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Chapter 3: Multi-Digit Multiplication

Chapter 4: Time and Measuring

Foreword

Math Mammoth Grade 4, South African Version comprises a complete maths 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 customised for use in South Africa 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 country. However, you can probably find material for any missing topics in the neighbouring grades of Math Mammoth.

This South African version has been **customised to South Africa** in the following manners:

- The names used are South African names (such as Ansie and Musa).
- The currency used is rand.
- The curriculum teaches the metric measurement units. Imperial units, such as inches and pounds, are not used.
- The spelling conforms to British international standards.
- Paper size is A4.
- Geographic names used emphasise South African locations (such as Pretoria, Johannesburg).

The four main areas of study for fourth grade 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 the 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 wish you success in teaching maths!

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.

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 the 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 maths lessons, for learning maths facts, or just for some fun. Each chapter introduction (in the student worktext) contains a link to a corresponding list.

- 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 which requires Internet access for use.

- 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 keep adding!

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

- Answer keys are provided for 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. 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	10	78	2.2	11
4-B	178	92	10	82	2.2	11
Grade 4 total	346	180	20	160	2.2	11

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	178					
Grade 4 total	346					

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 maths. Third-fourth graders might spend 30-60 minutes a day. Fifth-sixth graders might spend 45-75 minutes a day. If your child finds maths 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 maths.

Working space, the usage of additional paper and mental maths

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 organise 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 to be done using MENTAL MATHS.

However, there are some students who struggle with mental maths (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 maths.

Students struggling with mental maths 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 maths 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 printed 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, Chapter 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 maths 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 utilise 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.

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 maths 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 maths problems. As applications of maths, 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 in the beginning of the worktext or 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

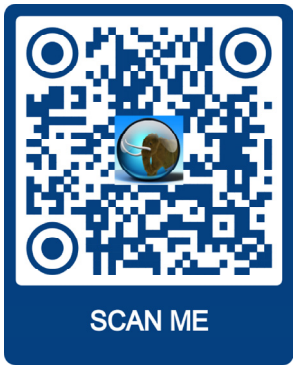
Helpful Resources on the Internet

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 maths concepts;
- **articles** that teach a maths concept.

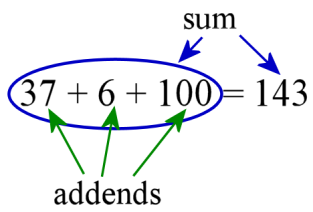
We heartily recommend you take a look at the list. Many of our customers love using these resources to supplement the bookwork. You can use the resources as you see fit for extra practice, to illustrate a concept better and even just for some fun. Enjoy!

https://links.mathmammoth.com/gr4ch1



Addition Revision

The numbers to be added are **addends**. The result is a **sum**.



You can write any number as a sum of its different parts: whole thousands, whole hundreds, whole tens, and ones.

5248 = 5000 + 200 + 40 + 8

thousands hundreds tens ones

2019 = 2000 + 0 + 10 + 9

You can add in parts (hundreds, tens, ones):

56 + 124

= 100 + 50 + 20 + 6 + 4

= 100 + 70 + 10 = 180

You can add in any order:

7 + 90 + 91 + 3

= 7 + 3 + 90 + 91

= 10 + 90 + 91 = 191

Trick: first add a bigger but easier number, then subtract to correct the error:

76 + 89

= 76 + 90 − 1

= 166 − 1 = 165

1. Add mentally. Compare the problems in each box!

a.	b.	c.	d.
70 + 80 = _____	140 + 50 = _____	50 + 60 = _____	80 + 90 = _____
77 + 80 = _____	141 + 50 = _____	54 + 65 = _____	82 + 93 = _____
77 + 82 = _____	144 + 55 = _____	58 + 62 = _____	88 + 91 = _____

2. Write each number as a sum of its parts: thousands, hundreds, tens, and ones.

a. 487 =	**b.** 2103 =
c. 8045 =	**d.** 650 =

3. Solve.

a. Erika added three numbers. Two of them were 56 and 90. The sum was 190. What was the third number she added?

b. The sum of four numbers is 70 and the sum of five other numbers is 80. What is the sum of all nine numbers?

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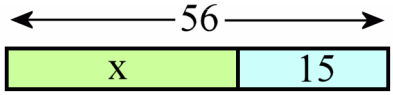
Bar Models in Addition and Subtraction

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.

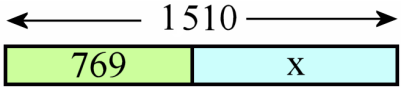


From the bar model, we can write <u>two</u> addition and <u>two</u> subtraction sentences—a **fact family**.

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

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

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



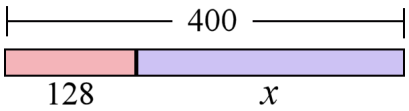
$$769 + x = 1510$$

We can solve it by subtracting the one part (769) from the total (1510).

$$x = 1510 - 769 = 741$$

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

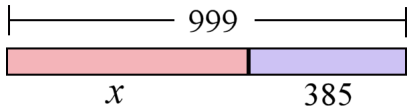
a.



_____ + _____ = _____

x = _____ − _____ = _____

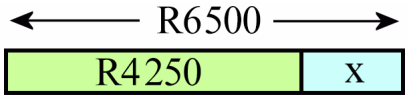
b.



_____ + _____ = _____

x = _____ − _____ = _____

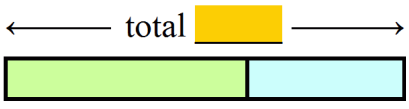
c. A laptop costs R6500. Dad has R4250. How much more does he need to buy it?



_____ + _____ = _____

x = _____ − _____ = _____

d. The school has 547 students, of which 265 are girls. How many are boys?



_____ + _____ = _____

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 1200-kilometre trip, the Lesiba 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 4000 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:

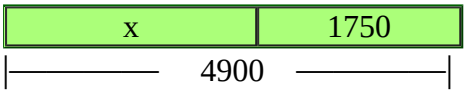
Solution: $x =$ _____

d. After travelling 56 kilometres, Dad said, "Okay, in 9 km we will be in Kingsville, and from there we will have 118 km left." How many kilometres in total is the trip?

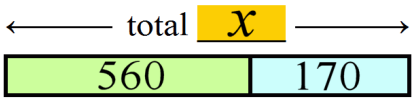
Addition:

Solution: $x =$ _____

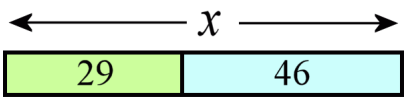
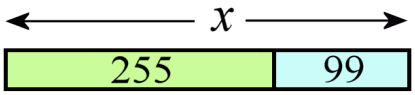
3. Make a word problem that matches the model. Then solve for *x*.



$x =$ _____

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.	 $x - 170 = 560$ $x = 170 + 560 = 730$

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

a.  x − 29 = _____ x = _____ + _____ = _____	**b.**  x − _____ = _____ x = _____ + _____ = _____

5. The number you are subtracting from is missing! Solve.

a. _____ − 4 = 20	**b.** _____ − 15 = 17	**c.** _____ − 22 − 7 = 70

Below, the number you are subtracting from is still missing. But this time it is denoted by x.

d. $x - 8 = 7$ x = _____	**e.** $x - 24 = 48$ x = _____	**f.** $x - 300 - 50 = 125$ x = _____

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 = _____ − _____ = _____	**b.**  $97 - x = 54$ x = _____ − _____ = _____

7. The number you subtract is still the unknown. Solve.

a. 20 − ____ = 12	**b.** 55 − ____ = 34	**c.** 234 − ____ = 100
d. $61 - x = 43$ x = _____	**e.** $100 - x = 72$ x = _____	**f.** $899 - x = 342$ x = _____

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

a. Jane had R15. After Dad gave Jane her allowance (x), Jane had R22. R15 + x = R22 OR R15 + R22 = x x = _____	**b.** Muzi 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. Jeanny had 120 marbles, but some of them got lost. Now she has 89 left. 120 − x = 89 OR 120 + 89 = x x = _____	**d.** Dithole 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. Mum went shopping with R250 and had R78 when she came home. How much did she spend?	originally − spent = left _____ − _____ = _____ x = _____
c. Nakedi had R200. Then she bought an item for R54 and another for R78. How much money does she have now?	_____ − _____ − _____ = _____ x = _____
d. Kopano bought one item for R23 and another for R29, and she had R125 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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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 judgment, and strive to vary the number of assigned exercises according to the student's needs.

The Lessons in Chapter 2

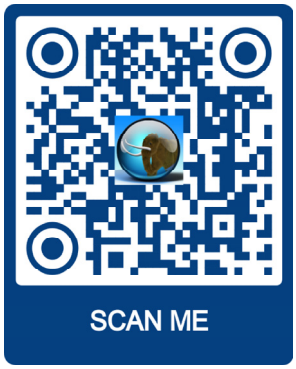
Helpful Resources on the Internet

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;
- online **games**, or occasionally, printable games;
- **animations** and interactive **illustrations** of maths concepts;
- **articles** that teach a maths 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!

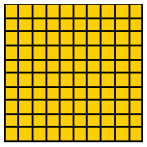
https://links.mathmammoth.com/gr4ch2

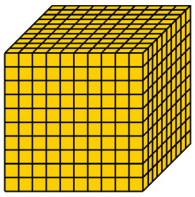


Thousands


one (o)


ten (t)


hundred (h)


thousand (th)

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

7284 has 7 thousands, 2 hundreds, 8 tens, and 4 ones.

Look at the pictures. How many...

- ones go into a ten? _____
- tens go into a hundred? _____
- hundreds go into a thousand? _____

The way we write numbers is based on number *ten*.

Writing the number 5608 in **expanded form** means we write out the number as a sum of its whole thousands, whole hundreds, whole tens, and ones. You can see all of this right from the number:

- It has **5** thousands = 5000
- It has **6** hundreds = 600
- It has **0** tens = 0
- It has **8** ones = 8

Now write it as a sum: 5608 = 5000 + 600 + 0 + 8

Four-digit numbers can be written with a space after the thousands, or without the space: both 5608 and 5608 are used.

1. Write the numbers in expanded form.

a. 8325 = 8000 + 300 + 20 + 5

b. 4935 =

c. 4039 =

d. 3002 =

e. 2090 =

f. 9405 =

2. Write the numbers in normal form.

a. 4000 + 500 + 90 + 3

b. 2000 + 90

c. 3000 + 200

d. 8000 + 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 7284, but 7 in the number 7284 actually means seven thousand. The **value** of the digit 7 is 7000.
The 2 in the number 7284 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.
9055	"9" in 9055 means nine thousand.	The value of the digit "9" is 9000.	"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 1970 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 5900).
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. 38**5**9 *fifty*

b. 2506

c. 5012

d. 3050

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

a. **5**09 *five hundred*

b. **9**843

c. 9**4**0

d. 20**8**8

e. 1**2**00

f. 400**2**

g. 79**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 4769 + 10? 4769 has 6 tens. One ten more means there will be 7 tens: 4779.

What is 2958 + 100? 2958 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: 3058.

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

n	2508	342	4009	59	6980	8299
n + 10						
n + 100						
n + 1000						

8. What is missing?

a. 4036 = 4000 + _____ + 30

b. 483 = 80 + 3 + _____

c. 9328 = 300 + 9000 + _____ + 20

d. 8005 = 5 + _____

e. 5320 = 20 + _____ + 300

f. 7609 = 9 + _____ + 7000

9. If you add 1 thousand, 1 hundred, 1 ten, and 1 to this number, it becomes 9000. 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.

Chapter 3: Multi-Digit Multiplication
Introduction

The third chapter of *Math Mammoth Grade 4* covers multi-digit multiplication and some related topics. This is one of the focus areas of 4th grade maths. 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 that, for example, we multiply 4×63 in two parts: first we multiply $4 \times 60 = 240$ and $4 \times 3 = 12$, and lastly the results are added: $240 + 12 = 252$.

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

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

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

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

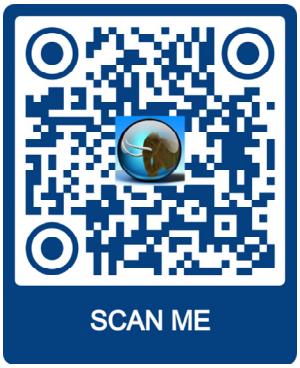
The lesson *So Many of the Same Thing* has to do with proportional reasoning. The idea is really simple, and prepares students for learning ratios and proportions in middle school.

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

Helpful Resources on the Internet

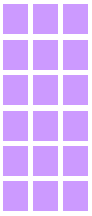
We have compiled a list of Internet resources that match the topics in this chapter. We heartily recommend you take a look at the list. Many of our customers love using these resources to supplement the bookwork. You can use the resources as you see fit for extra practice, to illustrate a concept better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

https://links.mathmammoth.com/gr4ch3



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 × 5 = 5 + 5 + 5 = 15.
- Multiplying by 1 means you have just one group: 1 × 17 = 17.
- Multiplying by 0 means "no groups": 0 × 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 = ____ × ____ = _____

20 + 20 + 20 + 20 = ____ × ____ = _____

b. 8 + 8 + 8 = ____ ×_____ = _____

80 + 80 + 80 = ____ ×____ = _____

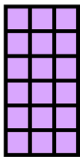
c. _____ = 4 × 500 = _____

_____ = 3 × 120 = _____

2. Write two multiplications.

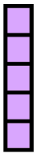
a. _____ ×_____ = _____

_____ × _____ = _____



b. _____ ×_____ = _____

_____ × _____ = _____



3. Solve.

a. 8 × 2 = _____	**b.** 3 × 5 = _____	**c.** 2 × 8 = _____	**d.** 3 × 10 = _____
8 × 0 × 7 = _____	1 × 2 × 5 = _____	2 × 2 × 2 = _____	3 × 3 × 3 = _____

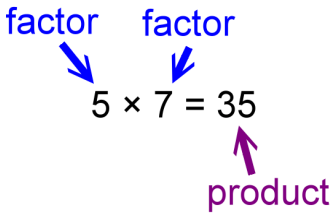
4. Find the products. You can often use addition.

a.	**b.**	**c.**	**d.**
2 × 24 = _____	2 × 150 = _____	4 × 1000 = _____	2 × 34 = _____
14 × 0 = ____	3 × 2000 = _____	5 × 200 = _____	3 × 21 = _____
16 × 1 = _____	4 × 3000 = _____	3 × 211 = _____	4 × 50 = _____

Multiplication terms

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

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



5. Find the unknown factors.

a. _____ × 2 × 2 = 24 _____ × 9 × 2 = 0	**b.** 3 × _____ = 600 4 × _____ = 1000	**c.** 500 × ____ = 1500 10 × _____ = 810

6. Fill in.

a. Write the the terms.

2 × 23 = 46
↑ ↑ ↑
_____ _____

b. Write a multiplication problem with factors 4 and 8.

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

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

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

Problem:	Number sentence:
a. Mum had three dozen eggs in cartons and five in a bowl. How many eggs did she have in all?	3 × 12 + 5 =
b. Pitso bought six packages of magazines. Each had 10 magazines. He opened one package and gave three magazines to his friend. How many magazines does Pitso have left?	
c. Ansie had seven boxes. Into four of the boxes, she put 10 crayons each, and into three boxes she put only 6. How many crayons did she use?	
d. Dithole bought three books for R150 each and paid with R500. What was his change?	
e. How many wheels do five tricycles and seven bikes have in total?	

Example. A simple hat costs R90. Another, fancier hat, costs R270.
How many times more expensive is the fancier hat?

It asks "how many times", so that is our unknown (?). We write a multiplication:

$$\_?\_ \times R90 = R270$$

It is easy to see the answer is three times, or ? = 3.

