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Chapter 3: Multi-Digit Multiplication

Chapter 4: Time and Measuring

Foreword

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

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

1. Students develop understanding and fluency with multi-digit multiplication, and use efficient multiplication procedures to solve problems.

2. They develop understanding of division to find quotients involving multi-digit dividends (long division), and they solve word problems involving division, including division with a remainder.

3. Students develop an understanding of fraction equivalence and some operations with fractions. They learn to add and subtract fractions with same denominators, and to multiply a fraction by a whole number.

4. Students learn the concept of angle. They draw and identify lines and angles, and classify shapes by properties of their lines and angles.

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

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

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

- The two books (parts A and B) are like a "framework", but you still have a lot of liberty in planning the child's studies. Chapters 1, 2, and 3 should be studied in order, and Chapter 3 (multiplication) should be studied before Chapter 5 (division). However, you can be flexible with chapters 4 (time and measuring) and 6 (geometry), and schedule them earlier or later. Also, most lessons from chapters 7 and 8 (fractions and decimals) can be studied earlier; however the topic of finding parts with division should naturally be studied only after mastering division.

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

- Don't automatically assign all the exercises. Use your judgment, trying to assign just enough for the child's needs. You can use the skipped exercises later for review. For most children, I recommend to start out by assigning about half of the available exercises. Adjust as necessary.

- For review, the curriculum includes a worksheet maker (Internet access required), mixed review lessons, additional cumulative review lessons, and the word problems continually require usage of past concepts. Please see more information about review (and other topics) in the FAQ at **https://www.mathmammoth.com/faq-lightblue.php**

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

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

I wish you success in teaching math!

Maria Miller, the author

Chapter 1: Addition, Subtraction, Patterns, and Graphs
Introduction

The first chapter of *Math Mammoth Grade 4* covers addition and subtraction, problem solving, patterns, graphs, and money. At first, we review the "technical aspects" of adding and subtracting: mental math techniques and adding and subtracting in columns. We also study some patterns. The lesson on Pascal's triangle is intended to be fun and fascinating—after all, Pascal's triangle is full of patterns!

In the next lesson, students use bar models (visual models with one or more horizontal "bars") to help them write addition and subtraction sentences with unknowns and to solve them. They are actually learning algebraic thinking and how to write and solve simple equations.

The lesson on the order of operations contains some review. We also connect this topic with real-life situations, such as shopping. The student writes simple expressions (number sentences) for word problems, which, again, practices algebraic thinking, and also helps students learn how to show their work in math problems. As applications of math, the chapter then contains straightforward lessons on bar graphs, line graphs, rounding, estimating, and money problems.

Keep in mind that the specific lessons in the chapter can take several days to finish. They are not "daily lessons." Instead, use the general guideline that fourth graders should finish about 2 pages daily or 9-11 pages a week. Also, I recommend not assigning all the exercises by default, but that you use your judgment, and try to vary the number of assigned exercises according to the student's needs. See the user guide at **https://www.mathmammoth.com/userguides/** for more guidance on using and pacing the curriculum.

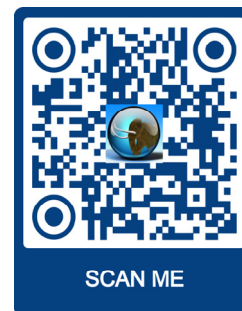Check out also the free videos matched to the curriculum at **https://www.mathmammoth.com/videos/**.

The Lessons in Chapter 1

Helpful Resources on the Internet

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

You can also access this list of links at **https://l.mathmammoth.com/gr4ch1**

SCAN ME

THE BASIC OPERATIONS

Add Like Mad
Click on single-digit numbers that add up to the given sum as quickly as you can, clearing the board.
https://www.sheppardsoftware.com/math/addition/add-like-mad/

Sum Game
Click on numbers from the grid that add up to the target number.
https://www.transum.org/Software/Game/Sum_Game.asp

Sum Square
Fill in the intersecting boxes with numbers such that each box contains the required sum. Each level gets progressively more challenging.
https://www.mathnook.com/math/sum-square.html

Addition Mystery Picture
Reinforce your addition skills while uncovering a hidden picture.
https://www.mathmammoth.com/practice/mystery-picture#min=20&max=100

Subtraction Mystery Picture
Practice subtraction of two-digit numbers while uncovering a hidden picture.
https://www.mathmammoth.com/practice/mystery-picture-subtraction#min=11&max=100

Minus Mission
Practice subtraction facts within your chosen range, such as 0-12 or 0-20 while destroying green slime.
https://www.mathplayground.com/ASB_MinusMission.html

Make a Number
You have four operations and four numbers. Can you make the target number?
https://www.mathplayground.com/make_a_number.html

Math Mahjong Subtraction or Multiplication
Match tiles with the same value. Match all the tiles to win the game!
https://games.forkids.education/math-mahjong-subtraction/

https://games.forkids.education/math-mahjong-multiplication/

PATTERNS AND PASCAL'S TRIANGLE

Common Number Patterns
A list of the most common number patterns with illustrations and examples. Each section has a set of interactive practice questions.
https://www.mathsisfun.com/numberpatterns.html

Pascal's Triangle at Math Is Fun
Learn fascinating facts and patterns in Pascal's triangle!
https://www.mathsisfun.com/pascals-triangle.html

Pascal's Triangle Activity at Transum.org
Complete the Pascal's triangle. There are other levels of this activity that involve creating color patterns.
https://www.transum.org/Maths/Activity/Pascals/Triangle.asp

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

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Coloring Multiples
Color various multiples (such as multiples of 6 or 10) in Pascal's Triangle, and see the patterns!
http://www.shodor.org/interactivate/activities/ColoringMultiples/

BAR MODELS AND PROBLEM SOLVING

Thinking Blocks - Addition and Subtraction
Model and solve word problems.
https://www.mathplayground.com/tb_addition/index.html

Jugs Puzzle — logical thinking puzzle
Fill and pour the water out of the two jugs until you get the desired quantity. Drag the jugs to empty or fill them.
https://www.mathsisfun.com/games/jugs-puzzle.html

Deep Sea Math Mystery
How many shells does each sea creature have? Solve the mystery!
https://www.mathplayground.com/deep_sea_math_mystery.html

Balancing Equations
Find the missing number to balance the calculations. Choose "Addition" and "Year 3".
https://mathsframe.co.uk/en/resources/resource/587/Balancing-Calculations

ORDER OF OPERATIONS

Choose Math Operation
Choose the operation(s) so that the given number sentence becomes true.
https://www.homeschoolmath.net/operation-game.php

Order of Operations Quiz
A 10-question online quiz that includes two different operations and possibly parentheses in each question. You can also modify the quiz parameters yourself.
https://www.thatquiz.org/tq-1/?-j8f-la

Order of Ops
Choose the expression to be solved in each step, and solve it. The program uses a visual representation of steps to show how the expression gets shorter at each step.
https://mrnussbaum.com/order-ops-online-game

The Order of Operations Millionaire
Answer multiple-choice questions that have to do with the order of operations, and win a million.
https://www.math-play.com/Order-of-Operations-Millionaire/order-of-operations-millionaire-game_html5.html

Exploring Order of Operations (Object Interactive)
Click on the operation to be done first in the given expression. The program then solves that, and you click on the *next* operation to be performed, etc., until it is solved. The resource also includes a game. Note: may load slowly.
https://www.learnalberta.ca/content/mejhm/html/object_interactives/order_of_operations/use_it.html

Order of Operations Practice
A simple online quiz of 10 questions. Uses parentheses and the four operations.
https://www.onlinemathlearning.com/order-of-operations-practice.html

ROUNDING AND ESTIMATING

Online Rounding Practice
Practice rounding to the nearest ten, hundred, or thousand.
https://www.mathmammoth.com/practice/rounding#number-range=0to10000&round-to=ten,hundred,thousand

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

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Rounding to Thousands, Ten Thousands, or Hundred Thousands (Tutorialspoint.com)
Practice your rounding skills with this online multiple-choice quiz.
https://bit.ly/rounding-thousands

Rounding Sharks Game
Round numbers to the nearest hundred by clicking the shark with the correct rounded number.
https://www.free-training-tutorial.com/rounding/sharks.html

Town Creator Rounding
Practice rounding to the nearest ten, hundred, or thousand. Click on the correct answer to each problem to add a new house to your town. Unlock new levels to add trees, cars, and more!
https://www.free-training-tutorial.com/rounding/towncreator/tc-rounding.html

Ice Ice Maybe — fast estimation game
Help penguins migrate across a perilous ocean patrolled by killer whales. The game uses all operations.
https://www.mangahigh.com/en/games/iceicemaybe

Estimation Games
Find the answer fast! You also get points for being close. Choose "Add 100s" or "Add Tens" "Subtract Tens", or "Subtract 100s" for 4th graders.
https://www.mathsisfun.com/numbers/estimation-game.php

MONEY

Change Maker
Determine how many of each denomination you need to make the exact change. Choose the "hard" level for 4th graders. Playable in US, Canadian, Mexican, UK, or Australian money.
https://www.funbrain.com/games/change-maker

Cash Out
Give correct change by clicking on the bills and coins. It has three levels of difficulty.
https://mrnussbaum.com/cash-out-online-game

DATA AND GRAPHS

Bar Charts
Interactive questions about bar charts. First, choose a topic for the graph. Next, choose how the vertical axis is presented; for example, "20 intervals, 10 marked". Lastly, choose the type of questions asked.
https://www.topmarks.co.uk/Flash.aspx?f=barchartv2

Graphs Quiz
A 10-question online quiz that involves a variety of types of questions on line graphs, bar graphs, and pictograms. You can also easily change the quiz parameters to your liking.
https://www.thatquiz.org/tq-5/?-j50f15-l5-p0

Line Graphs at Maths Is Fun
A simple tutorial on line graphs, followed by ten interactive practice questions.
https://www.mathsisfun.com/data/line-graphs.html

Make a Bar Graph
Enter data into the bar graph, and your results are shown live.
https://www.mathsisfun.com/data/bar-graph.html

Graph Master
Create a graph from your own data (you can even make it up). The interactive activity creates the graph, and also makes up multiple-choice questions from your data for you to answer.
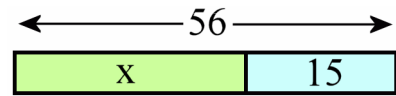https://mrnussbaum.com/graphmaster

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Bar Models in Addition and Subtraction

Think of this **bar model** as a long board, cut into two pieces. It is 56 units long in total, and the two parts are 15 and x units long.

$$\xleftarrow{\hspace{1cm}} 56 \xrightarrow{\hspace{1cm}}$$

| x | 15 |

From the bar model, we can write <u>two</u> addition and <u>two</u> subtraction sentences—a **fact family**.

The x stands for a number, too. We just don't know what it is yet. It is an **unknown**.

