Contents

Chapter 3: Multi-Digit Multiplication

Chapter 4: Time and Measuring

Foreword

Math Mammoth Grade 4 (International version; Canada) comprises a complete math curriculum for the fourth grade mathematics studies. This curriculum is essentially the same as the *Math Mammoth Grade 4* sold in the United States, only customized for international use in a few aspects (listed below). The curriculum meets the Common Core Standards in the United States, but it may not properly align to the fourth grade standards in your province. However, you can probably find material for any missing topics in the neighbouring grades of Math Mammoth.

This International version of Math Mammoth for Canada differs from the US version in these aspects:

- The curriculum uses metric measurement units, not customary (imperial) units.
- The currency used in the money lessons is the Canadian dollar.
- The spelling conforms to British international standards.
- The pages are formatted for A4 paper size.
- Large numbers are formatted with a space as the thousands separator (such as 12 394).
  (The decimals are formatted with a decimal point, as in the US version.)

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.

I heartily recommend that you read the full user guide in the following pages.

I wish you success in teaching math!

Maria Miller, the author

User Guide

Note: You can also find the information that follows online, at **https://www.mathmammoth.com/userguides/** .

Basic principles in using Math Mammoth Complete Curriculum

Math Mammoth is mastery-based, which means it concentrates on a few major topics at a time, in order to study them in depth. The two books (parts A and B) are like a "framework", but you still have a lot of liberty in planning your child's studies. You can even use it in a *spiral* manner, if you prefer. Simply have your student study in 2-3 chapters simultaneously. In fourth grade, chapters 3, 4, and 5 should be studied in order, but you can be flexible with all the other chapters and schedule them earlier or later.

Math Mammoth is not a scripted curriculum. In other words, it is not spelling out in exact detail what the teacher is to do or say. Instead, Math Mammoth gives you, the teacher, various tools for teaching:

- **The two student worktexts** (parts A and B) contain all the lesson material and exercises. They include the explanations of the concepts (the teaching part) in blue boxes. The worktexts also contain some advice for the teacher in the "Introduction" of each chapter.

  The teacher can read the teaching part of each lesson before the lesson, or read and study it together with the student in the lesson, or let the student read and study on his own. If you are a classroom teacher, you can copy the examples from the "blue teaching boxes" to the board and go through them on the board.

- There are hundreds of **videos** matched to the curriculum available at https://www.mathmammoth.com/videos/ . There isn't a video for every lesson, but there are dozens of videos for each grade level. You can simply have the author teach your child or student!

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

- For each chapter, there is a **link list to various free online games** and activities. These games can be used to supplement the math lessons, for learning math facts, or just for some fun. Each chapter introduction (in the student worktext) contains a link to the list corresponding to that chapter.

- The student books contain some **mixed revision lessons**, and the curriculum also provides you with additional **cumulative revision lessons**.

- There is a **chapter test** for each chapter of the curriculum, and a comprehensive end-of-year test.

- The **worksheet maker** allows you to make additional worksheets for most calculation-type topics in the curriculum. This is a single html file. You will need Internet access to be able to use it.

- You can use the free online exercises at https://www.mathmammoth.com/practice/
  This is an expanding section of the site, so check often to see what new topics we are adding to it!

- Some grade levels have **cut-outs** to make fraction manipulatives or geometric solids.

- And of course there are answer keys to everything.

How to get started

Have ready the first lesson from the student worktext. Go over the first teaching part (within the blue boxes) together with your child. Go through a few of the first exercises together, and then assign some problems for your child to do on their own.

Repeat this if the lesson has other blue teaching boxes. Naturally, you can also use the videos at
https://www.mathmammoth.com/videos/

Many children can eventually study the lessons completely on their own — the curriculum becomes self-teaching. However, children definitely vary in how much they need someone to be there to actually teach them.

Pacing the curriculum

The lessons in Math Mammoth complete curriculum are NOT intended to be done in a single teaching session or class. Sometimes you might be able to go through a whole lesson in one day, but more often, the lesson itself might span 3-5 pages and take 2-3 days or classes to complete.

Therefore, it is not possible to say exactly how many pages a student needs to do in one day. This will vary. However, it is helpful to calculate a general guideline as to how many pages per week you should cover in the student worktext in order to go through the curriculum in one school year (or whatever span of time you want to allot to it).

The table below lists how many pages there are for the student to finish in this particular grade level, and gives you a guideline for how many pages per day to finish, assuming a 180-day school year.

Example:

Grade level	Lesson pages	Number of school days	Days for tests and revisions	Days for the student book	Pages to study per day	Pages to study per week
4-A	168	88	8	80	2.1	10.5
4-B	177	92	8	84	2.1	10.5
Grade 4 total	345	180	16	164	2.1	10.5

The table below is for you to fill in. First fill in how many days of school you intend to have. Also allow several days for tests and additional revision before the test — at least twice the number of chapters in the curriculum. For example, if the particular grade has 8 chapters, allow at least 16 days for tests & additional revision. Then, to get a count of "pages/day", divide the number of pages by the number of available days. Then, multiply this number by 5 to get the approximate page count to cover in a week.