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

a. Each child has 10 toes. How many toes would seven children have? _____ × _____ = _?_ _?_ = _____	**b.** If each cow has four feet, how many cows are there if there is a total of 24 feet? _?_ × _____ = _____ _?_ = _____
c. One bicycle has two wheels. _?_ bicycles have 18 wheels. _____ × _____ = _____ _?_ = _____	**d.** One car has 4 wheels. So, *y* cars have 36 wheels. _____ × _____ = _____ *y* = _____
e. How many people would you need to have a total of 150 fingers? _____ × _____ = _____ *y* = _____	**f.** How many dozen eggs would be 60 eggs? _____ × _____ = _____ *y* = _____
g. Carl owns 20 children's books. Emma owns four times as many children's books. How many children's books does Emma own? _____ × _____ = _____ *y* = _____	**h.** You can fit 7 people in a van. How many such vans do you need to take 35 people to the beach? _____ × _____ = _____ *y* = _____
i. A track in the woods is 300 metres long. Another track is 1200 m long. How many times longer is the second track than the first? _____ × _____ = _____ *y* = _____	**j.** Mary has made 40 litres of juice and she puts it in 2-litre bottles. How many bottles will be filled? _____ × _____ = _____ *y* = _____

Multiplication Tables Revision

Why is it important to learn your multiplication tables? Why couldn't you just use addition or other ways to find what is 6 × 9, 7 × 8 or 4 × 7? There are several reasons:

1. The knowledge of multiplication tables is needed for the opposite operation: division. Once you know the tables, you can do divisions such as 54 ÷ 6 or 56 ÷ 7 quickly in your head.
2. You also need to know the multiplication tables in order to perform long division.
3. Knowing the tables helps you be able to quickly simplify fractions. For example, you need to be able *to immediately* notice that both numbers in the fraction $\frac{56}{64}$ are in the table of 8.
4. Fraction addition and subtraction are very difficult if you don't know your tables by heart.
5. The tables are also necessary to be able to find factors and prime factorisation of numbers.

1. Fill in the multiplication tables below and answer the questions.

1 × 5 =	7 × 5 =
2 × 5 =	8 × 5 =
3 × 5 =	9 × 5 =
4 × 5 =	10 × 5 =
5 × 5 =	11 × 5 =
6 × 5 =	12 × 5 =

To find a number times 5, first multiply that number by 10, and take half of that. So for 7 × 5, first go 7 × 10 = 70 and take half of that.

1 × 10 =	7 × 10 =
2 × 10 =	8 × 10 =
3 × 10 =	9 × 10 =
4 × 10 =	10 × 10 =
5 × 10 =	11 × 10 =
6 × 10 =	12 × 10 =

1 × 11 =	7 × 11 =
2 × 11 =	8 × 11 =
3 × 11 =	9 × 11 =
4 × 11 =	10 × 11 =
5 × 11 =	11 × 11 =
6 × 11 =	12 × 11 =

Elevens are as easy as pie!

2. What same answers do you find in the tables of 5 and 10? Why?

1 × 2 =	7 × 2 =
2 × 2 =	8 × 2 =
3 × 2 =	9 × 2 =
4 × 2 =	10 × 2 =
5 × 2 =	11 × 2 =
6 × 2 =	12 × 2 =

What same answers (products) do you find in the tables of 2, 4 and 8?

1 × 4 =	7 × 4 =
2 × 4 =	8 × 4 =
3 × 4 =	9 × 4 =
4 × 4 =	10 × 4 =
5 × 4 =	11 × 4 =
6 × 4 =	12 × 4 =

To find a number times 4, you can double it twice:

Example. 7 × 4 = ??
Double 7 is 14, then double that to get 28.

1 × 8 =	7 × 8 =
2 × 8 =	8 × 8 =
3 × 8 =	9 × 8 =
4 × 8 =	10 × 8 =
5 × 8 =	11 × 8 =
6 × 8 =	12 × 8 =

You can double a number three times to find these. For example, to find 6 × 8, find double 6, and double that, then double that.

5, 6, 7, 8 — fifty-six is 7 times 8.

Colour ones digits one colour and tens digits another. You will see a pattern.

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Revision Chapter 3

1. Multiply.

a. 400 × 3 = _____ 9 × 20 = _____	**b.** 70 × 60 = _____ 300 × 11 = _____	**c.** 90 × 900 = _____ 100 × 400 = _____

2. Find the missing factors. Think of how many zeros you need.

a. _____ × 50 = 4000 _____ × 50 = 350	**b.** 70 × _____ = 280 7 × _____= 2800	**c.** _____ × 40 = 12 000 _____ × 800 = 64 000

3. Solve the equations.

a. 4 × 30 = ? × 3 ? = _____	**b.** y × 500 = 250 × 4 y = _____	**c.** 450 + 350 = △ × 20 △ = _____

4. Solve this problem using **estimation**.
If you earn R1400 weekly, in how many weeks will you have earned more than R8000?

5. Multiply. Estimate the answer on the line.

a. 7 × 48 ≈ _____	**b.** 6 × 813 ≈ _____	**c.** 21 × 18 ≈ _____	**d.** 4 × 5903 ≈ _____

6. Fill in the table.

Lolly	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Price	**R0,90**							

7. Calculate in the right order.

$2 \times 98 - 8 \times 17$

8. Solve.

a. $(1500 - 1000) \times 4 =$ _____

b. $(76 + 34) \times 2 \times 0 =$ _____

c. $8 \times 2 \times (3 + 2) =$ _____

d. $200 \times (500 - 400) =$ _____

9. Draw a rectangle with several parts to illustrate the multiplications. You don't have to draw accurately—a sketch is good enough.

a. 8×24

= ___ × _____ + ___ × ___

= _____

b.

$$\begin{array}{r} 35 \\ \times\ 39 \\ \hline \\ \\ + \\ \hline \end{array}$$

10. Solve. Write a number sentence for each one, not just the answer.

a. A store owner bought 50 boxes of fishing lures, with 20 lures in each box, and each lure cost R8. What was the total cost?

_____

_____

b. Dad bought 8 boxes of crackers for R20,35 a box. What was his change from R200?

_____

_____

c. Charmain bought five frozen lollies for R1,50 each. Now she has R12,50 left. How much did she have originally?

_____

_____

d. A box of pencils costs R45 but it was discounted by R8. How much do five boxes cost?

_____

_____

11. Solve the problems. You can use the tables to help.

a. A horse can run 6 km in 15 minutes. How far could it run in 10 minutes?

b. Seven cans of tuna weigh 420 g. How much would ten cans weigh?

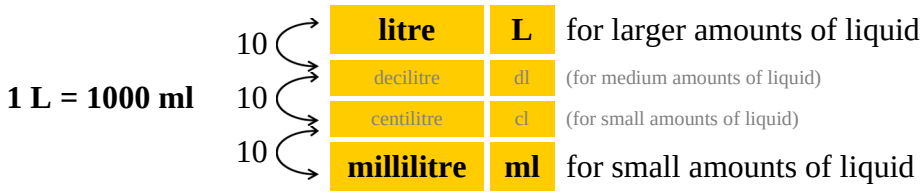
Chapter 4: Time and Measuring
Introduction

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 2000 grams).

And while the Common Core standards of the United States do not include them for 4th grade, I have also included some problems where we convert from a smaller unit to a bigger unit (such as 4500 ml into 4 L 500 ml or 4000 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:



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

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 maths concepts;
- **articles** that teach a maths 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/gr4ch4int

SCAN ME

Time Units

Pay close attention and memorise 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. Bonga puts R900 into his savings each month. After saving for half a year, he bought a keyboard for R4875. How much does he have left of his savings?

_____

_____

b. How much money do you spend in one year if you spend R3 for candy every day for a year?

_____

3. One hour is 60 minutes. Convert these times into minutes.

a. 5 h = _____ min	**b.** 4 h 6 min = _____ min	**c.** 8 h 18 min = _____ min
10 h = _____ min	3 h 37 min = _____ min	20 h 10 min = _____ min
12 h = _____ min	7 h 50 min = _____ min	12 h 3 min = _____ min

- Add the hours and minutes separately.
- If the sum of the minutes is more than 60, then each 60 minutes in the sum makes an hour.

Here, 125 minutes is 60 + 60 + 5 minutes, so we get two new hours from all of those minutes. The initial answer of 10 hours 125 minutes is changed into 12 hours 5 minutes.

$$\begin{array}{rr} 6\text{ h} & 50\text{ m} \\ 2\text{ h} & 30\text{ m} \\ +\ 2\text{ h} & 45\text{ m} \\ \hline 10\text{ h} & 125\text{ m} \end{array}$$

$$= 12\text{ h}\quad 5\text{ m}$$

4. Add the hours and minutes. Remember to convert the sum of minutes into hours and minutes.

a.

$$\begin{array}{rr} 2\text{ h} & 20\text{ m} \\ 1\text{ h} & 30\text{ m} \\ +\ 4\text{ h} & 55\text{ m} \\ \hline \end{array}$$

=

b.

$$\begin{array}{rr} 1\text{ h} & 22\text{ m} \\ 3\text{ h} & 53\text{ m} \\ +\ 5\text{ h} & 40\text{ m} \\ \hline \end{array}$$

=

c.

$$\begin{array}{rr} 2\text{ h} & 55\text{ m} \\ 2\text{ h} & 46\text{ m} \\ +\ 1\text{ h} & 51\text{ m} \\ \hline \end{array}$$

=

d.

$$\begin{array}{rr} 3\text{ h} & 48\text{ m} \\ 7\text{ h} & 12\text{ m} \\ +\ 4\text{ h} & 37\text{ m} \\ \hline \end{array}$$

=

5. Solve the problems.

a. If you watch a programme that lasts 35 minutes each day, how much time do you spend watching it in a week? Give your answer in minutes, and *also* as hours and minutes.

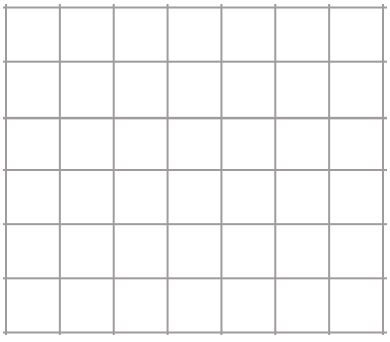
_____

b. This is a chart of Taelo's working hours at the bakery:

Monday	Tuesday	Wednesday	Thursday
2 h 30 min	3 h 50 min	1 h 10 min	3 h 25 min

How much time did he work in total during these 4 days?

_____



6. Solve.

a. Alida kept track of how long she spent doing maths homework:

Monday	Tuesday	Wednesday	Thursday	Sunday
45 min	35 min	1 h 10 min	1 h 5 min	40 min

How much time in total did she spend on maths homework?

_____

b. It takes about 40 minutes to drive from Riann's home to town. The family is going to drive to town, spend about 3 hours shopping, and then come back home. What is the total amount of time they will be gone on their shopping trip?

_____

c. Dineo finished the foot race in exactly two minutes, and Jeanny was 24 seconds faster. What was Jeanny's finishing time?

_____

d. John stayed in bed for three whole days after his surgery. How many hours is that?

_____

e. You walk your dog about 25 minutes each day. About how long do you spend walking your dog in a week? Give your answer in hours and minutes.

_____

_____

How much time do you spend in four weeks (a month)?

_____

f. Write a number sentence to find the number of seconds in one hour, and solve it.

_____

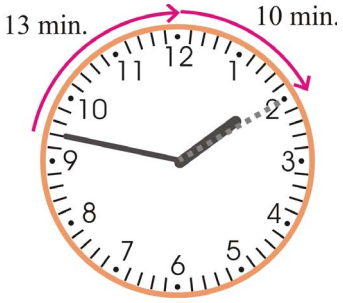
_____

Elapsed Time 1

How many minutes is it from 1:47 to 2:10?

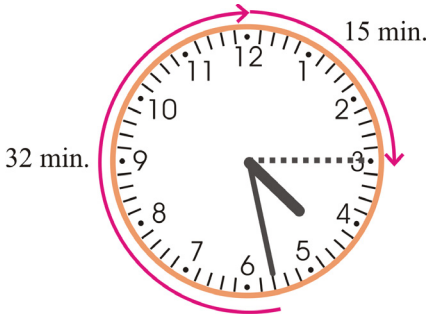
Notice that the hour changes from 1 to 2. We need to calculate this carefully, but it is easy when you calculate it in two parts:

From 1:47 to 2:00 is 13 minutes. From 2:00 to 2:10 is 10 minutes. So the total is 23 minutes.



How many minutes is it from 4:28 to 5:15?

Again, the hour changes, so we figure it in two parts: From 4:28 to 5:00 is 32 minutes. From 5 to 5:15 is 15 minutes. The total is: 32 + 15 = 47 minutes.

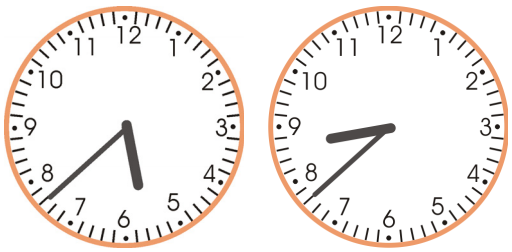


1. How many minutes is it from the time on the clock face until the given time?

 until 3:15 **a.** _____ minutes	 until 11:25 **b.** _____ minutes	 until 4:05 **c.** _____ minutes	 until 1:30 **d.** _____ minutes
 until 5:05 **e.** _____ minutes	 until 4:23 **f.** _____ minutes	 until 10:18 **g.** _____ minutes	 until 12:10 **h.** _____ minutes

How much time passes from 5:38 to 8:38?

The minutes are the same (:38), so the minute hand has made some full rounds—full hours—and ended up back in the same place. So you need to only look at the *difference in the hours*: From 5 to 8 is 3 hours. Three hours have passed.



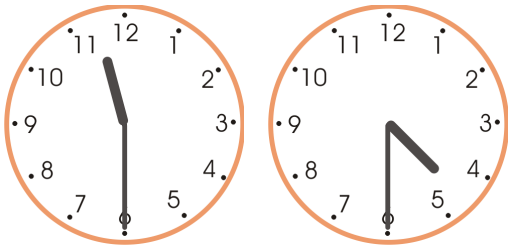
How much time passes from 11:30 to 4:30?

Once again, the minute hand has made several full rounds. From 11 to 4 is five hours.

You can also figure the passed time in parts:

(1) From 11:30 to 12:00 is half an hour.
(2) From 12:00 to 4:00 is four more hours.
(3) From 4:00 to 4:30 is another half an hour.

The total is five hours.



2. How much time passes during these intervals?

a. From 2:06 to 10:06	**b.** From 8:25 to 12:25	**c.** From 3:30 to 6:00
d. From 7:30 AM to 1:30 PM	**e.** From 10:00 AM to 3:30 PM	**f.** From 9:49 to 1:49
g. From 5 AM to 5 PM	**h.** From 11 PM to 12 noon	**i.** From 6 AM to 4 PM

3. Find the elapsed time in parts.

a. From 1:40 to 2:30

From 1:40 to 2:00	_____ minutes
From 2 to 2:30	_____ minutes
Total	

b. From 7:30 AM to 3:10 PM

From 7:30 to 8:00	
From 8:00 to 12:00	
From 12:00 to 3:00	
From 3:00 to 3:10	
Total	

4. How much time passes? Figure it out in parts.

a. From 2:35 to 8:15	**b.** From 6:40 AM to 4:15 PM

5. An aeroplane took off at 3:35 PM and landed at 7:10 PM.
How long was the flight?

6. Here is part of a television schedule. Answer the questions about the programmes.

Channel 1	Channel 2	Channel 3
4:30 Nature film: Whales 5:30 Children's Story Time 6:05 Early News 6:35 Shopping Spree Show 7:05 The Week in Politics	4:30 Cooking Class 5:05 Kids TV 5:55 Quick News 6:20 Nature Film: The Antarctic 7:25 Current Trends	4:45 Afternoon Bits 5:15 Nature film: Bees and Honey 6:20 Flash News 6:40 The Silly Faces Show 7:20 Arnold's Kitchen

a. Each of the three channels has a nature film.
List here how long each one of them lasts.

b. Which is the longer programme, "Children's Story Time" or "Kids TV"?
How many minutes longer?

c. Which channel has the *longest* news programme?