$x + 15 = 56$	$56 - x = 15$
$15 + x = 56$	$56 - 15 = x$

From this bar model, we can write a **missing addend** problem. It means that a number to be added is "missing" or unknown:

$$\xleftarrow{\hspace{1cm}} 1{,}510 \xrightarrow{\hspace{1cm}}$$

| 769 | x |

$$769 + x = 1{,}510$$

We can solve it by subtracting the one part (769) from the total (1,510).

$$769 + x = 1{,}510$$
$$x = 1{,}510 - 769 = 741$$

1. Write a missing addend problem that matches the bar model. Then solve it by subtracting.

a.

$$\xmapsto{\hspace{1cm}} 400 \xmapsto{\hspace{1cm}}$$

| 128 | x |

_____ + _____ = _____

$x =$ _____ − _____ = _____

b.

$$\xmapsto{\hspace{1cm}} 999 \xmapsto{\hspace{1cm}}$$

| x | 385 |

_____ + _____ = _____

$x =$ _____ − _____ = _____
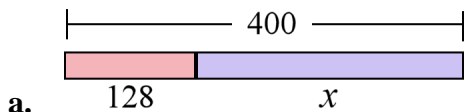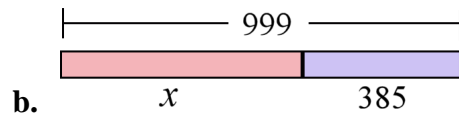
c. A car costs $1,200. Dad has $890. How much more does he need to buy it?

$$\xleftarrow{\hspace{1cm}} \$1{,}200 \xrightarrow{\hspace{1cm}}$$

| $890 | x |

_____ + _____ = _____

$x =$ _____ − _____ = _____
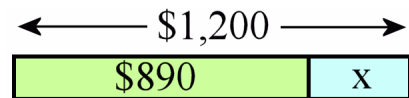
d. The school has 547 students, of which 265 are girls. How many are boys?

$$\xleftarrow{\hspace{0.5cm}} \text{total} \ \blacksquare \ \xrightarrow{\hspace{0.5cm}}$$

| | |

_____ + _____ = _____

$x =$ _____ − _____ = _____
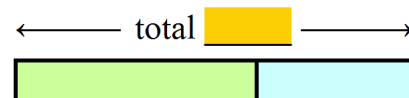
2. Add the given numbers *and* the unknown *x* to the bar model. Note, *x* is the unknown, or what the problem asks for. Then write an addition (a missing addend problem) and solve it.

a. Of their 1,200-mile trip, the Jones family traveled 420 miles yesterday and 370 miles today. How many miles do they have left to travel?

Addition:

Solution: *x* = _____

b. The store is expecting a shipment of 4,000 blank CDs. Three boxes of 400 arrived. How many CDs are yet to come?

Addition:

Solution: *x* = _____

c. A 250-cm board is divided into three parts: two 28-cm parts at the ends and a part in the middle. How long is the middle part?

Addition:

Solution: *x* = _____

d. After traveling 56 miles, Dad said, "Okay, in 9 miles we will be at Kensville, and from there we will have 118 miles left." How many miles in total is the trip?

Addition:

Solution: *x* = _____

3. Make a word problem that matches the model. Then solve for *x*.

x	1,750

4,900

x = _____

26

In this subtraction problem, $x - 170 = 560$, the *total* is unknown. (Remember, subtraction problems start with the total.)

Look at the bar model. We can solve x by adding.

← total x →

| 560 | 170 |

$x - 170 = 560$

$x = 170 + 560 = 730$

4. Write a subtraction problem that matches the bar model. Then solve it by adding.

a.
← x →

| 29 | 46 |

$x - \underline{\ 2\ 9\ } = \underline{\hspace{2cm}}$

$x = \underline{\hspace{1.5cm}} + \underline{\hspace{1.5cm}} = \underline{\hspace{1.5cm}}$

b.
← x →

| 255 | 99 |

$x - \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$
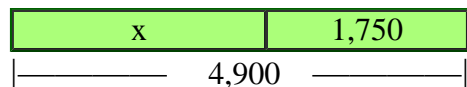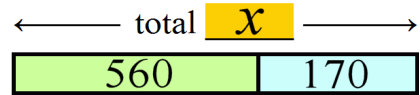
$x = \underline{\hspace{1.5cm}} + \underline{\hspace{1.5cm}} = \underline{\hspace{1.5cm}}$
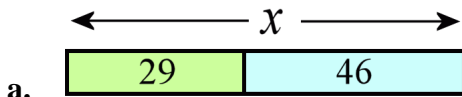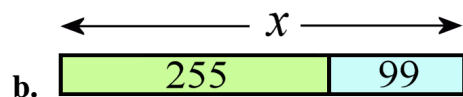
5. The number you are subtracting from is missing! Solve.

| a. $\underline{\hspace{1.5cm}} - 4 = 20$ | b. $\underline{\hspace{1.5cm}} - 15 = 17$ | c. $\underline{\hspace{1.5cm}} - 22 - 7 = 70$ |

Still, the number you are subtracting from is missing. This time, it is denoted by x, not by an empty line.

| d. $x - 8 = 7$ | e. $x - 24 = 48$ | f. $x - 300 - 50 = 125$ |
| $x = \underline{\hspace{1.5cm}}$ | $x = \underline{\hspace{1.5cm}}$ | $x = \underline{\hspace{1.5cm}}$ |

6. The number you subtract here is the unknown. Write the numbers and x in the bar model. Notice carefully which number is the *total*. Then write a subtraction that helps you solve x.

a.

$52 - x = 28$

$x = \underline{\hspace{1.5cm}} - \underline{\hspace{1.5cm}} = \underline{\hspace{1.5cm}}$

b.

$97 - x = 54$

$x = \underline{\hspace{1.5cm}} - \underline{\hspace{1.5cm}} = \underline{\hspace{1.5cm}}$
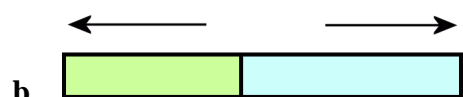
7. The number you subtract is still the unknown. Solve.

a. $20 - \underline{\hspace{1cm}} = 12$	b. $55 - \underline{\hspace{1cm}} = 34$	c. $234 - \underline{\hspace{1cm}} = 100$
d. $61 - x = 43$	e. $100 - x = 72$	f. $899 - x = 342$
$x = \underline{\hspace{1cm}}$	$x = \underline{\hspace{1cm}}$	$x = \underline{\hspace{1cm}}$

8. Circle the number sentence that fits the problem. Then solve for x.

a. Jane had $15. After Dad gave Jane her allowance (*x*), Jane had $22. $\$15 + x = \$22$ OR $\$15 + \$22 = x$ $x = $ _____	**b.** Mike had many drawings. He put 24 of them in the trash. Then he had 125 left. $125 - 24 = x$ OR $x - 24 = 125$ $x = $ _____
c. Jill had 120 marbles, but some of them got lost. Now she has 89 left. $120 - x = 89$ OR $120 + 89 = x$ $x = $ _____	**d.** Dave gave 67 of his stickers to a friend and now he has 150 left. $150 - 67 = x$ OR $x - 67 = 150$ $x = $ _____

9. Write a number sentence (addition or subtraction) with *x*. Solve it.

a. The 43 teachers and all the students of a school filled a 450-seat auditorium. How many students does the school have?	_____ + _____ = _____ $x = $ _____
b. Mom went shopping with $250 and had $78 when she came home. How much did she spend?	originally $-$ spent $=$ left _____ $-$ _____ = _____ $x = $ _____
c. Janet had $200. Then she bought an item for $54 and another for $78. How much money does she have now?	_____ $-$ _____ $-$ _____ = _____ $x = $ _____
d. Jean bought one item for $23 and another for $29, and she had $125 left. How much money did she have initially?	_____ $-$ _____ $-$ _____ = _____ $x = $ _____

Puzzle Corner   Find the missing numbers.

a. $200 - 45 - $ _____ $ - 70 = 25$	**b.** _____ $- 5 - 55 - 120 = 40$
c. $23 + 56 + x = 110$ $x = $ _____	**d.** $x + 15 + 15 + 15 + 15 = 97$ $x = $ _____

Order of Operations

1. Do operations within ( ) first. 2. Then multiply and divide, from left to right. 3. Then add and subtract, from left to right. In the examples, the operation to be done first is colored.	$60 - 21 \div 3 + 5$ $= 60 - 7 + 5$ $= 53 + 5$ $= 58$	$4 + 3 \times (6 - 2)$ $= 4 + 3 \times 4$ $= 4 + 12$ $= 16$

1. Calculate in the right order. Hint: circle the operation(s) to be done first (as if in a "balloon").

a. $2 \times (5 + 3) =$ _____	**b.** $2 \times 5 + 6 \div 2 =$ _____	**c.** $2 \times 5 + 9 \div 1 =$ _____
d. $20 - 3 \times 3 =$ _____	**e.** $(10 - 3) \times 3 + 1 =$ _____	**f.** $2 + (20 - 16) \times 3 =$ _____
g. $9 - 1 - 8 \div 2 =$ _____	**h.** $2 \times (2 + 2) - 3 =$ _____	**i.** $50 - 1 \times 7 + 2 \times 3 =$ _____

2. You cut off two 20-cm pieces of a 90-cm piece of wood.
   Which calculation tells you the length of the piece that is left?

   $90 - 20 + 20$ $\qquad\qquad$ $90 - 2 \times 20$ $\qquad\qquad$ $(90 - 20) \times 2$

3. James feeds his dogs 5 kg of dog food daily.
   He bought a 100-kg bag of dog food.
   How many kilograms are left after four days?
   Write a *single* number sentence to solve that.

4. Parking costs $2 per hour during the day and $3 per hour
   during the night. Write a single number sentence that tells
   you the cost of parking a car for 5 daytime hours and
   2 nighttime hours. Solve it.

5. Put operation symbols +, − , or × into the number sentences so that they become true.

a. $4 \ \square \ 1 \ \square \ 8 = 12$	**b.** $2 \ \square \ 10 \ \square \ 1 \ \square \ 2 = 14$	**c.** $3 \ \square \ 3 \ \square \ 3 = 6$

Notice: Whether you subtract a sum of several numbers → $100 - (40 + 20 + 30) = 10$

or subtract the numbers one by one → $100 - 40 - 20 - 30 = 10$

...the answer is the same!

Example. You buy items that cost $9, $5, and $12. You pay with $50.

To find the change you get, you could subtract the numbers one by one from fifty: $50 - 9 - 5 - 12$.

But it is easier to first *add* $9 + 5 + 12 = 26$ to get the total cost, and then subtract $50 - 26 = 24$. This last method can also be written as $50 - (9 + 5 + 12) = 24$.

6. Find the problems that have the same answer. You don't have to calculate the answers.

a. $500 - 30 - 30$	**b.** $250 + (100 - 50)$	**c.** $8{,}000 - (2{,}500 + 800 + 300)$
$500 - 30 + 30$	$250 + 100 - 50$	$8{,}000 - 2{,}500 + 800 + 300$
$500 - (30 + 30)$	$250 - 100 - 50$	$8{,}000 - 2{,}500 - 800 - 300$

7. A clerk in a store rings up all the items the customer buys, and figures out the change.

   Which calculation on the right gives you the the amount of change the customer receives?

   (You don't have to calculate the answer.)

   a. $\$50 - \$1.26 - \$6.55 - \$0.22 - \$5$

   b. $\$50 + \$1.26 + \$6.55 + \$0.22 + \$5$

   c. $\$50 - (\$1.26 + \$6.55 + \$0.22 + \$5)$

8. Describe a shopping situation where you need to do this calculation:

   $\$10 - 4 \times \$1.20$

9. Calculate.

a. $20 + 30 \div (2 + 3) =$ _____	**b.** $7 \times (5 + 6) \div 7 =$ _____	**c.** $32 - 8 + 5 + 20 \div 5 =$ _____
$200 - 3 - 3 - 3 =$ _____	$120 - (60 - 50) \times 2 =$ _____	$(20 - 16) \times 3 + 2 =$ _____

10. Put operation symbols $+$, $-$, or $\times$ into the number sentences so that they become true.

a. $50 \;\square\; 5 \;\square\; 10 = 0$	**b.** $100 \;\square\; (15 \;\square\; 17) \;\square\; 1 = 68$	**c.** $(2 \;\square\; 5\,) \;\square\; 2 = 14$

*See also the **Choose Two Operations** game at* **https://www.homeschoolmath.net/operation-game.php**

Making Bar Graphs

1. Beverly asked her classmates how many hours they watch TV each day.
   The results are below; she already organized them in order.