Grade level	Lesson pages	Number of school days	Days for tests and revisions	Days for the student book	Pages to study per day	Pages to study per week
4-A	168					
4-B	177					
Grade 4 total	345					

Now, let's assume you determine that you need to study about 2 pages a day, 10 pages a week in order to get through the curriculum. As you study each lesson, keep in mind that sometimes most of the page might be filled with blue teaching boxes and very few exercises. You might be able to cover 3 pages on such a day. Then some other day you might only assign one page of word problems. Also, you might be able to go through the pages quicker in some chapters, for example when studying graphs, because the large pictures fill the page so that one page does not have many problems.

When you have a page or two filled with lots of similar practice problems ("drill") or large sets of problems, feel free to **only assign 1/2 or 2/3 of those problems**. If your child gets it with less amount of exercises, then that is perfect! If not, you can always assign him/her the rest of the problems some other day. In fact, you could even use these unassigned problems the next week or next month for some additional revision.

In general, 1st-2nd graders might spend 25-40 minutes a day on math. Third-fourth graders might spend 30-60 minutes a day. Fifth-sixth graders might spend 45-75 minutes a day. If your child finds math enjoyable, he/she can of course spend more time with it! However, it is not good to drag out the lessons on a regular basis, because that can then affect the child's attitude towards math.

Working space, the usage of additional paper and mental math

The curriculum generally includes working space directly on the page for students to work out the problems. However, feel free to let your students to use extra paper when necessary. They can use it, not only for the "long" algorithms (where you line up numbers to add, subtract, multiply, and divide), but also to draw diagrams and pictures to help organize their thoughts. Some students won't need the additional space (and may resist the thought of extra paper), while some will benefit from it. Use your discretion.

Some exercises don't have any working space, but just an empty line for the answer (e.g. 200 + _____ = 1 000). Typically, I have intended that such exercises to be done using MENTAL MATH.

However, there are some students who struggle with mental math (often this is because of not having studied and used it in the past). As always, the teacher has the final say (not me!) as to how to approach the exercises and how to use the curriculum. We do want to prevent extreme frustration (to the point of tears). The goal is always to provide SOME challenge, but not too much, and to let students experience success enough so that they can continue enjoying learning math.

Students struggling with mental math will probably benefit from studying the basic principles of mental calculations from the earlier levels of Math Mammoth curriculum. To do so, look for lessons that list mental math strategies. They are taught in the chapters about addition, subtraction, place value, multiplication, and division. My article at https://www.mathmammoth.com/lessons/practical_tips_mental_math also gives you a summary of some of those principles.

Using tests

For each chapter, there is a **chapter test**, which can be administered right after studying the chapter. **The tests are optional.** Some families might prefer not to give tests at all. The main reason for the tests is for diagnostic purposes, and for record keeping. These tests are not aligned or matched to any standards.

In the digital version of the curriculum, the tests are provided both as PDF files and as html files. Normally, you would use the PDF files. The html files are included so you can edit them (in a word processor such as Word or LibreOffice), in case you want your student to take the test a second time. Remember to save the edited file under a different file name, or you will lose the original.

The end-of-year test is best administered as a diagnostic or assessment test, which will tell you how well the student remembers and has mastered the mathematics content of the entire grade level.

Using cumulative revisions and the worksheet maker

The student books contain mixed revision lessons which revise concepts from earlier chapters. The curriculum also comes with additional cumulative revision lessons, which are just like the mixed revision lessons in the student books, with a mix of problems covering various topics. These are found in their own folder in the digital version, and in the Tests & Cumulative Revisions book in the print version.

The cumulative revisions are optional; use them as needed. They are named indicating which chapters of the main curriculum the problems in the revision come from. For example, "Cumulative Revision, Chapters 1 - 4" includes problems that cover topics from chapters 1-4.

Both the mixed and cumulative revisions allow you to spot areas that the student has not grasped well or has forgotten. When you find such a topic or concept, you have several options:

1. Check if the worksheet maker lets you make worksheets for that topic.

2. Check for any online games and resources in the Introduction part of the particular chapter in which this topic or concept was taught.

3. If you have the digital version, you could simply reprint the lesson from the student worktext, and have the student restudy that.

4. Perhaps you only assigned 1/2 or 2/3 of the exercise sets in the student book at first, and can now use the remaining exercises.

5. Check if our online practice area at https://www.mathmammoth.com/practice/ has something for that topic.

6. Khan Academy has free online exercises, articles, and videos for most any math topic imaginable.

Concerning challenging word problems and puzzles

While this is not absolutely necessary, I heartily recommend supplementing Math Mammoth with challenging word problems and puzzles. You could do that once a month, for example, or more often if the student enjoys it.

The goal of challenging story problems and puzzles is to **develop the student's logical and abstract thinking and mental discipline**. I recommend starting these in fourth grade, at the latest. Then, students are able to read the problems on their own and have developed mathematical knowledge in many different areas. Of course I am not discouraging students from doing such in earlier grades, either.

Math Mammoth curriculum contains lots of word problems, and they are usually multi-step problems. Several of the lessons utilize a bar model for solving problems. Even so, the problems I have created are usually tied to a specific concept or concepts. I feel students can benefit from solving problems and puzzles that require them to think "out of the box" or are just different from the ones I have written.

I recommend you use the free Math Stars problem-solving newsletters as one of the main resources for puzzles and challenging problems:

Math Stars Problem Solving Newsletter (grades 1-8)
https://www.homeschoolmath.net/teaching/math-stars.php

I have also compiled a list of other resources for problem solving practice, which you can access at this link:

https://l.mathmammoth.com/challengingproblems

Another idea: you can find puzzles online by searching for "brain puzzles for kids," "logic puzzles for kids" or "brain teasers for kids."