Which one has the *shortest* news programme?

What is the difference between the two programmes in minutes?

d. Megan changed channels like this:

From 4:30 to 5:15 Channel 1
From 5:15 to 6:20 Channel 3
From 6:20 to 7:25 Channel 2

Which programmes did Megan watch (either totally or partially)?

The 24-Hour Clock

As you know, the hour hand goes around the entire 12-hour clock face two times in one day.
A day has 2 × 12 hours = 24 hours.

To indicate which "round" we are on, we can use the 24-hour clock. The hours are simply numbered from 0 to 23 (or sometimes from 1 to 24). The afternoon hours are those from 13 to 24.

The 24-hour time is commonly called the "military time" or astronomical time in the United States. In most countries of the world it is the dominant system used for bus, school or TV schedules.

4 p.m. = 16:00

How do we change a time expressed in the 12-hour clock to the 24-hour clock?

- For a.m. times, the numbers don't change, except that hours are written with two digits, so often you need to add a zero to the hours; e.g. 08:50.
- For p.m. times you add 12 to the hours.

The other way around, to change the 24-hour-clock times to the 12-hour-clock times, you subtract 12 hours from the afternoon times.

a.m. / p.m. system	24-hour clock
3:50 a.m.	03:50
noon	12:00
5:54 p.m.	17:54
10 p.m.	22:00
midnight	24:00

1. Change the times to the 24-hour clock times.

a. 5:40 a.m. _____ : _____	**b.** 8:00 p.m. _____ : _____	**c.** 6:15 p.m. _____ : _____	**d.** 11:04 a.m. _____ : _____
e. 12:30 p.m. _____ : _____	**f.** 4:35 p.m. _____ : _____	**g.** 11:55 p.m. _____ : _____	**h.** 7:05 p.m. _____ : _____

2. Change the 24-hour times to the a.m. / p.m. times.

a. 15:00 _____ : _____ p.m.	**b.** 17:29 _____ : _____	**c.** 04:23 _____ : _____	**d.** 23:55 _____ : _____
e. 14:30 _____ : _____	**f.** 10:45 _____ : _____	**g.** 16:00 _____ : _____	**h.** 21:15 _____ : _____

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Metric Units of Weight

In the metric system, each unit is 10 of the smaller unit. For example, 1 dekagram is 10 grams, and 1 kilogram is 10 hectograms. But dekagrams and hectograms are not commonly used. We only use kilograms and grams.

You just need to remember that **1 kg = 1000 g**. The word "kilo" actually means a thousand!

1. Choose the right weight for each thing.

a. a 10-year old boy	**b. a cat**	**c. an apple**
1 kg 30 g 30 kg	2 kg 200 g 2000 g	1 kg 100 g 1 g
d. a table	**e. a pencil**	**f. an adult woman**
2 kg 200 g 20 kg	5 g 5 kg 500 g	50 kg 200 kg 5 kg

2. One kilogram is a thousand grams. Fill in the table.

kilograms	**1/2**	**2**	**3**	**3 1/2**	**5**	**10**	**12**
grams							

kilograms							
grams	**500**	**1000**	**4000**	**4500**	**6000**	**10 000**	**40 000**

1 kg = 1000 g
To change 3 kg into grams, multiply by 1000: 3 × 1000 g = 3000 g
To change 5 kg 50 g into grams, first convert the 5 kg into grams: 5 × 1000 g = 5000 g. Then, add the 50 grams: 5000 g + 50 g = 5050 g.

3. Convert between kilograms and grams.

a. 2 kg = _____ g	**b.** 1 kg 600 g = _____ g	**c.** 8 kg 600 g = _____ g
3 kg = _____ g	8 kg 80 g = _____ g	5 kg 8 g = _____ g
4 kg = _____ g	2 kg 450 g = _____ g	7 kg 41 g = _____ g

4. Convert the amounts in grams into kilograms and grams.

a. 6000 g = _____ kg _____ g 6700 g = _____ kg _____ g 5300 g = _____ kg _____ g	**b.** 1200 g = _____ kg _____ g 6070 g = _____ kg _____ g 4770 g = _____ kg _____ g

5. Circle the heaviest amount.

a. 3 kg 300 g OR 3030 g	**b.** 6 kg 400 g OR 640 g	**c.** 10 kg OR 5000 g

6. Apples weigh about 150 grams each. Grandma wants about 1 kg of apples. How many apples should she get?

7. How many workbooks weighing 300 g each can you pack into a box so that its weight will not be over 2 kg?

8. Which is more chocolate: five chocolate bars 400 g each, or two jumbo chocolate bars 1 kg each?

When some weights are given in kilograms and some in grams, change them all to grams before adding.	Add kilograms to kilograms and grams to grams. Here, 1050 g makes 1 kg 50 g.
5 kg + 3 kg 650 g + 490 g = ? Change to grams first: = 5000 g + 3650 g + 490 g = 9140 g OR 9 kg 140 g 5 0 0 0 3 6 5 0 + 4 9 0 9 1 4 0	4 kg 250 g + 3 kg 800 g 7 kg 1050 g = 8 kg 50 g

9. Add.

a. 1 kg 820 g + 5 kg 700 g =	**b.** 7 kg 800 g + 4200 g	**c.** 4150 g + 3 kg 60 g + 600 g

10. Calculate.

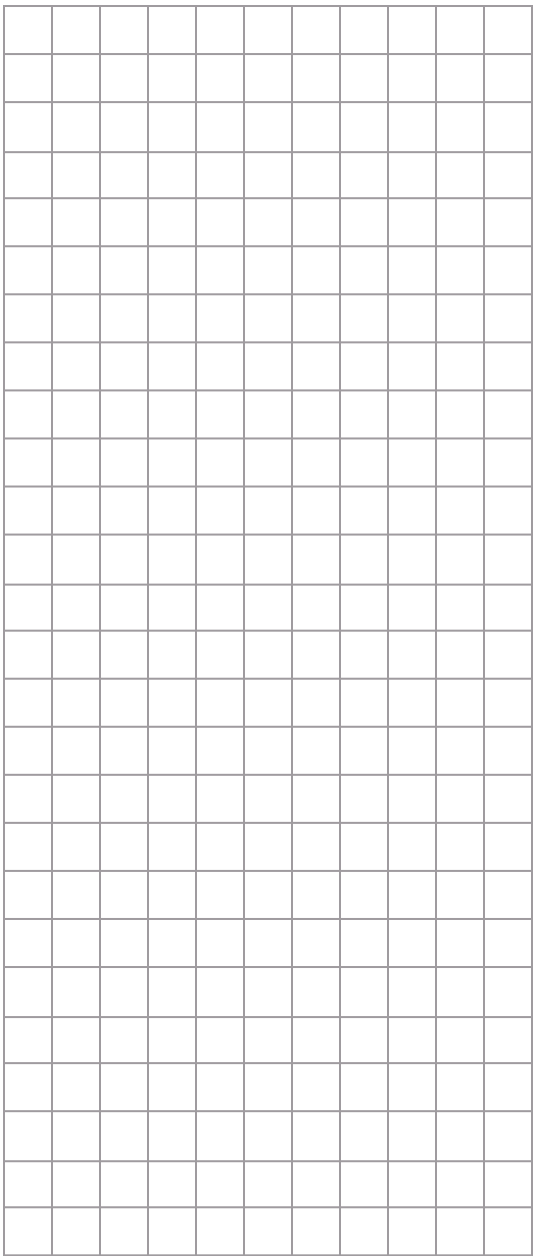
a.	b.
1 kg 700 g + 4 kg 200 g = ____ kg _____ g	4 × 300 g = ____ kg _____ g
1500 g + 500 g = ____ kg _____ g	4 × 500 g = ____ kg _____ g
4 kg 800 g + 4 kg 400 g = ____ kg _____ g	2 kg − 900 g = ____ kg _____ g

11. Jabulani received packages in the mail that weighed 700 g, 350 g, 4 kg 400 g and 1 kg 900 g. What was the total weight of the packages?

12. Ansie bought three 1-kg packages and seven 400-gram packages of buckwheat flour. How much did the flour weigh in total?

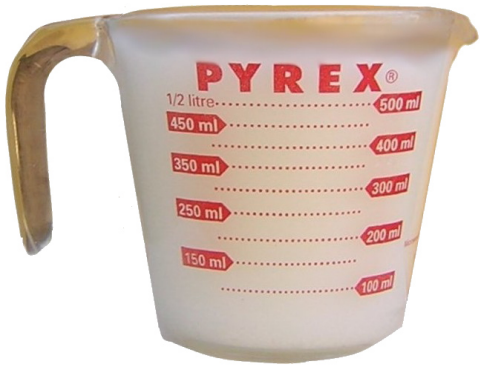
13. You need 2 kg of flour to make bread. The scale shows you already have 1050 g. How much more flour do you need?

14. A 200-gram bag of rice costs R4,69. How many bags do you need for 1 kg of rice? What is the total cost?



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, **1000 millilitres make one litre.** A millilitre is abbreviated "ml."

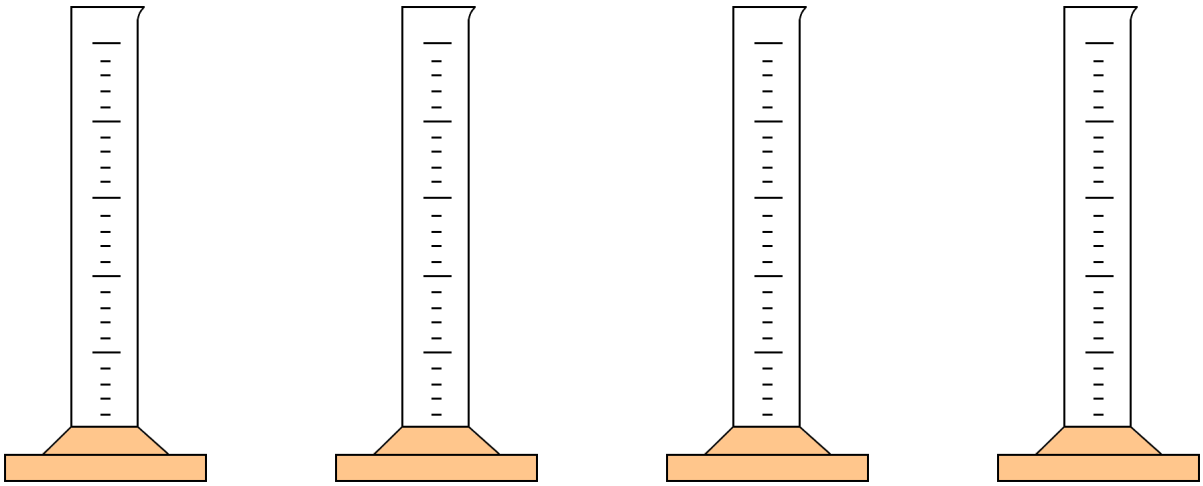
Most measuring cups used in cooking have a millilitre scale. Two cups is about 500 ml. Four cups (a U.S. quart) is about 1 L.

Units of volume in the metric system

1 L = 1000 ml

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

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 fuel tank of a sedan holds (45 / 450) L of petrol.

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Contents

Chapter 7: Fractions

Chapter 8: Decimals

Foreword

Math Mammoth Grade 4, South African Version comprises a complete maths 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 customised for use in South Africa 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 country. However, you can probably find material for any missing topics in the neighbouring grades of Math Mammoth.

This South African version has been **customised to South Africa** in the following manners:

- The names used are South African names (such as Ansie and Musa).
- The currency used is rand.
- The curriculum teaches the metric measurement units. Imperial units, such as inches and pounds, are not used.
- The spelling conforms to British international standards.
- Paper size is A4.
- Geographic names used emphasise South African locations (such as Pretoria, Johannesburg).

The four main areas of study for fourth grade 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 the 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-B, covers division (chapter 5), geometry (chapter 6), fractions (chapter 7), and decimals (chapter 8). The rest of the topics are covered in the 4-A worktext.

I wish you success in teaching maths!

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.

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 the 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 maths lessons, for learning maths facts, or just for some fun. Each chapter introduction (in the student worktext) contains a link to a corresponding list.

- 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 which requires Internet access for use.

- 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 keep adding!

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

- Answer keys are provided for 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. 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	167	91	10	81	2.0	10
4-B	177	89	10	79	2.2	11
Grade 4 total	344	180	20	160	2.2	10

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	167					
4-B	177					
Grade 4 total	344					

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 maths. Third-fourth graders might spend 30-60 minutes a day. Fifth-sixth graders might spend 45-75 minutes a day. If your child finds maths 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 maths.

Working space, the usage of additional paper and mental maths

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 organise 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 to be done using MENTAL MATHS.

However, there are some students who struggle with mental maths (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 maths.

Students struggling with mental maths 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 maths 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 revisf 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 printed 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, Chapter 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 maths 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 utilise 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.

Chapter 5: Division
Introduction

The fifth chapter of *Math Mammoth Grade 4* includes lessons on division, long division, remainder, average, divisibility, and problem solving. It is a long chapter, because division and long division are "in focus" in fourth grade. Therefore, feel free to mix the lessons from this chapter with lessons from some other chapter, essentially using the curriculum in a somewhat spiral manner. This is especially advisable if your student has difficulties retaining the material or starts feeling bored with these topics.

For further help in teaching these topics, check out the free videos matched to the curriculum at https://www.mathmammoth.com/videos/. Remember not to automatically assign all the exercises. Instead, adjust the amount of exercises according to the student's needs. The rest can be used later for revision.

We start out by revising basic division facts by single-digit numbers (such as 24 ÷ 4 or 56 ÷ 7). After that, we study terminology of division and dividing numbers by whole tens and hundreds (such as 400 ÷ 20). Next students practise the order of operations again—this time with division as one of the operations.

Then we study the concept of remainder, preparing students for the upcoming lessons on long division. At first, the concept of remainder is presented visually. Soon, students solve simple division problems with a remainder, written with the long division symbol (or long division "corner", as I like to call it).

Next comes a set of lessons intended to teach long division in several small steps. We start with divisions where each of the digits in the dividend (thousands, hundreds, tens, and ones) can be divided evenly by the divisor (for example, 3 096 ÷ 3). As the next step, there is a remainder in the ones. Then, the divisions have a remainder in the tens. Finally, there is a remainder in the hundreds and in the thousands, and this completes the step-by-step learning process for long division. The lessons also include lots of word problems to solve.

After long division, we study the concept of average, which is a nice application of division, and problems that involve finding a fractional part of a quantity using division. For example, we can find 3/4 of a number by first finding 1/4 (dividing by 4) and then multiplying the result by 3. Students get help from visual bar models to solve the problems.

The last section deals with elementary number theory. We study basic divisibility rules (though not all of them), prime numbers, and finding all factors of a given two-digit number.