   0 0 1 1 1 1 1 1 1 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 5 5 6

   Each number above is someone's answer to Beverly's question. For example, two people answered
   that they watch TV for 0 hours. Quite a few answered that they watch TV for 1 hour each day.

   With so many numbers, we need to first make a **frequency table**. In it, we write <u>how frequently</u> or
   <u>how often</u> each number appears in the data. After that, we can make a bar graph.

   a. In Beverly's data above, the number zero (0 hours of TV) appeared two times. The number two
   (2 hours of TV) appeared four times. Finish the frequency table and the bar graph.

Hours of TV	Frequency
0 h	2
1 h	
2 h	4
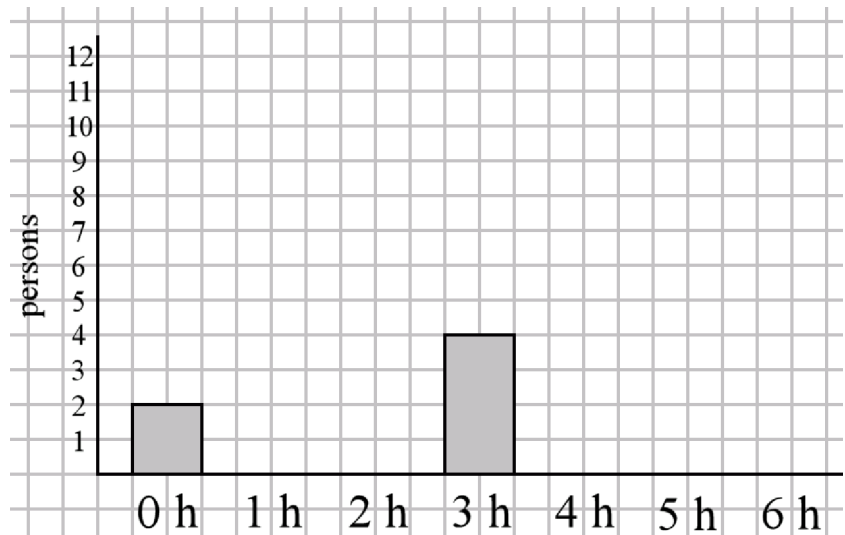
   b. How many classmates did Beverly question?

   c. What was the most common response to Beverly's question?

   d. How many of these children watch TV one hour or less?

   e. How many watch TV three hours or more?

   f. Are there more children who watch TV three hours than those who watch it two hours a day?

   g. Are there more children who watch TV two or more hours than children who watch TV less
   than two hours a day?

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Chapter 2: Large Numbers and Place Value
Introduction

The second chapter of *Math Mammoth Grade 4* covers large numbers (up to 1 million) and place value.

The first lessons only deal with thousands, or numbers with a maximum of four digits. These are for review and for deepening the student's understanding of place value, as understanding place value with four-digit numbers is crucial before moving on to larger numbers. After that we go on to numbers with five and six digits (numbers till one million). Students write them in expanded form, compare them, add and subtract them, and learn more about rounding.

Lastly, we briefly study the multiples of 10, 100, and 1,000. This lesson prepares the way for some very important ideas in the next chapter (multi-digit multiplication).

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

Helpful Resources on the Internet

You can also access this list of links at **https://l.mathmammoth.com/gr4ch2**

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

Base Ten Blocks
Click on buttons to make blocks appear. The level of difficulty can be adjusted.
https://www.hoodamath.com/mobile/games/basetenblocks.html

Place Value Puzzler
Place value game. Click on the asked place value in a number, or type in the rounded version of the number.
https://www.funbrain.com/games/place-value

Place Value Payoff
Match numbers written in standard form with numbers written in expanded form in this game.
https://www.quia.com/mc/279741.html

49
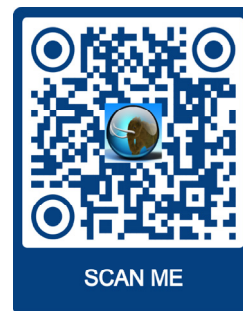
Identify Value of a Digit
Test your knowledge of place value with this interactive multiple-choice quiz.
https://www.khanacademy.org/math/cc-fourth-grade-math/imp-place-value-and-rounding-2/imp-intro-to-place-value/e/place_value?modal=1

Sea Life Comparing Numbers
Answer the problems correctly, and add plants, beautiful fish, corals, and more to the sea floor. Choose the number range "5 digit numbers (up to 99.000)".
https://www.free-training-tutorial.com/comparing-numbers/sealife/sl-comparing.html

Order Numbers - Online Practice
Practice placing numbers in order with this interactive activity.
https://www.mathmammoth.com/practice/order-numbers#questions=10&digits=5&baskets=4

Online Addition Practice
Practice adding large numbers in expanded form with this interactive online exercise.
https://www.mathmammoth.com/practice/place-value#mode=write-number&max-digits=6&question-number=10

Missing Addend Addition Practice
Find the missing number in each addition problem in this interactive online exercise.
https://www.mathmammoth.com/practice/place-value#mode=missing-part&max-digits=6&question-number=10

Addition Quiz
Practice adding in columns in this 10-question online quiz.
https://www.thatquiz.org/tq-1/?-jg41-l34-p0

Place Value Worksheets, Riddles, and Challenges
This page offers a variety of printable activities that practice place value on a fourth grade level.
https://www.math-salamanders.com/4th-grade-place-value.html

Number Bonds Challenge
Practice number bonds to 1,000 using mental calculations.
https://www.studyzone.tv/game277-code71792b287c7b987c78bfe788c25c635b

Adding and Subtracting Powers of Ten
Practice adding and subtracting powers of ten up to 1,000,000 in this interactive online quiz.
https://www.snappymaths.com/mixed/addsubmult10100/interactive/addsubpowers10/addsubpowers10.htm

Money Word Problems Worksheets: Addition and Subtraction
Practice addition and subtraction of various amounts of money with these printable worksheets.
https://www.dadsworksheets.com/worksheets/money-word-problems-addition-and-subtraction.html

ROUNDING AND ESTIMATING

Online Rounding Practice
Reinforce your rounding skills with this interactive online exercise
https://www.mathmammoth.com/practice/rounding#number-range=0to1000000&round-to=any-place

Rounding Sharks
Round numbers to the nearest hundred. Click on the shark that has the correctly rounded number.
https://www.free-training-tutorial.com/rounding/sharks.html

Rounding Quiz
Practice rounding large numbers with this interactive 10-question quiz.
https://www.thatquiz.org/tq-c/?-jg020-l5-mpnv600-p0

Rounding to Thousands, Ten Thousands, or Hundred Thousands (Tutorialspoint.com)
Practice your rounding skills with this online multiple-choice quiz.
https://bit.ly/round-ten-thousand

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Adding and Subtracting Big Numbers

1. Add large numbers exactly the same way as you add smaller numbers. See how well you can do!

a.	**b.**	**c.**
905,091 + 40,510	29,313 + 407,616	289,300 120,000 + 409,436

d.	**e.**	**f.**
89,502 45,987 + 13,770	560,421 340,060 + 4,987	299,674 178,498 + 45,988

2. Continue the patterns. Use mental math.

a.	**b.**	**c.**
29,100	906,500	610,400
29,300	916,600	610,000
29,500	926,700	609,600
30,900	997,400	606,800

Subtraction happens the same way as with smaller numbers. Just be careful with regrouping!	7 10 $\cancel{8}\cancel{0}0,000$ $-510,065$ _____	9 7 $\cancel{10}$ 10 $\cancel{8}\cancel{0}\cancel{0},000$ $-510,065$ _____	9 9 7 $\cancel{10}$ $\cancel{10}$ 10 $\cancel{8}\cancel{0}0,\cancel{0}00$ $-513,065$ _____
	Regroup...	Keep regrouping...	(Complete the problem.)

3. Subtract.

a. $\quad\quad 120,091$ $-\quad 34,510$ _____	b. $\quad\quad 199,136$ $-\quad 79,160$ _____	c. $\quad\quad 670,000$ $-\quad\quad 1,300$ _____
d. $\quad\quad 234,688$ $-\ 167,991$ _____	e. $\quad\quad 65,570$ $-\ 23,677$ _____	f. $\quad\quad 90,080$ $-\ 5,025$ _____
g. $\quad\quad 554,600$ $-\ 128,000$ _____	h. $\quad\quad 600,000$ $-223,065$ _____	i. $\quad\quad 400,000$ $-\ 18,344$ _____

4. Match the calculations that have the same answer.

a.	
$419,000 + 1,000$	$150,000 + 40,000$
$500 + 36,000$	$20,000 + 400,000$
$189,000 + 1,000$	$36,100 + 400$
$40,500 + 500$	$180,000 - 2,000$
$177,300 + 700$	$36,000 + 5,000$

b.	
$500,000 - 3,000$	$140,000 + 70,000$
$189,000 - 80,000$	$97,000 + 400,000$
$40,600 - 500$	$20,000 + 20,100$
$250,000 - 40,000$	$100,000 + 9,000$
$77,700 - 7,000$	$100,000 - 29,300$

Line up the ones, tens, hundreds, thousands, and so on - even the commas!

```
    1 3 4 , 6 0 7          1 3 4 , 6 0 7
  +     3 , 0 6 5        +     3 , 0 6 5
  ─────────────          ─────────────
```

NOT THIS WAY!
(numbers not lined up)

This is good!
Complete the problem.

```
    4 5 7 , 9 3 4          4 5 7 , 9 3 4
      3 7   , 9 2 1          3 7 , 9 2 1
  +           2 4        +           2 4
  ─────────────          ─────────────
```

THIS IS OFF!
(numbers not lined up)

This is good!
Complete the problem.

5. Calculate. Line up all the place value units carefully.

a. $300,145 + 2,399 + 345$

b. $560,073 + 81,400 + 98$

c. $23,000 + 456 + 3,256$

d. $345 + 870,077 + 32 + 5,801$

6. Add a thousand, a ten thousand, or a hundred thousand to the given numbers.

n	13,000	78,000	154,000	500,000	640,500
$n + 1,000$					
$n + 10,000$					
$n + 100,000$					

Line up the ones, tens, hundreds, and so on - even the commas.

5 0 9 , 0 3 2 − 2 1 9	5 0 9 , 0 3 2 − 2 1 9	2 4 5 , 0 3 2 − 3 7 , 9 2 1 1 1 8 , 1 1 1	2 4 5 , 0 3 2 − 3 7 , 9 2 1
NOT THIS WAY! (numbers not lined up)	This is correct! Complete the problem.	**THIS IS WRONG** (errors in regrouping)	You do the problem correctly!

7. Calculate.

a. 509,788 – 82,345

b. 30,760 – 2,906

c. 26,509 – 1,208

d. 984,044 – 329

8. Compare the two expressions (calculations) and write < , > or = .

a. 660,000 + 30,000 ☐ 620,000 + 40,000	**b.** 125,000 – 4,000 ☐ 119,000 + 2,000
c. 499,000 + 2,000 ☐ 501,000 – 1,000	**d.** 1,990 + 11 ☐ 1,999 + 2
e. 50,000 – 3,000 ☐ 60,000 – 12,000	**f.** 1,000,000 ☐ 600,000 + 400,000

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

Rounding and Estimating with Large Numbers

We can round numbers to the nearest ten, to the nearest hundred, to the nearest thousand, to the nearest ten thousand, and so on—to *any* place. No matter what place we are rounding to, the *rules of rounding* are the same.

Rules of rounding whole numbers

Look at the digit AFTER the place you are rounding to:

- If that digit is 0, 1, 2, 3, or 4, then round DOWN.

- If that digit is 5, 6, 7, 8, or 9, then round UP.