Frequently asked questions and contacting us

If you have more questions, please first check the FAQ at https://www.mathmammoth.com/faq-lightblue

If the FAQ does not cover your question, you can then contact us using the contact form at the Math Mammoth.com website.

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 revise 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 revision. We also connect this topic with real-life situations, such as shopping. The student writes simple expressions (number sentences) for word problems, which, again, practises 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 judgement, and try to vary the number of assigned exercises according to the student's needs.

Please see the user guide at https://www.mathmammoth.com/userguides/ for more guidance on using and pacing the curriculum.

I also offer free videos matched to the curriculum at https://www.mathmammoth.com/videos/.

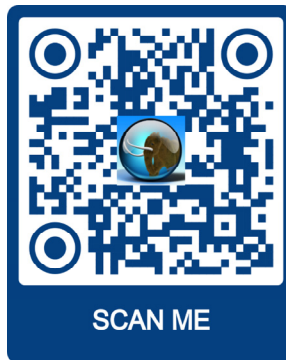**The Lessons in Chapter 1**

Helpful Resources on the Internet

We have compiled a list of Internet resources that match the topics in this chapter. This list of links includes web pages that offer:

- **online practice** for concepts;

- online **games**, or occasionally, printable games;

- **animations** and interactive **illustrations** of math concepts;

- **articles** that teach a math concept.

We heartily recommend you take a look at the list. Many of our customers love using these resources to supplement the bookwork. You can use the resources as you see fit for extra practice, to illustrate a concept better, and even just for some fun. Enjoy!

https://links.mathmammoth.com/gr4ch1

SCAN ME

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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.

$$\xleftarrow{\hspace{2em}} 56 \xrightarrow{\hspace{2em}}$$

x	15
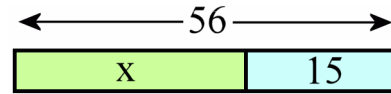
From the bar model, we can write <u>two</u> addition and <u>two</u> subtraction sentences—a **fact family**.

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:

$$\xleftarrow{\hspace{2em}} 1510 \xrightarrow{\hspace{2em}}$$

769	x

$$769 + x = 1\,510$$

We can solve it by subtracting the one part (769) from the total (1 510).
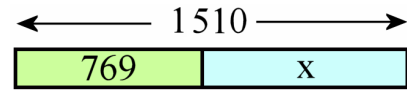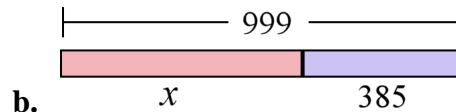
$$769 + x = 1\,510$$
$$x = 1\,510 - 769 = 741$$

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

a.

$$\xleftarrow{\hspace{2em}} 400 \xrightarrow{\hspace{2em}}$$

128	x

_____ + _____ = _____

$x =$ _____ − _____ = _____

b.

$$\xleftarrow{\hspace{2em}} 999 \xrightarrow{\hspace{2em}}$$

x	385

_____ + _____ = _____

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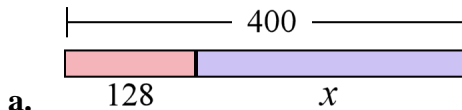
c. A laptop costs $1 200. Dad has $890. How much more does he need to buy it?

$$\xleftarrow{\hspace{2em}} \$1\,200 \xrightarrow{\hspace{2em}}$$

$890	x

_____ + _____ = _____

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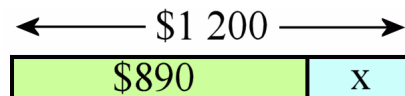
d. The school has 547 students, of which 265 are girls. How many are boys?

$$\xleftarrow{\hspace{1em}} \text{total} \xrightarrow{\hspace{1em}}$$

_____ + _____ = _____

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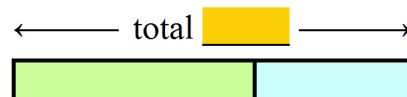
2. Add the given numbers *and* the unknown x to the bar model. Note, x is the unknown, or what the problem asks for. Then write an addition (a missing addend problem) and solve it

a. Of their 1 200-kilometre trip, the Ames family travelled 420 km yesterday and 370 km today. How many kilometres 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 travelling 56 kilometres, Dad said, "Okay, in 9 km we will be in Sidney, and from there we will have 118 km left." How many kilometres in total is the trip?
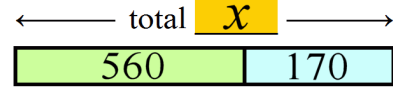
Addition:

Solution: $x =$ _____

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

x	1 750

4 900

$x =$ _____

<table>
<tr>
<td>

In this subtraction problem, $x - 170 = 560$, the *total* is unknown. (Remember, subtraction problems start with the total.)
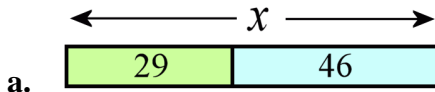
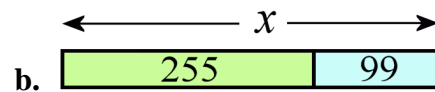Look at the bar model. We can solve x by adding.

