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Foreword

Math Mammoth Grade 5, Canadian Version, comprises a complete math curriculum for the fifth grade mathematics studies. This curriculum is essentially the same as the U.S. version of Math Mammoth Grade 5, only customized for Canadian audiences in a few aspects (listed below). The curriculum meets the Common Core Standards in the United States, but it may not perfectly align to the fifth grade standards in your province (it will more likely match with various 6th grade Canadian standards).

The Canadian version of Math Mammoth differs from the US version in these aspects:

- The curriculum uses mainly metric measurement units, and a few customary (imperial) units.
- The spelling conforms to British international standards.
- The pages are formatted for Letter-size paper.
- 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.)

Fifth grade is when we focus on fractions and decimals and their operations in great detail. Students also deepen their understanding of whole numbers, are introduced to the calculator, learn more problem solving and geometry, and study graphing. The main areas of study in Math Mammoth Grade 5 are:

- Multi-digit addition, subtraction, multiplication, and division (including division with two-digit divisors)
- Solving problems involving all four operations;
- The place value system, including decimal place value
- All four operations with decimals and conversions between measurements;
- The coordinate system and line graphs;
- Addition, subtraction, and multiplication of fractions; division of fractions in special cases;
- Geometry: volume and categorizing two-dimensional figures (especially triangles);

The year starts out with a study of the basic operations, some algebraic concepts, and primes and divisibility. In chapter 2, we go on to study place value, large numbers, and the usage of the calculator.

In chapter 3, students solve simple equations with the help of a pan balance. Then they learn to solve a variety of word problems using the bar model as a visual aid.

Chapter 4 is all about decimals and decimal arithmetic. Several lessons here focus on mental math strategies based on place value.

The last chapter in this part A is on graphing. Students encounter the coordinate plane and simple number patterns that are plotted as points on the grid. They also plot and read line graphs.

In part 5-B, students study more decimal arithmetic, all fraction operations, and geometry.

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

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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 fifth grade, chapter 4 should be studied before chapter 6, and chapter 7 before chapter 8, but you can be flexible with 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 review. 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 review lessons**, and the curriculum also provides you with additional **cumulative review 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.

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

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

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

Pacing the curriculum

Each chapter introduction contains a suggested pacing guide for that chapter. You will see a summary on the right. (This summary does not include time for optional tests.)

Most lessons are 2 or 3 pages long, intended for one day. Some lessons are 4-5 pages and can be covered in two days. There are also some optional lessons (not included in the tables on the right).

It can also be helpful to calculate a general guideline as to how many pages per week the student should cover in order to go through the curriculum in one school year.

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 (36-week) school year. The page count in the table below *includes* the optional lessons.

Worktext 5-A	
Chapter 1	21 days
Chapter 2	12 days
Chapter 3	9 days
Chapter 4	18 days
Chapter 5	11 days
TOTAL	**71 days**

Worktext 5-B	
Chapter 6	22 days
Chapter 7	18 days
Chapter 8	20 days
Chapter 9	12 days
TOTAL	**72 days**

Example:

Grade level	School days	Days for tests and reviews	Lesson pages	Days for the student book	Pages to study per day	Pages to study per week
5-A	89	10	176	79	2.23	11.1
5-B	91	10	182	81	2.25	11.2
Grade 5 total	180	20	358	160	2.24	11.2

The table below is for you to fill in. Allow several days for tests and additional review before tests — I suggest at least twice the number of chapters in the curriculum. Then, to get a count of "pages to study per day", **divide the number of lesson pages by the number of days for the student book**. Lastly, multiply this number by 5 to get the approximate page count to cover in a week.

Grade level	Number of school days	Days for tests and reviews	Lesson pages	Days for the student book	Pages to study per day	Pages to study per week
5-A			176			
5-B			182			
Grade 5 total			358			

Now, something important. Whenever the curriculum has lots of similar practice problems (a large set of problems), feel free to **only assign 1/2 or 2/3 of those problems**. If your student gets it with less amount of exercises, then that is perfect! If not, you can always assign the rest of the problems for some other day. In fact, you could even use these unassigned problems the next week or next month for some additional review.

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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 student finds math enjoyable, they 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 student'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 + _____ = 1000). Typically, I have intended that such exercises should 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 reviews and the worksheet maker

The student books contain mixed review lessons which review concepts from earlier chapters. The curriculum also comes with additional cumulative review lessons, which are just like the mixed review 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 Reviews book in the print version.

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

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Both the mixed and cumulative reviews 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.

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Chapter 1: The Four Operations
Introduction

We start fifth grade by studying the four basic operations. The topics include the order of operations, simple equations and expressions, long multiplication, long division, divisibility, primes, and factoring.

The main line of thought in the beginning portion of the chapter is that of a mathematical *expression*. In mathematics, an expression consists of numbers, letters, and operation symbols, but does not contain an equal sign (an equation does). Students determine which expression matches the given word problem, and write simple expressions for word problems, using the correct order of operations. Thus, they are learning how to represent a situation symbolically, which is a very important step in using mathematics to solve problems.

We also briefly study the concept of an equation, and students solve simple equations in several lessons.

Next, we revise multi-digit multiplication, starting with partial products (including a geometric visualization), and then going on to the standard multiplication algorithm with more digits than in 4th grade.

Then it is time for long division, especially practising long division with two-digit divisors. We also study why long division works, in the optional lesson *Long Division and Repeated Subtraction*. You can use the lesson as time allows and according to student interest. Throughout the lessons there are also word problems to solve.

The lessons for long multiplication often ask the student to estimate the answer before calculating. The lessons for long division ask for the student to check the answer by multiplying. Both of these methods serve the same purpose: to help them gauge whether the calculation is correct. Too often, students simply calculate something and hurry on by, without paying attention to their own work. We need to foster in them a sense of carefulness with calculations, and the habit of checking one's own work for accuracy. If necessary, assign less problems (especially similar calculations) so that students have time to think about and check their answers.

Lastly, we study the topics of divisibility, primes, and factoring. Students revise or learn the common divisibility rules for 2, 3, 4, 5, 6, 9, and 10. In prime factorisation, we use factor trees. The topic of finding factors is review from 4th grade. Prime factorization is a new topic; it is also studied in 6th grade.

Although the chapter is named "The Four Operations," the idea is not to practise each of the four operations separately, but rather to see how they are used together in solving problems and in simple equations. We are developing the students' *algebraic thinking*, including the abilities to: translate problems into mathematical operations, comprehend the many operations needed to yield an answer to a problem, and "undo" operations.

Pacing Suggestion for Chapter 1

This table does not include the chapter test as it is found in a different book (or file).
Please add one day to the pacing for the test if you use it.

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The Lessons in Chapter 1	page	span	suggested pacing	your pacing
Review of Long Division	41	*3 pages*	1 day	
A Two-Digit Divisor	44	*3 pages*	1 day	
More Long Division	47	*4 pages*	1 day	
Division with Mental Math	51	*3 pages*	1 day	
Long Division and Repeated Subtraction (optional)	53	*(5 pages)*	(2 days)	
Divisibility and Factors	58	*3 pages*	1 day	
More on Divisibility	61	*2 pages*	1 day	
Primes and Finding Factors	63	*3 pages*	1 day	
Prime Factorization	66	*5 pages*	2 days	
Chapter 1 Review	71	*3 pages*	1 day	
Chapter 1 Test (optional)				
TOTALS		*57 pages*	21 days	
with optional content		*(62 pages)*	(23 days)	

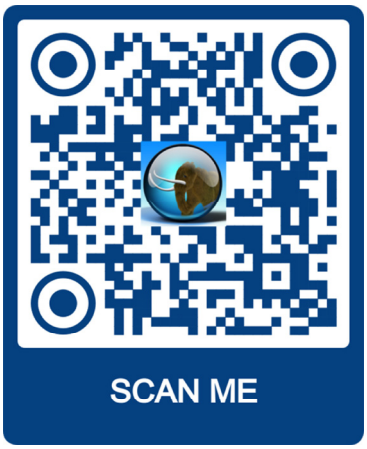
Helpful Resources on the Internet

We have compiled a list of Internet resources that match the topics in this chapter, including 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! Many of our customers love using these resources to supplement the bookwork. You can use these resources as you see fit for extra practice, to illustrate a concept better and even just for some fun. Enjoy!

https://l.mathmammoth.com/gr5ch1



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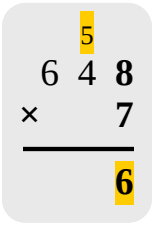
The Multiplication Algorithm

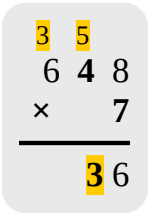
An *algorithm* is a step-by-step method for solving a particular kind of problem.

In this lesson we practice **the standard multiplication algorithm**, which you already know from 4th grade.

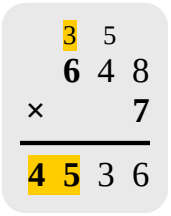
This algorithm is based on multiplying in parts. For example, 7 × 648 is done in three parts: 7 × 600, 7 × 40, and 7 × 8.
At each step, you may need to regroup and add.



