

math

MAMMOTH

Grade 3-B Worktext

Place value with thousands

Geometry

Measuring

Division

Fractions



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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-B, covers place value and 4-digit numbers (chapter 6), geometry (chapter 7), measuring (chapter 8), division (chapter 9), and fractions (chapter 10). The rest of the topics are covered in the 3-A 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 simply reprint some already studied pages.

I wish you success in your math teaching!

Maria Miller, the author

Chapter 6: Place Value with Thousands

Introduction

This chapter of *Math Mammoth Grade 3* covers 4-digit numbers (numbers with thousands), and adding and subtracting them. We also study rounding and estimating, which are very important skills for everyday life.

First, students learn 4-digit numbers, place value—breaking numbers such as 3,498 into thousands, hundreds, tens, and ones—and comparing 4-digit numbers. Next, they practice some mental addition and subtraction with 4-digit numbers. The lesson stresses the similarities between adding and subtracting 4-digit numbers and adding and subtracting smaller numbers. Practicing mental math also helps to build number sense.

We also study regrouping in addition and subtraction, using 4-digit numbers. If you purchased the download version, you can make more worksheets for addition and subtraction using the accompanying worksheet maker.

The last major topics in this chapter are rounding numbers to the nearest hundred and estimating. Students also get to do some more word problems in one lesson.

The Lessons

	page	span
Thousands	8	<i>4 pages</i>
Four-Digit Numbers and Place Value	12	<i>4 pages</i>
Which Number is Greater?	16	<i>2 pages</i>
Mental Adding and Subtracting	18	<i>4 pages</i>
Add 4-Digit Numbers with Regrouping	22	<i>2 pages</i>
Subtract 4-Digit Numbers with Regrouping	24	<i>4 pages</i>
Rounding to the Nearest Hundred	28	<i>3 pages</i>
Estimating	31	<i>3 pages</i>
Word Problems	34	<i>3 pages</i>
Mixed Review	37	<i>2 pages</i>
Review	39	<i>2 pages</i>

Helpful Resources on the Internet

Base Blocks from National Library of Virtual Manipulatives

Place enough thousand cubes, hundred-flats, ten-sticks, and one-blocks in the work area to show the 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

Maths Teacher's Toolkit

Use the place value calculator for this level to practice place value with 4-digit numbers. Some of the other tools are too easy for the focus of this chapter.

<http://www.crick.northants.sch.uk/Flash%20Studio/cfsmaths/Toolkit/Toolkit.htm>

Cookie Dough

Practice naming big numbers.

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

Can you say really big numbers?

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

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

Line Dry Game

Fill in a missing number on the clothesline based on different skip-counting patterns.

<http://www.fuelthebrain.com/Game/play.php?ID=15>

Maximum Capacity

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

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

Place value puzzler

Place value or rounding game. Choose “easy” place value or “easy” rounding for this level. You will need to click on the required place value in a number, or type in the answer for rounding.

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

Rounding Sharks

You will be asked to round numbers in the thousands to the nearest hundred. Click on the shark that has the number rounded correctly.

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

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Four-Digit Numbers and Place Value

Here the numbers 2467, 1090, and 5602 are written as a *sum* of their different place values.

It is like writing each part of the number out in full: the thousands, the hundreds, the tens, and the ones. **Notice the zeros!** When there are *no* hundreds, or tens, or ones, we write a zero.

thou- sands	hund- reds	tens	ones
2	4	6	7
2000 + 400 + 60 + 7			

thou- sands	hund- reds	tens	ones
1	0	9	0
1000 + 0 + 90 + 0			

thou- sands	hund- reds	tens	ones
5	6	0	2
5000 + 600 + 0 + 2			

1. Fill in the blanks, and write the numbers as a sum of the different place values.

a. 1,034 = ___ thousand ___ hundreds ___ tens ___ ones
 = 1000 + 0 + 30 + 4

b. 5,670 = ___ thousand ___ hundreds ___ tens ___ ones
 = 5000 + _____ + _____ + _____

c. 3,508 = ___ thousand ___ hundreds ___ tens ___ ones
 = _____ + _____ + _____ + _____

d. 8,389 = ___ thousand ___ hundreds ___ tens ___ ones
 = _____ + _____ + _____ + _____

e. 9,007 = ___ thousand ___ hundreds ___ tens ___ ones
 = _____ + _____ + _____ + _____

f. 7,214 = ___ thousand ___ hundreds ___ tens ___ ones
 = _____ + _____ + _____ + _____

2. Fill in the table.

<p>a. five thousand nine hundred ninety</p> <p>T H T O</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td style="width: 25px; height: 20px;"></td> <td style="width: 25px; height: 20px;"></td> <td style="width: 25px; height: 20px;"></td> <td style="width: 25px; height: 20px;"></td> </tr> </table>					<p>b. Six thousand sixteen</p> <p>T H T O</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td style="width: 25px; height: 20px;"></td> <td style="width: 25px; height: 20px;"></td> <td style="width: 25px; height: 20px;"></td> <td style="width: 25px; height: 20px;"></td> </tr> </table>					<p>c. Six thousand three hundred three</p> <p>T H T O</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td style="width: 25px; height: 20px;"></td> <td style="width: 25px; height: 20px;"></td> <td style="width: 25px; height: 20px;"></td> <td style="width: 25px; height: 20px;"></td> </tr> </table>										
<p>d. Eight thousand seven hundred</p> <p>T H T O</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td style="width: 25px; height: 20px;"></td> <td style="width: 25px; height: 20px;"></td> <td style="width: 25px; height: 20px;"></td> <td style="width: 25px; height: 20px;"></td> </tr> </table>					<p>e. Nine thousand two hundred forty-five</p> <p>T H T O</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td style="width: 25px; height: 20px;"></td> <td style="width: 25px; height: 20px;"></td> <td style="width: 25px; height: 20px;"></td> <td style="width: 25px; height: 20px;"></td> </tr> </table>					<p>f. Ten thousand</p> <p>ten thou- sands</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td style="width: 25px; height: 20px;"></td> <td style="width: 25px; height: 20px;"></td> <td style="width: 25px; height: 20px;"></td> <td style="width: 25px; height: 20px;"></td> <td style="width: 25px; height: 20px;"></td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> </tr> </table>						1	0	0	0	0
1	0	0	0	0																

3. These numbers are written as sums. Write them in the normal way.

<p>a. $2000 + 90 =$ _____</p> <p>$3000 + 200 =$ _____</p>	<p>b. $8000 + 5 =$ _____</p> <p>$1000 + 80 + 7 =$ _____</p>
<p>c. $8000 + 200 + 20 =$ _____</p> <p>$2000 + 500 + 90 + 8 =$ _____</p>	<p>d. $4000 + 50 =$ _____</p> <p>$2000 + 800 + 7 =$ _____</p>

4. What part of these numbers is missing?

<p>a. $5000 + 80 +$ _____ $= 5,083$</p>	<p>b. $7000 +$ _____ $+ 5 = 7,605$</p>
<p>c. _____ $+ 3000 = 3,050$</p>	<p>d. _____ $+ 700 + 1 = 2,701$</p>

5. Write the numbers immediately after and before the given number.

- a.** _____ 6,049 _____ **b.** _____ 2,324 _____
- c.** _____ 1,800 _____ **d.** _____ 8,809 _____
- e.** _____ 7,385 _____ **f.** _____ 9,244 _____