</td>
<td>

⟵ total **x** ⟶

| 560 | 170 |

$x - 170 = 560$

$x = 170 + 560 = 730$

</td>
</tr>
</table>

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

a. ⟵ x ⟶

| 29 | 46 |

$x - \underline{2\ 9} = \underline{\hspace{1.5cm}}$

$x = \underline{\hspace{1cm}} + \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$

b. ⟵ x ⟶

| 255 | 99 |

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

$x = \underline{\hspace{1cm}} + \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$

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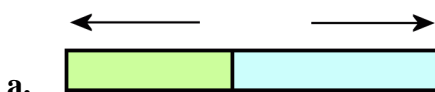
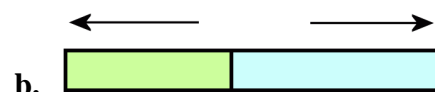| **d.** $x - 8 = 7$	**e.** $x - 24 = 48$	**f.** $x - 300 - 50 = 125$
$x = \underline{\hspace{1.5cm}}$	$x = \underline{\hspace{1.5cm}}$	$x = \underline{\hspace{1.5cm}}$

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.** $899 - x = 342$
$x = \underline{\hspace{1cm}}$	$x = \underline{\hspace{1cm}}$	$x = \underline{\hspace{1cm}}$

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

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.** Matt 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. Jenny had 120 marbles, but some of them got lost. Now she has 89 left. $120 - x = 89$ OR $120 + 89 = x$ $x =$ _____	**d.** Dylan 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. Natalie had \$200. Then she bought an item for \$54 and another for \$78. How much money does she have now?	_____ $-$ _____ $-$ _____ = _____ $x =$ _____
d. Kelly 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.** $x + 15 + 15 + 15 + 15 = 97$ $x =$ _____

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Line Graphs

A line graph shows how something changes over *time*, for example over hours, days, weeks, months, or years. The data values are often drawn as dots and then the dots are connected with lines.

A line graph has a horizontal axis (*x*-axis in the picture), and a vertical axis (*y*-axis). The horizontal axis is for the time units.

To read a line graph, look "up" from a time unit until you find a dot. Then draw an imaginary line from that dot to the vertical or *y*-axis, and read the value at that axis.

We can see that In July, Amy had $90 in her savings.
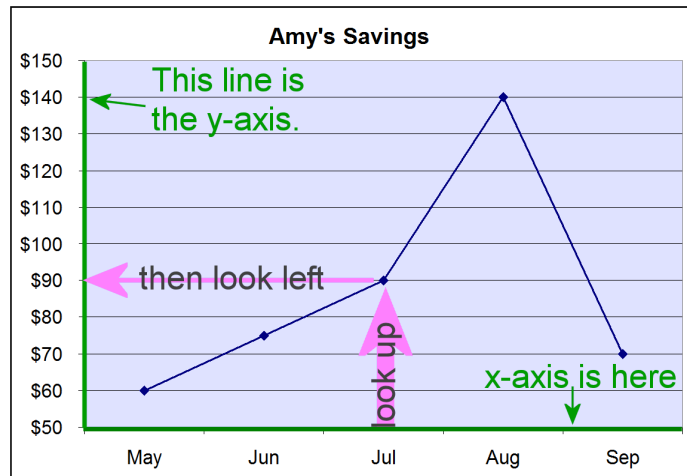
1. **a.** How many dollars did Amy have in her savings in May?

   b. How many dollars did Amy have in her savings in August?

   c. In which month did she have $75 in her savings?

   d. How many dollars did Amy add to her savings from June to July?

   e. How much less did Amy have in her savings in September than in August? What could have caused that?

2. The graph shows a puppy's weight for 10 days after birth. Notice how the two axes are named as "Day" and "grams".

   a. About how many grams did the puppy weigh on day 1? _____

   Day 2? _____

   Day 3? _____

   Day 4? _____

   b. What is the first day that the puppy weighed 600 g or more?

   c. What is the first day that the puppy weighed 700 g or more?
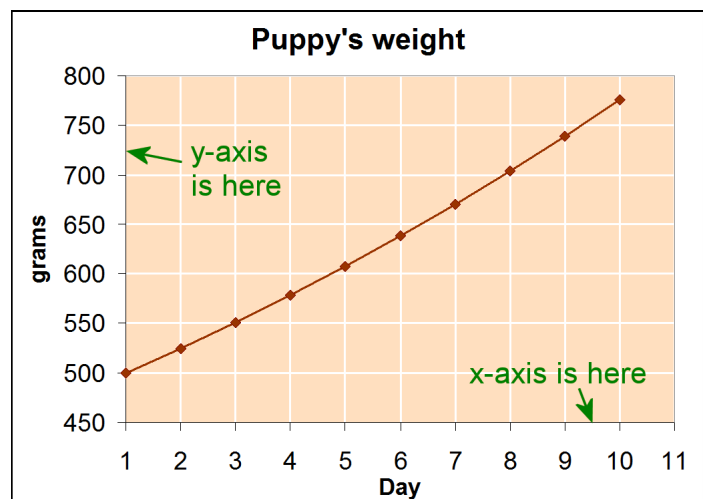
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Chapter 2: Large Numbers and Place Value
Introduction

This 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 revision 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 1000. 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 judgement, and try to vary the number of assigned exercises according to the student's needs.
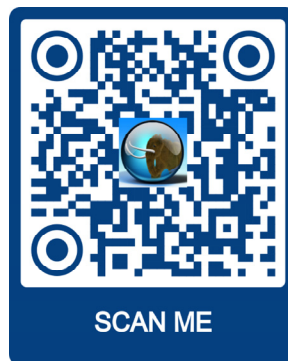
The Lessons in Chapter 2