7 × 8 = 56



7 × 4 + 5 = 33



7 × 6 + 3 = 45

1. Review your multiplication skills.

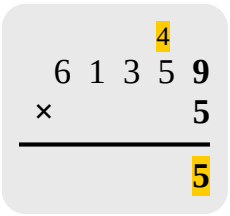
a. 415 × 8 = _____

b. 877 × 8 = _____

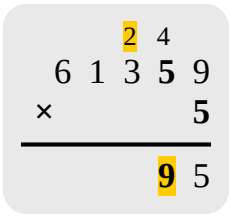
c. 1752 × 7 = _____

d. 2615 × 4 = _____

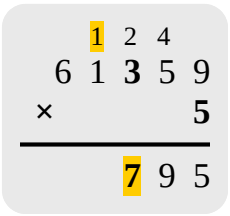
The process is the same with more digits. Study the example.



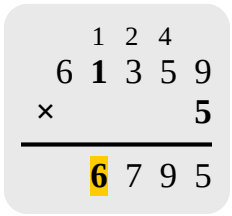
5 × 9 = 45



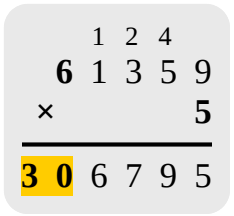
5 × 5 + 4 = 29



5 × 3 + 2 = 17



5 × 1 + 1 = 6



5 × 6 = 30

2. Multiply 5- and 6-digit numbers.

a. 17552 × 7 = _____	**b.** 27805 × 3 = _____	**c.** 144123 × 5 = _____
d. 270814 × 3 = _____	**e.** 51620 × 9 = _____	**f.** 239313 × 4 = _____

Sample worksheet from
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Estimate before you multiply. Then compare your estimated result with the final result, and that way you may catch some gross errors.

3 × 21 578 = ?

Round 21 578 in such a way that you can easily multiply in your head. It makes sense to round it to 22 000.

Estimate: 3 × 22 000 = 66 000

The exact result is 64 734. The estimate is quite close.

$$\begin{array}{r} {\scriptstyle 1\ 2\ 2\ \ } \\ 21578 \\ \times\ \ \ \ \ 3 \\ \hline 64734 \end{array}$$

3. First estimate, by rounding the number in such a way that you can multiply in your head. Then multiply. Check that your final answer is reasonably close to your estimate.

a. Estimate: 5 × 8871 ≈ _____

Calculate exactly:

$$\begin{array}{r} 8871 \\ \times\ \ \ 5 \\ \hline \end{array}$$

b. Estimate: 4 × 22 399 ≈ _____

Calculate exactly:

$$\begin{array}{r} 22399 \\ \times\ \ \ 4 \\ \hline \end{array}$$

c. Estimate: 7 × 87 240

≈ _____

Calculate exactly:

d. Estimate: 4 × 212 788

≈ _____

Calculate exactly:

4. Jenny's estimate for the problem 3 × 173 039 is quite far from her final answer. Figure out where Jenny makes an error or errors.

Jenny's estimate:

3 × 173 039
≈ 3 × 170 000
= 510 000

Jenny's calculation:

$$\begin{array}{r} {\scriptstyle 1\ 2\ \ \ \ } \\ 173039 \\ \times\ \ \ \ \ 3 \\ \hline 429017 \end{array}$$

Sample worksheet from
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Multiplying with money amounts is done the same way as with whole numbers: we multiply as if there was no decimal point.

Continue the example on the right.

Lastly, put the decimal point in the answer to mark the two digits for the cents.

$$\begin{array}{r} {\scriptstyle 4} \\ \$2\,1\,4.\mathbf{1}\,8 \\ \times \qquad\quad \mathbf{5} \\ \hline \mathbf{9}\,0 \end{array}$$

5. Multiply.

a.

$$\begin{array}{r} \$2\,2.7\,2 \\ \times \qquad 8 \\ \hline \end{array}$$

b.

$$\begin{array}{r} \$8\,1.5\,0 \\ \times \qquad 4 \\ \hline \end{array}$$

c.

$$\begin{array}{r} \$3\,4\,5.2\,5 \\ \times \qquad\quad 6 \\ \hline \end{array}$$

d.

$$\begin{array}{r} \$7\,1\,2.9\,0 \\ \times \qquad\quad 5 \\ \hline \end{array}$$

6. Emma bought three lamps for $31.75 each, and paid with $100. What was her change?

a. Write a **single expression** for this situation that includes two operations. Remember to consider the order of operations.

b. Find the answer (her change).

7. First estimate the total cost by rounding the price. Should you round it to the nearest dollar or to the nearest ten dollars? That depends on how well you can multiply in your head. Then find the exact cost.

a. Jack bought two train sets for $56.55 each.

Estimate: _____

b. The Internet is $128.95 per month. What does it cost for 6 months?

Estimate: _____

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Review how to multiply a two-digit number by a two-digit number.

Estimate: Round 29 ≈ 30 and 75 ≈ 70. Then, 29 × 75 ≈ 30 × 70 = 2100.

Notice! We rounded 75 *down* to 70.

Why? Because if we rounded both factors up, we would overestimate the answer. When multiplying, it often works out better to round one factor down and the other up.

Let's check that out: If we rounded 29 and 75 to 30 and 80, our estimation would be 30 × 80 = 2400. That is not nearly as good an estimate as 2100. (The exact answer is 2175.)

$$\begin{array}{r} {\scriptstyle 4} \\ 29 \\ \times\ 75 \\ \hline 145 \end{array}$$

First multiply **5 × 29**. Ignore the 7.

$$\begin{array}{r} {\scriptstyle 6\ 4} \\ 29 \\ \times\ 75 \\ \hline 145 \\ 2030 \end{array}$$

Then multiply **70 × 29**. Ignore the 5. Since you are multiplying by 70, your answer will end **in a zero**. Start out by placing that zero in the ones place. Then, simply multiply 7 × 29.

$$\begin{array}{r} 29 \\ \times\ 75 \\ \hline 145 \\ +\ 2030 \\ \hline 2175 \end{array}$$

Lastly add. The answer is close to our estimate of 2100. That is good.

8. First estimate. Then multiply. Lastly check that your answer is reasonably close to your estimate.

a. Estimate: _____

$$\begin{array}{r} 93 \\ \times\ 27 \\ \hline \end{array}$$

b. Estimate: _____

$$\begin{array}{r} 55 \\ \times\ 46 \\ \hline \end{array}$$

c. Estimate: _____

$$\begin{array}{r} 87 \\ \times\ 16 \\ \hline \end{array}$$

d. Estimate: _____

$$\begin{array}{r} 61 \\ \times\ 90 \\ \hline \end{array}$$

e. Estimate: _____

$$\begin{array}{r} 24 \\ \times\ 18 \\ \hline \end{array}$$

f. Estimate: _____

$$\begin{array}{r} 98 \\ \times\ 51 \\ \hline \end{array}$$

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

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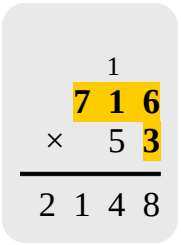
The process is the same when we multiply a three-digit number by a two-digit number.

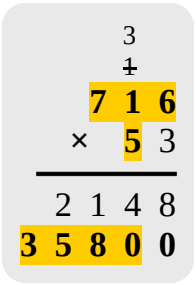
Estimate:
We round 716 to 700 and 53 to 50.

Then, 716 × 53 ≈ 700 × 50 = 35 000, which is reasonably close to 37 948.

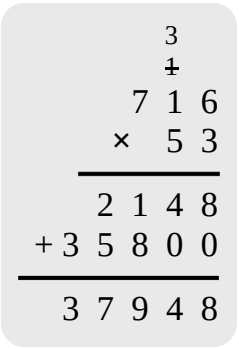
You could also estimate this way: 716 × 53 ≈ 720 × 50 = 36 000, which is even closer to the exact answer.



First multiply **3 × 716**.



Now multiply **50 × 716**. REMEMBER the zero in the ones place! It goes there because you are multiplying by 50.



Lastly add.

9. Multiply.

a. Estimate:

_____

			1	9	1
	x			2	5
+					

b. Estimate:

_____

			2	2	4
	x			4	1
+					

c. Estimate:

_____

			6	0	1
	x			3	5
+					

d. Estimate:

_____

$$\begin{array}{r} 255 \\ \times\ 78 \\ \hline \end{array}$$

e. Estimate:

_____

$$\begin{array}{r} 197 \\ \times\ 11 \\ \hline \end{array}$$

f. Estimate:

_____

$$\begin{array}{r} 324 \\ \times\ 35 \\ \hline \end{array}$$

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Chapter 2: Large Numbers and the Calculator
Introduction

In this chapter, we study large numbers and place value up to billions—that is, up to 12-digit numbers. Students will also add, subtract, and round large numbers, and learn about exponents and powers.

Concerning exponents and powers, the focus is on powers of ten (such as 10^2, 10^5, 10^8, and so on), which is what the student should master in this grade level. If your student has difficulties with exponents in general, there is no need to worry. Exponents and powers are taught from the very basics again in Math Mammoth grade 6.

Our number system is based on number 10, and it is *positional*: the place (location) of each digit matters in determining its value. Students have already learned quite a bit about place value. In this chapter, they will solidify their understanding of it. In particular, we examine multiplying numbers by powers of ten using a place value chart, and see how the common shortcut of tagging zeros to the end of a number actually has to do with the digits of the number *shifting* within the place value chart.

In this chapter, students will be introduced to the calculator for the first time, and therefore they will need a simple calculator (preferably a physical one). Some exercises may require the student to use a calculator on a computer or a phone, so as to fit more digits.

I have delayed the use of a calculator (as compared to many other math curricula) for a good reason. I have received numerous comments on the harm that indiscriminate calculator usage can cause. If children are allowed to use calculators freely, their minds get "lazy," and they will start relying on calculators even for simple things such as 6 × 7 or 320 + 50. It is just human nature!