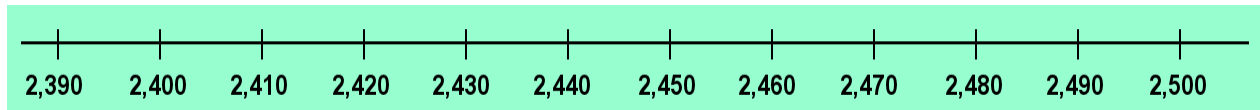
6. These numbers are written as sums, but in a scrambled order! Write them as normal numbers.

a. $4000 + 900 + 7 =$ _____	b. $80 + 500 + 8000 + 6 =$ _____
c. 2 thousand 7 ones 4 tens	d. 2 tens 6 hundred 4 thousand
e. 7 thousand 8 hundred 8 ones	f. 5 thousand 6 tens
g. 3 thousand 4 ones	h. 5 hundred 9 thousand

7. What part of these numbers is missing?

a. $900 + 2 +$ _____ $= 8,902$	b. $5000 + 40 +$ _____ $= 5,046$
c. _____ $+ 6000 + 40 = 6,540$	d. _____ $+ 4000 + 300 = 4,340$

8. Here is a number line from 2,390 to 2,500 with tick-marks for every 10.

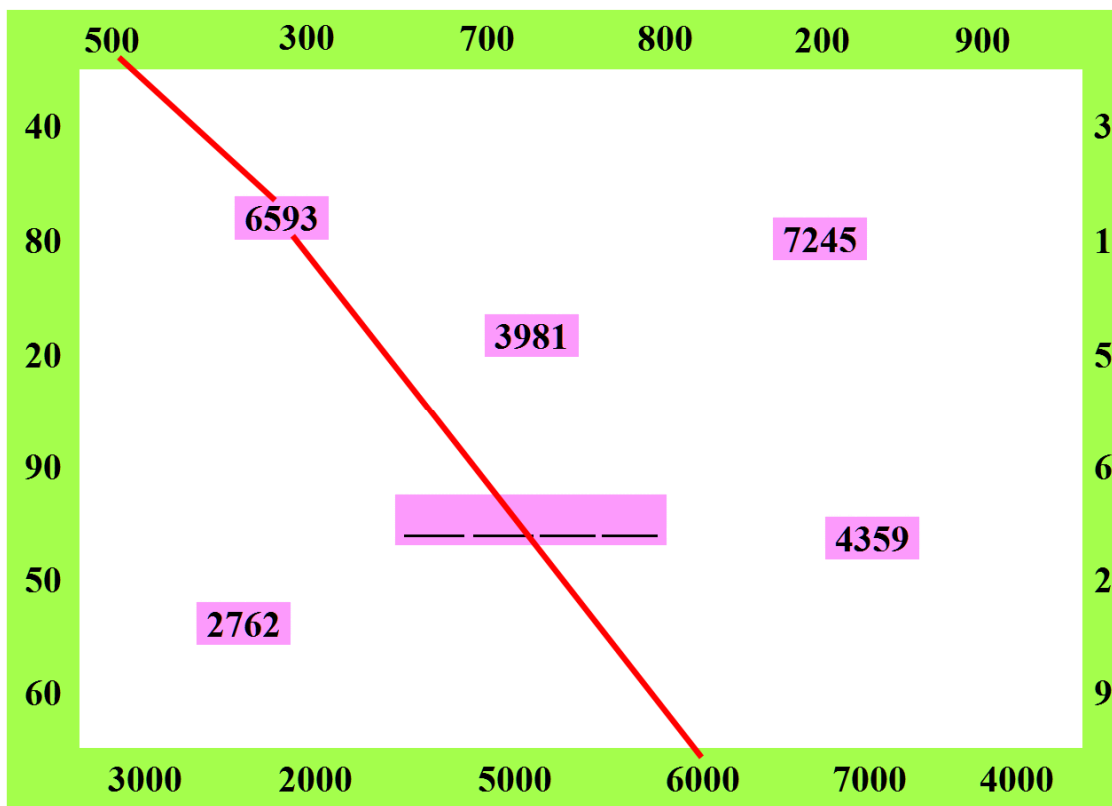


Mark these numbers on the number line (approximately):
2415 2398 2441 2476 2483 2499.

9. Draw a number line from 7,650 to 7,800 with tick marks at every 10.

Mark these numbers on the number line (approximately):
7659, 7672, 7745, 7758, 7777, 7796

10. Connect each number inside the puzzle to its whole thousands, hundreds, tens, and ones that it contains. For example, 6,593 is connected to 6,000 and to 500 (for starters). Add the unused numbers from the border to form the missing number inside.



11. Solve the puzzle. Think of breaking the numbers into thousands, hundreds, tens, and ones.

	+		+		+		=	5206
+		+		+		+		
	+		+		+		=	3078
+		+		+		+		
	+		+		+		=	1925
+		+		+		+		
	+		+		+		=	432
=		=		=		=		
5022		3235		1408		976		

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Chapter 7: Geometry

Introduction

The seventh chapter of *Math Mammoth Grade 3* deals with geometry. The emphasis is on two new concepts: area and perimeter.

First, we study and review shapes in one lesson where the student divides shapes into new ones, and also encounters some tilings (a.k.a. tessellations). Next, we study in more detail about some quadrilaterals, namely squares, rectangles, and rhombi (plural of rhombus).

Then comes the focus of this chapter: perimeter and area. Students find perimeters of polygons, including finding the perimeter when the side lengths are given, and finding an unknown side length when the perimeter is given.

They learn about area, and how to measure it in either square inches, square feet, square centimeters, square meters, or just square units if no unit of length is specified.

Students also relate area to the operations of multiplication and addition. They learn to find the area of a rectangle by multiplying the side lengths, and to find the area of rectilinear figures by dividing them into rectangles and adding the areas.

We also study the distributive property “in disguise.” This means using an area model to represent $a \times (b + c)$ as being equal to $a \times b$ plus $a \times c$. The expression $a \times (b + c)$ is the area of a rectangle with side lengths a and $(b + c)$, which is equal to the areas of two rectangles, one with sides a and b , and the other with sides a and c .

Multiplying by Whole Tens is a lesson about multiplication such as 3×40 or 90×7 . It is put here so that students can then use their multiplication skills to calculate areas of bigger rectangles.

Then we solve many area and perimeter problems. That is necessary so that students learn to distinguish between these two concepts. They also get to see rectangles with the same perimeter and different areas or with the same area and different perimeters.

Lastly we touch on solids, such as cube, rectangular prism, pyramids, cone, and cylinder, and study their faces, edges, and vertices. You can make paper models for them from the printouts provided in the curriculum. Alternatively you can buy them, usually made in plastic. Search on the internet for “geometric solids.”

The Lessons

	page	span
Shapes	45	4 pages
Some Special Quadrilaterals	50	3 pages
Perimeter	53	3 pages
Problems with Perimeter	57	3 pages
Getting Started with Area	60	2 pages
More About Area	62	4 pages
Multiplying by Whole Tens	66	4 pages
Area Units and Problems	70	4 pages
Area and Perimeter Problems	74	2 pages
More Area and Perimeter Problems	76	3 pages
Solids	79	2 pages
Mixed Review	81	2 pages
Geometry Review	83	2 pages

Helpful Resources on the Internet

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

SHAPES

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 Playground

Drag various colorful polygons to the work area to make your own creations!

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

Interactive Quadrilaterals

Drag the corners to play with squares, rectangles, rhombi, and more.