The Lessons in Chapter 5

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 maths concepts;
- **articles** that teach a maths 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/gr4ch5

SCAN ME

Revision of Division

Multiplication has to do with equal-size groups: 2 × 4 means 2 groups of 4.
Division is the opposite operation of multiplication, and it *also* has to do with equal-size groups:
8 ÷ 4 can mean, "How many groups of 4 are in 8?"
It can also mean, "How many in each group, when 8 things are put into 4 groups?"

Division has two "meanings":

- Dividing to find how many are in each group.
- Dividing into groups of a certain size.

2 × 6 = 12

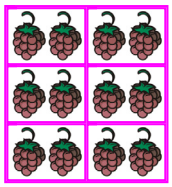
"12 divided into 2 groups; how many in each group?"

12 ÷ 2 = 6

OR

"How many sixes are in 12?"

12 ÷ 6 = 2



6 × 2 = 12

"12 divided into 6 groups; how many in each group?"

12 ÷ 6 = 2

OR

"How many twos are in 12?"

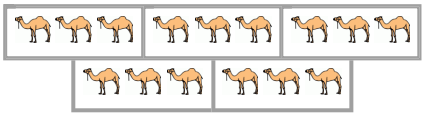
12 ÷ 2 = 6

1. Write a multiplication sentence and two division sentences.

a. _____

_____

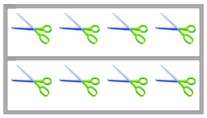
_____



b. _____

_____

_____



c. _____

_____

_____

2. Fact families: write two division and two multiplication sentences.

a. 21	**b. 24**	**c. 36**
7 and 3	4 and ____	4 and ____

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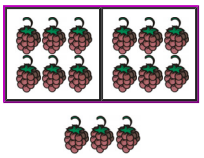
The Remainder, Part 1

Sometimes we can't divide objects into groups evenly and some of the objects are left over. Those "leftovers" are the **remainder**. We mark the remainder in division with the letter r.



15 ÷ 6 = 2 r3

These 15 berries are divided into groups of 6, as evenly as possible.

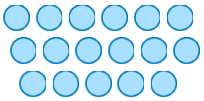
We can write the division **15 ÷ 6 = 2 r3**. The divisor (6) tells us how many berries there are in each group. The answer (2) tells us how many groups we got. The remainder is 3 berries.

1. Divide the things into groups of a certain size. Write a division. There will be a remainder.

a. Divide into groups of 4.

_____ ÷ _____ = _____ r__

b. Divide into groups of 2.



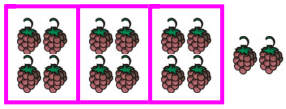
_____ ÷ _____ = _____ r__

c. Divide into groups of 5.

_____ ÷ _____ = _____ r__

2. Write a division with a remainder to match the picture. The size of the groups gives you the divisor.

a.

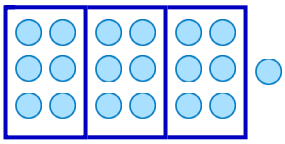


_____ ÷ _____ = _____ r__

b.

_____ ÷ _____ = _____ r__

c.



_____ ÷ _____ = _____ r__

3. Draw a picture to match the division problem, and solve. Think of making groups of a certain size.

a. Divide 16 into groups of 5.

_____ ÷ _____ = _____ r__

b. Divide 17 into groups of 3.

_____ ÷ _____ = _____ r__

c. Divide 15 into groups of 4.

_____ ÷ _____ = _____ r__

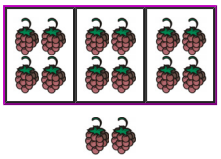
4. Draw a picture to match the division problem, and solve.

a. 17 ÷ 4 = _____ r_____

b. 9 ÷ 2 = _____ r_____

c. 11 ÷ 6 = _____ r_____

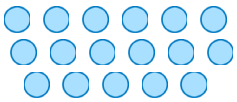
Besides dividing objects into groups of a certain size, we can also divide them into so many groups.



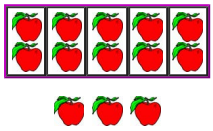
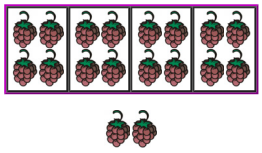
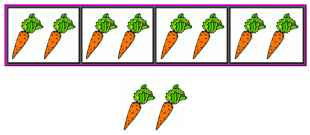
Here you see 14 berries divided into 3 groups as evenly as possible.

We can write the division **14 ÷ 3 = 4 r2**. This time, the divisor (3) tells us how many groups we made. The answer (4) tells us how many berries are in each group. The remainder is 2 berries.

5. Divide the objects into as many groups as indicated. Write a division. There will be a remainder.

a. Divide into three groups.	**b.** Divide into five groups.	**c.** Divide into four groups.
		
_____ ÷ _____ = _____ r__	_____ ÷ _____ = _____ r__	_____ ÷ _____ = _____ r__

6. Write a division with a remainder to match the picture. The number of groups gives you the divisor.

a.	**b.**	**c.**
		
_____ ÷ _____ = _____ r__	_____ ÷ _____ = _____ r__	_____ ÷ _____ = _____ r__

Find the remainder by thinking of the DIFFERENCE.

Example. What is 35 ÷ 6?

Think how many groups of 6 there are in 35, or how many times 6 goes into 35.
You can find out with multiplication: 5 × 6 = 30; 6 × 6 = 36. So, 6 goes into 35 five times.

Now find the difference between (5 × 6) and 35, or in other words between 30 and 35.
That difference is 5, and it is the remainder. So 35 ÷ 6 = 5 r5.

7. Solve.

a. 27 ÷ 5 = _____ r___ How many times does 5 go into 27?	**b.** 16 ÷ 6 = _____ r___ How many times does 6 go into 16?	**c.** 11 ÷ 2 = _____ r___ How many times does 2 go into 11?
d. 37 ÷ 5 = _____ r___	**e.** 26 ÷ 3 = _____ r___	**f.** 56 ÷ 9 = _____ r___
g. 43 ÷ 5 = _____ r___	**h.** 34 ÷ 6 = _____ r___	**i.** 40 ÷ 7 = _____ r___

8. Solve.

a.	b.	c.
23 ÷ 4 = _____ r____	16 ÷ 7 = _____ r____	21 ÷ 8 = _____ r____
23 ÷ 5 = _____ r____	20 ÷ 3 = _____ r____	12 ÷ 9 = _____ r____

9. Divide and find the remainder. Notice the patterns!

a. 10 ÷ 5 = 2 r 0	**b.** 17 ÷ 3 = _____ r___	**c.** 12 ÷ 4 = _____ r___
11 ÷ 5 = _____ r___	18 ÷ 3 = _____ r___	13 ÷ 4 = _____ r___
12 ÷ 5 = _____ r___	19 ÷ 3 = _____ r___	14 ÷ 4 = _____ r___
13 ÷ 5 = _____ r___	20 ÷ 3 = _____ r___	15 ÷ 4 = _____ r___
14 ÷ 5 = _____ r___	21 ÷ 3 = _____ r___	16 ÷ 4 = _____ r___
15 ÷ 5 = _____ r___	22 ÷ 3 = _____ r___	17 ÷ 4 = _____ r___

10. Write a number sentence for each word problem. Indicate the remainder, if any.

a. Jim arranged 27 toy cars into rows of 5. How many rows did he have? Were any left over? _____ ☐ _____ = _____	**b.** The teacher put 19 children into groups of 5. How many groups of 5 did she have? What can she do with the "remainder" children? _____ ☐ _____ = _____
c. Mum baked three dozen cookies. She ate three of them, and put the rest into bags, 6 cookies in each bag. How many full bags are there? _____	**d.** Jerry packaged 51 magazines into 8 bags. Was he able to do so evenly (the same number of magazines in each bag)? _____
e. Susan wants to organise 35 chairs into nice even rows. Can she organise them into rows of four chairs? Rows of five? Rows of six? Rows of seven?	**f.** Amy put 38 photographs into a photo album. On each page she could fit six photos. How many photos were on the last page? How many pages were full?

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Long Division with 4-Digit Numbers

```
   th h t o
    2
2 )5 7 1 8
  -4
   1
```

```
   th h t o
    2 8
2 )5 7 1 8
  -4
    1 7
  -1 6
       1
```

```
   th h t o
    2 8 5
2 )5 7 1 8
  -4
    1 7
  -1 6
      1 1
    -1 0
       1
```

```
   th h t o
    2 8 5 9
2 )5 7 1 8
  -4
    1 7
  -1 6
      1 1
    -1 0
       1 8
     -1 8
        0
```

Check:

```
  2 8 5 9
×       2
```

Long division with 4-digit numbers works the same way as with smaller numbers!

1. Divide. Check each division result with multiplication.

a. $3\overline{)7041}$ Check:

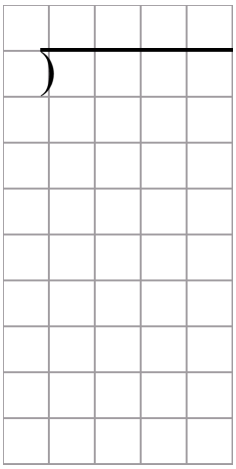
b. $4\overline{)9240}$ Check:

c. $4\overline{)7140}$ Check:

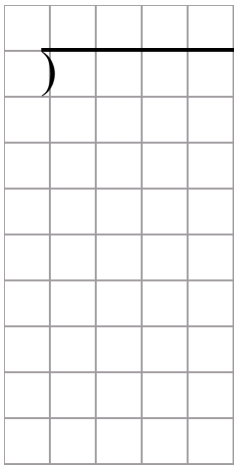
d. $2\overline{)9770}$ Check:

2. Divide. Use the grids below. Check each one by multiplication.

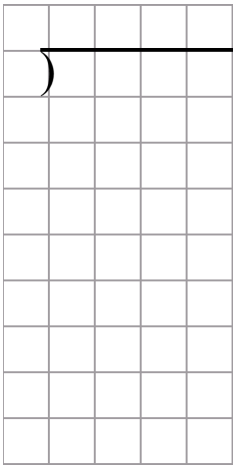
a. 5802 ÷ 3 Check:



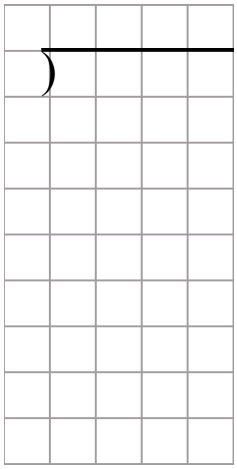
b. 1653 ÷ 3 Check:



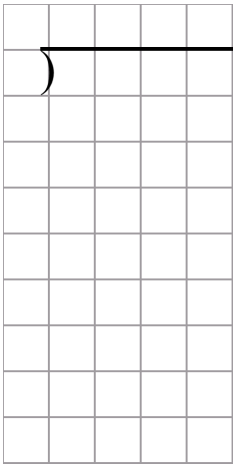
c. 9380 ÷ 7 Check:



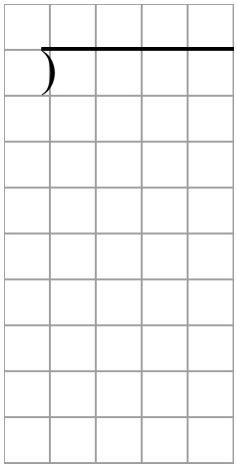
d. 9104 ÷ 8 Check:



e. 7902 ÷ 6 Check:



f. 6080 ÷ 5 Check:



There are not enough thousands. So, when you start, look at the **first two digits** of the dividend, and divide the divisor into those.

$$\begin{array}{r} 0\,4 \\ 7\overline{)3\,0\,5\,2} \\ -2\,8 \\ \hline 2\,5 \end{array}$$

7 does not go into 3, so look at the **first two digits** ("30"). 7 goes into 30 four times.

$$\begin{array}{r} 0\,4\,3 \\ 7\overline{)3\,0\,5\,2} \\ -2\,8 \\ \hline 2\,5 \\ -2\,1 \\ \hline 4\,2 \end{array}$$

7 goes into 25 three times. 4 tens is the remainder.

$$\begin{array}{r} 0\,4\,3\,6 \\ 7\overline{)3\,0\,5\,2} \\ -2\,8 \\ \hline 2\,5 \\ -2\,1 \\ \hline 4\,2 \\ -\,4\,2 \\ \hline 0 \end{array}$$

7 goes into 42 six times.

3. Divide. You may need to look at the first two digits of the dividend. Check your answers.

a. $3\overline{)1479}$ Check:

b. $5\overline{)1920}$ Check:

c. $6\overline{)5544}$ Check:

d. $5\overline{)245}$ Check:

e. $6\overline{)522}$ Check:

f. $9\overline{)3339}$ Check:

4. Two neighbours bought nine trees for R160 each, and shared the cost equally.
   How much did each person pay?

5. A DVD contains a total of 504 minutes of show episodes. The Mabuza family decided to watch them all in a week, and to watch the same amount each day.

   How many minutes will they watch each day?

   Express this also as hours and minutes.

6. A path through the woods is 920 metres long and it is divided into eight parts of equal length. Clues for a treasure hunt are placed at those points. The children get their first clue at the beginning of the path.

   a. At what distance from the start is the second clue?

   b. What is the distance to the third clue?

7. Pebetsi bought eight bags of balloons for her daughter's birthday party, because they were on sale. Each bag had 25 balloons. She took 96 balloons out and gave six balloons to each child.

   a. How many children were at the party?

   b. How many balloons does Pebetsi have left?

Chapter 6: Geometry
Introduction

We start our study of geometry by revising the third grade concepts of area and the perimeter of rectangles. Students also apply these concepts in various problems, including problems where they write simple equations and a problem where they explore all possible perimeters for a given area.

Note: Students will need a ruler and a protractor throughout the chapter.

The focus of the chapter is angles. Students learn about lines, rays, and angles; and about acute, right, obtuse, and straight angles. They learn how to measure and draw angles with a protractor. We also study angle problems where students write simple equations. The lesson *Estimating Angles* has an optional section on turning in an angle, which can be challenging, so feel free to omit it if you wish.

The lesson *Parallel and Perpendicular Lines* also ties in with the topic of angles, because two lines are perpendicular if they form a right angle. After that, we study parallelograms and other quadrilaterals in more detail, paying attention to their angles and lengths of sides.

We also study triangles and classify them according to their angles (acute, obtuse, or right triangles). Classifying triangles according to their sides (equilateral, isosceles, or scalene) will be studied in 5th grade. The last (and easy) topic in this chapter is line symmetry.

The lessons include quite a few drawing exercises which can be done on blank paper, in a notebook, or in the worktext (for most). Please stress to the student to always use a ruler and other proper tools, such as a protractor or a triangular ruler, so the drawings will be as accurate as possible. Some exercises may mention to only sketch something, in which case it is okay to not use any drawing tools.

Geometry is full of strange-sounding words. I suggest that student(s) keep a geometry notebook, where they draw picture(s) and text to explain every new concept or term. This will help them to remember those terms. They can also do the drawing exercises in the notebook. Encourage the students to be creative so that the notebook becomes their own special work. You can even give them credit for it.

The Lessons in Chapter 6

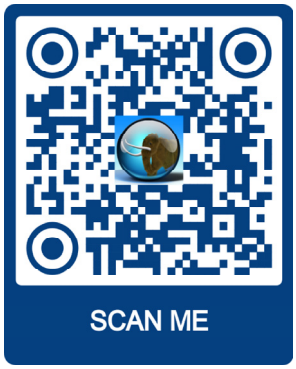
Helpful Resources on the Internet

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 maths concepts;
- **articles** that teach a maths concept.