As a result, students may enter college without even knowing their multiplication tables by heart. Then they have trouble if they are required to use mental math to solve simple problems.

Therefore, we educators need to *limit* calculator usage until the students are much older. Children *cannot* decide this for themselves, and definitely not in fifth grade.

However, I realize that the calculator is very useful, and students do need to learn to use it. In this curriculum, I try to not only show the students how to use a calculator, but also *when* to use it and when *not* to use it.

This chapter includes many problems where calculator usage is appropriate. We also practise estimating the result before using a calculator to find the exact answer, and choosing whether mental math or a calculator is the best "tool" for the calculation.

From now on, the curriculum will show a little calculator symbol next to the exercises where I feel calculator usage is appropriate.

Pacing Suggestion for Chapter 2

This table does not include the chapter test as it is found in a different book (or file).
Please add one day to the pacing for the test if you use it.

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The Lessons in Chapter 2	page	span	suggested pacing	your pacing
Adding and Subtracting Large Numbers	91	*3 pages*	1 day	
Rounding	94	*3 pages*	2 days	
The Calculator	97	*3 pages*	1 day	
When to Use the Calculator	100	*2 pages*	1 day	
Mixed Review Chapter 2	102	*2 pages*	1 day	
Chapter 2 Review	104	*3 pages*	1 day	
Chapter 2 Test (optional)				
TOTALS		*30 pages*	12 days	

Helpful Resources on the Internet

We have compiled a list of Internet resources that match the topics in this chapter, including 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! Many of our customers love using these resources to supplement the bookwork. You can use these resources as you see fit for extra practice, to illustrate a concept better and even just for some fun. Enjoy!

https://l.mathmammoth.com/gr5ch2

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Exponents and Powers

An exponent is used to signify repeated multiplication. For example, the expression $\mathbf{5^6}$ ("five to the sixth power") simply means we multiply number 5 by itself, repeatedly, six times:

$$\mathbf{5^6} = 5 \times 5 \times 5 \times 5 \times 5 \times 5$$

The number 5 is called the **base**. It tells us what number we are multiplying repeatedly. The little raised number is the **exponent**, and it tells us how many times the number is repeatedly multiplied.

Example 1. 2^4 means $2 \times 2 \times 2 \times 2$. It is read as "two to the fourth power." Its value is 16.

Example 2. 9^2 means 9×9 and is commonly read as "nine squared" (think of the area of a square with side length 9). Similarly, 11^2 is read as "eleven squared". (What is its value?)

Example 3. 4^3 means $4 \times 4 \times 4$ and is commonly read as "four cubed" (because of the volume of a cube with edges 4 units). Similarly, 10^3 is read as "ten cubed". (What is its value?)

1. Write using exponents, and solve.

a. $4 \times 4 \times 4 =$ ▢^▢ = _____

b. eight squared = ▢^▢ = _____

c. $10 \times 10 \times 10 =$ ▢^▢ = _____

d. $1 \times 1 \times 1 \times 1 \times 1 =$ ▢^▢ = _____

e. five cubed = ▢^▢ = _____

f. two to the fifth power = ▢^▢ = _____

g. $3 \times 3 \times 3 \times 3 =$ ▢^▢ = _____

h. zero to the tenth power = ▢^▢ = _____

2. Multiplication is repeated addition, and a power is repeated multiplication. Compare.

a. $2 + 2 + 2 + 2 = 4 \times 2 =$ _____

$2 \times 2 \times 2 \times 2 =$ ▢^▢ = _____

b. $5 + 5 + 5 =$ ___ × ___ = _____

$5 \times 5 \times 5 =$ ▢^▢ = _____

3. Read the powers aloud. Then find their values.

a. $5^2 =$

b. $2^3 =$

c. $3^3 =$

d. $7^2 =$

e. $1^6 =$

f. $0^7 =$

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Powers of ten are expressions where the number **10 is multiplied by itself.** For example, 100 is a power of ten because it is 10×10 or 10^2. Or, 100 000 is a power of ten because it is 10 multiplied by itself, five times (10^5).

4. Write these powers of ten as normal numbers. Notice there is a shortcut and a pattern!

a. 10^2 = _____	**d.** 10^5 = _____
b. 10^3 = _____	**e.** 10^6 = _____
c. 10^4 = _____	**f.** 10^7 = _____

SHORTCUT: In a power of ten, the exponent tells us how many _____ the number has after the digit 1.

Example 4. Let's say a child asked you how much in total is five $100-bills. You would think that's easy— the total is five hundred dollars! In symbols, $5 \times 10^2 = 500$.

Similarly, seven copies of (or seven times) one million equals seven million.
In symbols, $7 \times 1\,000\,000 = 7\,000\,000$ or $7 \times 10^6 = 7\,000\,000$.

5. Fill in.

a. nine copies of a hundred thousand ____ × _____ = _____	**b.** eight copies of ten thousand ____ × _____ = _____	
c. 5×10^4 = _____	**d.** 7×10^6 = _____	**e.** 3×10^8 = _____

6. Study the patterns in these powers of ten, and fill in the missing parts.

a. 10×10^2 = *1000* $10 \times 10 \times 10^2$ = _____ $10 \times 10 \times 10 \times 10^2$ = _____	**b.** 10×10^3 = _____ = $10^{\square}$ 100×10^3 = _____ = $10^{\square}$ 1000×10^3 = _____ = $10^{\square}$
c. _____ × 10^3 = 100 000 _____ × 10^4 = 100 000 _____ × 10^4 = 1 000 000	**d.** _____ × 10^5 = 1 000 000 _____ × 10^5 = 100 000 000 _____ × 10^3 = 10 000 000

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7. Multiply a number times a power of ten. Compare the problems in each box.

a. $5 \times 100 =$ _____ $16 \times 100 =$ _____	**b.** $6 \times 10^3 =$ _____ $23 \times 10^3 =$ _____	**c.** $3 \times 10^4 =$ _____ $89 \times 10^4 =$ _____
d. $9 \times 10^5 =$ _____ $19 \times 10^5 =$ _____	**e.** $3 \times 10^7 =$ _____ $32 \times 10^7 =$ _____	

8. Luke says that 10^7 is three times as big as 10^4. Is he correct?

Explain why or why not.

9. Find the missing exponent or the entire power of ten.

a. $6 \times 10^{\square} = 6000$ $71 \times 10^{\square} = 71\,000\,000$	**b.** $3 \times 10^{\square} = 300\,000$ $9 \times 10^{\square} = 90\,000\,000$	**c.** $56 \times \square^{\square} = 560\,000$ $295 \times \square^{\square} = 2\,950\,000\,000$

10. Astronomy involves some really big numbers. Write these numbers in the normal manner.

Pluto's surface area is about 17×10^6 km^2.

The sun's average distance from Earth is 15×10^7 km.

Haumea is a dwarf planet located beyond Neptune's orbit.
The mass of Haumea is about 4×10^{21} kg.

Some challenges. Can you find a shortcut?

Puzzle Corner

a. $10^3 \times 10^2 =$ _____

b. $5 \times 10^2 \times 10^4 =$ _____

c. $10^5 \times 10^3 =$ _____

d. $8 \times 10^4 \times 2 \times 10^3 =$ _____

e. $10^6 \times 10^2 \times 10^2 = 10^{\square}$

f. $10^3 \times 10^5 \times 10^2 \times 10^4 = 10^{\square}$

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The Place Value System

The number system we use is based on number ten, and it is a *positional* number system. This means that the position or **place** of each digit has to do with its value.

The **place** of a digit is its **location** within the number.

For example, in the number on the right, the digit 9 is in the ten millions place, and the digit 4 is in the hundred millions place.

In what place is digit 5? Digit 7?

Notice how the number ten has to do with these *places*. You see powers of ten at work! That is why our number system is a *base ten* system.

Read: *"273 billion, 498 million, 16 thousand, 520."*

We group the digits of large numbers into groups of three. These groupings are called "periods," and they make it easy to read large numbers. Simply read each three digits as if it were a *number by itself*, and at the spaces, say the word "billion," "million," and "thousand."

1. A thousand thousands makes a million. What about a thousand millions? What do we call it? Also, write this number. Write it also using an exponent.

2. Arrange the digits of each number into groups of three with spaces. Then read each number.

a. 39204848486 **b.** 490255549632 **c.** 2843729584

d. 45038300820 **e.** 9000004000 **f.** 915008360000

3. Write the numbers. You will need to use zeros; be careful!

a. 159 billion 372 million 932 thousand 2 =

b. 7 billion 372 million 40 thousand 20 =

c. 57 billion 430 million 200 =

d. 607 billion 43 thousand 17 =

e. 372 million 150 =

f. 4 billion 901 thousand =

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What is the **value** of a digit?

In the base ten system, each digit is **multiplied by a certain power of ten**, and this is its value.

This power of ten comes from the *place* of the digit.

For example, in 3 065 820, the digit **6** is in the *ten thousands* place. Its value is **6** times *ten thousand*, or 60 000.

Here's a trick: If you set all the *other* digits in the number to zero, you will see the digit's value. See the chart.

	o	h	t	o	h	t	o
	3	0	6	5	8	2	0
The value of the digit 3 is	3	0	0	0	0	0	0
The value of the digit 6 is			6	0	0	0	0
The value of the digit 5 is				5	0	0	0
The value of the digit 8 is					8	0	0
The value of the digit 2 is						2	0

If you add all these, ↑ you will get the number itself!