<http://www.mathsisfun.com/geometry/quadrilaterals-interactive.html>

Shapes Identification Quiz from ThatQuiz.org

An online quiz in a multiple-choice format, asking to identify common two-dimensional shapes. You can modify the quiz parameters to your liking.

www.thatquiz.org/tq-f/math/shapes/

Sample worksheet from

www.mathmammoth.com

Tangram puzzles for kids

Use the seven pieces of the Tangram to form the given puzzle. Complete the puzzle by moving and rotating the seven shapes.

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

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/fold-set>

Online Kaleidoscope

Create your own kaleidoscope creation with this interactive tool.

http://www.zefrank.com/dtoy_vs_byokal/

AREA AND PERIMETER

Everything you wanted to know about area and perimeter

Short explanations of how to find the perimeter of simple shapes and the area of rectangles, followed by quizzes on three levels. In perimeter, level two, some side lengths are not given. In level three, you calculate the perimeter of compound shapes. In area of rectangles, level 1 has just rectangles, and levels 2 and 3 have compound shapes made of rectangles.

www.bgfl.org/custom/resources_ftp/client_ftp/ks2/maths/perimeter_and_area/index.html

Shape Explorer

Find the perimeter and area of odd shapes on a rectangular grid.

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

Math Playground: Measuring the Area and Perimeter of Rectangles

Amy and her brother, Ben, explain how to find the area and perimeter of rectangles and show you how changing the perimeter of a rectangle affects its area. After the lesson, you will use an interactive ruler to measure the length and width of 10 rectangles, and to calculate the perimeter and area of each.

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

Math Playground: Party Designer

You need to design areas for the party, such as a crafts table, food table, seesaw, and so on, so that they have the given perimeters and areas.

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

BBC Bitesize - Perimeter

A simple revision (review) “bite” for perimeter that includes short explanations and a few quiz questions.

<http://www.bbc.co.uk/schools/ks3bitesize/maths/measures/perimeter/revise1.shtml>

BBC Bitesize - Area

Brief revision (review) “bites”, including a few interactive questions, about area: counting squares, area of rectangles, area of triangles, parallelograms, and of compound shapes. Includes an activity and a test.

<http://www.bbc.co.uk/schools/ks3bitesize/maths/measures/area/revise1.shtml>

Sample worksheet from
www.mathmammoth.com

Geometry Area/Perimeter Quiz from ThatQuiz.org

An online quiz, asking either the area or perimeter of rectangles, triangles, and circles. You can modify the quiz parameters to your liking, for example to omit the circle, or instead of solving for area, you solve for an unknown side when the perimeter/area is given.

<http://www.thatquiz.org/tq-4/?-j201v-lc-m2kc0-na-p0>

Perimeter Game from Cyram.org

A simple online quiz for finding the perimeter of rectangles, triangles, or compound rectangles where not all side lengths are given.

<http://www.cyram.org/Projects/perimetergame/index.html>

FunBrain: Shape Surveyor Geometry Game

A simple and easy game that practices finding either the perimeter or area of rectangles.

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

Area of Rectangle

Drag the corners of the rectangle and see how the side lengths and areas change.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=46>

XP Math: Find Perimeters of Parallelograms

This online quiz shows you parallelograms and rectangles, and you need to calculate the perimeter, including typing in the right unit, and not using the altitude of the parallelogram.

<http://www.xpmath.com/forums/arcade.php?do=play&gameid=10>

SOLIDS

Identify solids

Select the name and drop it on the correct solid.

<http://www.softschools.com/math/geometry/shapes/solids/games/>

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>

2-D and 3-D Shapes

Learn about different solids and see them rotate.

http://www.bgfl.org/bgfl/custom/resources_fpf/client_ftp/ks2/maths/3d/index.htm

Identify solids

Click to identify the partially buried 3-dimensional shapes.

<http://www.primaryresources.co.uk/online/longshape3d.html>

Space Blocks

Build with blocks to illustrate three-dimensional shapes.

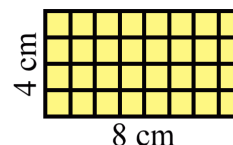
http://nlvm.usu.edu/en/nav/frames_asid_195_g_2_t_2.html

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Area and Perimeter Problems

Sometimes it's easy to confuse perimeter and area.

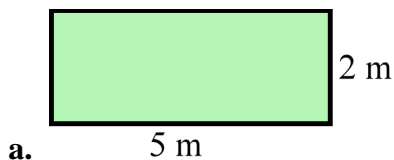
- AREA has to do with covering the shape with squares. Your answer will be in square centimeters, square inches, square feet, square meters, or just square units.
- PERIMETER has to do with “going all the way around.” Your answer will be in some unit of length, such as centimeters, meters, inches, or feet.



Area: $4 \text{ cm} \times 8 \text{ cm} = 32 \text{ cm}^2$.

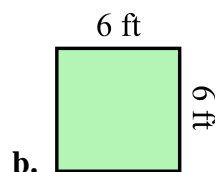
Perimeter:
 $4 \text{ cm} + 8 \text{ cm} + 4 \text{ cm} + 8 \text{ cm} = 24 \text{ cm}$

1. Find the area and perimeter of the rectangles.



Perimeter = _____

Area = _____



Perimeter = _____

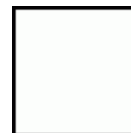
Area = _____



c. 4 in. wide, 2 in. tall

Perimeter = _____

Area = _____



d. A square with 3 cm sides

Perimeter = _____

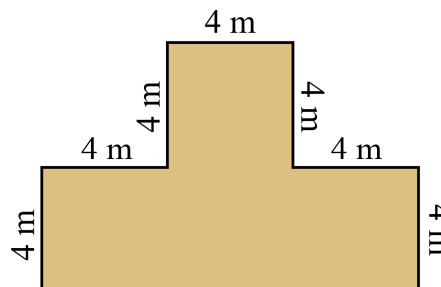
Area = _____

2. Find the area and perimeter of this shape.

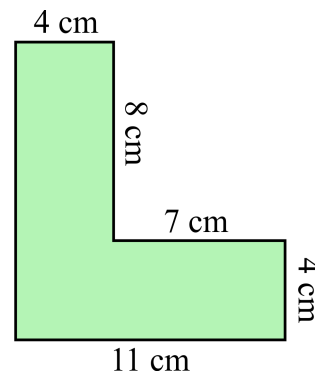
Notice that one side length is not given.
 You need to figure that out.

Area

Perimeter



3. Find the area and perimeter of this shape.
Notice that one side length is not given.
You need to figure that out.



Area

Perimeter

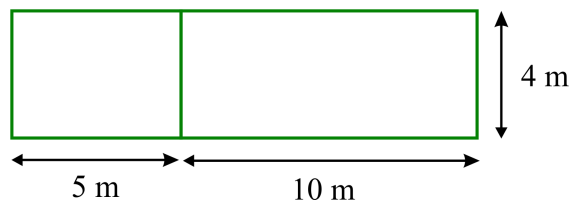
4. This is a two-part lawn.

- a. Find the areas of the two parts.

_____ and _____

- b. Find the total area.

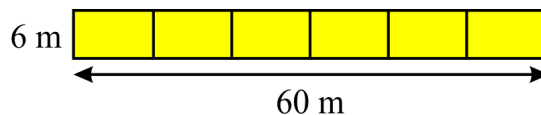
- c. Find the perimeter.