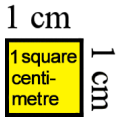
We heartily recommend you take a look at the list. Many of our customers love using these resources to supplement the bookwork. You can use the resources as you see fit for extra practice, to illustrate a concept better and even just for some fun. Enjoy!

https://links.mathmammoth.com/gr4ch6

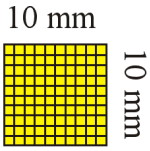


Revision: Area of Rectangles

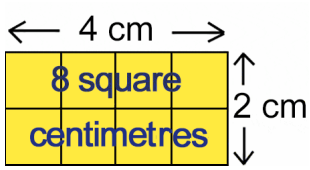
Area is always measured in **squares of some size**. We use the superscript "2" with a unit of length to indicate the "squaring." For example, 120 cm^2 means 120 square centimetres.



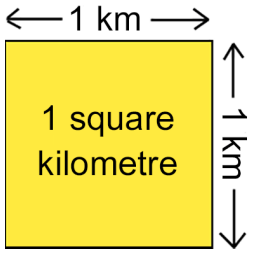
The area of this square is 1 square centimetre, or 1 cm^2.



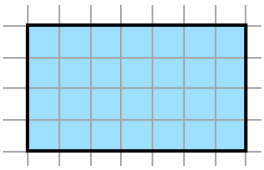
Each tiny square has an area of 1 square millimetre, or 1 mm^2. The area of the whole square is 10 mm × 10 mm = 100 mm^2.



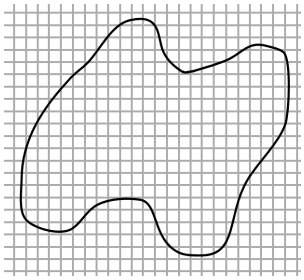
You can use multiplication to find how many square centimetres this rectangle covers: 2 cm × 4 cm = 8 cm^2.



The area of this square is 1 km × 1 km = 1 square kilometre, or 1 km^2.



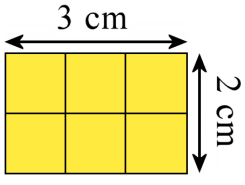
If no particular unit of length is given for the sides, we just use the word "unit" for the lengths. The area is then 7 units × 4 units = 28 *square units.*



If the figure is some other shape than a rectangle, we will still use little squares to measure its area. It is just more difficult to find out how many little squares it covers, and we may have to use partial (fractional) squares as well.

1. Write a multiplication to calculate the area of these rectangles. Include the units!

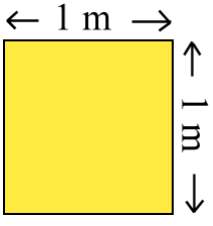
a.



A = _____ × _____

= _____

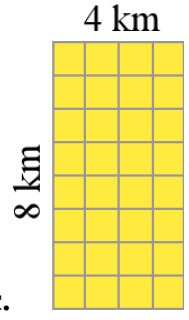
b.



A = _____ × _____

= _____

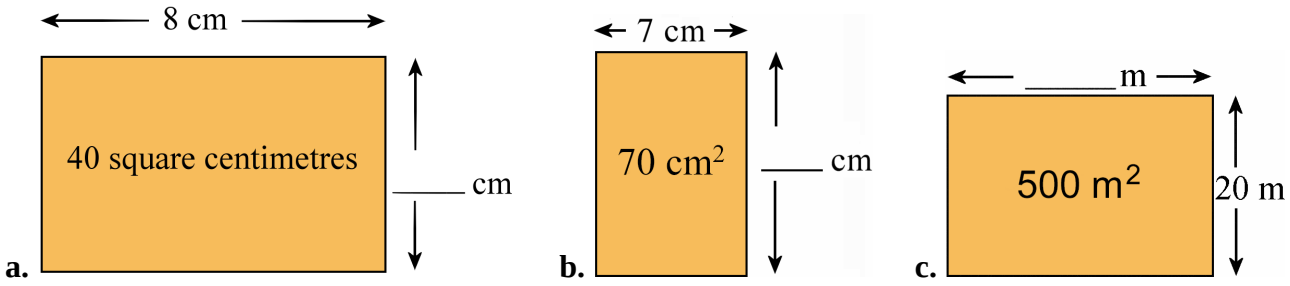
c.



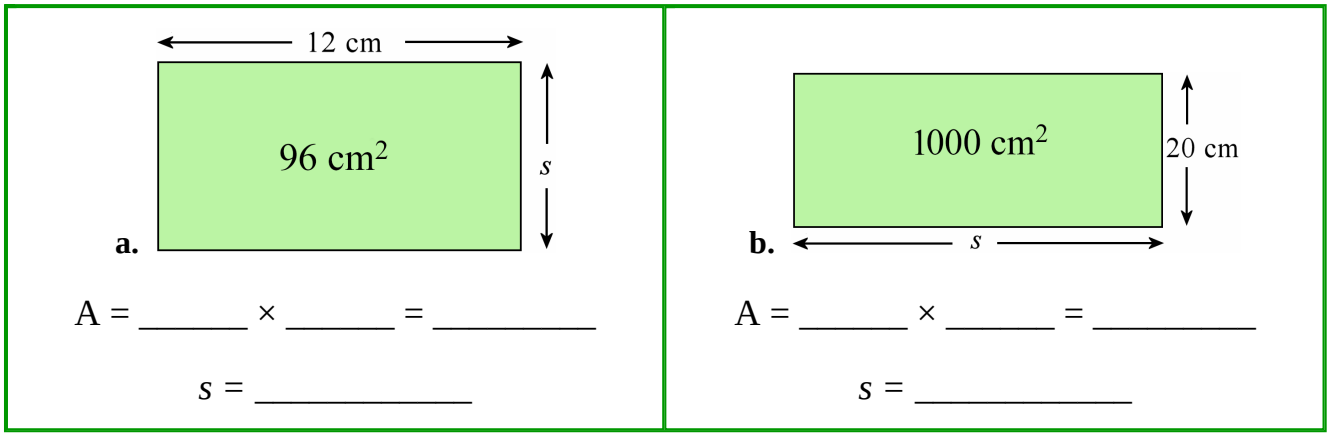
A = _____ × _____

= _____

2. Find the missing measurements.



3. Write an equation—a multiplication with an unknown—for the area. Then solve.



4. Write an equation (a multiplication with an unknown) for the area. Then solve.

a. The area of a rectangle is 45 m^2, and its one side measures 9 m.
How long is the other side (s)?

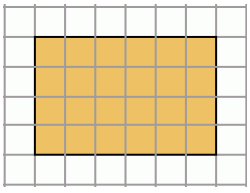
_____ × _____ = _____; s = _____

b. The area of a rectangular field is 500 m^2, and its one side measures 20 m.
How long is the other side (s)?

_____ × _____ = _____; s = _____

5. This is a plan for a doghouse. In the grid, the side of each little square is 15 cm.

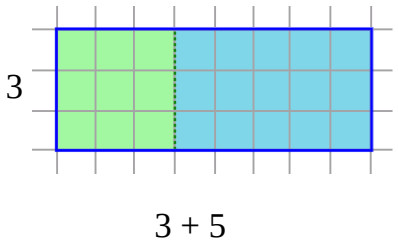
What is the area of the doghouse in square centimetres?



If we think of this rectangle as two rectangles, we can write its area as $3 \times 3 + 3 \times 5$.

But if we think of it as one rectangle with sides 3 units and (3 + 5) units, then we can write its area as $3 \times (3 + 5)$.

Those two are of course equal. So, thinking of it as one rectangle or two rectangles, we get:



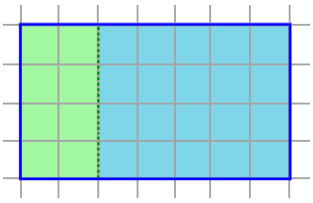
$3 \times (3 + 5) = 3 \times 3 + 3 \times 5$

area of the whole rectangle | area of the first part | area of the second part

6. Write a number sentence for the total area, thinking of one rectangle or two.

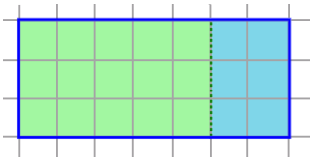
a. ___ × (___ + ___) = ___ × ___ + ___ × ___

area of the whole rectangle | area of the first part | area of the second part

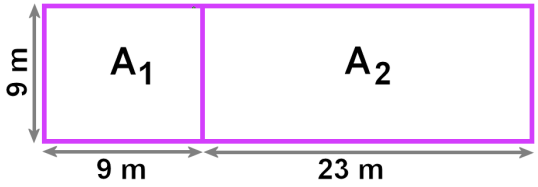


b. ___ × (___ + ___) = ___ × ___ + ___ × ___

area of the whole rectangle | area of the first part | area of the second part



7. This is a plan for a two-part clubhouse.



a. Write a multiplication and addition sentence for the total area, thinking of one rectangle or two. Solve it.

A = _____ × (_____ + _____)

= _____ × _____ + _____ × _____

= _____

b. How much larger in area is the part A_2 than the part A_1?

8. Answer. Optionally, you can sketch these squares on blank paper to help you.

a. A square has an area of 16 square centimetres. How long is its side? _____

b. A square has an area of 9 cm^2. How long is its side? _____

c. A square has an area of 1 square metre. How long is its side? _____

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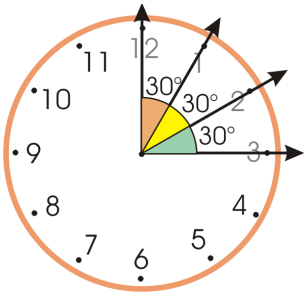
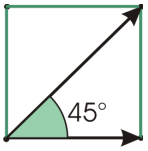
Estimating Angles

30° and 60° angles

The angle between two neighbouring clock hours is 30°.

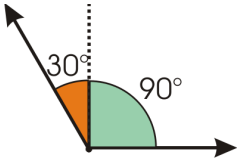


45° angle



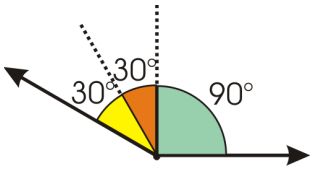
A diagonal of a square forms a 45° angle with the side of the square.

120° angle



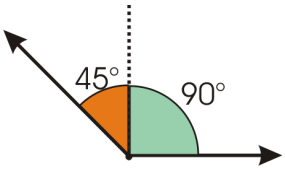
Add 30° to a right angle.

150° angle



Add yet another 30° angle.

135° angle

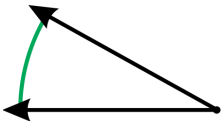


Add a 45° angle to a right angle.

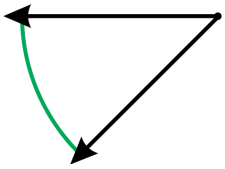
1. **a.** It is two o'clock. What angle is formed by the minute hand and the hour hand?

b. It is five o'clock. What angle is formed by the minute hand and the hour hand?

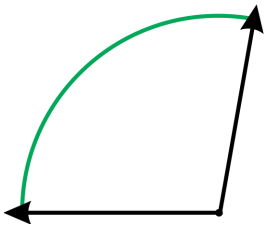
2. Estimate the angle measures in degrees.



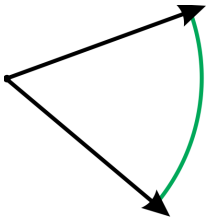
a. _____



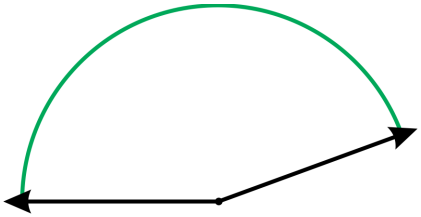
b. _____



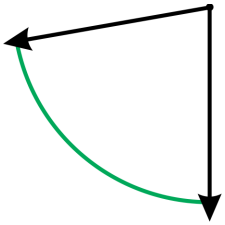
c. _____



d. _____

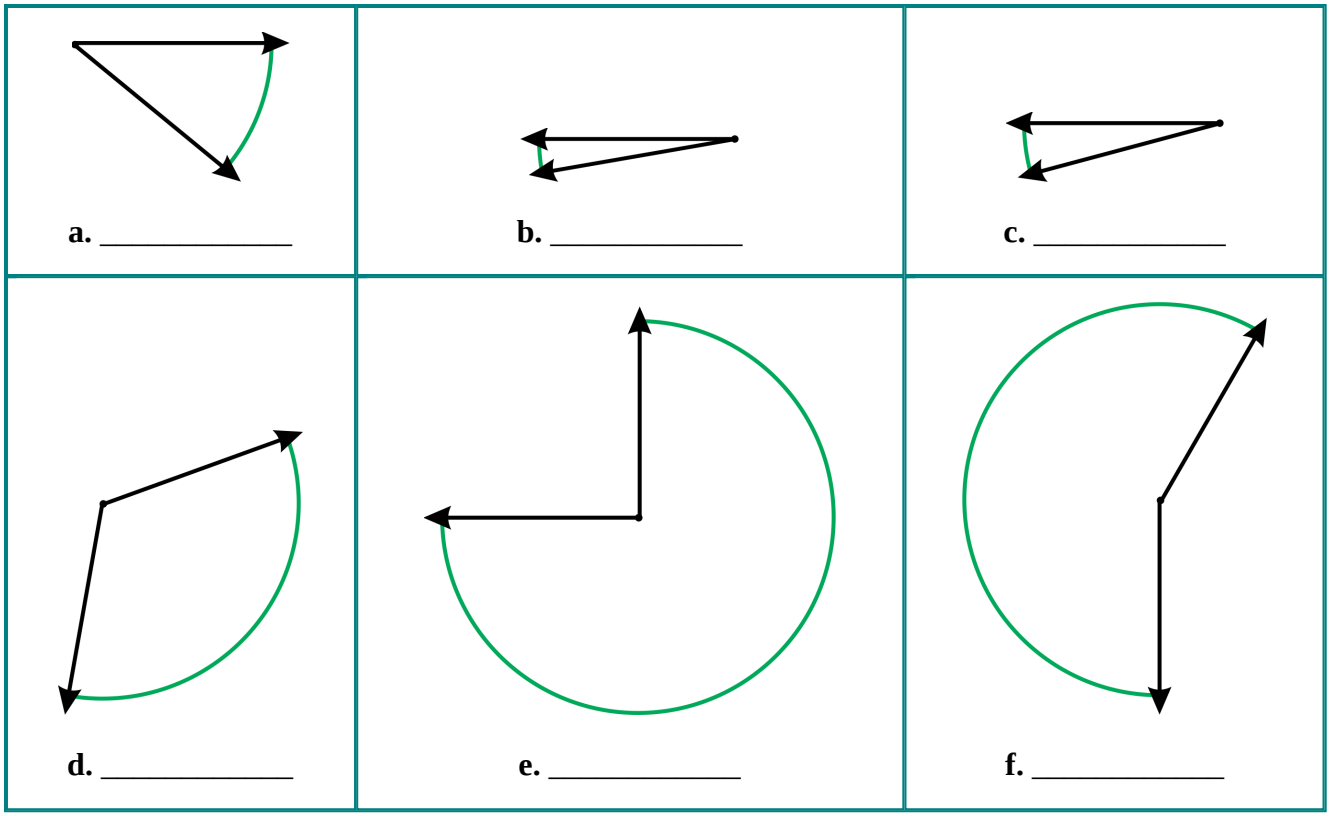


e. _____

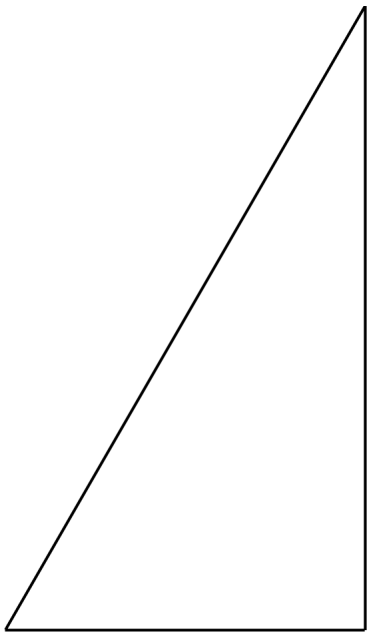


f. _____

3. Estimate the angle measures in degrees. Note that the last two angles are bigger than 180°—they are **reflex angles**.