(The "h", "t", "o" refer to hundreds, tens, and ones.)

4. Consider the number 16 380 502. Use the chart to help you if you'd like. In that number...

t	o	h	t	o	h	t	o
1	6	3	8	0	5	0	2

a. What is the value of digit 5?

b. What is the value of digit 8?

c. What is the value of digit 1?

5. In what place is the underlined digit? What is its value? You can use the charts to help you.

a. 293 4<u>7</u>6 020

Place: *ten thousands place*

Value: _____

b. 3 29<u>9</u> 005 392

Place: _____

Value: _____

c. <u>2</u>8 837 402 000

Place: _____

Value: _____

d. 2<u>9</u>3 476 020

Place: _____

Value: _____

e. 3 <u>2</u>99 005 392

Place: _____

Value: _____

f. 28 837 4<u>3</u>2 000

Place: _____

Value: _____

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Chapter 3: Problem Solving
Introduction

We start out this chapter by studying simple equations, presented as pan balance puzzles. The pan balance works very well for modelling the process of solving equations. In the second lesson, students use the bar model to help them solve equations. The equations on this level are very simple. More complex equations are presented in grades 6 and especially in grade 7 (pre-algebra).

The bulk of this chapter is then spent on the topic of problem solving, focusing on problems that involve a fractional part of a whole in some manner.

These lessons teach students to draw a visual bar model for the problems. The bar model is a very good tool to help students conceptualize and solve problems that otherwise they might need an algebraic equation for. At the same time, using the bar model helps the students develop algebraic thinking. Essentially, one block in the bar model corresponds to the unknown *x* in an equation.

Encourage students to plan a solution for a problem before starting the solution, instead of simply jumping in without much thinking. Also, the problems in these lessons give a good opportunity to teach students to check their final answer: does it make sense? Does it fit with what the problem states?

Many students are afraid of word problems. That doesn't have to be. One key is to get students used to solving problems and allow them enough practice at the right difficulty level. Another important factor is that we educators don't "chastise" students for errors or put down errors. Just the opposite — an error should be seen as a great opportunity for learning. In fact, brain research has proven that our brains grow and make new connections when we think about a mistake we made!

When a student has made a mistake, you can ask, "Can you show me how you got your answer?", and not even say there was a mistake. As they explain their thought process, you can help them, or they might notice the error themselves.

Pacing Suggestion for Chapter 3

This table does not include the chapter test as it is found in a different book (or file).
Please add one day to the pacing for the test if you use it.

The Lessons in Chapter 3	page	span	suggested pacing	your pacing
Balance Problems and Equations, Part 1	109	*3 pages*	1 day	
Balance Problems and Equations, Part 2	112	*3 pages*	1 day	
Problem Solving with Bar Models 1	115	*3 pages*	1 day	
Problem Solving with Bar Models 2	118	*2 pages*	1 day	
Problem Solving with Bar Models 3	120	*2 pages*	1 day	
Problem Solving with Bar Models 4	122	*2 pages*	1 day	
Miscellaneous Problems	124	*2 pages*	1 day	
Mixed Review Chapter 3	126	*2 pages*	1 day	
Chapter 3 Review	128	*3 pages*	1 day	
Chapter 3 Test (optional)				
TOTALS		*22 pages*	9 days	

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Helpful Resources on the Internet

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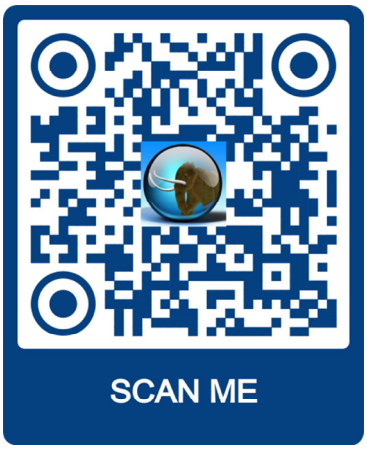

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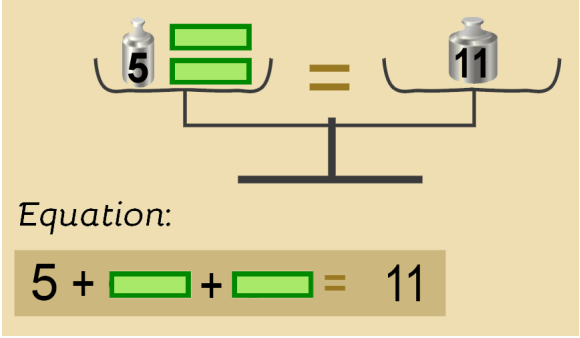
Balance Problems and Equations 1

Here you see a pan balance, or scales, and some things on both pans. Each rectangle represents an unknown (and "weighs" the same, or has the same value).

Since the balance is *balanced* (neither pan is going down—they are level with each other), the two sides (pans) of the scales weigh the same.

This portrays a mathematical equation: what is in the left pan *equals* what is in the right pan. (Things in the same pan are simply added.)



The equation is:

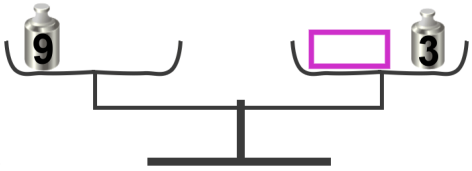
$5 + \square + \square = 11$

(If it helps you, you can think of kilograms or pounds.)

When we figure out how much the unknown shape weighs, we solve the equation.
The solution is: $\square = 3$

1. Write an equation for each balance. Then use mental math to solve how much each geometric shape "weighs." You can write a number inside each of the geometric shapes to help you.

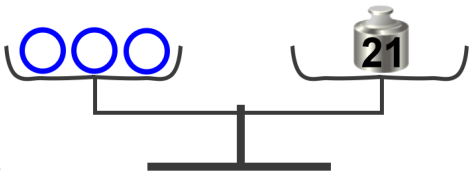
a.



Equation: $9 = \square + 3$

Solution: $\square = 6$

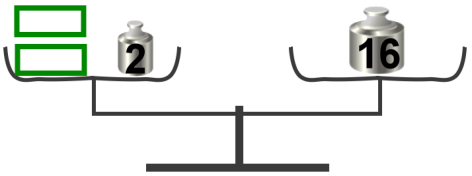
b.



Equation: _____

Solution: ○ = _____

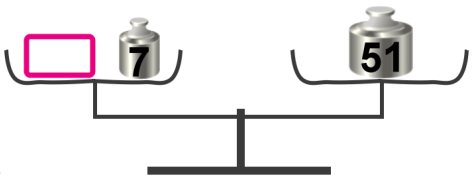
c.



Equation: _____

Solution: ▭ = _____

d.



Equation: _____

Solution: ▭ = _____

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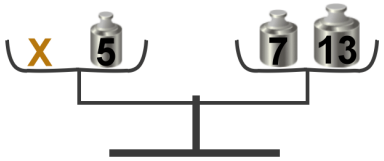
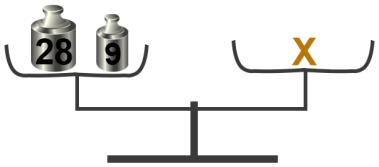
From now on we will use ***x*** for the unknown instead of a geometric shape.
It is the most commonly used letter of the alphabet to signify an unknown.



$x + 5 = 7 + 13$
$x + 5 = 20$
$x = 15$

Example 1. To solve this equation, first add 7 and 13 that are in the right "pan".

We get $x + 5 = 20$. The solution is easy to see now with mental math: $x = 15$. You can also use subtraction: $x = 20 - 5 = 15$.



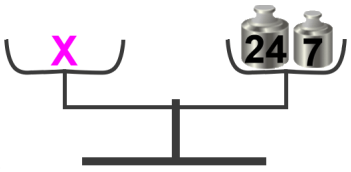
$28 + 9 = x$
$37 = x$
$x = 37$

Example 2. Sometimes x is on the right side of the equation. That is not a problem. In the last step you can flip the sides, so that your last line will be $x =$ (something).

Notice that we *align the equal signs* when solving an equation. It keeps everything tidy and easy to read.

2. Write an equation. Write a second step if necessary. Lastly write what x stands for.

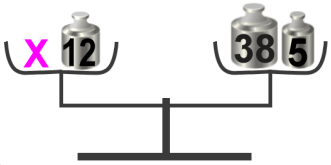
a.



_____ = _____

x = _____

b.



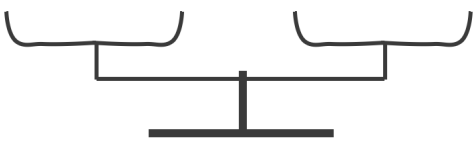
_____ = _____

_____ = _____

x = _____

3. Draw x's and weights on the left and right sides on the two pans to match the given equation, then solve. You may not need all the empty lines provided.

a.



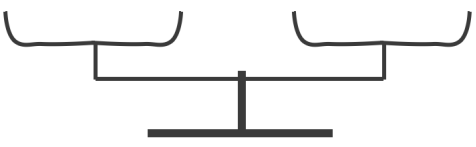
$x + 18 = 5 + 31$

_____ = _____

_____ = _____

_____ = _____

b.