Helpful Resources on the Internet

We have compiled a list of Internet resources that match the topics in this chapter. This list of links includes web pages that offer:
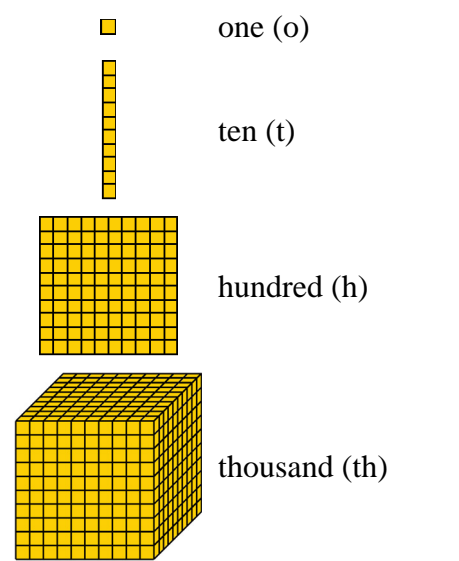
- **online practice** for concepts;

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https://links.mathmammoth.com/gr4ch2

SCAN ME

Thousands

☐ one (o)	Look at the pictures. How many...
	• ones go into a ten? _____
ten (t)	• tens go into a hundred? _____
	• hundreds go into a thousand? _____
	The way we write numbers is based on number *ten*.

Writing the number 5 608 in **expanded form** means we write out the number <u>as a sum</u> of whole thousands, whole hundreds, whole tens, and ones. You can see all of this right from the number:

hundred (h)

- It has **<u>5</u>** thousands = 5 000

- It has **<u>6</u>** hundreds = 600

thousand (th)

- It has **<u>0</u>** tens = 0

- It has **<u>8</u>** ones = 8

th	h	t	o
7	**2**	**8**	**4**

7 284 has
7 thousands, 2 hundreds,
8 tens, and 4 ones.

Now write it as a sum: 5 608 = 5 000 + 600 + 0 + 8

1. Write the numbers in expanded form.

    a. 8 325 = 8 000 + 300 + 20 + 5   **b.** 4 935 =

    c. 4 039 =   **d.** 3 002

    e. 2 090 =   **f.** 9 405

2. Write the numbers in normal form.

    a. 4 000 + 500 + 90 + 3   **b.** 2 000 + 90

    c. 3 000 + 200   **d.** 8 000 + 5

    e. 4 thousand, 6 hundred   **f.** 8 tens, 4 thousand

    g. 3 ones, 7 thousand, 2 hundred   **h.** 4 hundred, 5 ones, 1 thousand

    i. fifty, 7 thousand   **j.** 4 thousand, 5 ones

    k. 9 ones, sixty, 4 thousand   **l.** 8 hundred, 3 thousand, 9 ones

The 7, 2, 8, and 4 are called **digits** of the number 7 284, but 7 in the number 7 284
actually means seven thousand. The **value** of the digit 7 is 7 000.
The 2 in the number 7 284 actually means two hundred. The *value* of the digit 2 is 200.
The *value* of the digit 8 is eighty or 80. The value of the digit 4 is four.

The value of any digit in a number depends on its **place** (where it is located).

6**9**0	"9" in 690 means ninety.	The value of the digit "9" is 90.	"9" is in the tens place.
9 055	"9" in 9 055 means nine thousand.	The value of the digit "9" is 9 000.	"9" is in the thousands place.
41**9**	"9" in 419 means just nine.	The value of the digit "9" is 9.	"9" is in the ones place.
1 **9**70	"9" in 1 970 means nine hundred.	The value of the digit "9" is 900.	"9" is in the hundreds place.

We write numbers using a **place-value notation:** each digit has a place and a value.

Examples. If nine is in the hundreds place, then its value is 900 (such as in the number 5 900).
If nine is in the tens place, then its value is 90 (such as in the number 498).

3. What is the value of the digit 5 in the following numbers?

   a. 3 8**5**9 *fifty*   **b.** 2 506

   c. 5 012   **d.** 3 050

4. Write or tell the value of the underlined digit.

   a. **5**09 *five hundred*   **b.** **9** 843

   c. 9**4**0   **d.** 2 0**8**8

   e. 1 **2**00   **f.** 4 00**2**

   g. 7 9**2**8   **h.** 74**5**

5. **a.** What is the largest possible number you can build with the digits 2, 5, 8, and 4?

   b. What is the smallest possible number you can build with them?

6. What is the *difference* between the largest and the smallest possible
   numbers you can build with the digits 6, 9, and 1?

What is 4 769 + 10?   4 769 has 6 tens. One ten more means there will be 7 tens: 4 779.

What is 2 958 + 100?   2 958 has nine hundreds. One hundred more means there will be 10 hundreds, but that makes a thousand. Our answer will have 3 thousands and no hundreds: 3 058.

