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Foreword

Math Mammoth Grade 4, International 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 international use in a few aspects (listed below). The curriculum meets the Common Core Standards in the United States, but it may not properly align to the fourth grade standards in your country. However, you can probably find material for any missing topics in the neighbouring grades of Math Mammoth.

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

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

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

1. Students develop understanding and fluency with multi-digit multiplication, and use efficient multiplication procedures to solve problems.
2. They develop understanding of division to find quotients involving multi-digit dividends (long division), and they solve word problems involving division, including division with a remainder.
3. Students develop an understanding of fraction equivalence and some operations with fractions. They learn to add and subtract fractions with same denominators, and to multiply a fraction by a whole number.
4. Students learn the concept of angle. They draw and identify lines and angles, and classify shapes by properties of their lines and angles.

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

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

I 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

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

Most lessons are 2 or 3 pages long, intended for 1-2 days. Some lessons are 4-5 pages and can be covered in two days. There are also some optional lessons (not included in the tables on the right).

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

The table below lists how many pages there are for the student to finish in this particular grade level, and gives you a guideline for how many pages per day to finish, assuming a 180-day (36-week) school year. The page count in the table below *includes* the optional lessons.

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	174	88	8	80	2.18	10.9
4-B	183	92	8	84	2.18	10.9
Grade 4 total	357	180	16	164	2.18	10.9

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

Grade level	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	174					
4-B	183					
Grade 4 total	357					

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

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

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 student finds maths enjoyable, they can of course spend more time with it! However, it is not good to drag out the lessons on a regular basis, because that can then affect the student's attitude towards 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. $200 + \underline{\quad} = 1000$). 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 revision 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.

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

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.

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

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. As applications, 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.” As a general guideline, 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.

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

Pacing Suggestion for Chapter 1

This table does not include the chapter test, as it is found in a different place. Please add one day to the pacing for the test if you use it.

The Lessons in Chapter 1	page	span	suggested pacing	your pacing
Addition Revision	15	3 pages	2 days	
Adding in Columns	18	1 page	1 day	
Subtraction Revision	19	3 pages	2 days	
Subtract in Columns	22	3 pages	2 days	
Patterns and Mental Maths	25	2 pages	1 day	
Patterns in Pascal’s Triangle (optional)	27	(2 pages)	1 day	
Bar Models in Addition and Subtraction	29	4 pages	2 days	
Order of Operations	33	2 pages	1-2 days	
Making Bar Graphs	35	2 pages	1 day	
Line Graphs	37	3 pages	2 days	
Rounding	40	3 pages	2 days	
Estimating	43	2 pages	1 day	
Money and Discounts	45	3 pages	2 days	
Calculate and Estimate Money Amounts	48	3 pages	2 days	
Revision, Chapter 1	51	2 pages	1 day	
Chapter 1 Test (optional)				
TOTALS		36 pages	23-24 days	
with optional content		(38 pages)	(22-23 days)	

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

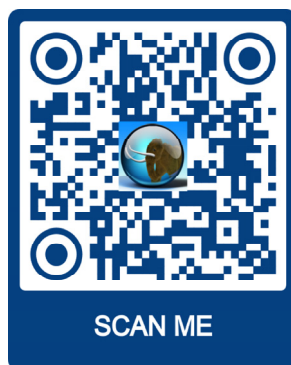
Helpful Resources on the Internet

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.

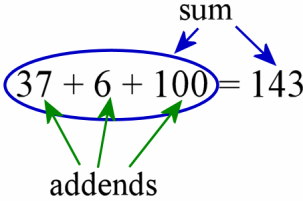
We heartily recommend you take a look at the list. Many of our customers love using these resources to supplement the bookwork. You can use the resources as you see fit for extra practice, to illustrate a concept better and even just for some fun. Enjoy!

<https://links.mathmammoth.com/gr4ch1>



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

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. Emma 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?

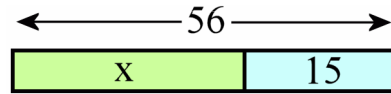
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Bar Models in Addition and Subtraction

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 two addition and two subtraction sentences—a **fact family**.

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



$$x + 15 = 56$$

$$56 - x = 15$$

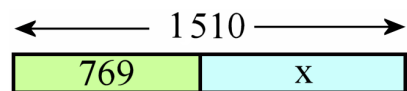
$$15 + x = 56$$

$$56 - 15 = x$$

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

$$769 + x = 1510$$

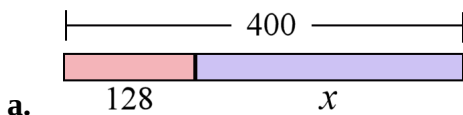
We can solve it by subtracting the one part (769) from the total (1510).



$$769 + x = 1510$$

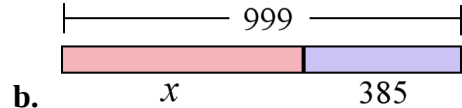
$$x = 1510 - 769 = 741$$

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



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

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



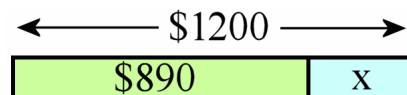
$$\underline{\hspace{2cm}} + \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

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

c. A laptop costs \$1200. Dad has \$890.
How much more does he need to buy it?