$8 + 17 = 11 + x$

_____ = _____

_____ = _____

_____ = _____

Sample worksheet from
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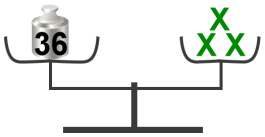
Whenever there are lots of x's in the same pan, use this shorthand notation:

- $x + x$ is written as $2x$. It means 2 times x.
- $x + x + x$ is written as $3x$. It means 3 times x.
- $x + x + x + x$ is written as $4x$, and so on.

We simply omit the multiplication sign between a number and a letter (such as 4 and x).

Example 3.



You can use *division* to solve this.

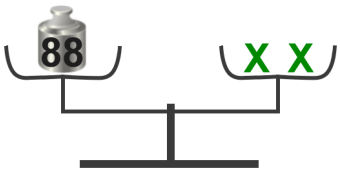
$36 = 3x$

$12 = x$

Lastly, flip the sides. → $x = 12$

4. Write an equation to match the balance. Then solve what x stands for.

a.

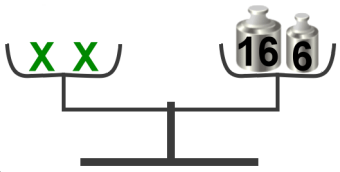


_____ = _____

_____ = _____

x = _____

b.

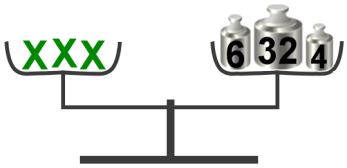


_____ = _____

_____ = _____

x = _____

c.



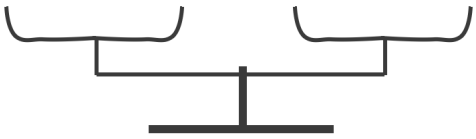
_____ = _____

_____ = _____

x = _____

5. Draw x's and weights on the left and right sides on the two pans to match the given equation, then solve. You may not need all the empty lines provided.

a.



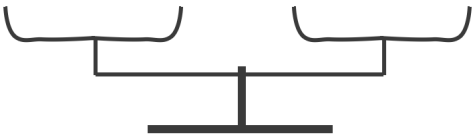
$3x = 16 + 35$

_____ = _____

_____ = _____

_____ = _____

b.



$2 + 27 + 25 = 6x$

_____ = _____

_____ = _____

_____ = _____

Puzzle Corner

Solve the equations.

a. $3928 + 3943 = 17x$

b. $10\,000 - 5493 - 834 - 3673 = 22x$

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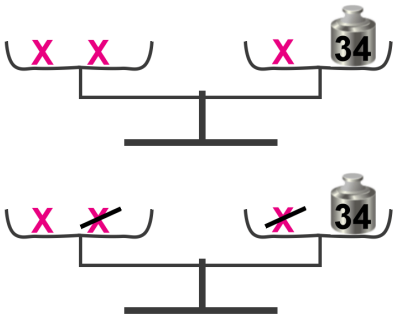
Balance Problems and Equations 2

If there are *x*'s on both sides, use this "trick": Take away, or subtract, the same amount of *x*'s from both sides so that you will only have ONE *x* left on one side.

Example 1.

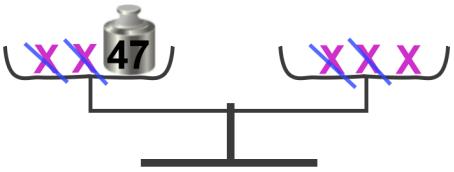
$2x = x + 34$

$x = 34$



1. First write the equation as the balance shows it. Then solve, crossing out *x*'s from both sides.

a.

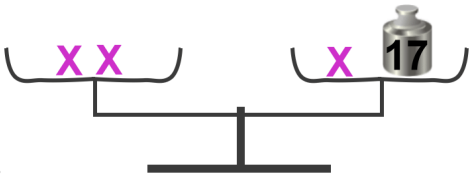


$2x + 47 = 3x$

$47 = x$

$x = 47$

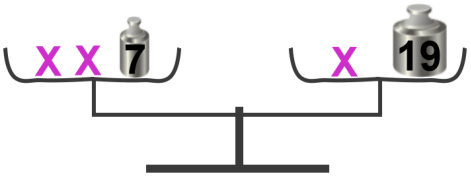
b.



_____ = _____

_____ = _____

c.

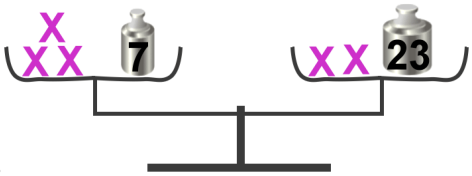


_____ = _____

_____ = _____

_____ = _____

d.

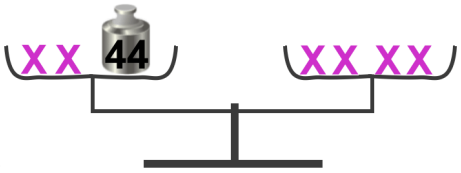


_____ = _____

_____ = _____

_____ = _____

e.



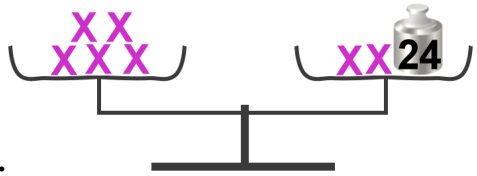
_____ = _____

_____ = _____

_____ = _____

_____ = _____

f.



_____ = _____

_____ = _____

_____ = _____

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Chapter 4: Decimals, Part 1
Introduction

In this first chapter about decimal arithmetic, students study place value with decimals, add and subtract decimals, and learn to multiply and divide decimals by whole numbers. We study more about decimal multiplication and division in chapter 6, along with conversions between measurement units. Some of the decimal lessons can appear boring, plus there are quite a few of them, so I hope that by breaking up the decimal topics into two chapters, students will not get "bogged down" by the number of topics to study. It can also help them retain the concepts, because we review some topics from this chapter in chapter 6.

The first two lessons deal with place value, first with tenths and hundredths (up to two decimal digits), and then with thousandths (three decimal digits). Then we briefly look at decimals on a number line. These lessons are very important, since understanding decimal place value is the foundation for understanding operations with decimals.

We start building on this foundation in the lesson *Add and Subtract Decimals — Mental Math*. Students solve sums such as 0.8 + 0.06 based on their knowledge of place value. The value of that sum is 0.86, not 0.14, like students with a misconception could answer.

Adding and subtracting decimals in columns comes next. This is the common algorithm where the decimal points (or all places) need to be lined up before adding or subtracting. Students also learn to compare and round decimals.

Then lastly for this chapter, we study multiplying and dividing decimals by whole numbers, both using mental math, and using column-multiplication and long division. The mental math strategies are based on place value, and one reason I include so many mental calculations is because they help students understand and solidify the concept of decimal place value.

You might wonder why *Math Mammoth Grade 5* presents decimals before fractions. The traditional way is to teach fractions first because then we can show that decimals are simply fractions of a specific type — namely, they are fractions with denominators that are powers of ten (for example, 0.45 is simply the fraction 45/100).

There are several reasons I present decimals before fractions. First, students have studied some about both decimals and fractions in earlier grades, so they should have the necessary background to comprehend that the decimals we are studying here *are* fractions. Therefore, I see no need to study all fraction arithmetic in 5th grade before decimal arithmetic.

Secondly, I feel that decimal arithmetic is somewhat easier than fraction arithmetic, and students already know more about it than they know about all the fraction arithmetic that is studied in 5th grade (in 5-B). Thus, studying decimal arithmetic first may be easier for some students.

Pacing Suggestion for Chapter 4

This table does not include the chapter test as it is found in a different book (or file).
Please add one day to the pacing for the test if you use it.

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The Lessons in Chapter 4	page	span	suggested pacing	your pacing
Add and Subtract Decimals—Mental Math	143	*4 pages*	2 days	
Add and Subtract Decimals in Columns	147	*2 pages*	1 day	
Comparing Decimals	149	*2 pages*	1 day	
Rounding Decimals	151	*2 pages*	1 day	
Multiply a Decimal by a Whole Number	153	*4 pages*	2 days	
More on Multiplying Decimals	157	*2 pages*	1 day	
More Practice and Review	159	*2 pages*	1 day	
Divide Decimals by Whole Numbers 1	161	*4 pages*	2 days	
Divide Decimals by Whole Numbers 2	165	*2 pages*	1 day	
Mixed Review Chapter 4	167	*2 pages*	1 day	
Chapter 4 Review	169	*3 pages*	1 day	
Chapter 4 Test (optional)				
TOTALS		*39 pages*	18 days	

Helpful Resources on the Internet

We have compiled a list of Internet resources that match the topics in this chapter, including 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! Many of our customers love using these resources to supplement the bookwork. You can use these resources as you see fit for extra practice, to illustrate a concept better and even just for some fun. Enjoy!

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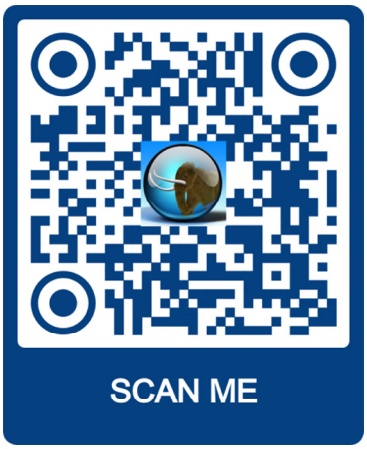

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Add and Subtract Decimals in Columns

Adding and subtracting decimals in columns is easy. Simply write the numbers carefully one under the other, **aligning each place, AND aligning the decimal points**.