7. Fill in the table, adding 10, 100, or 1000. If in doubt, you can add in columns.

n	2 508	342	4 009	59	6 980	8 299
$n + 10$						
$n + 100$						
$n + 1000$						

8. What is missing?

   a. 4 036 = 4 000 + _____ + 30   **b.** 483 = 80 + 3 + _____

   c. 9 328 = 300 + 9 000 + _____ + 20   **d.** 8 005 = 5 + _____

   e. 5 320 = 20 + _____ + 300   **f.** 7 609 = 9 + _____ + 7 000

9. If you add 1 thousand, 1 hundred, 1 ten, and 1 to this number, it becomes 9 000.
   What is the number?

Puzzle Corner   Build the largest and the least possible number you can with the given digits. Then find their difference (subtract).

a. 7 and 5	**b.** 2 and 9	**c.** 4 and 5	**d.** 8 and 3
75 and 57 *difference: 18*			

e. In which multiplication table can you find each of the differences?

f. Find two (single) digits so that when you do the same thing you did above, the difference is 36.

g. Find two digits so that when you do the same thing you did above, the difference is 27.

h. Find two digits so that when you do the same thing you did above, the difference is 81.

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

Chapter 3: Multi-Digit Multiplication
Introduction

The third chapter of *Math Mammoth Grade 4* covers multi-digit multiplication and related topics, which 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 revise 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, for example, that 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 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 lessons at your discretion. The method taught in the lessons is most useful for students who 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 practise multiplication with more digits in fifth grade.

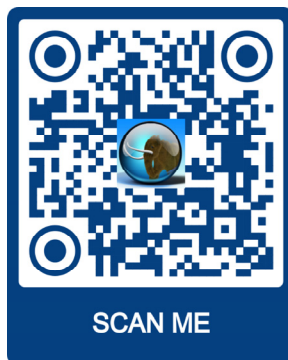### The Lessons in Chapter 3

Helpful Resources on the Internet

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https://links.mathmammoth.com/gr4ch3

SCAN ME

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.	b.	c.	d.
$8 \times 2 =$ _____	$3 \times 5 =$ _____	$2 \times 8 =$ _____	$3 \times 10 =$ _____
$8 \times 0 \times 7 =$ _____	$1 \times 2 \times 5 =$ _____	$2 \times 2 \times 2 =$ _____	$3 \times 3 \times 3 =$ _____

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

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

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The Standard Multiplication Algorithm with a Two-Digit Multiplier

You have learned to calculate multiplications such as 67×53 in parts.
You did two multiplications and then added. It took three separate calculations.

In the traditional way of multiplying there are also three separate calculations, but all three calculations appear together. Study how we solve **67×53** below.

```
    2
    5 3
  × 6 7
  ─────
  3 7 1
```

First multiply **7×53**.
Pretend the 6 of the 67 is not there.

```
  1 2
    5 3
  × 6 7
  ─────
  3 7 1
  3 1 8 0
```

Then multiply **60×53**, but write the result under the 371. Remember the zero. Pretend that the 7 of the 67 is not there. You can cross out the carry number from the previous calculation, so you won't get confused by it.

```
  1 2
      5 3
    × 6 7
    ─────
    3 7 1
  + 3 1 8 0
  ─────────
    3 5 5 1
```

Lastly add.

Study these examples, too. <u>Note we need an extra zero</u> in the ones place on the second line!

5×34

```
    2
    3 4
  × 2 5
  ─────
  1 7 0
```

20×34

```
    3 4
  × 2 5
  ─────
  1 7 0
  6 8 0
```

Add.

```
      3 4
    × 2 5
    ─────
    1 7 0
  + 6 8 0
  ─────────
    8 5 0
```

4×63

```
    1
    6 3
  × 9 4
  ─────
  2 5 2
```

90×63

```
    2
    6 3
  × 9 4
  ─────
  2 5 2
  5 6 7 0
```

Add.

```
      6 3
    × 9 4
    ─────
    2 5 2
  + 5 6 7 0
  ─────────
    5 9 2 2
```

1. Fill in the missing digits and complete the calculations.

a.
```
        6 5
    x   1 8
  ─────────
  +   6 5 0
  ─────────
```

b.
```
        8 2
    x   9 4
  ─────────
  + 7 3 8 0
  ─────────
```

c.
```
        9 3
    x   2 2
  ─────────
      1 8 6
  +
  ─────────
```

d.
```
        7 0
    x   5 3
  ─────────
      2 1 0
  +
  ─────────
```

2. Multiply.

a.
```
      5 3
  x   1 2
```

b.
```
      1 1
  x   3 5
```

c.
```
      7 8
  x   8 2
```

d.
```
      4 9
  x   2 0
```

e.
```
      3 8
  x   1 3
```

f.
```
      2 5
  x   3 8
```

g.
```
      1 7
  x   5 2
```

h.
```
      1 9
  x   4 9
```

3. Multiply – but first, estimate the result. Compare your final answer to your estimated answer.
   If there is a big difference, you might have an error somewhere.

a. Estimate: _____ × _____

= _____

```
      5 6
  x   1 3
```

b. Estimate: _____ × _____

= _____

```
      2 5
  x   6 5
```

c. Estimate: _____ × _____

= _____

```
      6 5
  x   4 4
```

d. Estimate: _____ × _____

= _____

```
      4 4
  x   1 4
```

e. Estimate: _____ × _____

= _____

```
      9 2
  x   4 6
```

f. Estimate: _____ × _____

= _____

```
      9 3
  x   7 7
```

4. Multiply – but first, estimate the result.

a. Estimate: _____ × _____

= _____

```
        8 1
  x     8 1
```

b. Estimate: _____ × _____

= _____

```
        9 7
  x     3 3
```

c. Estimate: _____ × _____

= _____

```
        2 8
  x     5 4
```

5. Solve the word problems. Write a number sentence for each one. Give more than just the final answer.

a. How many eggs is 15 dozen eggs?