4. Estimate the measures of all the angles in this triangle. Then measure with a protractor to check.



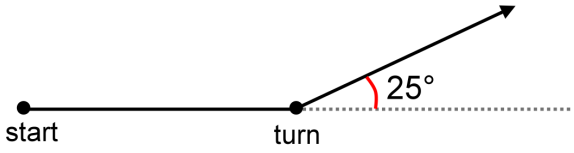
5. Draw these angles without using a protractor. In other words, estimate. After you have drawn the angle, measure it with a protractor to see how close you came to the correct angle.

a. 45°	**b.** 60°
c. 30°	**d.** 120°

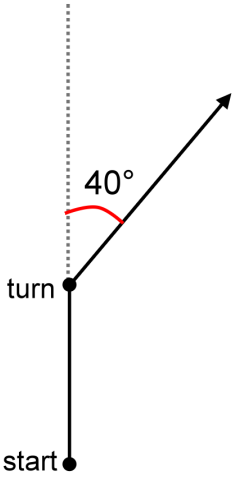
Turning in an angle (*This section is optional.*)

Look at the pictures. They show turning at a certain angle.

The two sides of the turning angle are the direction you *would have continued*, and the direction you actually go to.

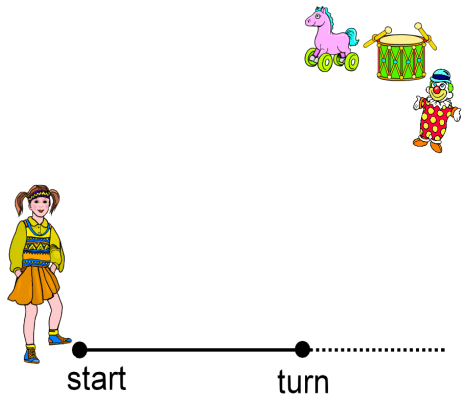


Turning 25° to the left.

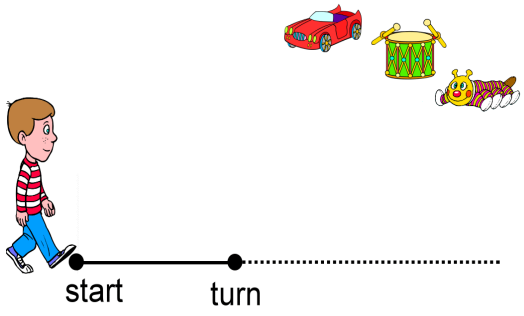


Turning 40° to the right.

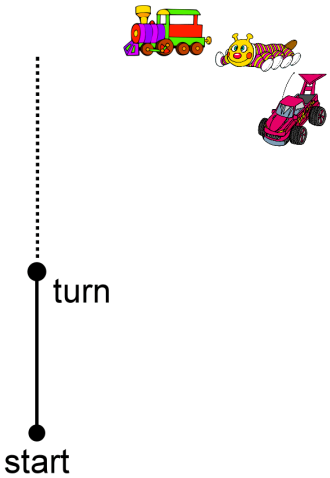
6. First estimate the turning angle and find which toy the child would get. Then check with a protractor.



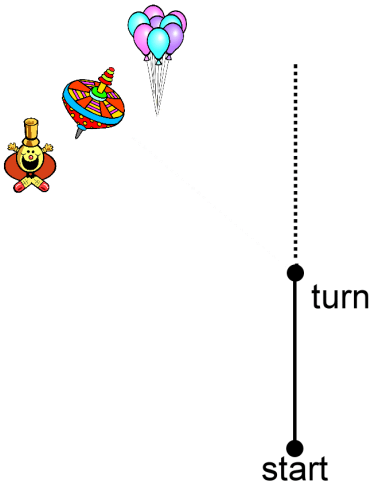
a. Jeanine turns 70° to her left.



b. Jack turns 30° to his left.

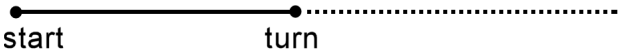


c. Turn 30° to the right.

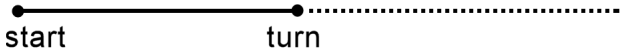


d. Turn 50° to the left

7. Sketch the route of a person who travels and then turns in a 45° angle to his right.



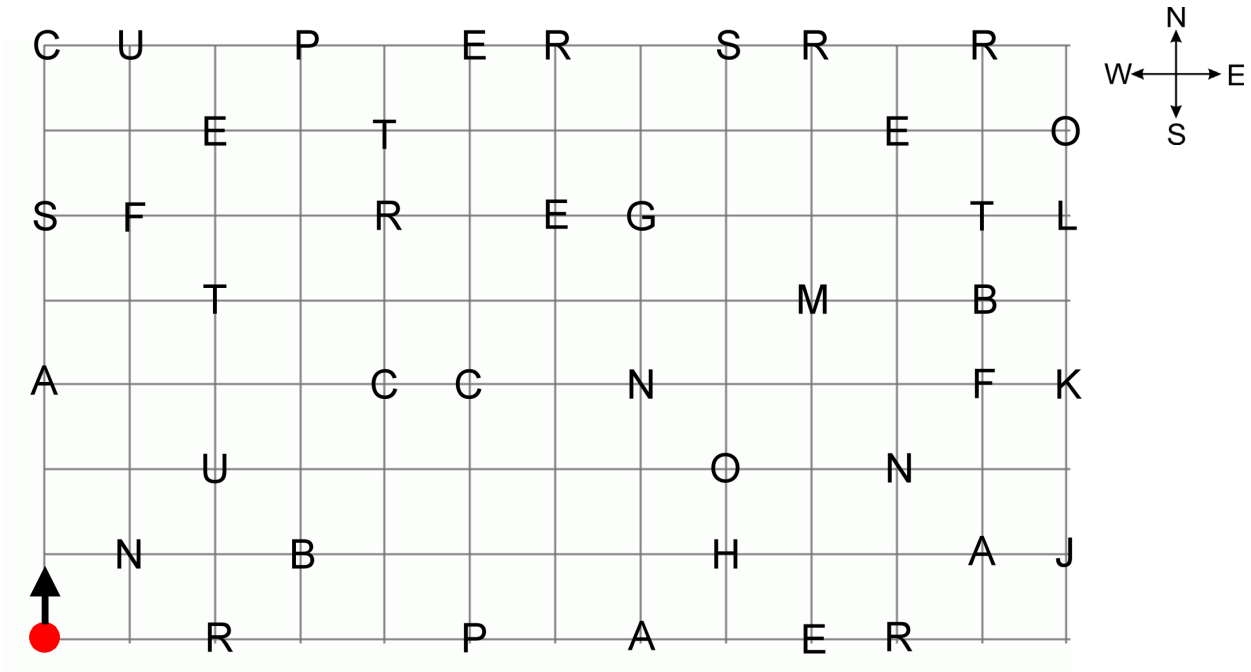
8. Sketch the route of a person who travels and then turns in a 60° angle to his left.



Puzzle Corner

Follow the directions, and "gather" all the letters you pass through. What message will they make?

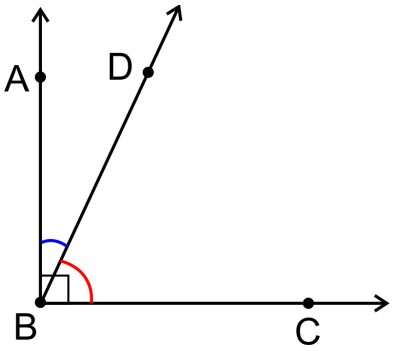
Start. Move five blocks to the north (up). Turn 30° to the right and go until you hit a letter. Turn due east. Go three blocks. Turn 45° to your right and go until you hit a letter. Turn due west. Go two blocks. Turn 30° to your left and continue till you hit a letter. At the letter, turn due south and continue four blocks. Turn 90° to your left and go two blocks. Turn 45° to your left and continue until the letter "R". Stop.



Angle Problems

1. Angle ABC is a right angle.

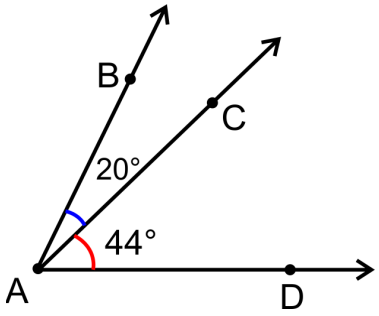
Think: can you *calculate* ∠ABD if you first measure∠DBC?



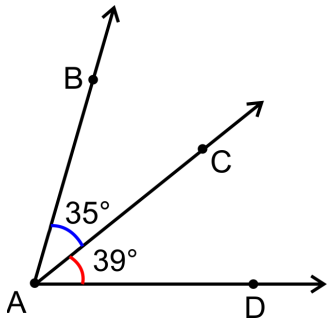
We can ADD angle measures when the angles share a vertex and they do not overlap.

Therefore,

$$\angle BAD = 20° + 44° = 64°$$

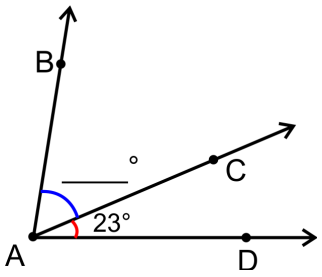


2. Figure out the unknown angle. Do *not* measure it. Use logical thinking!

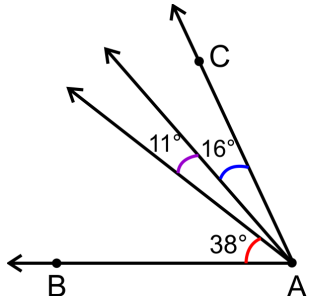


a. ∠BAD = _____°

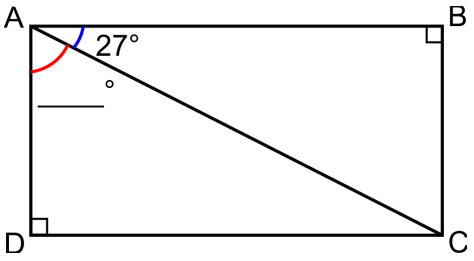
Note:
∠BAD = 81°



b. ∠BAC = _____°



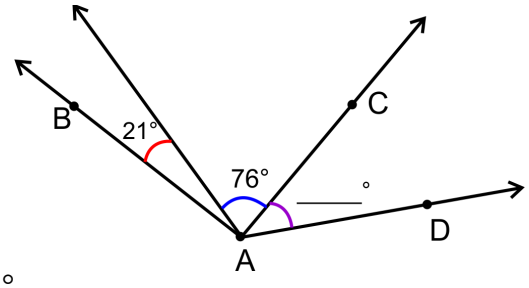
c. ∠BAC = _____°



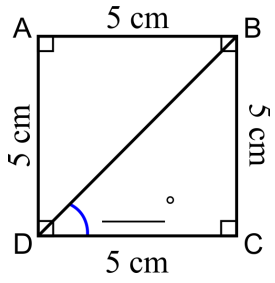
d. ∠CAD = _____°

3. Figure out the unknown angle. Do *not* measure it.

Note:
∠BAD = 132°



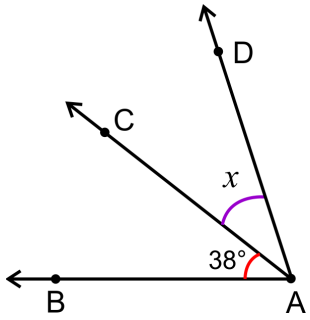
a. ∠CAD = _____°



b. ∠BDC = _____°

4. Write an addition for the angle measures. Use the unknown *x* for one angle measure. Then find what the unknown stands for. The first one is done for you.

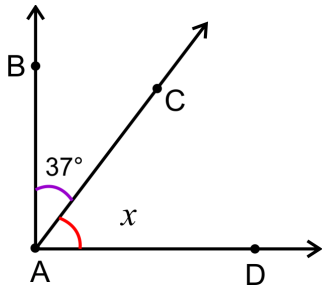
Note:
∠BAD = 72°



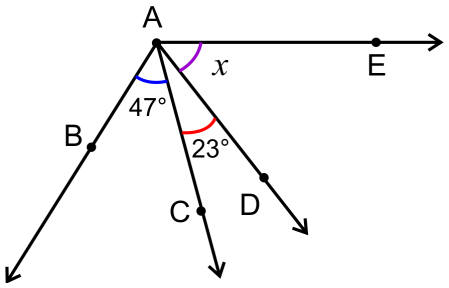
a. $38^\circ + x = 72^\circ$

$x = 34^\circ$

Note:
∠BAD = 90°

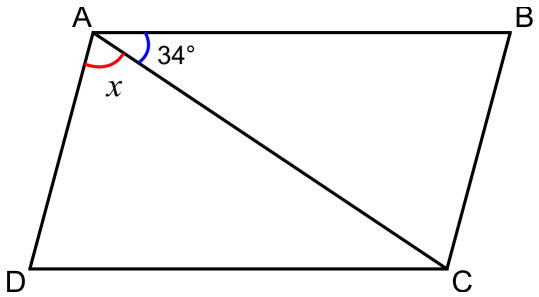


b.



Note: **∠BAE = 122°**

c.



Note: **∠BAD = 105°**

d.

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Chapter 7: Fractions
Introduction

In third grade, students have studied equivalent fractions and compared some easy fractions. In fourth grade, it is time to expand their knowledge of fraction topics. We study:

- mixed numbers
- adding and subtracting like fractions and mixed numbers with like fractional parts (sums where the denominators are the same, such as 5/6 + 3/6 or 1 2/3 + 2 1/3)
- equivalent fractions (for example, 2/3 = 8/12)
- comparing fractions
- multiplying a fraction by a whole number (for example 5 × ½)

Then in fifth grade, students tackle *all* four operations with fractions. This chapter is laying groundwork for that. The lessons here are important also because they are the basis for understanding decimal numbers, which is the topic of the next chapter.

In this grade, we continue studying fractions and their operations with the help of visual models. In addition to the visuals in the lessons, you can optionally also use fraction manipulatives, but they are not required.

Visual models help children build a strong conceptual understanding of fraction operations. While we do study some actual rules of fraction arithmetic in this chapter, we also want to avoid presenting fraction maths as a list of computational rules to be learned by rote memory. If students only memorise these rules, then they will also easily confuse them (eventually), because there are so many of them. The rules become *shortcuts* for ideas that are already understood, but we don't want to start with them. The goal is to let the ideas and concepts "sink in" first, and then study the shortcuts.

A friendly reminder: don't automatically assign all the exercises. As always, use your judgement.

The Lessons in Chapter 7

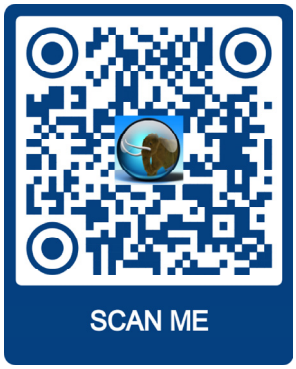
Helpful Resources on the Internet

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 maths concepts;
- **articles** that teach a maths 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/gr4ch7



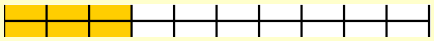
One Whole and Its Fractional Parts

A fraction always relates to some kind of *one whole*. Study the examples below:

Let's say the one whole is this square. It is divided into 12 parts.