Then add and subtract as if there were no decimal points. Lastly, put a decimal point in the answer.

Line up the ones, the tenths, the hundredths, and the thousandths.

1.457 + 6.7 + 5

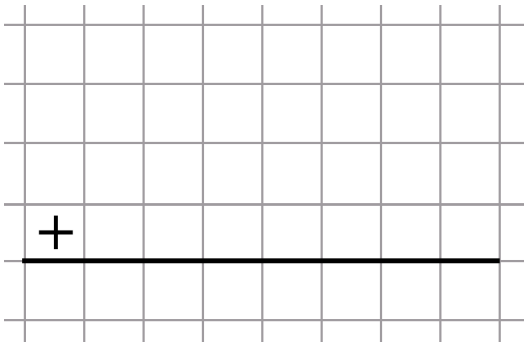
= 1.457 + 6.700 + 5.000

$$\begin{array}{r} {\scriptstyle 1} \\ 1.457 \\ 6.700 \\ +\ 5.000 \\ \hline 13.157 \end{array}$$

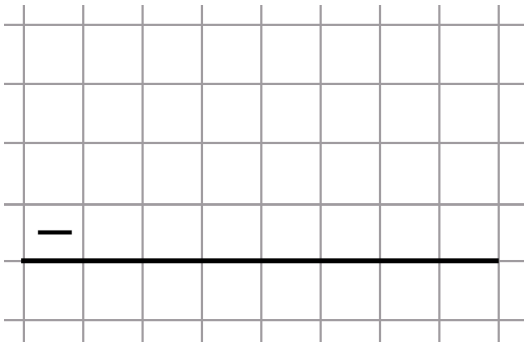
Notice: you can write zeros in the empty places.

1. Add or subtract. Line up the different places and the decimal points carefully.

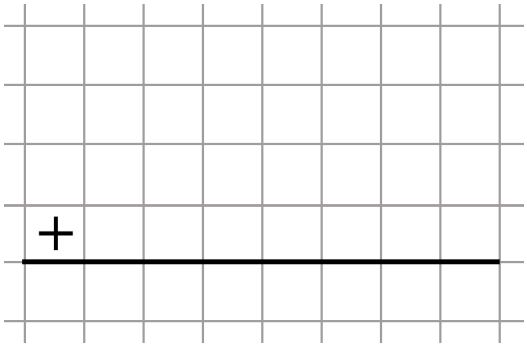
a. 190 + 342.25 + 45.808



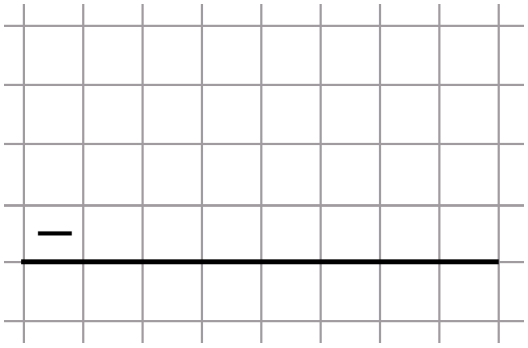
b. 145.5 − 24.93



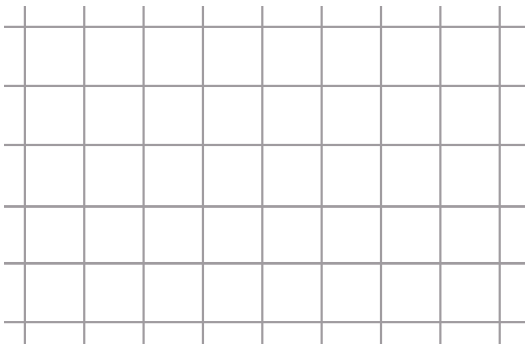
c. 1.293 + 12.6 + 605.99



d. 253 − 23.28



2. Mrs. Wood's precious puppy weighed 0.236 kg when it was born. At the next checkup, it weighed 0.37 kg. How much weight had it gained?



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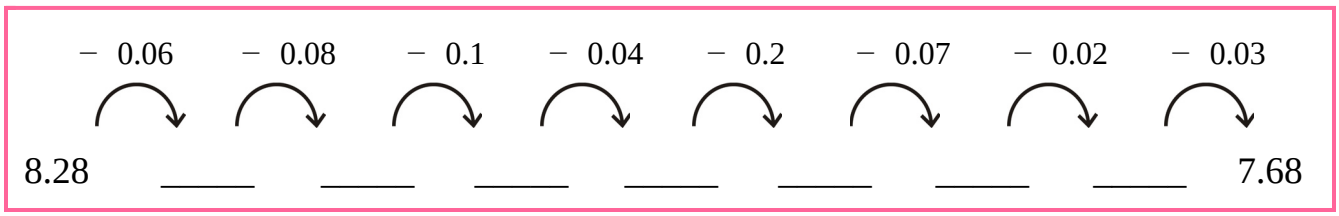
3. Fill in the missing numbers. Use mental math if you can.



4. Calculate:

a. 1.09 − 0.549

b. 0.82 + 45.1 + 8.492 + 305

5. Dad caught some fish that weighed 1.19 kg, 1.565 kg, 2.1 kg and 1.47 kg.

a. What was the total weight of the catch?

b. How much short of 7 kg was his catch?

6. Allison checked some distances using an online map service.

From	To	Distance (miles)
home	library	2.3
home	store	1.67
library	store	1.055
home	Sheila's	1.08
store	Sheila's	1.508
library	Sheila's	1.25

Find the total distance for these routes:

a. From Allison's home to the library, then to the store, and then home again.

b. From the library to Sheila's house, to the store, then to Allison's house.

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Comparing Decimals

To compare decimals, **compare them place by place** (tenths to tenths, hundredths to hundredths, *etc.*), starting from the *biggest* place. A place value chart can help.

Example 1. Which is more, 0.04 or 0.016?

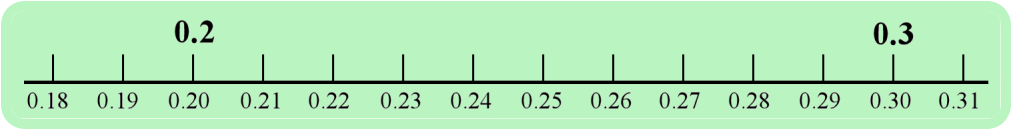
- Check the ONES: Both 0.04 and 0.016 have zero ones.
- Next, the TENTHS: They both have zero tenths.
- The HUNDREDTHS: 0.04 has *four* hundredths whereas 0.016 has *one*.
- THOUSANDTHS do not count since we found that 0.04 had more hundredths than 0.016. Even one hundredth is more than the 6 thousandths 0.016 has.

	0	.	0	4	
	0	.	0	1	6
T	O		te	hu	th

So, this **place-by-place comparison** shows that 0.04 > 0.016.

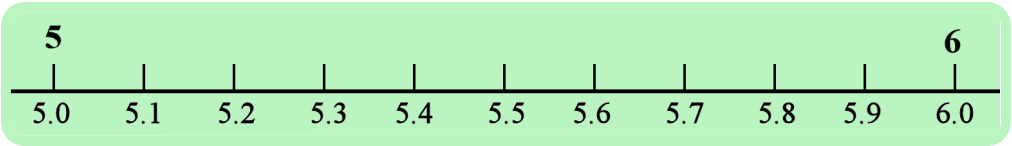
1. **a.** Some students think that 0.3 < 0.21 because 3 < 21. But is it so? Mark 0.3 and 0.21 on the number line below.

0.3 ☐ 0.21



b. Mark 5.02 and 5.2 on the number line. Are they equal, as some students think?

5.02 ☐ 5.2



2. Write these numbers in order, from the smallest to the greatest. The number line above can help.

5.01 5.3 5.03 4.8 5.24 4.92 5.1 5.15 5.19

_____ < _____ < _____ < _____ < _____ < _____ < _____ < _____ < _____

3. Compare the numbers and write < , = , or > . You can use the place value charts to help.

a. 0.6 ☐ 0.006

		.			
		.			
T	O		te	hu	th

b. 0.03 ☐ 0.3

		.			
		.			
T	O		te	hu	th

c. 0.8 ☐ 0.008

		.			
		.			
T	O		te	hu	th

d. 0.80 ☐ 0.800

		.			
		.			
T	O		te	hu	th

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Chapter 5: Graphing
Introduction

This chapter introduces the coordinate grid, but only in the first quadrant. Students learn to plot points and to read their coordinates. They practise using grids with different scaling, and also draw shapes and lines.

Then, students study simple number patterns (number rules), and plot points produced by the rule. This concept will later on lead to the study of *functions* (in 8th grade and beyond).

Next, we study line graphs, which is a natural application of the coordinate grid. Students read and make line graphs, including double line graphs, and answer questions about data already plotted.

At the end of the chapter, we also review the concept of average (also called the *mean*) , and see how it relates to line graphs.

Pacing Suggestion for Chapter 5

This table does not include the chapter test as it is found in a different book (or file).
Please add one day to the pacing for the test if you use it.