- Change to zeros all the digits *after* the place you are rounding to.

- If rounding up, the digit in the place you are rounding to is increased by 1.

Remember, the squiggly equals sign (" ≈ ") is read "is about," or "is approximately."

To help us, let's draw a line ⦙ between the digit we are rounding to and the next smaller one.

Rounding to the nearest TEN:	Rounding to the nearest HUNDRED:	Rounding to the nearest THOUSAND:
2,56**7** ≈ 2,570	2,**5**67 ≈ 2,600	2**3**,802 ≈ 24,000
395,84**9** ≈ 395,850	395,**8**49 ≈ 395,800	98**0**,097 ≈ 980,000

Rounding to the nearest TEN THOUSAND:	Rounding to the nearest HUNDRED THOUSAND:	
7**2**6,451 ≈ 730,000	**8**67,300 ≈ 900,000	
9**5**3,987 ≈ 950,000	**1**26,835 ≈ 100,000	

1. Round the numbers as the dashed line indicates (to the underlined digit).

a. 45**5**2,550 ≈	**b.** 8**6**,256 ≈	**c.** 77,**5**79 ≈
d. 24**5**,250 ≈	**e.** **8**94,077 ≈	**f.** 38**5**,706 ≈
g. **6**15,493 ≈	**h.** **5**27,009 ≈	**i.** **2**52,000 ≈
j. **2**6,566 ≈	**k.** 94**4**,032 ≈	**l.** 33**5**,700 ≈
m. 48,42**2**1 ≈	**n.** 8,**5**55 ≈	**o.** 40**0**9,239 ≈

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Chapter 3: Multi-Digit Multiplication
Introduction

The third chapter of *Math Mammoth Grade 4* covers multi-digit multiplication and some related topics. This is one of the focus areas of 4th grade math. For further help in teaching these topics, check out the free videos matched to the curriculum at **https://www.mathmammoth.com/videos/**.

The first lessons briefly review the concept of multiplication and the multiplication tables. Next, students encounter equations in disguise — presented with shapes on both sides of a pan balance — in the lesson *Scales Puzzles*. This lesson is intended to be fun and motivational.

Then, the focus shifts to multi-digit multiplication (also called multiplication algorithm or multiplying in columns). We start out by learning to multiply numbers by multiples of ten and hundred (for example, 20×4 or 500×6). After this is mastered, students learn the very important concept of **multiplying in parts, or partial products**. This means that, for example, we multiply 4×63 in two parts: first we multiply $4 \times 60 = 240$ and $4 \times 3 = 12$, and lastly the results are added: $240 + 12 = 252$.

This principle underlies all other multiplication algorithms, so it is important to master. We don't want children to "blindly" memorize the multiplication algorithm without understanding what is going on with it. The partial products algorithm (multiplying in parts) also ties in with an area model, and it is very important that students see the connection between this visual model and the procedure.

The chapter contains two lessons about multiplying in columns the "easy way". This "easy way" is a simplified form of the traditional multiplication algorithm, based on partial products. You may skip these two lessons at your discretion. The method taught in those lessons is most useful for students who may have trouble with the traditional form of the algorithm. This method is also helpful in cementing the student's understanding of the partial products method.

The traditional, or standard, form of multiplication algorithm is taught next, and is hopefully fairly easy, with the partial products as a foundation.

Students also study estimation, the order of operations, and multiplying with money. There are numerous word problems in all of the lessons. Students are encouraged to write number sentences for the word problems—essentially learning to show their work and their thinking process.

The lesson *So Many of the Same Thing* has to do with proportional reasoning. The idea is really simple, and prepares students for learning ratios and proportions in middle school.

The last major topic in the chapter is multiplying two-digit numbers by two-digit numbers. Again, we first study partial products and tie that in with an area model. The lesson *Multiplying in Parts: Another Way* is optional. Lastly, the chapter teaches the standard algorithm for two-digit by two-digit multiplication. Students will practice multiplication with more digits in fifth grade.

The Lessons in Chapter 3

Helpful Resources on the Internet

You can also access this list of links at **https://l.mathmammoth.com/gr4ch3**

DISCLAIMER: *We check these links a few times a year. However, we cannot guarantee that the links have not changed. Parental supervision is always recommended.*

Multiplication Tables — Online Practice
Ad-free online practice of the multiplication tables at MathMammoth.com website. Also works as an offline program in most browsers. Includes the option for both timed and non-timed practice.
https://www.mathmammoth.com/practice/multiplication.php

Multiplication games for the multiplication tables
Improve your multiplication skills with these fun games!
https://www.multiplication.com/games/all-games

https://www.hoodamath.com/games/multiplication.html

Interactive Pan Balance
Each of the four shapes is assigned a certain (unknown) weight. You need to figure out their weights by placing them on the two sides of the pan balance in different configurations.
https://www.nctm.org/Classroom-Resources/Illuminations/Interactives/Pan-Balance----Shapes/

Stable Scales Quiz
In each picture, the scales are balanced. Can you find the weight of the items on the scales?
https://www.transum.org/Software/SW/Starter_of_the_day/Students/Stable_Scales_Quiz.asp
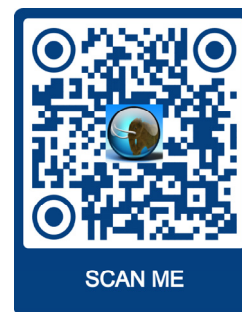
Sample worksheet from
https://www.mathmammoth.com

MULTIPLYING IN PARTS (PARTIAL PRODUCTS)

Mental Multiplication of Multiples of 10 and 100
This activity allows you to rehearse the mental multiplication of multiples of 10 and 100, e.g. 30×400 etc. Play against the clock and see what level you can get up to before you run out of time!
https://www.studyzone.tv/game86-code3dc5617c60ff2ca509aabc60944162d1

Area Model Multiplication
Build rectangles of various sizes and relate multiplication to area. Discover new strategies for multiplying large numbers. Use the game screen to test your problem solving strategies!
https://www.mathmammoth.com/practice/area-model-multiplication

Partial Products Finder App
An interactive app that illustrates multiplication (up to 30 x 30) with an area model.
https://apps.mathlearningcenter.org/partial-product-finder/

Multiply 2-Digits by 1-Digit with Area Models – from Khan Academy
Practice multiplying in parts with the aid of area models.
https://bit.ly/multiply-area-models

MULTIPLICATION ALGORITHM

One-Digit by Two-Digits Multiplication Game
Students will multiply one-digit numbers by two-digit whole numbers, then get to try to shoot a basket.
https://www.math-play.com/one-digit-by-two-digit-multiplication-game/one-digit-by-two-digit-multiplication-game_html5.html

Multiplication Jeopardy Game
You get to solve multi-digit multiplication questions of 1-digit by 1-digit, 1-digit by 2-digit, and 1-digit by 3-digit numbers in this game.
https://www.math-play.com/Multiplicaton-Jeopardy/multiplication-game_html5.html

Canoe Penguins
Answer the multiplication problems quickly and correctly to help your penguins win the race!
https://www.arcademics.com/games/canoe-penguins

Batter's Up Baseball
Answer the multiplication problems correctly to help the home team beat the visiting team. Choose "Double" or "Homerun" level.
https://prongo.com/baseball-multiply/

Multi-Digit Multiplication Practice
Practice vertical (column) multiplication with this fun and colorful online game!
https://www.mathmammoth.com/practice/vertical-multiplication

Multi-Digit Multiplication Number Battle Card Game
Arrange your cards to make the highest product possible.
https://booksmartmath.com/wp-content/uploads/2020/04/Multi-Digit-Multiplication-Number-Battle.pdf

Multiplication Quiz
Practice multiplying by one digit in this 10-question online quiz.
https://www.thatquiz.org/tq-1/?-jg24-la-p0

Math FROG MultipliACTION
Practice 2 by 2 digit multiplication online. Enter one digit in each box.
https://cemc2.math.uwaterloo.ca/mathfrog/english/kidz/mult5.shtml

ORDER OF OPERATIONS

Choose Math Operation
Choose the operation(s) so that the number sentence is true. Helps develop number sense and logical thinking.
https://www.homeschoolmath.net/operation-game.php

Order of Ops
Save seven members of a Royal Family from prison by using your order of operation skills. Choose the expression to be solved in each step, and solve it. The program uses a visual representation of a stairway to show how the expression gets shorter at each step.
https://mrnussbaum.com/order-ops-online-game

Order of Operations Quiz
A 10-question online quiz that includes two different operations and possibly parentheses in each question. You can also modify the quiz parameters yourself.
https://www.thatquiz.org/tq-1/?-j8f-la

Exploring Order of Operations (Object Interactive)
Click on the operation to be done first in the given expression. The program then solves that, and you click on the *next* operation to be performed, etc., until it is solved. The resource also includes a game. Note: may load slowly.
https://www.learnalberta.ca/content/mejhm/html/object_interactives/order_of_operations/use_it.html

Order of Operations Practice
A simple online quiz of 10 questions. Uses parentheses and the four operations.
https://www.onlinemathlearning.com/order-of-operations-practice.html

MISCELLANEOUS

Multiplication Matching Game
Practice the multiplication tables while also uncovering a hidden picture in this fun matching game!
https://www.mathmammoth.com/practice/multiplication-matching

Unitary Method
Answers questions involving simple proportions in this interactive self-check activity.
https://www.transum.org/software/SW/Starter_of_the_day/Students/Unitary_Method.asp

Thinking Blocks
Thinking Blocks is an engaging, interactive math tool that helps students learn how to solve multi-step word problems. Choose "Thinking Blocks Multiplication".
https://www.mathplayground.com/thinkingblocks.html

Multiplication Word Problem Quiz
This 10-question quiz focuses on using multiplication to solve word problems.
https://www.softschools.com/quizzes/math/multiplication_word_problems/quiz1059.html

7 practical tips for mental math (that ANYONE can use!)
People with number sense use numbers flexibly, and EVERYONE can learn these mental math strategies to improve their number sense.
https://www.mathmammoth.com/lessons/practical_tips_mental_math.php

Understanding Multiplication

- Multiplication has to do with many groups of the same size: 3×5 means three groups of 5. You can find the total by adding: $3 \times 5 = 5 + 5 + 5 = 15$.

- Multiplying by 1 means you have just one group: $1 \times 17 = 17$.

- Multiplying by 0 means "no groups": $0 \times 82 = 0$
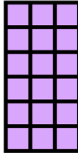
- The order in which you multiply does not matter: 3×6 and 6×3 are both 18.

3 groups of 6 *or* 6 groups of 3.

1. Write the additions as multiplications, or vice versa. Solve.

a. $2 + 2 + 2 + 2 =$ _____ $\times$ _____ $=$ _____

$20 + 20 + 20 + 20 =$ _____ $\times$ _____ $=$ _____

b. $8 + 8 + 8 =$ _____ $\times$ _____ $=$ _____

$80 + 80 + 80 =$ _____ $\times$ _____ $=$ _____

c. _____ $= 4 \times 500 =$ _____

_____ $= 3 \times 120 =$ _____

2. Write two multiplications.

a. _____ $\times$ _____ $=$ _____

_____ $\times$ _____ $=$ _____

b. _____ $\times$ _____ $=$ _____

_____ $\times$ _____ $=$ _____

3. Solve.

a. $8 \times 2 =$ _____

$8 \times 0 \times 7 =$ _____

b. $3 \times 5 =$ _____

$1 \times 2 \times 5 =$ _____

c. $2 \times 8 =$ _____

$2 \times 2 \times 2 =$ _____

d. $3 \times 10 =$ _____

$3 \times 3 \times 3 =$ _____

4. Find the products. You can often use addition.

a.	b.	c.	d.
$2 \times 24 =$ _____	$2 \times 150 =$ _____	$4 \times 1{,}000 =$ _____	$2 \times 34 =$ _____
$14 \times 0 =$ ____	$3 \times 2{,}000 =$ _____	$5 \times 200 =$ _____	$3 \times 21 =$ _____
$16 \times 1 =$ _____	$4 \times 3{,}000 =$ _____	$3 \times 211 =$ _____	$4 \times 50 =$ _____

Multiplication terms

The numbers being multiplied are **factors**.
The result is called a **product**.