_____

Estimate: _____

b. How many minutes are there in 21 hours?

_____

Estimate: _____

c. The 455 pupils in a school are going to a zoo by bus. One bus can seat 39 passengers. Are 11 buses enough to take them all?

_____

Estimate: _____

d. Each month, Brenda earns $21 for watering her neighbour's flowers. How much does she earn in a year?

_____

Estimate: _____

6. **a.** Is the answer to 53×61 he same as to 51×63?
   After all, it is just switching the ones digits.

   b. What about 42×71 and 41×72?
   If they are not the same, how much is
   the difference?

7. Find the change, if a teacher buys 15 shirts
   for $17 each and pays with $300.

8. One year has 52 weeks. Sally pays $98 weekly
   in rent. How much will she pay in a year?

9. Calculate in the correct order.

   a. $60 \times (10 + 20) \times 2 =$ _____

   $30 \times (40 - 40) \times 2 =$ _____

   b. $8 \times (200 - 100) - 500 =$ _____

   $(800 - 200) \times 20 + 100 =$ _____

Puzzle Corner   Fill in the missing numbers in these multiplications:

```
  □ 0 □          6 □ 7         □ 3 □         8 □ 4
×     3       ×     □       ×     4       ×     5
─────────     ─────────     ─────────     ─────────
  3 1 5       4 0 0 2       9 □ 6         4 □ 7 □
```

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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 the actual act of measuring, but on conversions between the units and on word problems that involve conversions.

Students may have difficulty with the conversions, and that is why they will also be studied in 5th grade. At this point, students should be able to easily convert from a bigger unit to a smaller unit (such as converting 3 m into 300 centimetres, or 2 kg into 2 000 grams).

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 4 000 millimetres into 4 metres), because I feel most students are capable of doing these in 4th grade.

The lessons include tables that list the units and the conversion factors. 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:

	litre	**L**	for larger amounts of liquid
10	decilitre	dl	(for medium amounts of liquid)
1 L = 1 000 ml 10	centilitre	cl	(for small amounts of liquid)
10	**millilitre**	**ml**	for small amounts of liquid

The lesson only deals with millilitres and litres. However, the chart *also* shows the two other units (decilitres and centilitres) in order to help familiarize the students with these two basic ideas 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

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https://links.mathmammoth.com/gr4ch4int

Scan me

Time Units

Pay close attention and <u>memorize</u> these relationships between time units, if you don't know them yet.	1 minute = 60 seconds 1 hour = 60 minutes 1 day = 24 hours	1 week = 7 days 1 year = 12 months 1 year = 365 days

1. Fill in.

a.

Days	Hours
1	*24*
2	
3	
4	
5	
6	
7	
8	

b.

Minutes	Seconds
1	*60*
2	
3	
4	
5	
6	
7	
8	

c.

Years	Months
1	
2	
3	
4	
5	
6	
7	
8	

2. Solve. Write a number sentence for each question, not just the answer.

a. Brian puts $120 into his savings each month. After saving for half a year, he bought a keyboard for $399. How much does he have left of his savings?

_____

_____

b. How much money do you spend in one year if you spend $3 for a candy bar every day for a year?

_____

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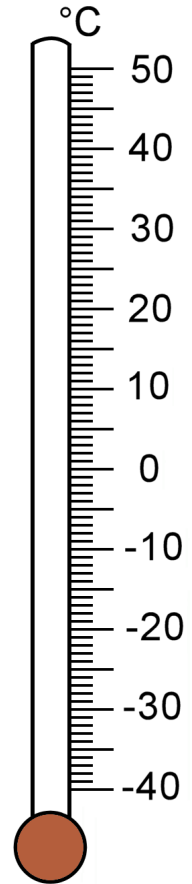
1. Mark these temperatures or temperature ranges on the side of the thermometer at the right.

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.
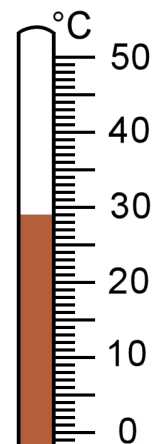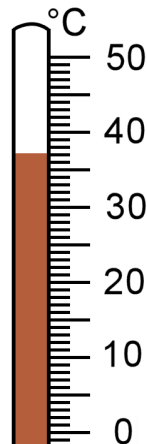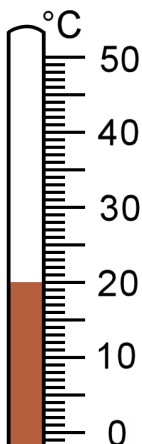
a. _____ °C   **b.** _____ °C   **c.** _____ °C   **d.** _____ °C   **e.** _____ °C

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Metric Units of Volume

The most common units of volume in the metric system are **litres** and **millilitres**.

You may have seen juice or other liquids sold in one-litre bottles. A litre is usually abbreviated "L" but sometimes you may see just a lowercase "l."

Millilitres are thousandth parts of a litre. In other words, **1 000 millilitres make one litre.** A millilitre is abbreviated "ml."

Most measuring cups used in cooking have a millilitre scale. Two cups is about 500 ml. Four cups (a U.S. quart) is about 1 L.