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SCAN ME

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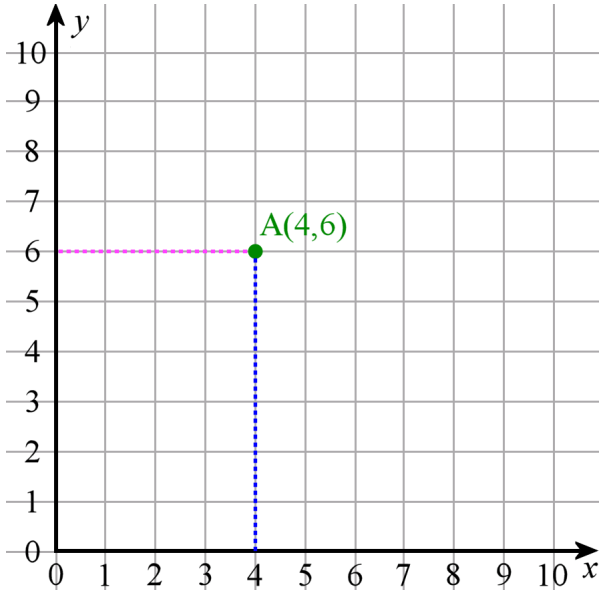
The Coordinate Grid

This is a **coordinate grid**. It consists of two number lines that are set perpendicular (at right angles) to each other.



The horizontal number line is called the ***x*-axis**. The vertical one is called the ***y*-axis**.

You can see one point, called "A," that is drawn or *plotted* on the grid.

Since we have two number lines, we use *two* numbers (4 and 6) to signify its location. Those numbers are the **coordinates** of the point A.

The first number, 4, is the ***x*-coordinate** of the point A. It is called the *x*-coordinate because point A is four units from zero in the horizontal direction (direction of the *x*-axis).

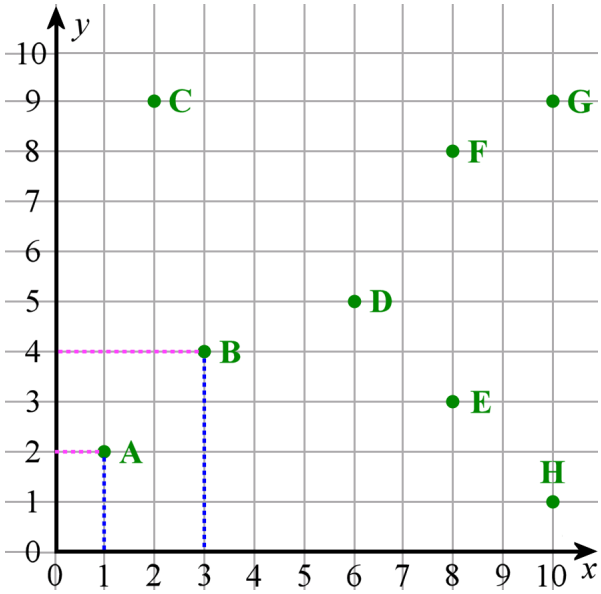
We can see that by drawing a straight line down from A. The line *intersects*, or "hits," the *x*-axis at 4.

The second number is the **y-coordinate** of the point A. In the vertical direction, point A is six units from zero. When we draw a line directly towards left from A, it intersects the *y*-axis at 6.

We write the two coordinates of a point inside parentheses, separated by a comma: (4, 6).

Note: (4, 6) is an **ordered pair**: the order of the two coordinates matters. The *first* number is ALWAYS the *x*-coordinate, and the *second* number is always the *y*-coordinate, not vice versa.

1. Write the two coordinates of the points plotted on the coordinate grid. For points A and B, the helping lines are drawn in. (The helping lines are not necessary to draw; they are just that — *helping* lines. You can draw them if they help you.)



A (___, ___) B (___, ___)

C (___, ___) D (___, ___)

E (___, ___) F (___, ___)

G (___, ___) H (___, ___)

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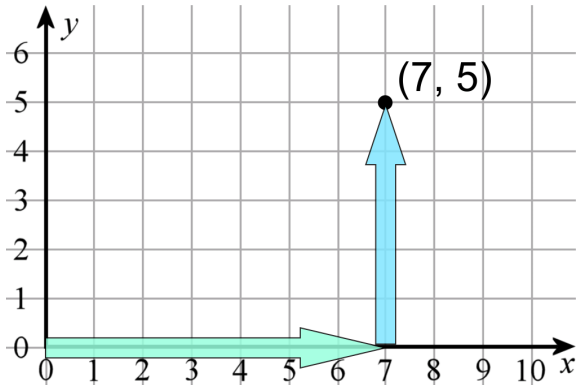
To plot points, you can first "travel" on the *x*-axis from the point (0, 0) (the **origin**) the number of units indicated by the *x*-coordinate.

Then travel UP as many units as the *y*-coordinate indicates.

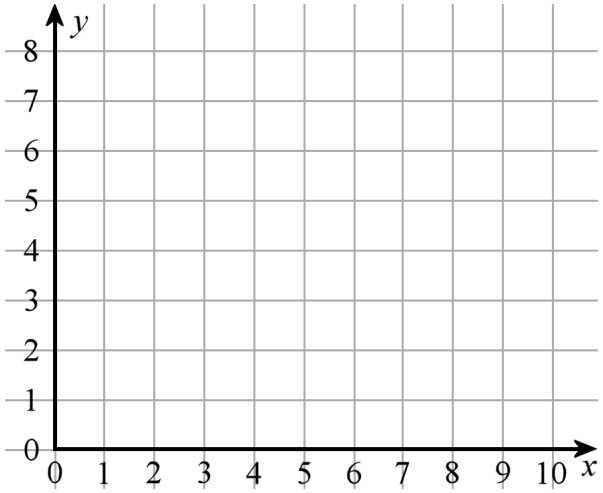
The image shows an example of how to plot (7, 5).



2. Plot the following points on the coordinate grid. Then join them with line segments in the alphabetical order. What do you get?

   A(1, 5) B(4, 3) C(4, 6)

   D(7, 5) E(6, 8)

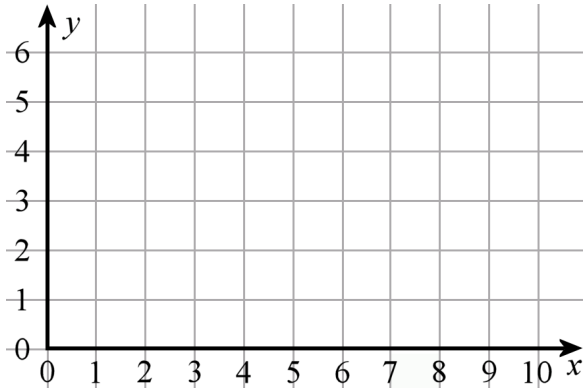


3. **Zero as a coordinate.** Plot the following points in the grid on the right.

   A(0, 6) B(0, 3) C (0, 0)

   D(5, 0) E(9, 0)

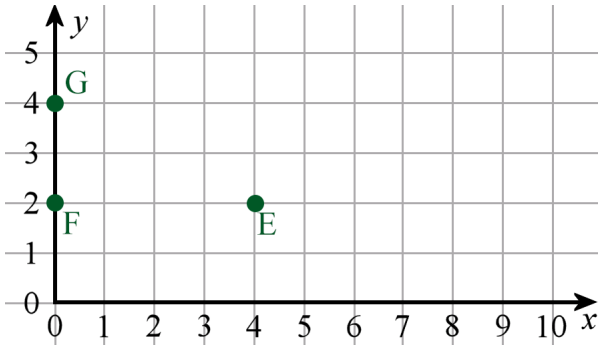
   What do you notice?



4. **a.** Write the coordinates of the points E, F, and G.

   b. Plot a fourth point, H, so that when you join E, F, G, and H with line segments, you will get a rectangle.

   c. What are the coordinates of H?



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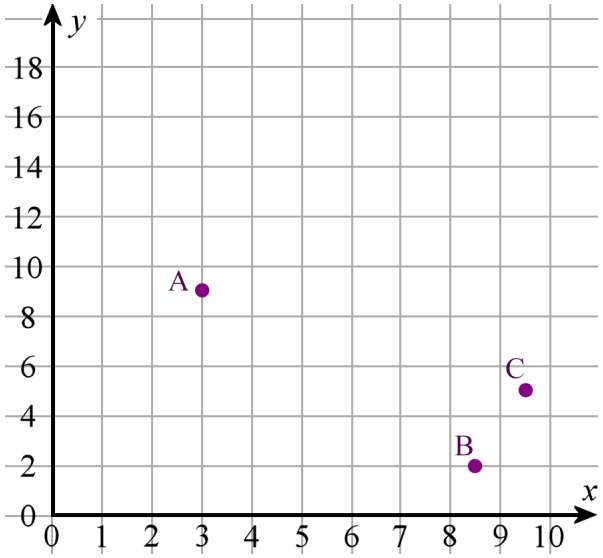
5. In this grid, the *y*-axis is scaled differently.



a. Write the coordinates of these points:

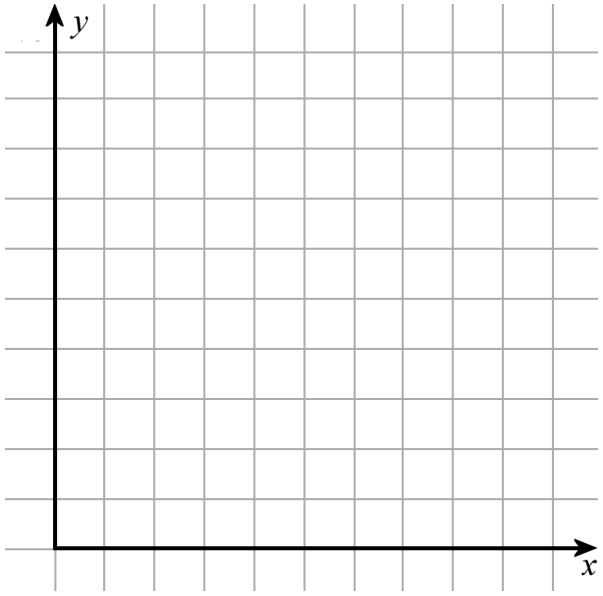
A(____, ____) B(____, ____)

C(____, ____)

b. Plot these points. Note that the points don't necessarily fall on the gridlines.