5. Find the total area of this rectangle,
and also the area of each little part.

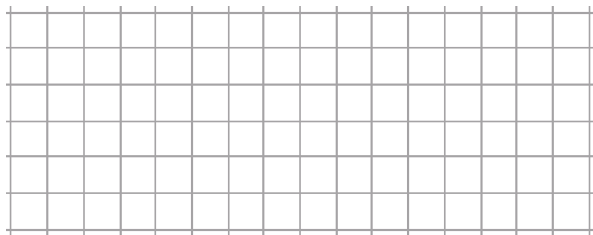
Area of each part:

Total area:



Puzzle Corner

Can you draw these rectangles? Guess and check!



- a. Draw a rectangle with an area of 39 squares, and a perimeter of 32 units.



- b. Draw a rectangle with an area of 56 squares, and a perimeter of 36 units.

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Chapter 8: Measuring

Introduction

The eighth chapter of *Math Mammoth Grade 3* covers measuring-related topics. Both the metric system and the customary system are covered.

First, students learn about units of length. We start the chapter by measuring to the nearest quarter of an inch. Since most rulers measure to the eighth or sixteenth part of an inch, it is helpful to cut out a ruler from the lesson that only has tick marks for every fourth of an inch, and tape that onto an existing ruler.

Next, students measure using centimeters and millimeters. They also create line plots from measurement data where the horizontal scale is marked off in quarters of an inch.

The next two lessons help students become familiar with feet, yards, miles, meters, and kilometers—the units for measuring medium and long distances.

Then it is time to measure weight. The first lesson deals with pounds and ounces, and the next one with grams and kilograms. It is very helpful if you can use a kitchen scale for these lessons, perhaps borrow one if you don't have one.

Lastly we study liquid volume, first of all the customary units (cup, pint, quart, gallon) and then the metric units (liter and milliliter). The emphasis is on becoming familiar with the customary units of volume and measuring volume in milliliters.

Many of the lessons in this chapter also have an optional section about conversions between measuring units, such as changing three meters into centimeters, or two feet into inches. Converting between units is beyond the Common Core standards for third grade (it is actually included in the 4th and 5th grade standards), but I have included some easy conversion problems here because I feel many third graders are ready for them.

We all use various measuring units in our everyday lives, and using them is the key to remembering what they are, how big they are, and what the conversion factors are. Naturally, people in the United States 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, measuring tapes, and rulers.

The Lessons

	page	span
Measuring to the Nearest Fourth-Inch	87	4 pages
Centimeters and Millimeters	91	4 pages
Line Plots and More Measuring	95	3 pages
Feet, Yards, and Miles.....	98	2 pages
Meters and Kilometers	100	2 pages
Pounds and Ounces	102	4 pages
Grams and Kilograms	106	4 pages

Cups, Pints, Quarts, and Gallons	110	3 pages
Milliliters and Liters	113	2 pages
Mixed Review	115	2 pages
Review	117	2 pages

Helpful Resources on the Internet

The Ruler Game

Choose between whole inches, half-inches, quarters, eighths, or sixteenth parts of an inch to measure. Click on the given measurement on a ruler. Timed or not timed versions available.

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

Measure It!

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

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

Sal's Sub Shop

Customers order subs, and you need to cut them to the given measurements - sometimes in metric units, sometimes in inches.

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

Reading a Tape Measure Worksheets

Worksheet generator - you can choose to which accuracy to measure, inches, or inches and feet.

http://theworksheetgenerator.com/read_tape.html

Measurement Game for Kids

Measure the length and weight of various parcels using the interactive scales and ruler so you can give them a stamp with the correct postage rate. Uses grams and centimeters.

<http://www.kidsmathgamesonline.com/geometry/measurement.html>

Reading Scales

You can illustrate a variety of measuring devices, such as scales, measuring cup, thermometer, and speedometer, and how to read them. Generate examples using different scales on different devices at the press of a button.

<http://www.teacherled.com/2008/01/28/reading-scales>

Reading Scales

Weigh objects on this virtual balance scale, using weights of 10 g, 50 g, 250 g, and 500 g.

<http://www.teacherled.com/resources/oldscales/oldscalesload.html>

Measures

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

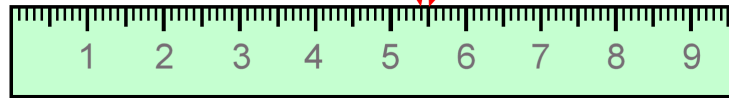
http://www.bgfl.org/bgfl/custom/resources_ftp/client_ftp/ks2/maths/measures

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Centimeters and Millimeters

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

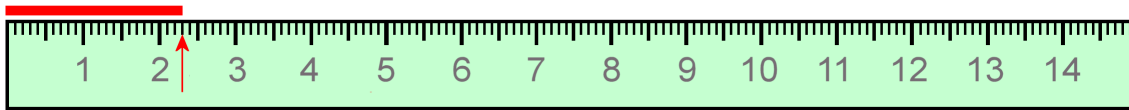
The distance from one short line to the
next line is 1 millimeter. We write 1 mm.
Millimeters are very tiny!



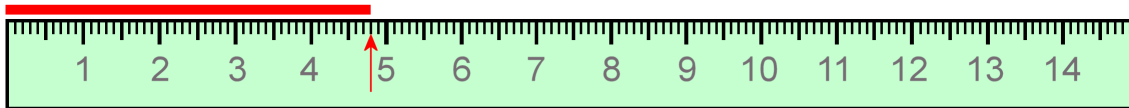
Look at the ruler: there are 10 millimeters in each centimeter.

Measuring lines

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



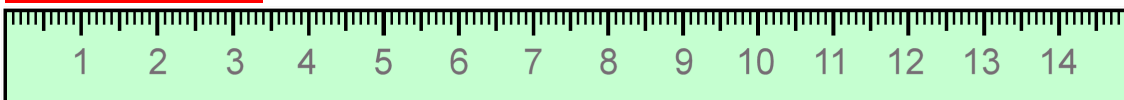
This line is 2 cm 3 mm long.



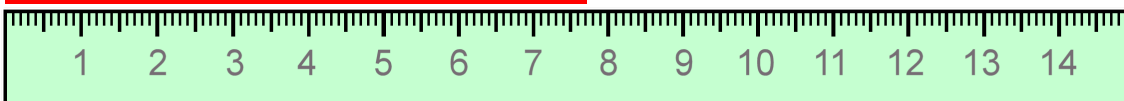
This line is 4 cm 8 mm long.

