9 \times 2 = \underline{\hspace{2cm}}$	d. $2 \times 11 = \underline{\hspace{2cm}}$
$7 \times 1 = \underline{\hspace{2cm}}$	$2 \times 5 = \underline{\hspace{2cm}}$	$3 \times 0 = \underline{\hspace{2cm}}$	$10 \times 2 = \underline{\hspace{2cm}}$
$1 \times 8 = \underline{\hspace{2cm}}$	$6 \times 2 = \underline{\hspace{2cm}}$	$1 \times 2 = \underline{\hspace{2cm}}$	$0 \times 7 = \underline{\hspace{2cm}}$

6. Multiplying by two is the same as **doubling**. Write an addition sentence and multiply by two to double the number in each problem.

a. Double 8 $\underline{8} + \underline{8} = \underline{\hspace{2cm}}$ $\underline{2} \times \underline{8} = \underline{\hspace{2cm}}$	b. Double 13 $\underline{\hspace{1cm}} + \underline{\hspace{1cm}} = \underline{\hspace{2cm}}$ $\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{2cm}}$	c. Double 15 $\underline{\hspace{1cm}} + \underline{\hspace{1cm}} = \underline{\hspace{2cm}}$ $\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{2cm}}$
d. Double 25 $\underline{\hspace{1cm}} + \underline{\hspace{1cm}} = \underline{\hspace{2cm}}$ $\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{2cm}}$	e. Double 32 $\underline{\hspace{1cm}} + \underline{\hspace{1cm}} = \underline{\hspace{2cm}}$ $\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{2cm}}$	f. Double 45 $\underline{\hspace{1cm}} + \underline{\hspace{1cm}} = \underline{\hspace{2cm}}$ $\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{2cm}}$

7. Continue the multiplication table of 2 a little bit further. Notice that all the answers in the multiplication table of 2 are **even** numbers.

$2 \times 12 = \underline{\hspace{2cm}}$	$2 \times 15 = \underline{\hspace{2cm}}$	$2 \times 18 = \underline{\hspace{2cm}}$	$2 \times 21 = \underline{\hspace{2cm}}$
$2 \times 13 = \underline{\hspace{2cm}}$	$2 \times 16 = \underline{\hspace{2cm}}$	$2 \times 19 = \underline{\hspace{2cm}}$	$2 \times 22 = \underline{\hspace{2cm}}$
$2 \times 14 = \underline{\hspace{2cm}}$	$2 \times 17 = \underline{\hspace{2cm}}$	$2 \times 20 = \underline{\hspace{2cm}}$	$2 \times 23 = \underline{\hspace{2cm}}$

8. Underline or circle whether the number is even or odd. If the number is even, write it as “two times the number that was doubled.” If the number is odd, don't do anything.

a. 14 is even/odd $2 \times \underline{\hspace{1cm}}$	b. 7 is even/odd $2 \times \underline{\hspace{1cm}}$	c. 18 is even/odd $2 \times \underline{\hspace{1cm}}$
d. 21 is even/odd $2 \times \underline{\hspace{1cm}}$	e. 30 is even/odd $2 \times \underline{\hspace{1cm}}$	f. 34 is even/odd $2 \times \underline{\hspace{1cm}}$

9. Solve. Write a multiplication or a combination of multiplication and addition for each problem.

a. How many feet do seven chickens have?

$$\underline{\quad} \times \underline{\quad} = \underline{\quad}$$

b. How many feet do five chickens and one cow have?

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

c. How many feet do two cows and one chicken have?

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

d. How many feet do three cows and five chickens have?

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

10. Write an animal feet problem to match this addition and multiplication:

$$8 \times 2 + 2 \times 4 = 24$$

You can also make animal feet problems for your friend/classmate!

11. Solve the word problems. Write a multiplication, addition, or a subtraction, or perhaps a combination of them, for each problem.

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

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

b. John earns two dollars every time he helps with the yard work. He did yard work six times and saved all his money. Then he bought a book that cost eight dollars. How much money did he have left?

Fred had \$11 in his piggy bank. Each week he saved \$2 from the money he earned, for eight weeks. Then he had just enough money to buy an expensive model airplane. How much did the airplane cost?



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Chapter 4: Telling Time

Introduction

This chapter covers reading the clock to the minute, finding time intervals (elapsed time), using the calendar, and making simple conversions between units of time.

First, we review the topic of reading the clock to the five-minute intervals, first using numbers in telling the time, such as 6:45 or 12:15. Then, children learn about quarter hours, such as a quarter till 6 or a quarter past 9. We also review the topic of using “past” and “till”, such as in 20 till 6 or 10 past 11. Next we study elapsed time in more detail in the lesson “How Many Minutes Pass.”

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 next two 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.

We also study using the calendar, and converting between time units, such as changing 2 hours to 120 minutes or changing 340 minutes to 5 hours 40 minutes.

The Lessons in Chapter 4

	page	span
Review: Reading the Clock	139	2 pages
Half and Quarter Hours	141	2 pages
Review: Till and Past	143	2 pages
How Many Minutes Pass	145	3 pages
Practice	148	1 page
Clock to the Minute	149	3 pages
Elapsed Time	152	2 pages
More on Elapsed Time	154	4 pages
Using the Calendar	158	2 pages
Mixed Review	160	4 pages
Review	162	1 page

Helpful Resources on the Internet

What Time Will it Be?

Move the hands on the clock to show what time it will be after a certain amount of minutes.

http://nlvm.usu.edu/en/nav/frames_asid_318_g_2_t_4.html

Match Clocks

Make the digital clock show the time given on an analog clock.

http://nlvm.usu.edu/en/nav/frames_asid_317_g_2_t_4.html

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

Elapsed Time Worksheets

Generate printable worksheets for elapsed time. You can practice the elapsed time, finding the starting time, or finding the ending time. The time interval can be to the accuracy of 1 minute, 5 minutes, 10 minutes, 15 minutes, 30 minutes, or whole hours.