There may be more than two factors. For example, in
$4 \times 5 \times 2 = 40$, the numbers 4, 5, and 2 are all factors.

factor   factor

$5 \times 7 = 35$

product

---

5. Find the unknown factors.

a. _____ $\times 2 \times 2 = 24$	**b.** $3 \times$ _____ $= 600$	**c.** $500 \times$ ____ $= 1{,}500$
_____ $\times 9 \times 2 = 0$	$4 \times$ _____ $= 1{,}000$	$10 \times$ _____ $= 810$

6. Fill in.

a. Write the the terms. $2 \quad \times \quad 23 \quad = 46$ $\uparrow \qquad \uparrow \qquad \uparrow$ _____ _____	**b.** Write a multiplication problem with factors 4 and 8.

c. What happens if one of the factors is zero? The _____ is _____.

d. In one multiplication problem, two factors are 2 and 6. The product is 60.
What is the third factor?

7. Write a number sentence for each of these problems. Use several operations in it.

Problem:	Number sentence:
a. Mom had three dozen eggs in cartons and five in a bowl. How many eggs did she have in all?	$3 \times 12 + 5 =$
b. Jack bought six packages of magazines. Each had 10 magazines. He opened one package and gave three magazines to his friend. How many magazines does Jack have left?	
c. Anna had seven boxes. Into four of the boxes, she put 10 crayons each, and into three boxes she put only 6. How many crayons did she use?	
d. Ernest bought three books for $11 each and paid with $50. What was his change?	
e. How many wheels do five tricycles and seven bikes have in total?	

> **Example.** A simple hat costs $6. Another, fancier hat, costs $18.
> How many times more expensive is the fancier hat?
>
> It asks "how many times", so that is our unknown (?). We write a multiplication:
>
> $$\underline{?} \times 6 = \$18$$
>
> It is easy to see the answer is three times, or ? = 3.

8. Solve the problems. Write a multiplication <u>with an unknown</u> (? or *y*) for each problem. What is the unknown in each problem? It is what the problem asks for or what you do not know.
   (Note also: we are not using *x* as an unknown, as it could be confused with the multiplication sign ?.)

a. Each child has 10 toes. How many toes would seven children have? _____ × _____ = _?_ _?_ = _____	**b.** If each cow has four feet, how many cows are there if there is a total of 24 feet? _?_ × _____ = _____ _?_ = _____
c. One bicycle has two wheels. _?_ bicycles have 18 wheels. _____ × _____ = _____ _?_ = _____	**d.** One car has 4 wheels. So, *y* cars have 36 wheels. _____ × _____ = _____ *y* = _____
e. How many people would you need to have a total of 150 fingers? _____ × _____ = _____ *y* = _____	**f.** How many dozen eggs would be 60 eggs? _____ × _____ = _____ *y* = _____
g. Carl owns 20 children's books. Emma owns four times as many children's books. How many children's books does Emma own? _____ × _____ = _____ *y* = _____	**h.** You can fit 7 people in a van. How many such vans do you need to take 35 people to the beach? _____ × _____ = _____ *y* = _____
i. A track in the woods is 300 yards long. Another track is 1,200 yards long. How many times longer is the second track than the first? _____ × _____ = _____ *y* = _____	**j.** Margaret has made 40 cups of jelly and she puts it in pint jars. How many jars will be filled? _____ × _____ = _____ *y* = _____

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Multiply in Columns—the Easy Way

```
    3 8              3 8              3 8              3 8
  ×   6            ×   6            ×   6            ×   6
  ───────          ───────          ───────          ───────
                     4 8              4 8              4 8
                                    1 8 0          + 1 8 0
                                                    ───────
                                                     2 2 8
```

Let's multiply
6 × 38 in parts,
writing one
number under
the other.

First multiply
6 × 8.

Then multiply 6 × 30 and
write the result under the 48.
Remember, the "3" is in the
tens place in the number 38
so it actually means 30.

Lastly, add.

Multiply 9 × 2.   Then 9 × 80.   Add.   Multiply 3 × 7.   Then 3 × 40.   Add.

```
    8 2              8 2              8 2              4 7              4 7              4 7
  ×   9            ×   9            ×   9            ×   3            ×   3            ×   3
  ───────          ───────          ───────          ───────          ───────          ───────
    1 8              1 8              1 8              2 1              2 1              2 1
                   7 2 0          + 7 2 0                            1 2 0          + 1 2 0
                                   ───────                                           ───────
                                     7 3 8                                             1 4 1
```

1. Multiply.

a.
```
        7 6
  ×       6
  ─────────
+
```

b.
```
        8 9
  ×       5
  ─────────
+
```

c.
```
        4 3
  ×       7
  ─────────
+
```

d.
```
        5 2
  ×       6
  ─────────
+
```

e.
```
        8 3
  ×       5
  ─────────
+
```

f.
```
        9 4
  ×       6
  ─────────
+
```

g.
```
        3 2
  ×       9
  ─────────
+
```

h.
```
        4 1
  ×       7
  ─────────
+
```

Multiplying a 3-digit number happens in exactly the same way.

You multiply in parts: first the ones, then the tens, then the hundreds. Lastly, add.

Just don't forget that you are multiplying *whole tens* and *whole hundreds*, not just "plain" numbers.

ones:	tens:	hundreds:	Add.
7×6	7×20	7×500	

ones:
```
  5 2 6
×     7
-------
    4 2
```

tens:
```
  5 2 6
×     7
-------
    4 2
  1 4 0
```

hundreds:
```
  5 2 6
×     7
-------
    4 2
  1 4 0
3 5 0 0
```

Add.
```
    5 2 6
  ×     7
  -------
      4 2
    1 4 0
+ 3 5 0 0
  -------
  3 6 8 2
```

2. Multiply.

a.
```
  1 3 7
×     6
```

b.
```
  2 1 8
×     4
```

c.
```
  3 1 3
×     7
```

d.
```
  5 6 4
×     4
```

e.
```
  9 0 2
×     4
```

f.
```
  6 9 5
×     3
```

g.
```
  7 8 0
×     8
```

h.
```
  3 2 4
×     6
```

i.
```
  9 2 7
×     6
```

j.
```
  5 6 6
×     3
```

k.
```
  2 5 7
×     8
```

l.
```
  6 0 8
×     5
```

3. Solve the equations.

a. $\triangle \times 80 = 480$

$\triangle = $ _____

b. $5 \times \underline{\ ?\ } = 450$

$\underline{\ ?\ } = $ _____

c. $900 \times z = 81{,}000$

$z = $ _____

4. Solve.   **a.** $58 \times 5 + 291$ **b.** $1,000 - 3 \times 145$

5. Solve.

a. A \$236 burglar alarm is discounted by \$40. A store buys seven. What is the total cost?

b. One side of a square is 248 feet. What is its perimeter?

6. Solve the equations.

a. $50 \times \underline{\ ?\ } = 2,000$

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

b. $\triangle \times 60 = 2,400$

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

c. $70 \times z = 49,000$

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

d. $\triangle \times 30 = 9 \times 40$

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

e. $5 \times \underline{\ ?\ } \times 2 = 1,000$

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

f. $40 \times p = 800 \times 4$

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

Puzzle Corner

Figure out the missing numbers.

a.
```
    ☐ ☐ ☐
  ×       7
  ─────────
        1 4
      4 9 0
  + 7 0 0
  ─────────
```

b.
```
    ☐ ☐ ☐
  ×       4
  ─────────
      ☐ ☐
    2 0 0
  + 1 2 0 0
  ─────────
    1 4 3 2
```

c.
```
    ☐ ☐ ☐
  ×       9
  ─────────
        8 1
      ☐ ☐
  + 6 3 0 0
  ─────────
    6 3 8 1
```

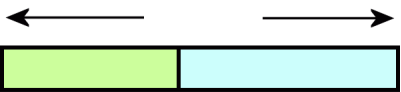(This page intentionally left blank.)
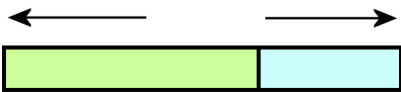
Mixed Review Chapter 3

1. Solve mentally. (Order of Operations /Ch.1)

a. $2{,}000 - (500 + 100) =$ _____ **b.** $7{,}000 - (3{,}200 - 200) =$ _____

c. $5{,}000 + (1{,}000 - 900 + 100) =$ _____ **d.** $740 - (550 - 200 + 50) =$ _____

e. $(900 - 200) - (300 + 200) =$ _____

f. $1{,}000 + (5{,}000 - 500) + (4{,}000 - 500) =$ _____

2. Write the numbers and *x* in the bar model. Notice carefully what number is the total.
   Then write another matching subtraction that helps you solve *x*. (Bar Models in Addition and Subtraction/Ch.1)

a.

$126 - x = 57$

$x =$ _____ $-$ _____ $=$ _____

b.

$2{,}000 - x = 1{,}199$

$x =$ _____ $-$ _____ $=$ _____

3. Round the numbers (as the dashed line indicates) to the underlined digit.

(Rounding and Estimating Large Numbers/Ch.2)

a. 44**3**,920 $\approx$	**b.** 21**9**,506 $\approx$	**c.** 617,**0**74 $\approx$
d. 19**9**,734 $\approx$	**e.** **3**27,100 $\approx$	**f.** 8**1**,226 $\approx$

4. Multiply using the shortcut. (Multiplying by Whole Tens and Hundreds/Ch.3)

a. $76 \times 100 =$ _____	**b.** $10 \times 619 =$ _____	**c.** $98 \times 1{,}000 =$ _____
$40 \times 100 =$ _____	$10 \times 2{,}670 =$ _____	$1{,}000 \times 430 =$ _____

5. Use the shortcut "backwards" to solve the divisions. (Multiplying by Whole Tens and Hundreds/Ch.3)

a. $1{,}560 \div 10 =$ _____	**b.** $700 \div 10 =$ _____	**c.** $21{,}000 \div 1000 =$ _____
$800 \div 10 =$ _____	$15{,}000 \div 100 =$ _____	$999{,}000 \div 100 =$ _____
$8{,}400 \div 100 =$ _____	$46{,}400 \div 100 =$ _____	$1{,}000{,}000 \div 1000 =$ _____

6. Solve in the correct order. (Order of Operations Again/Ch.3)

a. $90 + 15 + 2 \times 7 =$ _____

$90 \times 10 + 120 - 40 =$ _____

b. $500 - 7 \times 70 - 10 =$ _____

$10 \times 7 \times 5 + 100 + 250 =$ _____

7. Compare, and write $<$, $>$, or $=$ in the boxes.

a. 100×26 ☐ 40×70 **b.** $5 + 195$ ☐ 40×5 **c.** 4×72 ☐ 300

8. Mason multiplied wrong. Find what mistake Mason made each time. Then correct his mistakes.
   (Multiplying in Columns - the Standard Way/Ch.3)

$$\begin{array}{r} \overset{5}{} \\ 4\ 8 \\ \times\ \ 7 \\ \hline 2\ 8\ 6 \end{array} \qquad\qquad \begin{array}{r} \overset{6}{} \\ 4\ 8 \\ \times\ \ 8 \\ \hline 3\ 2\ 4 \end{array} \qquad\qquad \begin{array}{r} \overset{2}{} \\ 2\ 3\ 9 \\ \times\ \ \ \ 3 \\ \hline 6\ 9\ 7 \end{array}$$

9. Solve.

a. Mick earned $345 for picking strawberries, and Jeanine earned three times as much. How much did they earn in total?