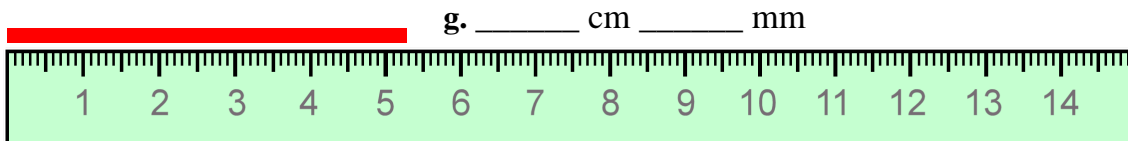
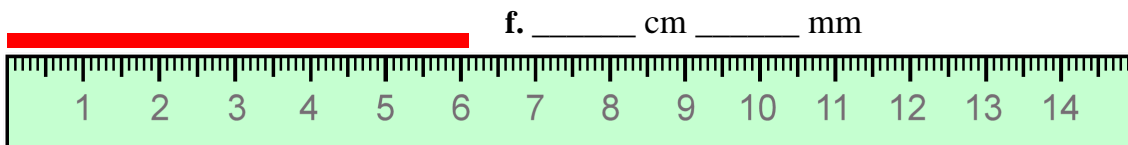
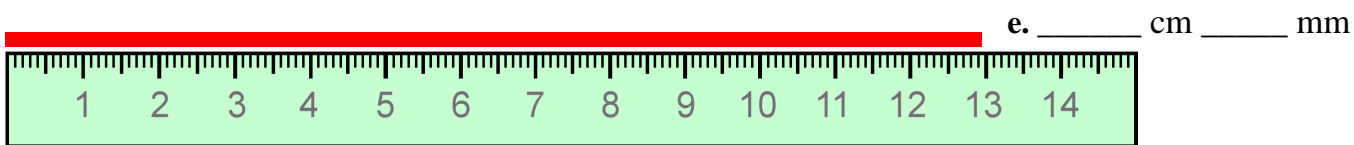
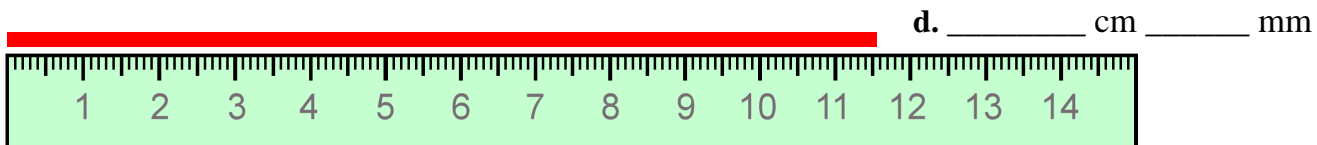
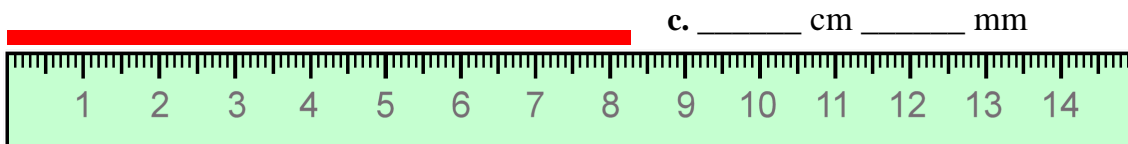
1. Measure the lines using the ruler.

a. _____ cm _____ mm



b. _____ cm _____ mm





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

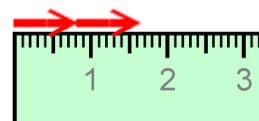
3. Measure items you can find at home, using a centimeter-millimeter ruler.

If the item is not exactly as long as the markers on the ruler, choose the nearest mark.

Item	Length
	_____ cm _____ mm

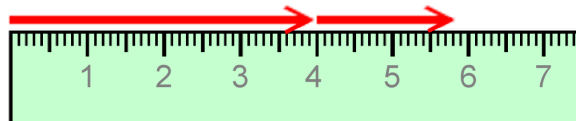
The first arrow is 8 mm. The second arrow is 8 mm too.
End-to-end, they measure together 16 mm *OR* 1 cm 6 mm.

$$8 \text{ mm} + 8 \text{ mm} = 16 \text{ mm} = 1 \text{ cm } 6 \text{ mm}$$



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

$$4 \text{ cm} + 1 \text{ cm } 8 \text{ mm} = 5 \text{ cm } 8 \text{ mm}$$



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.

$$9 \text{ mm} + 6 \text{ mm} = 15 \text{ mm} = 1 \text{ cm } 5 \text{ mm}$$

$$8 \text{ cm } 4 \text{ mm} + 3 \text{ cm } 7 \text{ mm} = 11 \text{ cm } 11 \text{ mm} = 12 \text{ cm } 1 \text{ mm}$$

4. Figure out these “line additions”.

a. $1 \text{ cm } 5 \text{ mm} + 5 \text{ mm} = \text{_____ cm _____ mm}$

b. $8 \text{ mm} + 9 \text{ mm} = \text{_____ cm _____ mm}$

c. $5 \text{ mm} + 5 \text{ cm } 8 \text{ mm} = \text{_____ cm _____ mm}$

d. $15 \text{ mm} + 14 \text{ mm} = \text{_____ cm _____ mm}$

e. $5 \text{ cm } 2 \text{ mm} + 7 \text{ cm } 4 \text{ mm} = \text{_____ cm _____ mm}$

f. $10 \text{ cm } 8 \text{ mm} + 7 \text{ cm } 7 \text{ mm} = \text{_____ cm _____ mm}$

g. $13 \text{ cm } 9 \text{ mm} + 50 \text{ cm } 2 \text{ mm} = \text{_____ cm _____ mm}$

h. $9 \text{ mm} + 17 \text{ mm} + 2 \text{ cm } 2 \text{ mm} = \text{_____ cm _____ mm}$

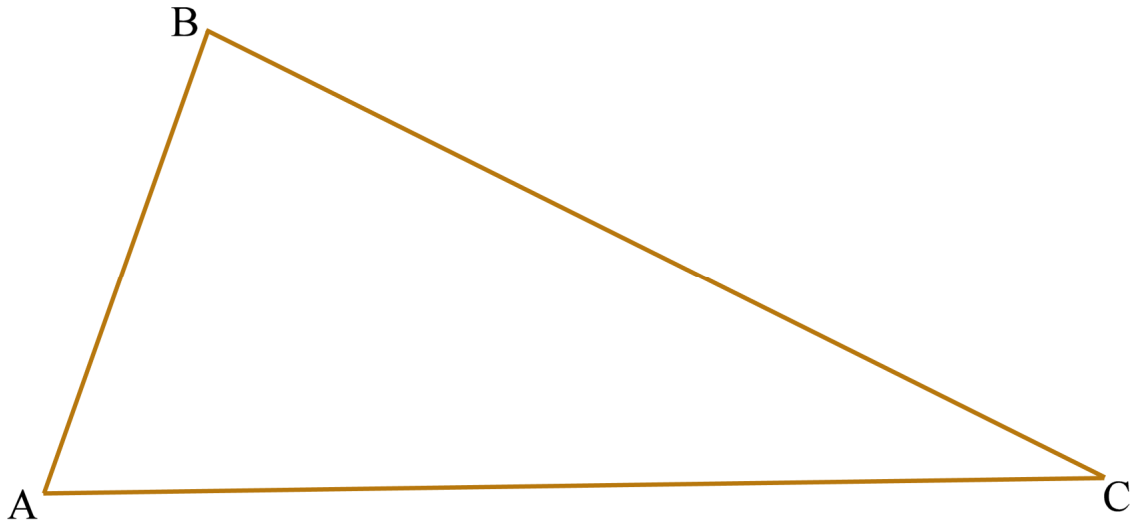
5. Change between centimeters and millimeters.

a.	b.	c.
1 cm = _____ mm	1 cm 1 mm = <u>11</u> 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.
70 mm = _____ cm	12 mm = ____ cm ____ mm	89 mm = ____ cm ____ mm
100 mm = _____ cm	45 mm = ____ cm ____ mm	102 mm = ____ cm ____ mm

7. Measure the sides of this triangle, and find the perimeter.



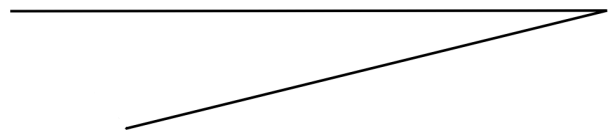
Side AB: _____ cm _____ mm

Side BC: _____ cm _____ mm

Side CA: _____ cm _____ mm

Perimeter _____ cm _____ mm

8. Draw the third side of this triangle. Then find its perimeter.



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Chapter 9: Division

Introduction

The ninth chapter of *Math Mammoth Grade 3* covers the concept of division, basic division facts that are based on the multiplication tables, and the concept of remainder. The aim is to lay a good foundation for the concept of division, cementing the link between multiplication and division.