Each part is $\frac{1}{12}$ of the whole. Also, we can write $1 = \frac{12}{12}$.

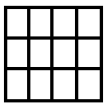
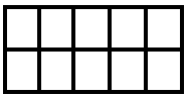
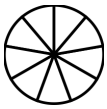
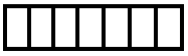
Maybe the one whole is this line, and $\frac{3}{10}$ of it is coloured.



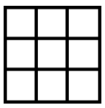
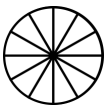
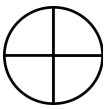
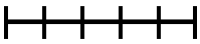
Maybe the one whole is Dad's salary. To find 5/6 of it, imagine dividing the salary into 6 parts, and taking five of those parts. All six parts form the one whole, or $\frac{6}{6} = 1$

$\frac{7}{12}$ The top number is the **numerator**. It *numerates* or counts *how many pieces* there are.
The bottom number is the **denominator**. It *denominates* or *names* what kind of parts they are.

1. Colour parts. Write the coloured part *and* the white (uncoloured) part as a fraction.

a. Colour 1 part.	**b.** Colour 5 parts.	**c.** Colour 8 parts.	**d.** Colour 3 parts.
			
$\frac{1}{12}$ and ___	and	and	and

2. Colour and write one whole as a fraction.

				
a. 1 = ___	**b.** 1 = ___	**c.** 1 = ___	**d.** 1 = ___	**e.** 1 = ___

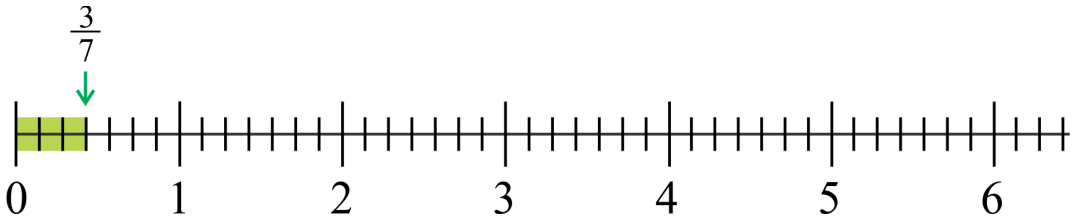
3. Solve.

a. The Jiyane family ate $\frac{3}{4}$ of the pie.
How much is left?

b. Jali ate $\frac{1}{6}$ of the pizza.
How much is left?

c. Five boys shared a chocolate bar equally. Each one got ___ of the bar.

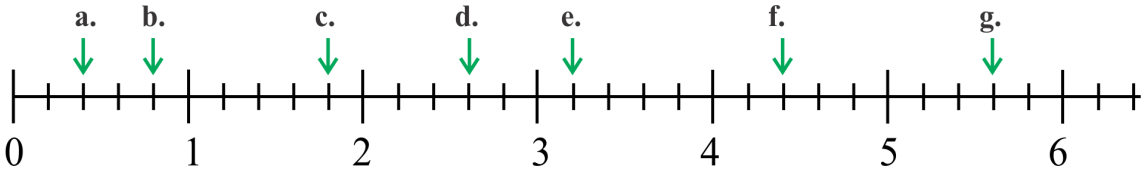
To show 3/7 on a number line, each whole-number interval (from 0 to 1, from 1 to 2, from 2 to 3, and so on) is divided into seven parts. Three of those parts are coloured to show 3/7.



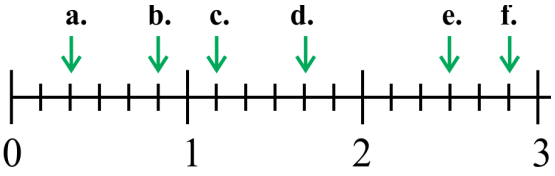
In a **mixed number**, we have a whole number and a fraction. The number line below shows 2 2/7 (two and two sevenths).

In problems 4 - 6, write the fractions and mixed numbers that the arrows mark on the number line.

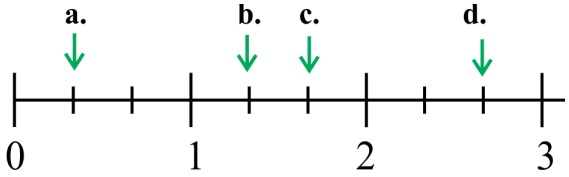
4.



5.



6.

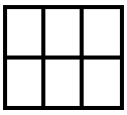
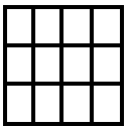
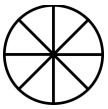
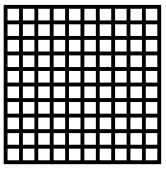


7. Mark the mixed numbers on the number line:

a. 1 2/4 **b.** 3/4 **c.** 4 1/4 **d.** 5 1/2 **e.** 3 1/4 **f.** 2 3/4

Hint: First divide each whole-number interval into four parts (using three tick marks).

8. Colour. Then write an addition, adding the coloured and white parts. Notice what sum you get.

a. Colour 1 part.	**b.** Colour 10 parts.	**c.** Colour 3 parts.	**d.** Colour 15 parts.
 $\frac{1}{6} + \frac{\quad}{\quad} = 1$			

9. Find what fraction is missing from one whole.

a. $\frac{3}{4} + \frac{\quad}{\quad} = 1$ **b.** $\frac{6}{7} + \frac{\quad}{\quad} = 1$ **c.** $\frac{1}{8} + \frac{\quad}{\quad} = 1$ **d.** $\frac{11}{12} + \frac{\quad}{\quad} = 1$

10. **a.** Mary drank $\frac{1}{4}$ litre of juice from a 1-litre pitcher, and her brother drank another $\frac{1}{4}$ litre. How much juice is left in the pitcher?

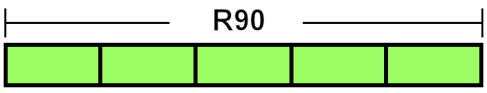
b. A loaf of bread was cut into 20 slices. Jack and John ate three slices each. What fractional part of the bread is left?

11. Let's revise how to find a fractional part using division.

a. Remember division? Find 1/10 of 90 km.

Then find 4/10 of 90 km.

b. The cost of a meal at a restaurant was R90. It was divided so that Cindy paid 2/5 of it and Sandra paid 3/5 of it.



How many rand did Cindy pay?

How many rand did Sandra pay?

c. Dad used 2/9 of his R6300 pay cheque.

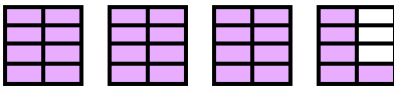
What fractional part is left of his pay cheque?

How many rand are left of his pay cheque?

Mixed Numbers

Mixed numbers have two parts: a whole-number part and a fractional part.

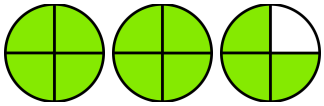
This picture illustrates $3\frac{5}{8}$: *three and five eighths*.



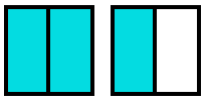
Notice: the coloured portion is $3\frac{5}{8}$. The uncoloured part is $\frac{3}{8}$.

If we add the coloured and uncoloured parts, we get four wholes: $3\frac{5}{8} + \frac{3}{8} = 4$.

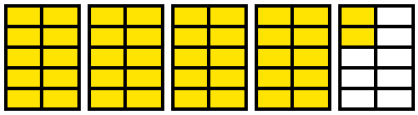
1. Write the mixed numbers these pictures illustrate.



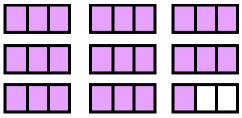
a.



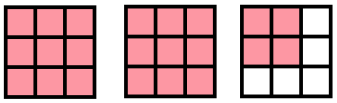
b.



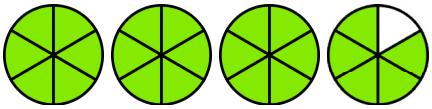
c.



d.



e.

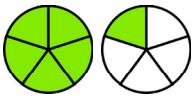


f.

2. Write an addition sentence, adding what is coloured and what is not. Look at the example.

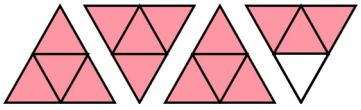
a. $2\frac{2}{4} + \frac{2}{4} = 3$

b.

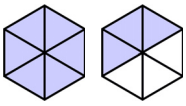


c.

d.



e.



f.

3. How much is missing from the next whole number?

a. $1\frac{1}{4} + \square = 2$

b. $3\frac{2}{10} + \square = 4$

c. $8\frac{4}{9} + \square = 9$

d. $5\frac{1}{8} + \square = 6$

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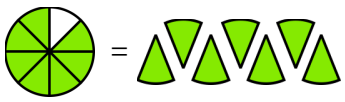
Multiplying Fractions by Whole Numbers

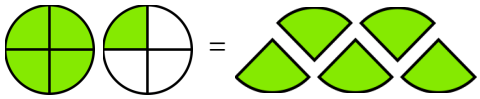
You already know that $\frac{7}{8}$ is seven copies of $\frac{1}{8}$.

From this we can write a multiplication: $\frac{7}{8} = 7 \times \frac{1}{8}$.



Similarly, $1\frac{1}{4}$ is $\frac{5}{4}$ *(as a fraction)*, so it is five copies of $\frac{1}{4}$.

From this we can write a multiplication: $1\frac{1}{4} = 5 \times \frac{1}{4}$.



1. Fill in.

a. 

$\frac{3}{7} = 3 \times \frac{\square}{\square}$

b. 

$\frac{6}{9} = \square \times \frac{\square}{\square}$

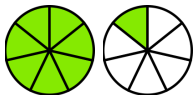
c. 

$4 \times \frac{1}{5} = \frac{\square}{\square}$

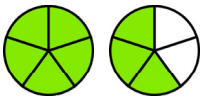
d. 

$7 \times \frac{1}{10} = \frac{\square}{\square}$

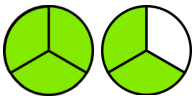
2. Fill in.

a. 

$\frac{8}{7} = 8 \times \frac{\square}{\square}$

b. 

$1\frac{3}{5} = \frac{\square}{5} = 8 \times \frac{\square}{\square}$

c. 

$1\frac{2}{3} = \frac{\square}{3} = \square \times \frac{\square}{\square}$

d. $10 \times \frac{1}{6} = \frac{\square}{\square} = \frac{\square}{\square}$

e. $7 \times \frac{1}{4} = \frac{\square}{\square} = \frac{\square}{\square}$

f. $9 \times \frac{1}{3} = \frac{\square}{\square} =$

3. **a.** Mary is preparing a dinner for 10 people. She needs to buy 1/6 kg of chicken per person. How many kilograms of chicken will she need to buy (at least)?

b. Between what two whole numbers does your answer lie?

c. She will also prepare 1/2 litre of juice for each guest. How many litres of juice will she need?

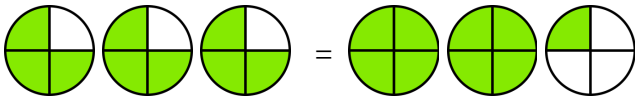
Example 1. Look at the picture.

It illustrates $3 \times \frac{3}{4}$ as three copies of $\frac{3}{4}$.

How many fourths are there in total?

There are nine fourths. So, $3 \times \frac{3}{4} = \frac{9}{4}$.

As a mixed number, this is 2 ¼.

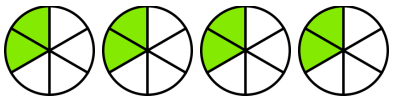


$$3 \times \frac{3}{4} = \frac{9}{4} = 2\frac{1}{4}$$

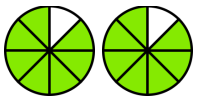
4. Multiply.

a. 

$3 \times \frac{2}{4} = \frac{\quad}{\quad} = \frac{\quad}{\quad}$

b. 

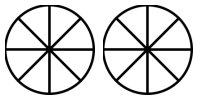
$4 \times \frac{2}{6} = \frac{\quad}{\quad} = \frac{\quad}{\quad}$

c. 

$2 \times \frac{7}{8} = \frac{\quad}{\quad} = \frac{\quad}{\quad}$

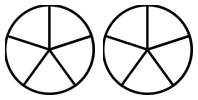
5. Colour repeatedly to solve the multiplications. *Give your answer as a mixed number.*

a. Colour five times (copies of) $\frac{3}{8}$.



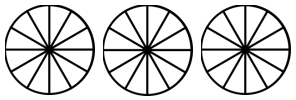
$5 \times \frac{3}{8} =$

b. Colour four times (copies of) $\frac{2}{5}$.



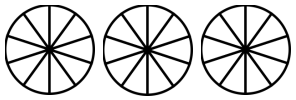
$4 \times \frac{2}{5} =$

c. Colour five times $\frac{7}{12}$.

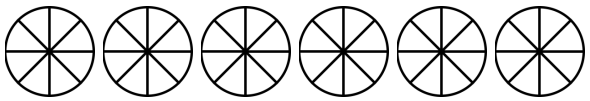


$5 \times \frac{7}{12} =$

d. Colour five times $\frac{6}{10}$.



$5 \times \frac{6}{10} =$

e. 

$9 \times \frac{5}{8} =$

Can you find a shortcut for these problems?

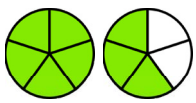
If you can, use it to solve the problems below. (*If not, don't worry about it.*)

f. $4 \times \frac{2}{3} =$

g. $3 \times \frac{4}{10} =$

h. $2 \times \frac{5}{6} =$

6. Fill in.

a. 

$\frac{8}{5} = 4 \times \frac{\quad}{\quad}$

b. 

$\frac{9}{4} = 3 \times \frac{\quad}{\quad}$

c. 

$2\frac{2}{3} = 2 \times \frac{\quad}{\quad}$

To multiply a whole number by a fraction, find the total number of "pieces".
This means you multiply the whole number and the top number of the fraction.

Example 2. $6 \times \frac{2}{5}$ means 6 × 2 pieces, or 12 pieces. Each piece is a fifth. So, we get $\frac{12}{5}$.

Lastly, change $\frac{12}{5}$ into a mixed number: it is $2\frac{2}{5}$.

Example 3. Multiplication can be done in either order.

So, $5 \times \frac{3}{8}$ is the same as $\frac{3}{8} \times 5$. They both equal $\frac{5 \times 3}{8} = \frac{15}{8}$, which is $1\frac{7}{8}$.

7. Solve. Give your answer as a mixed number if possible.

a. $5 \times \frac{1}{4} =$	**b.** $3 \times \frac{2}{3} =$	**c.** $4 \times \frac{2}{7} =$
d. $7 \times \frac{2}{10} =$	**e.** $\frac{3}{8} \times 6 =$	**f.** $7 \times \frac{2}{100} =$
g. $\frac{7}{10} \times 3 =$	**h.** $6 \times \frac{12}{100} =$	**i.** $\frac{11}{10} \times 3 =$
j. $\frac{5}{8} \times 5 =$	**k.** $2 \times \frac{4}{3} =$	**l.** $\frac{7}{4} \times 2 =$

8. The side of a square is 7/8 km. What is its perimeter?

9. Bonga's toy blocks are 3 2/5 cm tall each.

a. How tall is a stack of six of them?

b. How about a stack of 18?

10. Sello prepares a pasta dish with meat for 8 people.
He plans to buy 1/8 kg of meat per person.
How much meat should he buy?