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

Analog/digital clock games and worksheets. 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 the clock runs to a time and you type 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/>

That Quiz: Time

Online quizzes for all time-related topics: reading the clock, time passed, adding/subtracting with time, conversion of time units, and time zone practice. The quizzes have many levels, can be timed or not, and include lots of options for customization. Easy to use and set up.

www.thatquiz.org/tq-g/math/time

On Time

Set the clock's hands to the given time. Four different levels.

http://www.sheppardsoftware.com/mathgames/earlymath/on_time_game1.htm

Clock Shoot

A game where you need to click on the clock with the matching time (analog/digital). Three different levels: whole hours, half hours, or quarter hours.

http://www.sheppardsoftware.com/mathgames/earlymath/clock_shoot.htm

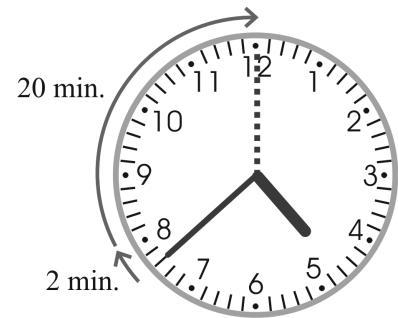
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Elapsed Time

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.

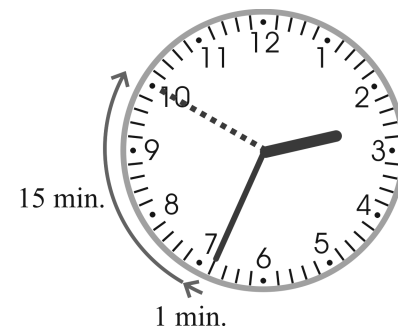
Or, add up from 34 till 50:

$$34 + \underline{6} = 40$$

$$40 + \underline{10} = 50.$$

You added 16 minutes.

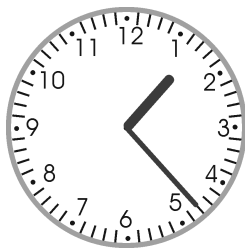
Or, imagine the minute hand moving on the clock face: it moves 1 minute, and then another 15 minutes — a total of 16 minutes.



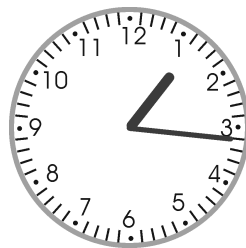
1. How many minutes is it till the next whole hour?



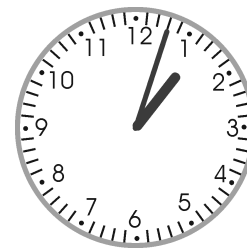
a. _____ minutes



b. _____ minutes



c. _____ minutes



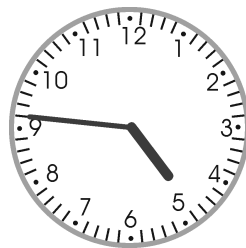
d. _____ minutes



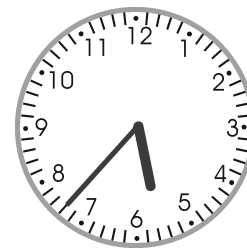
e. _____ minutes



f. _____ minutes

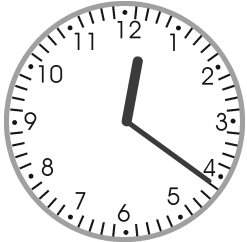
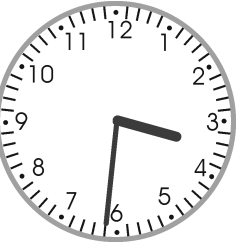
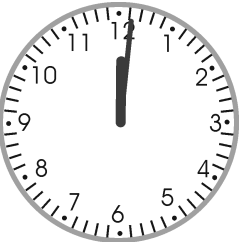
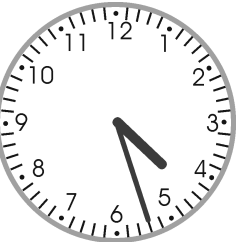


g. _____ minutes



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 arrived 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.

You can make free worksheets for counting coins at <http://www.homeschoolmath.net/worksheets/money.php>, or using the worksheets generator that comes with the supportive materials of this curriculum.

The Lessons in Chapter 5

	page	span
Using the Half-Dollar	165	2 pages
Dollars	167	3 pages
Making Change	170	4 pages
Mental Math and Money Problems	174	3 pages
Solving Money Problems	177	4 pages
Mixed Review	181	2 pages
Review	183	1 page

Helpful Resources on the Internet

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

US Money Worksheets

Count common US coins or bills. You can choose which coins/bills will be used, and how many coins/bills are shown at most. Other currencies are available at www.homeschoolmath.net/worksheets
<http://www.homeschoolmath.net/worksheets/money.php>

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>

Cash Out

Make the correct change by clicking on the bills and coins.

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

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/

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.

<http://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 the “\$” 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 100 cents, they 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. _____ ¢ = \$5.69	e. _____ ¢ = \$0.30	f. _____ ¢ = \$3.06

5. Mark opened his piggy bank and counted the coins. He had 245 cents.
He also had \$5 in his wallet. How much money does Mark have in total?

6. 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	\$ _____



If I buy:	I will have left:
c. a book for \$4.20 and a magazine for \$1.50	\$ _____
d. two brushes for \$3.35 each	\$ _____



If I buy:	I will have left:
e. a pen (\$0.60) and an eraser (\$0.50)	\$ _____
f. three pencils for \$0.40 each	\$ _____