The concept of division in itself is not difficult—after all, it is like backwards multiplication. From that follows that the student needs to know the multiplication tables well as a prerequisite for this chapter. The student can start studying the lessons in this chapter even if he still needs some practice with the multiplication tables, but if he is a long ways from mastering them, he should not study this chapter yet.

There are basically two ways to illustrate division with concrete objects. The first way is equal sharing: we divide or share items equally between people. For example, the problem $12 \div 3$ would mean, “If you share 12 bananas equally among 3 people, how many bananas does each one get?”

The second way has to do with grouping. The problem $12 \div 3$ would be: “If you have 12 items, how many groups of three items can you make?” These two interpretations of division are important to understand so that the student can solve real-life and mathematical problems involving division.

We also study division by zero. From studying that lesson, students should recognize that division by zero “does not work.” I realize that in higher forms of mathematics, division by zero may be defined (such as having the value infinity), but for now, this is the understanding that a third grader should get.

Lastly we study the concept of the “remainder”, or division that is not exact. First, the students find the remainder using visual models (you could also use manipulatives). After that follows the explanation of how to find the remainder by calculating. This concept will be studied again in fourth grade.

The Lessons

	page	span
Division as Making Groups	122	4 pages
Division and Multiplication	126	4 pages
Division and Multiplication Facts	130	3 pages
Dividing Evenly into Groups	133	4 pages
Division Word Problems	137	3 pages
Zero in Division	140	3 pages
When Division is not Exact	143	3 pages
More Practice with the Remainder	146	2 pages
Mixed Review	148	2 pages
Review	150	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. The first number from the left (below the screen) lets you control the maximum number in the problems.

<http://www.thegreatmartinicompany.com/inequalities/multiplicationdivinequality.html>

Mystery Picture Game

Using division and addition.

<http://www.dositey.com/2008/math/m/mystery2AD.htm>

Fun 4 the Brain

Practice your basic facts with these simple games that appeal to kids.

<http://www.fun4thebrain.com/division.html>

Math Magician games

Flashcard problems in all four operations. Answer 20 questions in one minute.

<http://www.oswego.org/ocsd-web/games/Mathmagician/cathymath.html>

Cross the Swamp

Help Little Ron move from log to log across the swamp and practice multiplication/division or addition/subtraction.

<http://www.bbc.co.uk/schools/starship/maths/crosstheswamp.shtml>

Arithme-Tiles

Use the four operations and numbers on neighboring tiles to make target numbers.

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

Math Games at Sheppard Software

A bunch of different games to practice addition, subtraction, multiplication, and division facts: Fruit Shoot, Pop Up Math, Math MahJong, Matching games, Make 24, and many more. The site also has games for place value, coins, fractions, and other topics.

<http://www.sheppardsoftware.com/math.htm>

Arcademic Skill Builders

Website with fun, arcade-type games to practice the four basic operations. Both single- and multi-user games.

<http://www.arcademicskillbuilders.com>

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>

Tux Math

A free software. This is a versatile arcade game for math facts with many options. Includes all operations. You need to shoot falling comets that can damage penguins' igloos.

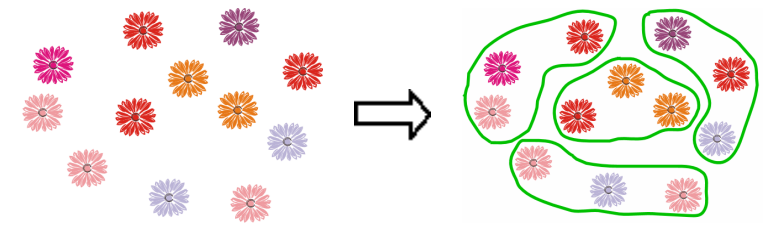
<http://sourceforge.net/projects/tuxmath>

Read also my review at <http://homeschoolmath.blogspot.com/2011/05/tux-math.html>

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Division as Making Groups

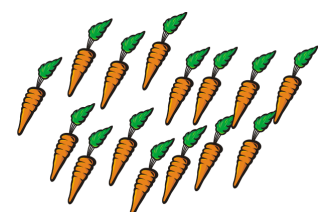
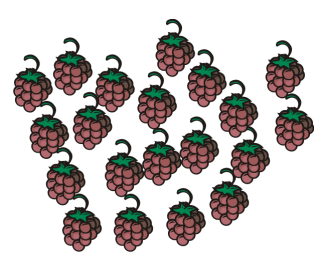
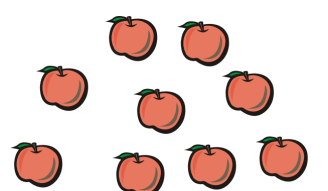
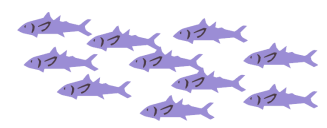

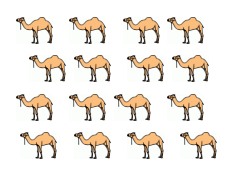
There are 12 daisies. Make groups of 3.

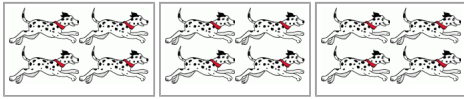


How many groups? Four groups.

How many 3's are there in 12? Four.

1. Divide into groups.

<p>a. There are <u>15</u> carrots. Make groups of 5.</p>  <p>How many groups? _____</p> <p>How many 5's are there in <u>15</u>? _____</p>	<p>b. There are _____ berries. Make groups of 4.</p>  <p>How many groups? _____</p> <p>How many 4's are there in _____? _____</p>	<p>c. There are _____ apples. Make groups of 3.</p>  <p>How many groups? _____</p> <p>How many 3's are there in _____? _____</p>
<p>d. There are _____ fish. Make groups of 2.</p>  <p>How many groups? _____</p> <p>How many 2's are there in _____? _____</p>	<p>e. There are _____ daisies. Make groups of 6.</p>  <p>How many groups? _____</p> <p>How many 6's are there in _____? _____</p>	<p>f. There are _____ camels. Make groups of 4.</p>  <p>How many groups? _____</p> <p>How many 4's are there in _____? _____</p>



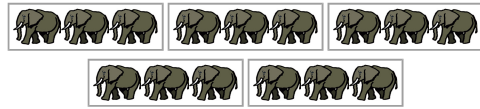
DIVIDE... 12 dogs into groups of four.

How many groups? Three

How many 4's in 12? _____

$$12 \div 4 = 3$$

”Twelve divided by four is three.”



DIVIDE... 15 elephants into groups of three.

How many groups? _____

How many 3's in 15? _____

$$15 \div 3 = 5$$

“Fifteen divided by three is five.”