Chapter 8: Decimals
Introduction

In fourth grade, students learn about decimal numbers that have one or two decimal digits, and they learn to add and subtract them. It is important to grasp these simple topics well because we are laying a groundwork for fifth and sixth grades where decimal operations take "centre stage."

The focus is, first of all, on understanding that decimals are simply fractions with a denominator of 10 or 100. Then with that in mind, we study comparing, adding, and subtracting them.

Take note of this common misconception that students have. Many students add 0,5 + 0,9 = 0,14. The correct way to view 0,5 + 0,9 is as 5 tenths plus 9 tenths, which is 14 tenths = 1,4.

An example of another misconception is when a student adds 0,5 + 0,11 = 0,16. This student is thinking of the decimal parts as if they were "whole numbers" and adding 5 + 11 = 16. To solve 0,5 + 0,11 correctly, students can rewrite 0,5 as 0,50, and then the problem becomes 0,50 + 0,11 = 0,61.

In the lesson *Using Decimals with Measuring Units*, students encounter decimals in connection with metric units, such as 0,1 km or 2,4 kg, and they also convert between the units, such as writing 0,5 km as 500 m. This topic will be studied further in 5th grade.

The Lessons in Chapter 8

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:

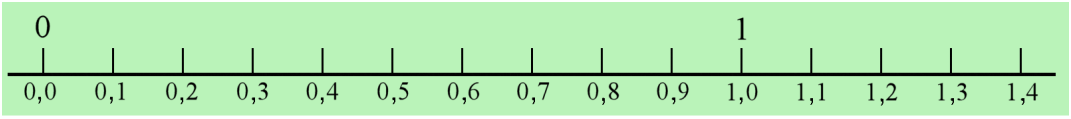
- **online practice** for concepts;
- online **games**, or occasionally, printable games;
- **animations** and interactive **illustrations** of maths concepts;
- **articles** that teach a maths concept.

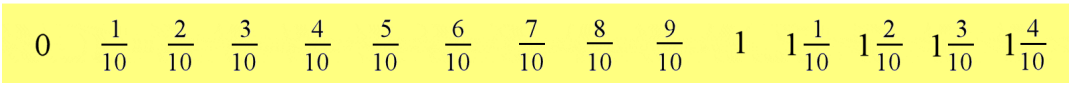
We heartily recommend you take a look at the list. Many of our customers love using these resources to supplement the bookwork. You can use the resources as you see fit for extra practice, to illustrate a concept better and even just for some fun. Enjoy!

https://links.mathmammoth.com/gr4ch8

Decimal Numbers—Tenths

The number line between 0 and 1 is divided into ten parts. Each of these ten parts is $\frac{1}{10}$, a **tenth**.





Under the tick marks, you see **decimal numbers** such as 0,1, 0,2, 0,3, and so on.

These are the same numbers as the fractions $\frac{1}{10}$, $\frac{2}{10}$, $\frac{3}{10}$, and so on.

The digit right after the decimal comma (such as the digit 3 in 0,3) tells us **how many tenths** the number has. That digit is in the tenths place. So, 0,3 means—and is read as—three tenths.

0,6 means six tenths, or $\frac{6}{10}$.

1,5 means 1 whole and 5 tenths, or $1\frac{5}{10}$.

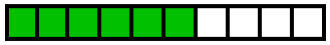
Note: $\frac{1}{8}$ is ***not*** 0,8. Instead, 0,8 is eight tenths, or $\frac{8}{10}$. The denominator is always 10!

1. Write the fractions as decimals and vice versa.

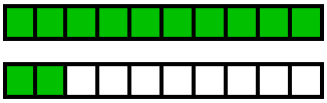
a. $\frac{7}{10}$	**b.** $2\frac{4}{10}$	**c.** $10\frac{9}{10}$	**d.** 0,9	**e.** 29,3

2. Write the decimal and the fraction that each picture shows.

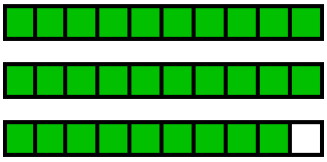
a.



b.

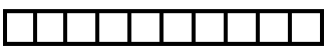


c.



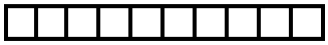
3. Shade parts to show the decimals.

a.



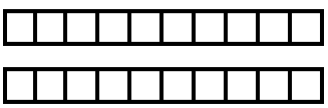
0,4

b.



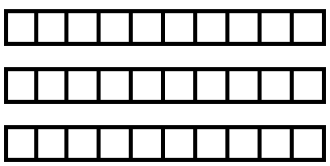
0,1

c.



1,6

d.

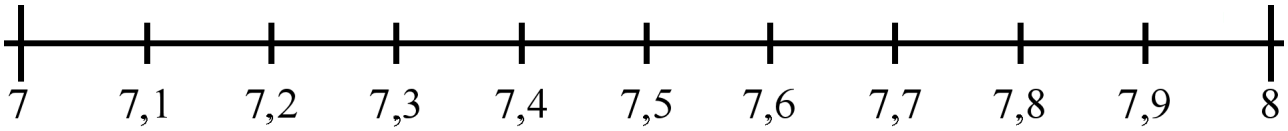


2,8

"**Decimal**" comes from the Latin word *decem*, which simply means "**ten**." The way we write numbers is a **decimal number system**, because it is based on number ten: we use ten different digits (from 0 to 9) and write digits in places such as the ones place, tens place, hundreds place, and so on, each of those places having a value that is ten times the value of the previous place.

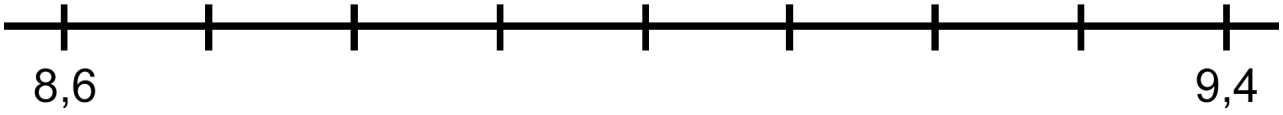
In common language, the word "decimal number" has come to mean numbers which have digits after the decimal comma, such as 5,8 or 9,302. In reality, any number within the decimal number system could be termed as a decimal number, including whole numbers such as 12 or 381.

4. Write a mixed number under each decimal number.

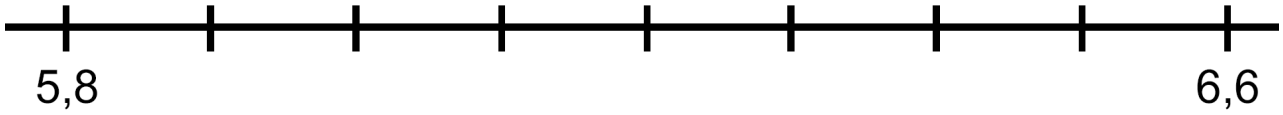


5. Label the tick marks with decimal numbers.

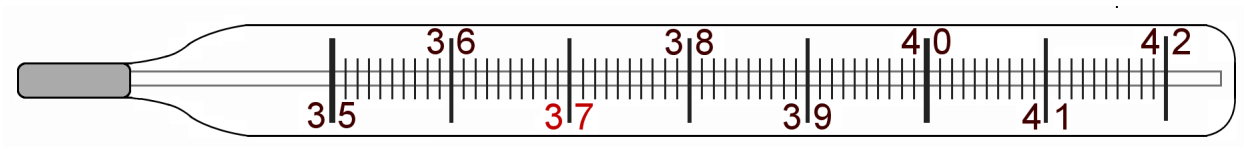
a.



b.



6. **a.** Mark these temperatures with dots on the thermometer:
37,4°C, 36,2°C, 38,7°C, 41,8°C, 40,5°C



b. Which temperatures would indicate a fever?

7. Compare. Write $<$, $>$, or $=$ between the numbers.

a. 0,5 ☐ 0,9	**b.** 1,3 ☐ 0,3	**c.** 5,1 ☐ 49	**d.** 0,4 ☐ $\frac{1}{2}$	**e.** 16,0 ☐ 16

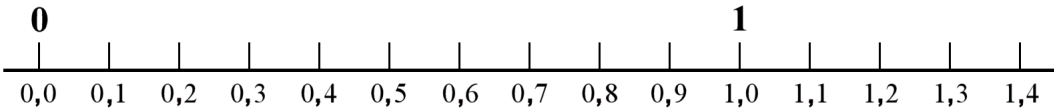
8. Write in order from the smallest to the largest number:

1,2 0,9 2,6 0,1 $2\frac{1}{2}$ 2,3 3,0 $\frac{1}{2}$

Adding and Subtracting with Tenths

You already know how to add or subtract decimals that have tenths, such as 0,8 + 0,5. They are just fractions with a denominator of 10. Compare the two additions in each box. One of them is written with decimals and the other with fractions.	$0{,}1 + 0{,}5 = 0{,}6$ $\frac{1}{10} + \frac{5}{10} = \frac{6}{10}$	$8{,}4 - 2{,}3 = 6{,}1$ $8\frac{4}{10} - 2\frac{3}{10} = 6\frac{1}{10}$
There is one tricky thing: 0,6 + 0,7 *is* **NOT** 0,13! To see why, add the corresponding fractions. Notice that six-tenths and seven-tenths makes thirteen-tenths, which is more than one!	$0{,}6 + 0{,}7 = 1{,}3$ $\frac{6}{10} + \frac{7}{10} = \frac{13}{10} = 1\frac{3}{10}$	$1{,}5 + 0{,}9 = 2{,}4$ $1\frac{5}{10} + \frac{9}{10} = 2\frac{4}{10}$

1. Write an addition *or* subtraction sentence for each "number-line jump.



a. You are at 0,7, and you jump *five tenths* to the right. _____

b. You are at 0,6, and you jump *eight tenths* to the right. _____

c. You are at 1,1, and you jump *eight tenths* to the left. _____

d. You are at 1,3, and you jump *four tenths* to the left. _____

e. You are at 0,2, and you jump *eleven tenths* to the right. _____

2. Solve the fraction additions, and then write them using decimals.

a. $\frac{2}{10} + \frac{7}{10} =$ *0,2 +*	**b.** $\frac{5}{10} + \frac{6}{10} =$	**c.** $\frac{9}{10} + \frac{8}{10} =$

3. Add or subtract.

a.	**b.**	**c.**	**d.**
0,9 + 0,2 = _____	0,5 + 0,7 = _____	0,8 + 0,7 = _____	1,8 − 0,9 = _____
1,9 + 0,2 = _____	3,5 + 0,7 = _____	0,8 + 2,7 = _____	5,8 − 0,9 = _____

4. Calculate.

a.	**b.**	**c.**	**d.**
2,3 + 0,9 = _____	1,5 + 0,7 = _____	6,6 − 0,5 = _____	4,7 − 1,7 = _____

5. Write the numbers.

a. 3 tenths, 5 ones

b. 7 tens, 8 ones, 4 tenths

c. 4 tenths, 3 ones, 6 tens

T	O		te
4	**7**	**,**	**5**

In this place value chart, "T" means tens, "O" means ones, and "te" means tenths.

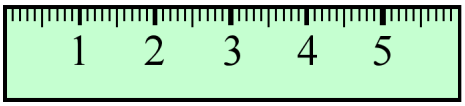
We can see that the number 47,5 has 4 tens, 7 ones, and 5 tenths.

6. Continue the patterns by adding or subtracting the same number repeatedly.

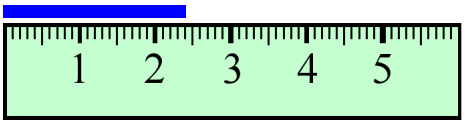
a. 0,1	**b.** 1,1	**c.** 2,5	**d.** 3,6
+ 0,2 = _____	+ 0,5 = _____	+ 0,3 = _____	− 0,4 = _____
+ 0,2 = _____	+ 0,5 = _____	+ 0,3 = _____	− 0,4 = _____
+ 0,2 = _____	+ 0,5 = _____	+ 0,3 = _____	− 0,4 = _____
+ 0,2 = _____	+ 0,5 = _____	+ 0,3 = _____	− 0,4 = _____
+ 0,2 = _____	+ 0,5 = _____	+ 0,3 = _____	− 0,4 = _____
+ 0,2 = _____	+ 0,5 = _____	+ 0,3 = _____	− 0,4 = _____

7. Remember: **1 millimetre is one-tenth of a centimetre.** Or, 1 mm = 0,1 cm.

a. Draw a line that is 4,7 cm long.



b. Measure the line in centimetres. Use a decimal.



8. In (a) and (b), convert. In (c), add and give your answer in centimetres.

a. 0,5 cm = _____ mm

1,2 cm = _____ mm

b. 7 mm = _____ cm

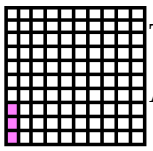
35 mm = _____ cm

c. 5 mm + 0,9 cm = _____ cm

4 cm + 3,4 cm = _____ cm

9. The two sides of a rectangle measure 6,5 cm and 3,6 cm. Draw the rectangle on blank paper. What is its perimeter?

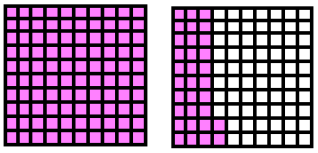
Two Decimal Digits—Hundredths



This is 3 hundredths (3/100).

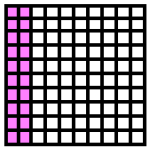
As a decimal, we write **0,03**.

Read 0,03 as "three hundredths."



This is 1 and 32 hundredths (1 32/100). As a decimal, we write **1,32**.

Read 1,32 as "one and 32 hundredths."

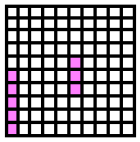


This is 20 hundredths (20/100). As a decimal, we write it as **0,20**.

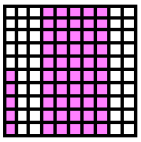
It is *also* two tenths (2/10 or 0,2), because it is two columns, and each column is one-tenth of the whole. So, 0,20 = 0,2, or 20 hundredths equals 2 tenths.

The two decimal digits after the decimal comma indicate *hundredths*.

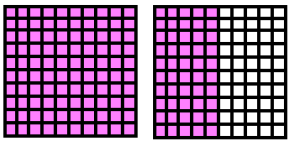
1. Write the number that each picture illustrates as a decimal *and* as a fraction or mixed number. Then read the decimals aloud.



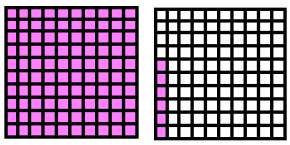
a. _____ =



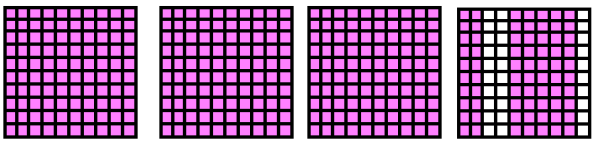
b. _____ =



c. _____ =

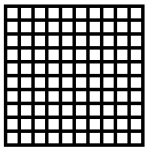


d. _____ =

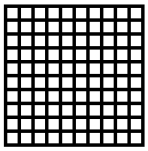


e. _____ =

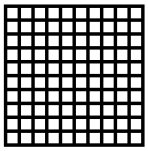
2. Colour to illustrate the decimals. Then write them as fractions. Read the decimals aloud.



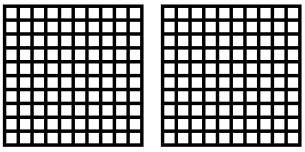
a. 0,52 =



b. 0,7 =



c. 0,09 =



d. 1,08 =