_____

_____

_____

b. A grocery store pays out $145,600 in salaries and $12,390 in other expenses *each* month. Calculate its total expenses for June, July, and August.

Are the total expenses more than half a million dollars?

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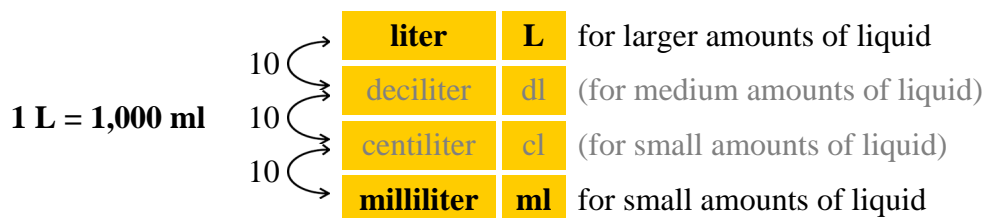
Chapter 4: Time and Measuring
Introduction

The fourth chapter of *Math Mammoth Grade 4* includes lessons on time, temperature, length, weight, and volume. The focus is no longer on the actual act of measuring, but on conversions between the units and on word problems that involve conversions.

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

Conversions between measurement units is a big focus point of the chapter. Students may have difficulties with this, and that is why this topic will also be studied in 5th grade. At this point, students should be able to easily convert a bigger unit into a smaller unit (such as converting 3 feet into 36 inches or 2 kg into 2,000 grams).

While the Common Core standards do not include them for fourth grade, I have also included some problems where we convert from a smaller unit to a bigger unit (such as 4,500 ml into 4 L 500 ml or 12 feet into 4 yards) because I feel most children are capable of doing these in fourth grade. If you feel your child has difficulty with converting from a smaller unit to a bigger one, feel free to omit those particular exercises. They are intermixed though, and not marked in any special way.

The chapter includes separate lessons for customary and metric units. Each lesson dealing with measuring units includes a table that lists the units we are studying and the conversion factors. For metric units, those tables always include all the units, even when they are not in common usage. For example, for metric units of volume, the chart looks like this:

liter	**L**	for larger amounts of liquid
deciliter	dl	(for medium amounts of liquid)
centiliter	cl	(for small amounts of liquid)
milliliter	**ml**	for small amounts of liquid

1 L = 1,000 ml   10, 10, 10

The lesson deals only with milliliters and liters. However, the chart also shows the other two units (deciliters and centiliters) in order to help students become familiar with those basic units of the metric system:

1. The units always differ by a factor of ten;

2. The units are named consistently with the same prefixes (milli-, centi-, deci-, deka-, hecto-, and kilo-). These prefixes and their meanings are not yet studied in detail in fourth grade. You may, at your discretion, explain them to the student.
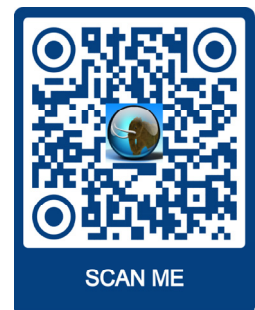
The Lessons in Chapter 4

Helpful Resources on the Internet

You can also access this list of links at **https://l.mathmammoth.com/gr4ch4**

DISCLAIMER: We check these links a few times a year. However, we cannot guarantee that the links have not changed. Parental supervision is always recommended.

SCAN ME

ELAPSED TIME

Elapsed Time
Find how much time passes between two different given times (elapsed time or time intervals) in this customizable online exercise.
https://www.mathmammoth.com/practice/clocks

Elapsed Time
Click "New Time". Then click the buttons that advance the time on the clock, until the time matches the "End" time. Choose difficulty levels 1 and 2 for this grade level.
http://www.shodor.org/interactivate/activities/ElapsedTime/

Elapsed Time Worksheets
Generate printable worksheets for elapsed time. You can practice the elapsed time, finding the starting time, or finding the ending time.
https://www.mathnook.com/worksheets/elapsedtimeworksheets.php

**Sample worksheet from
https://www.mathmammoth.com**

Find the Start Time
Word problems about starting times with multiple-choice answers. Choose "full screen", then "Find the start time". Next, choose option 4 or 5.
https://mathsframe.co.uk/en/resources/resource/119/find_the_start_time

ThatQuiz—Elapsed time
A ten-question quiz on Elapsed Time
https://www.thatquiz.org/tq-g/?-j4-l4-p0

Adding Time Word Problems
Read the time and then answer a word problem involving adding a given time.
https://mathsframe.co.uk/en/resources/resource/118/adding_time_word_problems

Converting Units of Time Quiz
Practice converting between various units of time with this multiple-choice quiz.
https://www.turtlediary.com/quiz/converting-units-of-time.html

Telling the Time
Practice reading the time on an analogue clock. Choose a level to practice, and then choose the option "24 hour clock".
https://mathsframe.co.uk/en/resources/resource/116/telling_the_time#

Interactivate: Elapsed Time
Practice calculating elapsed time with analog or digital clocks.
http://www.shodor.org/interactivate/activities/ElapsedTime/

Elapsed Time Quiz
A 10-question online quiz that practices elapsed time in hours and minutes.
https://www.thatquiz.org/tq-g/?-j4-l3-mpnv600-p0

TEMPERATURE

Thermo Quiz
Select the box that contains the temperature the thermometer is showing.
https://www.mathnook.com/math/thermometer-quiz.html

Reading a Thermometer in Degrees Celsius Quiz
An interactive multiple-choice quiz.
https://www.fractions4kids.com/reading-temperatures-in-degrees-celsius-free-math-quiz/

Sort the Temperatures Activity
Organize the scenarios in order from coldest to hottest.
https://www.mathnook.com/math/sort-the-temperatures.html

Reading a Thermometer in Fahrenheit Quiz
Read the thermometer, and then enter the correct temperature in the box.
https://www.fractions4kids.com/reading-a-thermometer-in-fahrenheit-math-practice-quiz/

Temperatures
Practice reading a thermometer with this interactive online quiz.
https://www.transum.org/Software/SW/Starter_of_the_day/students/Temperature.asp?Level=1

Temperature
Practice reading thermometers with different scales.
https://www.topmarks.co.uk/Flash.aspx?f=Temperaturev2

Temperature Quiz
Answer questions about reasonable temperatures in Fahrenheit and Celsius in this interactive multiple-choice quiz.
https://www.softschools.com/quizzes/math/temperature_measurement/quiz2112.html

Interactive World Map with Climate Graphs
Click on the dots on the map to see line graphs demonstrating the climates of various world cities.
https://www.digitalatlasproject.net/themes/climate-systems/climate-graphs

Introducing Line Graphs
Practice interpreting data on a line graph with this interactive activity.
https://kids.classroomsecrets.co.uk/resource/year-4-introducing-line-graphs-game/

LENGTH

The Ruler Game
Click on the measurements on the ruler that correspond with the measurements that appear.
https://www.rulergame.net/

Reading a Ruler by Eighths
Practice reading a ruler by eighths with a matching exercise and a game of Concentration.
https://www.quia.com/jg/1364429.html

Measure It!
Practice measuring lines with either centimeters or inches. Multiple choice questions.
https://www.funbrain.com/games/measure-it

Sal's Sub Shop
Cut the subs to the given measurements—sometimes in metric units, sometimes in inches.
https://mrnussbaum.com/sal-s-sub-shop-online-game

Reading a Tape Measure Worksheets
Worksheet generator—choose to measure in inches, or inches and feet.
https://themathworksheetsite.com/read_tape.html

Funny Numbers - Length
Practice adding or subtracting amounts of feet and inches. Choose the option "Length" in the menu.
https://tangmath.com/funnynumbers

Convert to Smaller Units (in, ft, yd, & mi)
Practice converting between customary units of length in this interactive online exercise.
https://cutt.ly/Convert-customary-units-length

Convert to Smaller Units (mm, cm, m, & km)
Practice converting between metric units of length in this interactive online quiz.
https://cutt.ly/Convert-metric-units-length

Metric Units of Length Matching Game
Practice converting metric units of length while also uncovering a hidden picture.
https://www.mathmammoth.com/practice/measurement-units#tiles=24&level=2&opts=km-m,m-cm,m-mm,cm-mm

Quiz on metric units of length
Practice converting between metric units of length in this 10-question quiz.
https://www.thatquiz.org/tq-n/?-j147-l2-p0

WEIGHT

Funny Numbers - Weight
Practice adding or subtracting amounts of pounds and ounces. Choose the option "Weight" in the menu.
https://tangmath.com/funnynumbers

Reading Scales
Illustrate how to read a scales or a thermometer. Use the buttons to generate new scales and measurements.
https://www.teacherled.com/iresources/scales/mass/

https://www.teacherled.com/iresources/scales/temperature/

Ounces, Pounds, and Tons
Answer questions about customary units of weight in this jeopardy-style game.
https://www.quia.com/cb/426998.html

Convert to Smaller Units (g and kg)
Practice converting from kilograms to grams in this interactive exercise.
https://cutt.ly/Convert-Metric-Units-Weight

Estimate Mass (Grams and Kilograms)
Test your knowledge of metric units of weight with this short interactive quiz.
https://www.khanacademy.org/math/cc-fourth-grade-math/imp-measurement-and-data-2/imp-estimating-mass/e/estimating-mass?modal=1

VOLUME

Artie Ounces Soda Jerk
Practice standard units of volume with this fun soda jerk game. Fill the client orders as fast as you can!
https://mrnussbaum.com/artie-ounces-soda-jerk-online-game

Standard Liquid Volume Matching Game
Match standard liquid volumes with equivalent volumes.
https://www.quia.com/mc/126277.html

MathPup Rocket Tank
Help MathPup fly into space by filling his jetpack with the exact amount of fuel needed (practices customary units of volume).
https://www.mathnook.com/math2/mathpup-rocket-tank.html

Estimate Volume (Milliliters and Liters)
Test your knowledge of metric units of volume with this short interactive quiz.
https://www.khanacademy.org/math/cc-fourth-grade-math/imp-measurement-and-data-2/imp-estimating-volume/e/estimating-volume?modal=1

GENERAL

Customary Units of Measurement Matching Game
Practice converting customary measurement units while also uncovering a hidden picture.
https://cutt.ly/customary-units-matching-game

Measuring
Worksheets, fact sheets, and quizzes that practice various measuring concepts in both metric and imperial units.
https://www.bbc.co.uk/teach/skillswise/measuring/zkvqcqt

Conversion Quizzes - ThatQuiz.org
A customizable online quiz about conversions between measuring units. The options include both metric and customary systems and six different difficulty levels.
https://www.thatquiz.org/tq-n/science/metric-system/

Appropriate Metric Unit
Choose the most appropriate metric unit for measuring various things, such as the weight of a child, the height of a building, the amount of liquid in a bowl, and so on.
https://mrnussbaum.com/appropriate-metric-units-online

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Elapsed Time 3

When does it end? Typically, we *add* the starting time and the elapsed time to find the time when something ends.

Example 1. A meeting starts at 2:30 p.m. and lasts for 1 hour 15 minutes. When will it end?

Simply add the hours to the hours and minutes to the minutes:

2 hours + 1 hour = 3 hours and 30 min + 15 min = 45 min. The meeting ends at 3:45 p.m.

Example 2. Jake started playing at 3:35 p.m. and played for 45 minutes. When did he stop?