18 ÷ 6 = ? *Think: If you DIVIDE 18 into groups of six, how many groups are there? How many groups of six are there in 18? How many sixes are there in 18?*

Since $6 + 6 + 6 = 18$, there are **THREE** sixes in 18. So, $18 \div 6 = 3$

2. Write a division sentence to fit the pictures in exercise 1.

a. _____ ÷ _____ = _____	b. _____ ÷ _____ = _____	c. _____ ÷ _____ = _____
d. _____ ÷ _____ = _____	e. _____ ÷ _____ = _____	f. _____ ÷ _____ = _____

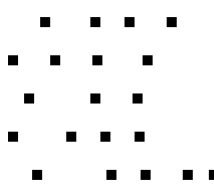
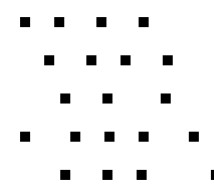
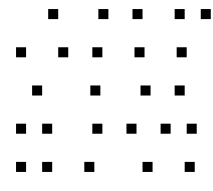
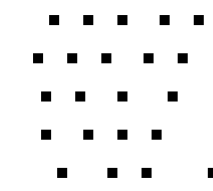
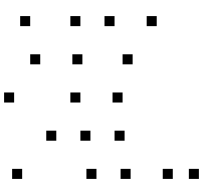
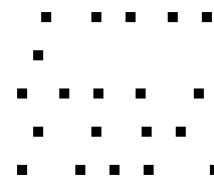
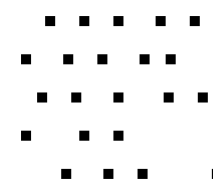
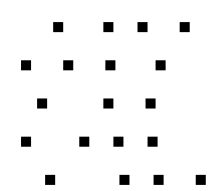
3. Make a division sentence.

<p>a. Divide 10 rams into groups of two. How many groups?</p> <p>_____ ÷ _____ = _____</p>	<p>b. Divide _____ camels into groups of four. How many groups?</p> <p>_____ ÷ _____ = _____</p>	<p>c. Divide _____ apples into groups of six. How many groups?</p> <p>_____ ÷ _____ = _____</p>
<p>d. Divide _____ books into groups of three. How many groups?</p> <p>_____ ÷ _____ = _____</p>	<p>e. Divide _____ scissors into groups of five. How many groups?</p> <p>_____ ÷ _____ = _____</p>	<p>f. Divide _____ crosses into groups of three. How many groups?</p> <p>_____ ÷ _____ = _____</p>

4. Draw sticks. Divide them into groups to fit the division sentence.

a. $18 \div 3 = \underline{\hspace{2cm}}$	b. $24 \div 2 = \underline{\hspace{2cm}}$
c. $21 \div 3 = \underline{\hspace{2cm}}$	d. $25 \div 5 = \underline{\hspace{2cm}}$
e. $15 \div 5 = \underline{\hspace{2cm}}$	f. $24 \div 8 = \underline{\hspace{2cm}}$

5. Make groups by circling dots and write a division sentence.

<p>a. Make groups of 4</p>  <p>$\underline{\hspace{2cm}} \div 4 = \underline{\hspace{2cm}}$</p>	<p>b. Make groups of 2</p>  <p>$\underline{\hspace{2cm}} \div 2 = \underline{\hspace{2cm}}$</p>	<p>c. Make groups of 6</p>  <p>$\underline{\hspace{2cm}} \div 6 = \underline{\hspace{2cm}}$</p>	<p>d. Make groups of 3</p>  <p>$\underline{\hspace{2cm}} \div 3 = \underline{\hspace{2cm}}$</p>
<p>e. Make groups of 5</p>  <p>$\underline{\hspace{2cm}} \div 5 = \underline{\hspace{2cm}}$</p>	<p>f. Make groups of 7</p>  <p>$\underline{\hspace{2cm}} \div 7 = \underline{\hspace{2cm}}$</p>	<p>g. Make groups of 6</p>  <p>$\underline{\hspace{2cm}} \div 6 = \underline{\hspace{2cm}}$</p>	<p>h. Make groups of 10</p>  <p>$\underline{\hspace{2cm}} \div 10 = \underline{\hspace{2cm}}$</p>

6. Solve the word problems. Write a division or a multiplication for each problem.

The box is for the \times or \div symbol.

<p>a. The class has 20 students. You can fit five students into a van. How many vans are needed?</p> <p>_____ <input type="text"/> _____ = _____</p>	<p>b. Ken placed 30 marbles in rows of 5. How many rows did he get?</p> <p>_____ <input type="text"/> _____ = _____</p>
<p>c. Erica packed hairpins in bags. She put 20 pins in each bag and filled four bags. How many pins were there?</p> <p>_____ <input type="text"/> _____ = _____</p>	<p>d. Kelly packaged 28 T-shirts in bags. She put four shirts in each bag. How many bags did she use?</p> <p>_____ <input type="text"/> _____ = _____</p>
<p>e. Brian has 16 poster boards. He needs four of them to make a big poster board. How many big ones can he make?</p> <p>_____ <input type="text"/> _____ = _____</p>	<p>f. Marlene studied three hours each day for seven days. How many hours did she spend studying in total?</p> <p>_____ <input type="text"/> _____ = _____</p>

7. Solve. You can draw to help. Can you find a pattern?

<p>a.</p> <p>4 \div 2 = _____</p> <p>6 \div 2 = _____</p> <p>8 \div 2 = _____</p> <p>10 \div 2 = _____</p> <p>12 \div 2 = _____</p> <p>14 \div 2 = _____</p> <p>16 \div 2 = _____</p> <p>_____ \div 2 = _____</p> <p>_____ \div 2 = _____</p>	<p>b.</p> <p>20 \div 10 = _____</p> <p>30 \div 10 = _____</p> <p>40 \div 10 = _____</p> <p>50 \div 10 = _____</p> <p>_____ \div 10 = _____</p> <p>_____ \div 10 = _____</p> <p>_____ \div 10 = _____</p> <p>_____ \div 10 = _____</p> <p>_____ \div 10 = _____</p>	<p>c.</p> <p>10 \div 5 = _____</p> <p>15 \div 5 = _____</p> <p>20 \div 5 = _____</p> <p>25 \div 5 = _____</p> <p>_____ \div 5 = _____</p> <p>_____ \div 5 = _____</p> <p>_____ \div 5 = _____</p> <p>_____ \div 5 = _____</p> <p>_____ \div 5 = _____</p>
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Chapter 10: Fractions

Introduction

The last chapter of *Math Mammoth Grade 3* deals with a few elementary fraction concepts: the concepts of a fraction and of a mixed number, fractions on a number line, equivalent fractions, and comparing fractions.

First, the student learns to identify fractions in visual models, and to draw “pie models” for some common fractions. You can also use manipulatives or the fraction cutouts provided. In the download version they are found in their separate folder, and in the printed version they are appended to the answer key.

Next, students represent fractions on a number line diagram by partitioning the interval from 0 to 1 into equal parts. They also study fractions on number lines that go up to 3 and learn to write whole numbers as fractions.

The lesson about mixed numbers relies on visual models and number lines. I strongly feel that students first need to understand fraction operations and concepts with the help of visual models or manipulatives, and not introducing the various rules for calculations too soon. Students match fractions and mixed numbers, and even convert mixed numbers back into fractions using visual models. The actual rule for the conversion is not introduced on this level.

Next we study equivalent fractions. Students recognize and generate simple equivalent fractions using visual models and number lines.

Lastly, students compare fractions in special cases, such as when they have the same numerator or the same denominator, or when the comparison can be made from visual models. They also learn that comparisons are valid only when the two fractions refer to the same whole.

The Lessons

	page	span
Understanding Fractions	155	4 pages
Fractions on a Number Line	159	4 pages
Mixed Numbers	163	4 pages
Equivalent Fractions	167	3 pages
Comparing Fractions 1	170	3 pages
Comparing Fractions 2	173	2 pages
Mixed Review	175	2 pages
Fractions Review	177	3 pages

Helpful Resources on the Internet

Conceptua Fractions: Identify Fractions

A visual tool that shows fractions or mixed numbers using a pie, a bar, dots, and a number line.