Units of volume in the metric system

1 L = 1 000 ml

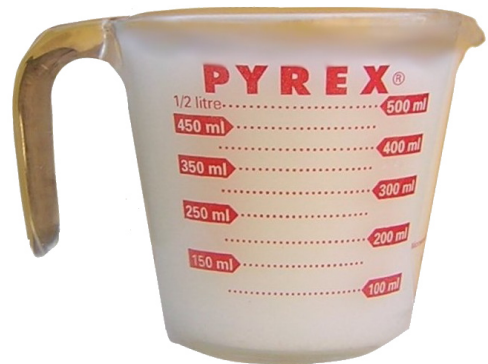|		
litre	**L**	for larger amounts of liquid
decilitre	dl	(for medium amounts of liquid)
centilitre	cl	(for small amounts of liquid)
millilitre	**ml**	for small amounts of liquid

10, 10, 10

1. The cylinder can hold 500 ml when full. Colour the cylinder to fill it to the correct measurement.
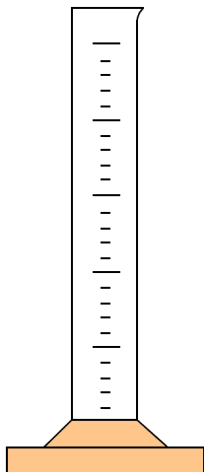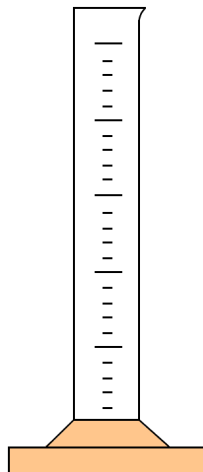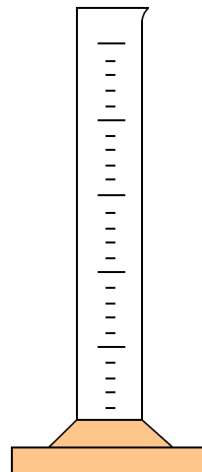
a. 300 ml   **b.** 120 ml   **c.** 440 ml   **d.** 280 ml
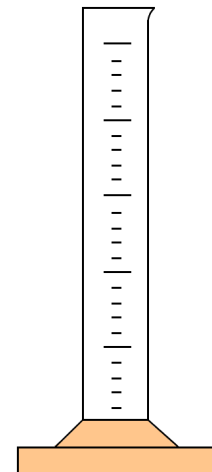
2. Underline the correct amount.

a. An eye dropper can hold (5/500) millilitres.

b. Three cups of flour is about (75/750) ml.

c. A bucket of water is about (10/100) litres.

d. A quart of juice is about (1/3) litres.

e. A glass of milk is about (20/200) ml.

f. The gas tank of a car holds (80/800) L of gas.

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1 L = 1 000 ml
To change 4 L into millilitres, multiply by 1 000: $4 \times 1\ 000\ ml$ = 4 000 ml
To change 2 L 250 ml into millilitres, first convert the 2 L into millilitres: $2 \times 1\ 000\ ml$ = 2 000 ml. Then, add the 250 millilitres: $2\ 000\ ml + 250\ ml$ = 2 250 ml.

3. Fill in the tables.

L	1/2	1	1 1/2	2	5	12
ml						

L						
ml	2 500	3 000	4 500	8 000	10 000	20 000

4. Convert between litres and millilitres.

a.	b.	c.
2 L = _____ ml 6 L = _____ ml	1 L 200 ml = _____ ml 4 L 230 ml = _____ ml	7 L 70 ml = _____ ml 4 L 330 ml = _____ ml
d.	**e.**	**f.**
3 000 ml = _____ L 10 000 ml = _____ L	4 300 ml = ____ L _____ ml 9 880 ml = ____ L _____ ml	3 040 ml = ____ L _____ ml 5 053 ml = ____ L _____ ml

5. Solve.

a. Jeanine drank 250 ml of a 1-litre bottle of juice.
How much is left?

b. Mark filled four 200-ml glasses from a 2-litre bottle of juice.
How much is left now?

c. How many 200-ml glasses can you fill with 1 litre of water?

How about from a 5-litre water cooler?

d. A 250-ml cup of yogurt costs $1.20. You bought enough of
them to equal one litre of yogurt. How much did that cost?

You can add litres to litres, and millilitres to millilitres.

In the end, check if the sum of the millilitres is more than 1000 ml.
If so, you get some whole litres from that.

```
   2 L    650 ml
 + 1 L    700 ml
   3 L   1350 ml

 = 4 L    350 ml
```

6. Add.

a.
```
   1 L   800 ml
         650 ml
 + 2 L   700 ml
 ─────────────────

 =
```

b. 5 L 200 ml + 2 500 ml

c. 450 ml + 450 ml + 2 L 150 ml

7. Calculate in your head. Just remember that 1 litre is 1000 ml!

a.	**b.**
3 L 700 ml + 700 ml = ____ L _____ ml	5 L − 600 ml = ____ L _____ ml
6 L 800 ml + 2 L 400 ml = ____ L _____ ml	4 L − 2 L 300 ml = ____ L _____ ml

8. During his workday, Matt consumed 1 1/2 litres
   of water, 400 ml of coffee, and 200 ml of juice.
   What was the total volume of the liquids he drank?

9. Jeanine bought five 250-ml cans of juice, two 2-litre
   bottles of water, and three 350-ml bottles of juice.
   Find the total amount of liquid in litres and millilitres.

10. A 150 ml container of yogurt costs $0.78. If you
    buy enough of them to equal a little over one litre,
    how much does that cost?