We can add as we did above: 35 min + 45 min = 80 min to get a total time of 3 hours 80 minutes, but 80 minutes is more than one hour! We need to think of the 80 minutes as 60 + 20, because 60 minutes makes one hour. The final answer is 4 hours and 20 minutes, or 4:20 p.m.

Example 3. If it started raining at 10:53 and it rained for 4 hours and 40 minutes, when did the rain end?

We can add the starting time and the time that has elapsed (on the right). Note that the sum of the minutes is more than 60, so we convert the 93 minutes to 1 hour and 33 minutes. The final answer is 15:33 or 3:33 p.m.

```
  10 h  53 m
+  4 h  40 m
  14 h  93 m

= 15  h  33 m
```

1. When will it end?

a. Guests will come at 3:40 p.m. and stay for two hours and 30 minutes.

b. Mom will start cooking pizza at 13:45, and it will take her one hour and 40 minutes.

c. The pool will open at 8 a.m. and be open for ten-and-a-half hours. When will it close?

d. Jen's exam will take two-and-a-half hours, and start at 8:45 am.

e. The airplane will take off at 18:08 and fly for three hours and 55 minutes.

f. The food will be put into the oven at 5:47 p.m. for 35 minutes.

g. Factory workers work in three shifts. How long is each shift?

Shift 1	6:00 a.m. - 2:30 p.m.
Shift 2	2:00 p.m. - 10:00 p.m.
Shift 3	9:30 p.m. - 6:30 a.m.

How many minutes do each two shifts overlap?

When did it start?

We can subtract, think backwards, or use other strategies to find the starting time.

Example 4. An airplane landed at 4:30 p.m. The flight took 3 hours and 40 minutes. When did the plane take off?

Think backwards from the ending time. Start at 4:30 and imagine the minute hand traveling backwards 3 full rounds, and then 40 minutes. Where do you end up?

Alternatively, subtract in columns. You will again need to regroup one hour as 60 minutes. The answer of 50 minutes means the clock time was <u>12:50 p.m</u>.

$$
\begin{array}{r}
3h \quad 90\,m \\
\cancel{4\,h} \quad \cancel{30\,m} \\
-\ 3\,h \quad 40\,m \\
\hline
50\,m
\end{array}
$$

Example 5. A 55-minute class ended at 21:10. When did it start?

If it had lasted for one hour, it would have started at 20:10. It was 5 minutes shorter than that, so it started 5 minutes later, or at <u>20:15</u>.

2. Find the starting time.

   a. From _____ : _____ p.m. till 2:00 p.m. is 40 minutes.

   b. From _____ : _____ p.m. till 8:12 p.m. is 30 minutes.

   c. From _____ : _____ a.m. till 4:15 a.m. is 1 hour 30 minutes.

   d. From _____ : _____ p.m. till 7:34 p.m. is 4 hours 10 minutes.

   e. From _____ : _____ a.m. till 5:00 p.m. is 6 hours 20 minutes.

   f. From _____ : _____ p.m. till 4:30 p.m. is 2 hours 40 minutes.

3. Find the ending or starting time. Imagine the minute hand turning, or use your practice clock.

a. 06:15 → _____	**b.** 02:03 → _____	**c.** 11:30 → _____
40 minutes	25 minutes	35 minutes
d. _____ → 05:50	**e.** _____ → 07:00	**f.** _____ → 12:10
35 minutes	45 minutes	20 minutes

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4. Solve.

a. The Johnson family arrived in the city at 10:30 after riding in the car for
3 hours and 15 minutes. When did they leave home?

b. When should the Johnson family leave the city to make it back home by 20:00
(assuming the driving time back home is the same)?

c. Shannon kept a record of how long it took him to run the track through the woods. Complete
the chart with the amount of time he spent running each day.

	Mo	**Wd**	**Th**	**Fr**	**Sa**
Start: End:	17:15 18:20	17:03 18:05	17:05 18:12	17:45 18:39	17:12 18:15
Running time:					

d. Find the total amount of time that Shannon spent running during the week.

e. Gordon works from 08:30 until 17:15 each day. He has a 30-minute lunch break and
two 15-minute "coffee" breaks. How many hours and minutes does he actually work?

f. The air conditioner is kept running from 7:30 a.m. until 9 p.m.
How many hours does the air conditioner run in a *week*?

g. An airplane is scheduled to take off at 3:40 p.m. and land at 5:10 p.m.
The flight is delayed so that it leaves at 3:55 p.m. instead. When will it land?

Measuring Temperature: Celsius

Temperature tells us how hot or cold something is. Temperature is measured in degrees Celsius in many parts of our world. We use a little elevated circle ° to mean degrees. So, 24°C is "24 degrees Celsius".

The Celsius scale

The Celsius scale gets its name from the Swedish astronomer Anders Celsius (1701 – 1744). He developed the scale two years before his death. He used 0 for the boiling point of water and 100 for the freezing point of water. These two were reversed in 1745, so the two defining points for the Celsius scale became:

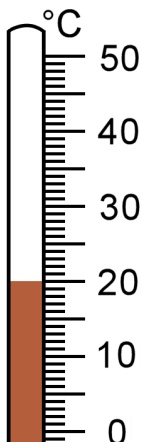|	
The freezing point of water	**0°C**
The boiling point of water	**100°C**

(under normal conditions)
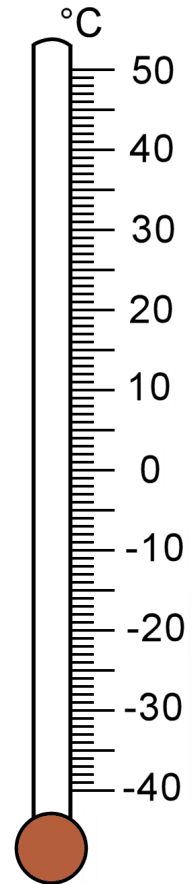
1. Mark these temperatures or temperature ranges on the side of the thermometer at the right.

Normal body temperature	37°C
Hot summer weather	25...35°C
Nice inside temperature	19...23°C
Below freezing (icy and snowy)	-40...0°C (negative)

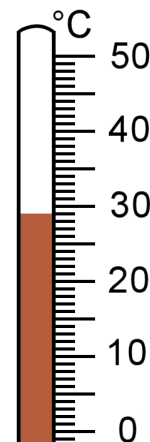2. Write the temperatures.
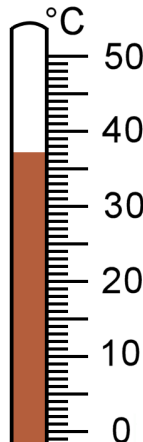
a. _____ °C   b. _____ °C   c. _____ °C   d. _____ °C   e. _____ °C

3. If you have a thermometer that measures in Celsius degrees, use it to measure the temperature:

a. outside _____ **b.** inside _____ **c.** in the fridge _____

You need to leave the thermometer in each place for about 10-15 minutes before reading it.

4. Check the weather forecast from the Internet: **https://www.bbc.com/weather/**

Navigate to any area of the world you wish to. The temperatures are shown in Celsius degrees. Can you tell from the temperatures if it is cold, hot, warm, or cool?

5. In the box on the right, match the temperatures with the descriptions.

a fall day	5°C
a summer day	39°C
a fever	22°C
hot soup	55°C
boiling oil	-12°C
It is snowing!	200°C
inside a fridge	12°C
inside a house	21°C

6. Draw the liquid in the thermometers. Write the right description underneath:
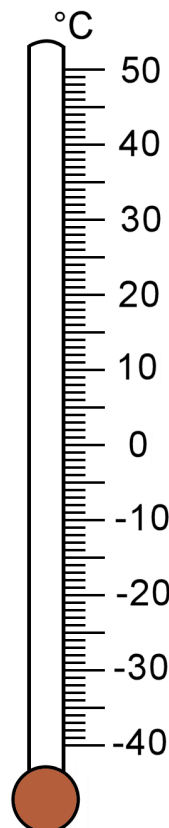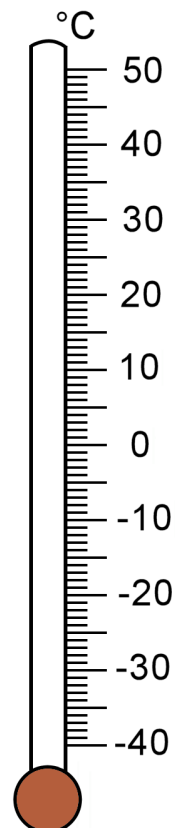*water freezing, a spring day, inside, a hot day*
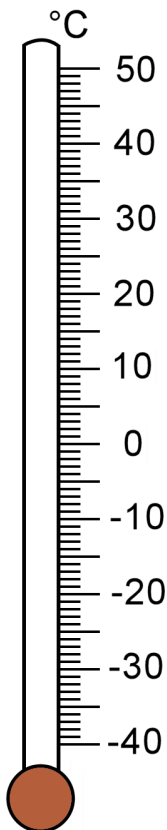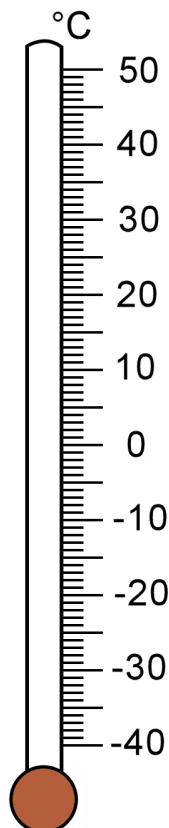
a. 0°C   **b.** 10°C   **c.** 20°C   **d.** 30°C
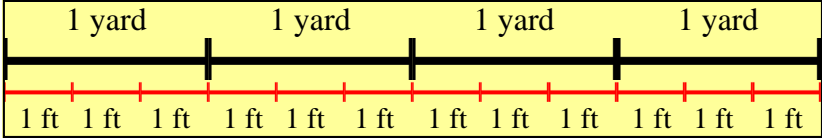
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Feet, Yards, and Miles

12 inches equal 1 foot. 1 ft = 12 in

Three feet make one yard.
1 yd = 3 ft

1 yard	1 yard	1 yard	1 yard
1 ft 1 ft 1 ft	1 ft 1 ft 1 ft	1 ft 1 ft 1 ft	1 ft 1 ft 1 ft

1. Use a tape measure to measure lengths of some objects and distances in feet and inches.

Item	How long
	_____ ft _____ in

2. Draw a long line at least 20 ft long (outside, if necessary) and make marks on it for 1 ft, 2 ft, 3 ft, and so on. Then walk along your line. First, try to take 1-foot steps. Then, try to take 2-foot steps. Then, try to take 1-yard steps.

   Which kind of steps were the most comfortable and easiest for you to take?

3. First, practice taking 2-foot steps on the line you drew. Then measure some distances by taking 2-foot steps. For example, measure the width of a street or the length of a room. Lastly figure out the distances in feet.

Distance	in steps	in feet

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4. One foot is 12 inches. Fill in.

a.

Feet	Inches
1	
2	
3	
4	
5	

b.

Feet	Inches
6	
7	
8	
9	
10	

c.

Feet	Inches
11	
12	
13	
14	
15	

5. One foot is 12 inches. Convert between feet and inches.

a. 6 ft = _____ in

11 ft = _____ in

b. 2 ft 5 in = _____ in

7 ft 8 in = _____ in

c. 13 ft 7 in = _____ in

11 ft 11 in = _____ in

d. 36 in = _____ ft

50 in = _____ ft _____ in

e. 27 in = _____ ft _____ in

100 in = _____ ft _____ in

f. 64 in = _____ ft _____ in

85 in = _____ ft _____ in

6. Solve.

a. Sally is 4 ft 6 in tall, and Jerry is 5 ft 2 in tall. How many inches taller is Jerry than Sally?

b. Mia was 4 ft 10 in tall. Next year she grew three inches.
How tall is she now?

c. The world's *tallest* man is Sultan Kösen from Turkey. He measures 8 feet 3 inches.
The world's *shortest* man is Chandra Bahadur Dangi from Nepal. He is 1 foot 9 inches.