<http://www.conceptuamath.com/fractions.html#IdentifyingFractions>

Visualizing Fractions

This tool shows you 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 the “Parts as Wholes” activity.

http://nlvm.usu.edu/en/nav/frames_asid_170_g_2_t_3.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 into mixed numbers and scoop the right amount of ice cream flavors onto the cone.

<http://www.mrnussbaum.com/icecream/index.html>

Equivalent Fractions from National Library of Virtual Manipulatives (NLVM)

See the equivalency of two fractions as the applet divides the whole into more pieces.

http://nlvm.usu.edu/en/nav/frames_asid_105_g_2_t_1.html

Equivalent Fractions

Construct two other, equivalent fractions to the given fraction using a circle or a square. Use the sliders to divide your shape into a certain amount of parts, then click on the parts to color some of them. Click the check mark to check if you got the equivalent fractions right. The fractions are also shown on the number line.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=80>

Conceptua Math: Equivalent Fractions

A visual tool to illustrate the equivalency of fractions. You can use pie, rectangular, or number line model. Divide each shape into parts using the sliders. Click on parts to color or uncolor them. Use two or three fractions. Free registration required.

<http://www.conceptuamath.com/fractions/equivalent-fractions.html>

Conceptua Math: Order Fractions on a Number Line

First create fractions using the button on the top right, then lock them. Use the “dot” button to see them placed on the number line. Then you can use the buttons on the left to see the fractions represented in different ways. Lastly, drag the fractions under the number line dots, and press the check mark.

<http://www.conceptuamath.com/fractions/ordering-fractions-number-line.html>

Fraction Games at Sheppard Software

Many games for fraction math. For this level, use the first four games: simple fractions matching, mixed fractions matching, equivalent fractions matching, and comparing fractions balloon pop.

<http://www.sheppardsoftware.com/math.htm#fractions>

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 a couple of games, for example: make cookies for Grampy.

<http://www.visualfractions.com/>

Who Wants pizza?

Explains the concept of a fraction, teaches addition and multiplication with a pizza example, then has some interactive exercises.

<http://math.rice.edu/~lanius/fractions/index.html>

Fractioncity

Make “fraction streets” and help children 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.

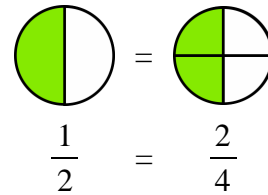
<http://www.teachnet.com/lesson/math/fractioncity.html>

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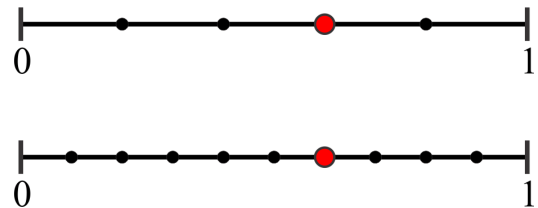
Equivalent Fractions

If you eat half of a pizza, or $\frac{2}{4}$ of a pizza, you have eaten the same amount. The two fractions are *equivalent*.

We can write an equal sign between them: $\frac{1}{2} = \frac{2}{4}$.



The dot for $\frac{3}{5}$ is in the same place on the number line as the dot for $\frac{6}{10}$. Again, the two fractions are *equivalent*. We can write $\frac{3}{5} = \frac{6}{10}$.



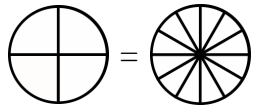
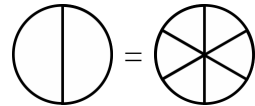
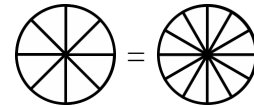
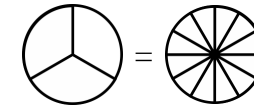






1. Write the equivalent fractions.

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

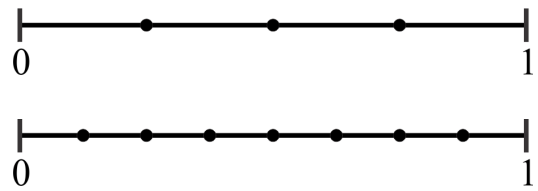
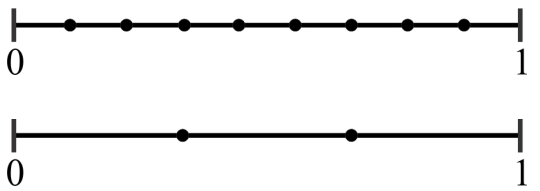
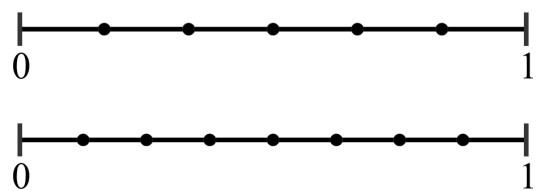

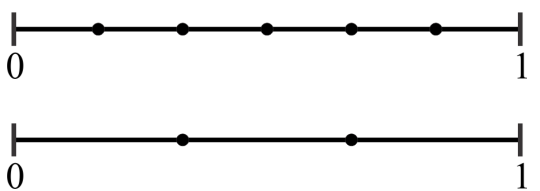

2. Write the equivalent fractions.

 a. =	 b. =
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3. Shade the parts for the first fraction. Shade the same *amount* in the second picture. Write the second fraction.

 <p>a. $\frac{1}{4} =$</p>	 <p>b. $\frac{1}{2} =$</p>	 <p>c. $\frac{6}{8} =$</p>	 <p>d. $\frac{2}{3} =$</p>
<p>e. $\frac{1}{3} =$   </p>	<p>f. $\frac{8}{12} =$   </p>		









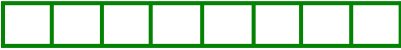





4. Mark the equivalent fractions on the number lines.

 <p>a. $\frac{3}{4} = \frac{6}{8}$</p>	 <p>b. $\frac{3}{9} = \frac{1}{3}$</p>
 <p>c. $\frac{3}{6} =$ </p>	 <p>d. $\frac{2}{6} =$ </p>

5. Mark the equivalent fractions on the number lines. This time, you need to first divide each number line into equal parts.

 <p>a. $\frac{2}{4} = \frac{1}{2}$</p>	 <p>b. $\frac{2}{3} = \frac{4}{6}$</p>
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6. Color and write many fractions that are equivalent to the first fraction.

<p>a.  $\frac{1}{3}$</p> <p> </p> <p> </p> <p> </p>	<p>b.  $\frac{1}{4}$</p> <p> </p> <p> </p> <p> </p>
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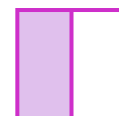
7. Four children have a chocolate bar to share. Cassy says, "Let's divide it into four equal pieces, and everybody gets one piece." Hannah says, "No, let's divide it into twelve equal pieces and everybody gets three pieces."



Whose idea lets everybody get a fair share?

8. Draw a picture to show that $\frac{1}{2} = \frac{4}{8}$.

9. **a.** Half of the pie is left. Show in the picture how three persons can share it equally.



b. What two equivalent fractions can you write from your "cutting"?

10. Are $\frac{5}{5}$ and $\frac{4}{4}$ equivalent fractions?
Why or why not?

Puzzle Corner	<p>Which is longer, a line that is $3 \frac{1}{2}$ inches long or a line that is $3 \frac{1}{4}$ inches long? How much longer is it?</p>
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