D(7, 11) E(1 ½, 9) F(9 ¼, 2)

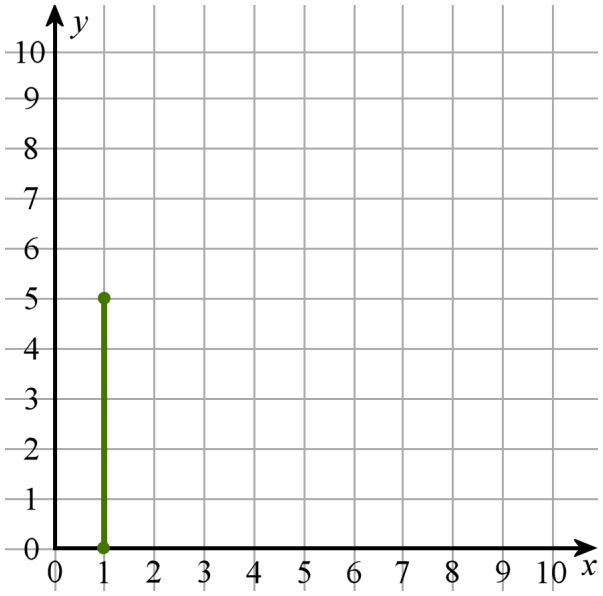
6. **a.** Design a scaling for the axes so that the point P(36, 38) will fit on this grid.



b. Then plot these points also, and connect the points with line segments in order. What shape is formed?

Q(36, 28) R(16, 18) S(26, 38)

7. Here, "LINE (5,6) - (2,7)" means a line segment that is drawn from (5, 6) to (2, 7).



Draw the following line segments (joining the two given points). Use a ruler! The first one is already done for you.

What figure is formed?

LINE (1, 0) - (1, 5) LINE (1, 5) - (0, 5)

LINE (0, 5) - (4, 7) LINE (4, 7) - (8, 5)

LINE (8, 5) - (7, 5) LINE (3, 0) - (3, 3)

LINE (5, 0) - (5, 3) LINE (3, 3) - (5, 3)

LINE (1, 0) - (7, 0) LINE (7, 0) - (7, 5)

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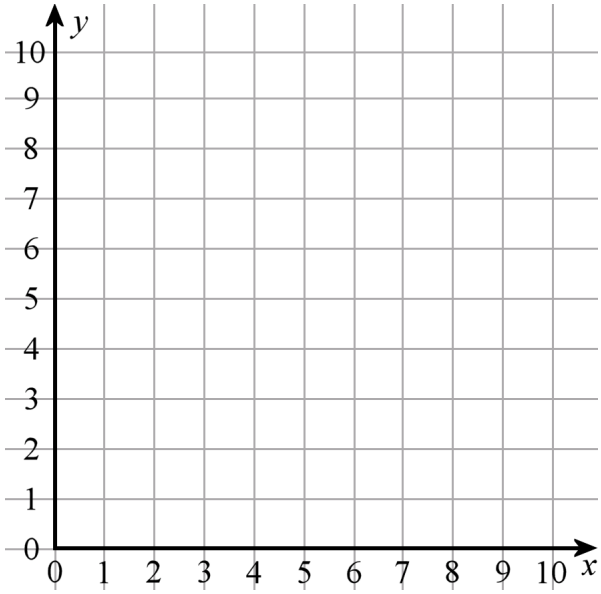
Chapter 5 Review

1. **a.** Fill in the *x* and *y* values according to the rules.

   x-values: start at 0, and add 1 each time.

   y-values: start at 9, and subtract 1 each time.

x							
y							

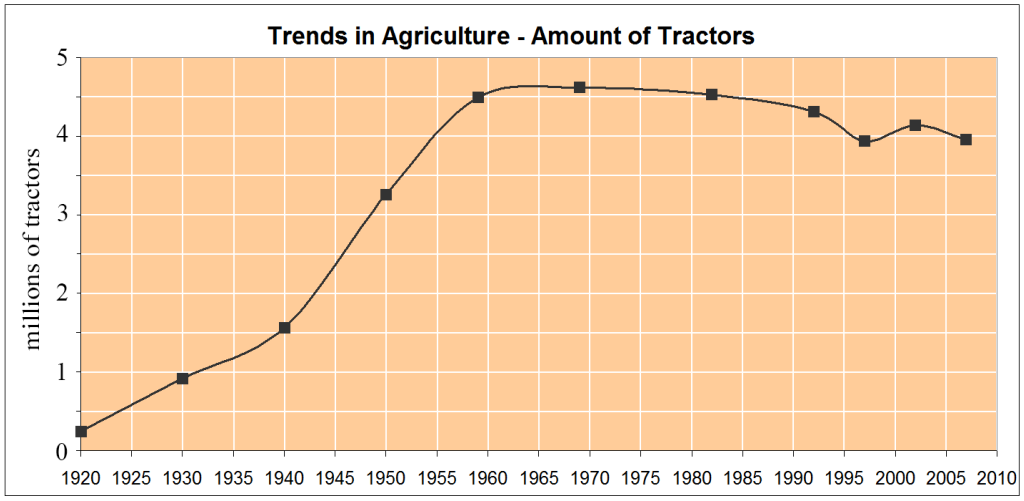


b. Plot the points formed by the number pairs.

c. What simple rule ties the *x* and *y*-coordinates together in each case?

d. Explain in your own words why this is so.

2. Answer the questions based on the graph.



Source: Census of Agriculture

a. Rounding to the nearest half a million, about how many tractors were there in 1930?

In 1960?

b. During which decade did the amount of tractors rise the quickest?

c. What was the *approximate* amount of increase in tractors during that decade?

d. Describe the trend in the amount of tractors between 1970 and 1995.

Sample worksheet from
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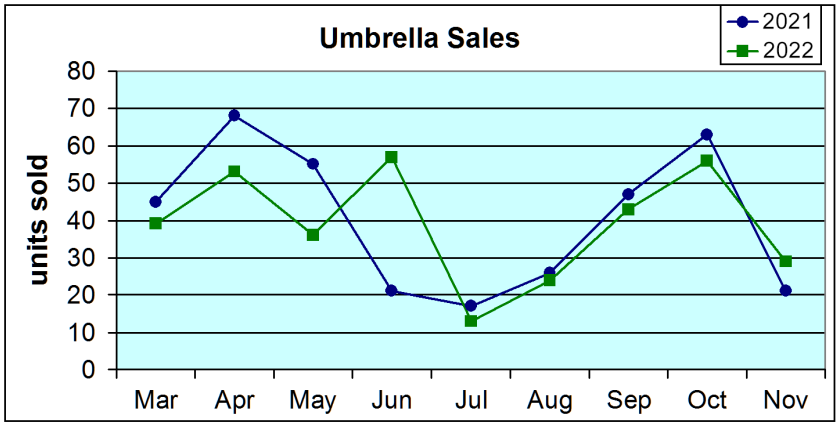
3. Find the mean of this data set to the nearest hundredth:
   5, 9, 13, 12, 16, 10, 19, 11, 10. Use long division.

4. A department store tracked the sales of umbrellas.

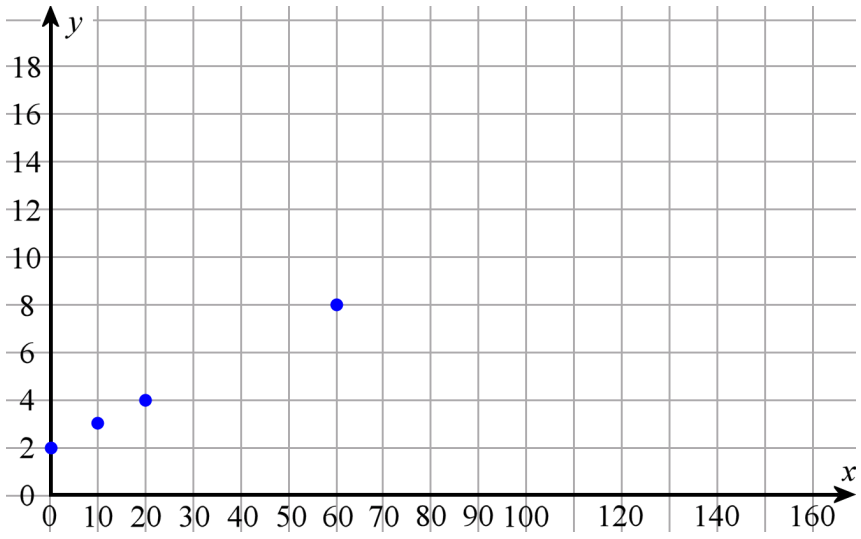


a. In 2021, in which months were the sales less than 40 umbrellas?

b. Find the month with the greatest difference between 2021 and 2022 sales.

5. The four points you see plotted follow a certain pattern. Figure out the pattern, and then fill in the table, following the pattern.

   Also, plot the remaining points.



x	0	10	20	30	40	50	60	70	80	90	100	110
y												

b. (Optional challenge). What rule ties the x and y-coordinates together?

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