Figure out the difference in their heights!

d. *A challenge.* The long sides of a rectangle are 5 ft 6 in, and its perimeter 16 ft 10 in. How long are the shorter sides?

5 ft 6 in

5 ft 6 in

181
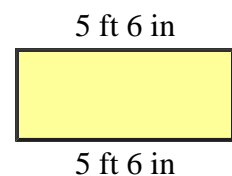
7. One yard is three feet. Fill in the tables.

a.

Yards	Feet
1	
2	
3	

b.

Yards	Feet
4	
5	
6	

c.

Yards	Feet
7	
8	
9	

8. One yard is 3 feet. Convert between yards and feet.

a. 6 yd = _____ ft 13 yd = _____ ft	**b.** 2 yd 2 ft = _____ ft 5 yd 1 ft = _____ ft	**c.** 24 ft = _____ yd 42 ft = _____ yd
d. 13 ft = _____ yd _____ ft 17 ft = _____ yd _____ ft	**e.** 22 ft = _____ yd _____ ft 29 ft = _____ yd _____ ft	**f.** 32 ft = _____ yd _____ ft 40 ft = _____ yd _____ ft

9. Jessie ran 400 yards and Andrew ran 1,000 feet. Who ran a longer distance?

How much longer?

10. This is a soccer field. Calculate the distance marked with (?).

   a. in yards

   b. in feet
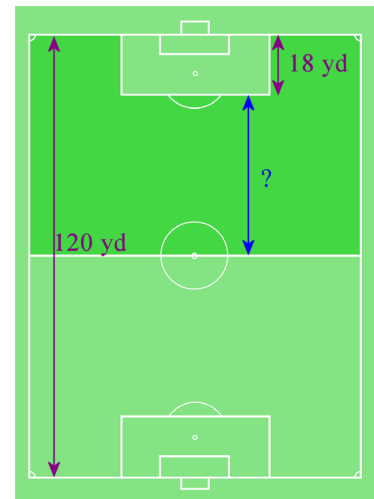
11. Olivia bought 6 yards of material. She cut off
   two pieces that were 2 feet long each.
   Now how much material does she have left?

12. Olivia also cut a 1-yard piece of different material into two pieces.
   One piece was 1 ft 4 in long. How long is the remaining piece?

You can add feet to feet and inches to inches. Just remember that if you get more than 12 inches, each 12 inches makes a new foot.

Example 1. 2 ft 7 in + 1 ft 8 in

= 3 ft 15 in = 4 ft 3 in

Now, 15 inches is more than one foot—it is 1 foot 3 inches. So, we need to add one more foot to the 3 feet. The original answer 3 ft 15 in becomes 4 ft 3 in.

Example 2. When you add feet and inches in columns, again, check if the sum of the inches is 12 or more and makes an entire foot or feet.

$$
\begin{array}{r}
3\ \text{ft}\quad 8\ \text{in} \\
+\ 6\ \text{ft}\quad 11\ \text{in} \\
\hline
9\ \text{ft}\quad 19\ \text{in}\ =\ 10\ \text{ft}\quad 7\ \text{in}
\end{array}
$$

13. Solve.

a. The long sides of a rectangle are 6 ft 4 in, and the short sides are 2 ft 10 in. Mark the measurements around the rectangle.

Perimeter = _____ ft _____ in

b. Each side is 8 in.

Perimeter = _____ ft _____ in
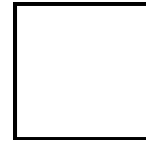
c. Each side is 1 ft 8 in.

Perimeter = _____ ft _____ in

d. You have three pieces of furniture: a table, 5 ft 6 in long, a bed, 8 ft 3 in long, and a dresser, 3 ft 8 in long. Can they all fit along a wall that is 18 ft long?

e. A box is 2 ft 8 in tall. How tall is a stack of three of them?

A **mile** is used to measure long distances. **One mile is 5,280 feet**.

Mile originates from the Roman measure "mille passus," which means "thousand paces," where a pace is a double-step. The Roman mile was exactly 5,000 *Roman* feet.
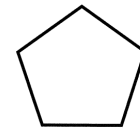Read in the links below how the 5,000-foot mile became a 5,280-foot mile around year 1300:

https://www.sizes.com/units/mile.htm and https://en.wikipedia.org/wiki/Furlong

14. Solve.

a. How many feet is four miles?

_____

_____

b. Convert 5 mi 2,350 ft into feet.

_____

_____

c. Which is a longer distance, 2 mi 800 ft or 13,000 ft? Use estimation (1 mile is *about* _____ ft).

_____

d. An airplane flies at the height of 21,000 feet.
About how many miles is that? _____

e. About how many miles tall is Mt. Everest (elevation 29,029 ft)?   _____

f. Andrew can walk 300 feet in one minute. How many feet can he walk in 50 minutes?

_____

About how many whole miles is that? _____

g. Anthony walks 950 ft to school every morning. Figure out how many feet he walks to and from school in a five-day school week.

_____

About how many whole miles is that? _____

Metric Units for Measuring Length

The basic unit for measuring length in the metric system is **the meter**. All the other units are based on the meter, and in fact, have the word "meter" in them.

Each unit in the metric system is 10 times the smaller unit. For example, 1 kilometer is 10 hectometers and 1 centimeter is 10 millimeters. However, we don't commonly use hectometers, dekameters, or decimeters. You need to learn only the units that are bolded in the chart.

Units of length in the metric system

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

10, 10, 10, 10, 10, 10, 10

Remember also that **1 meter is very close to 1 yard**. One meter is just a bit longer than one yard.

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

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

   1 meter   1 meter   1 meter   1 meter
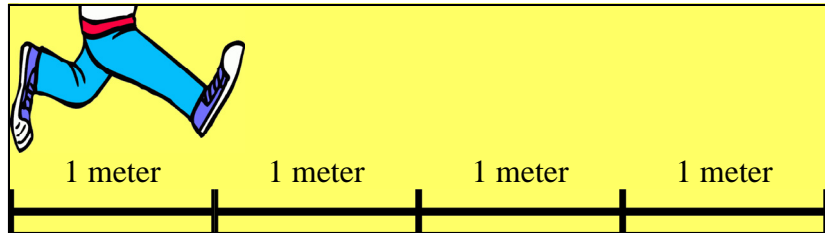
   b. On the second line make marks at each foot, from 1 to 13 feet. Then take 1-yard hops.

   Do the two kinds of hops feel about the same?

2. Measure how tall you and other people are in centimeters. Write it also using whole meters and centimeters.

Name	Height
	_____ cm = _1_ m _____ cm.

185

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Conversions between units

Remember what millimeters look like on a ruler. They are tiny! **Ten millimeters make 1 cm.**

Then verify from a measuring tape that **100 centimeters makes one meter**. "Centi" means one hundred (from the Latin word *centum*). That is why 1 dollar has 100 *cents*, and 1 meter has 100 *centi*meters.

Lastly, **1 kilometer is 1,000 meters**, because "kilo" means one thousand.

1 km = 1,000 m	**1 m = 100 cm**	**1 cm = 10 mm**

3. One meter is 100 cm. Convert between meters and centimeters.

a. 5 m = _____ cm	**b.** 4 m 6 cm = _____ cm	**c.** 800 cm = _____ m
8 m = _____ cm	9 m 19 cm = _____ cm	239 cm = ____ m _____ cm
12 m = _____ cm	10 m 80 cm = _____ cm	407 cm = ____ m _____ cm

4. One centimeter is 10 mm. Convert between centimeters and millimeters.

a. 5 cm = _____ mm	**b.** 2 cm 8 mm = _____ mm	**c.** 50 mm = ____ cm _____ mm
8 cm = _____ mm	7 cm 5 mm = _____ mm	72 mm = ____ cm _____ mm
14 cm = _____ mm	10 cm 4 mm = _____ mm	145 mm = ____ cm _____ mm

5. One kilometer is 1,000 m. Convert between kilometers and meters.

a. 5 km = _____ m	**b.** 2 km 800 m = _____ m	**c.** 2,000 m = _____ km
23 km = _____ m	6 km 50 m = _____ m	4,300 m = ____ km _____ m
1 km 200 m = _____ m	13 km 579 m = _____ m	18,700 m = ____ km _____ m

6. Calculate. Give your answer using whole kilometers and meters.
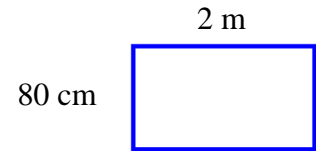
   a. 5 km 200 m + 8 km 900 m

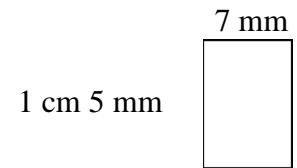   **b.** 3 km 600 m + 2 km 800 m

   c. 1,500 m + 2 km 600 m

   d. 6×700 m

186

7. Solve.

a. Find the perimeter of this rectangle.

2 m

80 cm

b. Find the perimeter of this rectangle.

7 mm

1 cm 5 mm

c. One side of a square measures 5 cm 6 mm. What is its perimeter?

d. *A challenge.* A square has a perimeter of 6 cm. How long is its side?

8. Solve the problems.

a. How many millimeters are in a *meter*?

b. John jogs around a track 1 km 800 m long twice a day, five days a week.
   How long a distance does he jog in a day?

   In a week?

c. Gary is 1 m 34 cm tall and Jared is 142 cm tall.
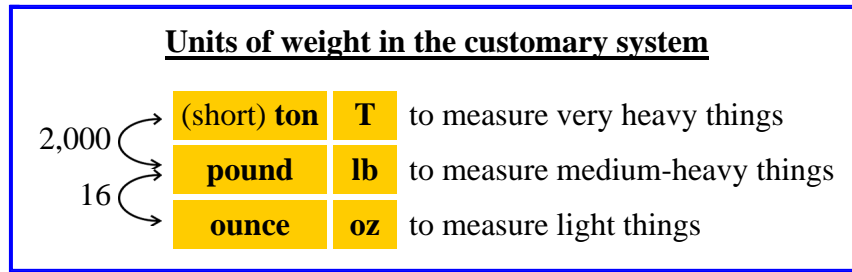   How much taller is Jared?

Kathy's wallpaper has butterflies that are 8 cm wide. She will put the wallpaper in her room. How many complete butterflies can she have on a wall that is 1 meter long?

How about if the wall is 3 meters long?

Puzzle Corner

Customary Units of Weight

Units of weight in the customary system

(short) **ton**	**T**	to measure very heavy things
pound	**lb**	to measure medium-heavy things
ounce	**oz**	to measure light things

2,000

16

1. Measure light items with a kitchen scale. Write your results here.

Item	Weight
	_____ lb _____ oz

2. Choose the right weight for each thing. Sometimes there are two possibilities.

a. a sparrow	**b. a book**	**c. an elephant**
10 oz 1 oz 16 oz	1 lb 2 oz 20 oz	40 oz 40 lb 4 T
d. a car	**e. a magazine**	**f. a healthy woman**
2 T 3,500 lb 300 lb	5 oz 2 lb 1 lb	80 lb 130 lb 60 lb
g. a tractor	**h. a 3-year old boy**	**i. a fridge**
200 T 3 T 140 lb	22 lb 44 lb 66 lb	7 lb 200 lb 1 T

3. One pound is 16 ounces. One ton is 2,000 pounds. Fill in the tables.

Pounds	1/2	1	2	2 1/2	3	4	5
Ounces							

Tons	2	3	4	5	10	12	20
Pounds							

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