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

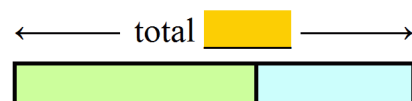
$$x = \underline{\hspace{2cm}} - \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$



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

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

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



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 Ames family travelled 420 km yesterday and 370 km today. How many kilometres do they have left to travel?



Addition:

Solution: $x = \underline{\hspace{2cm}}$

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

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

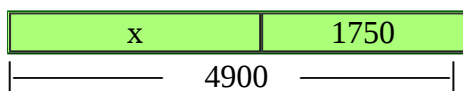
- d. After travelling 56 kilometres, Dad said, "Okay, in 9 km we will be in Sidney, and from there we will have 118 km left." How many kilometres in total is the trip?



Addition:

Solution: $x = \underline{\hspace{2cm}}$

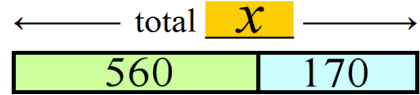
3. Make a word problem that matches the model. Then solve for x .



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

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

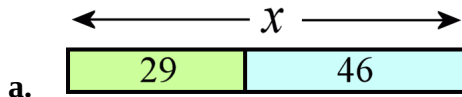
Look at the bar model. We can solve x by adding.



$$x - 170 = 560$$

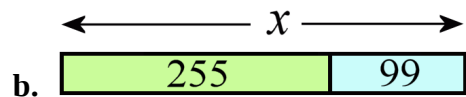
$$x = 170 + 560 = 730$$

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



$$x - 29 = \underline{\hspace{2cm}}$$

$$x = \underline{\hspace{2cm}} + \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$



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

$$x = \underline{\hspace{2cm}} + \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

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

a. $\underline{\hspace{2cm}} - 4 = 20$

b. $\underline{\hspace{2cm}} - 15 = 17$

c. $\underline{\hspace{2cm}} - 22 - 7 = 70$

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

d. $x - 8 = 7$

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

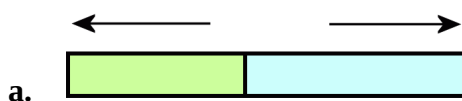
e. $x - 24 = 48$

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

f. $x - 300 - 50 = 125$

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

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 .



$$52 - x = 28$$

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



$$97 - x = 54$$

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

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

a. $20 - \underline{\hspace{2cm}} = 12$

b. $55 - \underline{\hspace{2cm}} = 34$

c. $234 - \underline{\hspace{2cm}} = 100$

d. $61 - x = 43$

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

e. $100 - x = 72$

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

f. $899 - x = 342$

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

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

a. Jane had \$15. After Dad gave Jane her allowance (x), Jane had \$22. $\\$15 + x = \\22 OR $\\$15 + \\$22 = x$ $x = \underline{\hspace{2cm}}$	b. Matt had many drawings. He put 24 of them in the trash. Then he had 125 left. $125 - 24 = x$ OR $x - 24 = 125$ $x = \underline{\hspace{2cm}}$
c. Jenny had 120 marbles, but some of them got lost. Now she has 89 left. $120 - x = 89$ OR $120 + 89 = x$ $x = \underline{\hspace{2cm}}$	d. Dylan gave 67 of his stickers to a friend and now he has 150 left. $150 - 67 = x$ OR $x - 67 = 150$ $x = \underline{\hspace{2cm}}$

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?	$\underline{\hspace{2cm}} + \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ $x = \underline{\hspace{2cm}}$
b. Mum went shopping with \$250 and had \$78 when she came home. How much did she spend?	originally – spent = left $\underline{\hspace{2cm}} - \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ $x = \underline{\hspace{2cm}}$
c. Natalie had \$200. Then she bought an item for \$54 and another for \$78. How much money does she have now?	$\underline{\hspace{2cm}} - \underline{\hspace{2cm}} - \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ $x = \underline{\hspace{2cm}}$
d. Kelly bought one item for \$23 and another for \$29, and she had \$125 left. How much money did she have initially?	$\underline{\hspace{2cm}} - \underline{\hspace{2cm}} - \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ $x = \underline{\hspace{2cm}}$

Puzzle Corner

Find the missing numbers.

a. $200 - 45 - \underline{\hspace{2cm}} - 70 = 25$	b. $\underline{\hspace{2cm}} - 5 - 55 - 120 = 40$
c. $23 + 56 + x = 110$ $x = \underline{\hspace{2cm}}$	d. $x + 15 + 15 + 15 + 15 = 97$ $x = \underline{\hspace{2cm}}$

Order of Operations

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

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

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

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

$90 - 20 + 20$

$90 - 2 \times 20$

$(90 - 20) \times 2$

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

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

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

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

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Subtraction happens the same way as with smaller numbers. Just be careful with regrouping!	$\begin{array}{r} 7 \text{ } 10 \\ 800\,000 \\ - 510\,065 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ 7 \cancel{10} \text{ } 10 \\ 800\,000 \\ - 510\,065 \\ \hline \end{array}$	$\begin{array}{r} 9 \text{ } 9 \\ 7 \cancel{10} \cancel{10} \text{ } 10 \\ 800\,000 \\ - 513\,065 \\ \hline \end{array}$
	Regroup...	Keep regrouping...	(Complete the problem.)

3. Subtract.

a. $\begin{array}{r} 1\,20\,091 \\ - 34\,510 \\ \hline \end{array}$	b. $\begin{array}{r} 199\,136 \\ - 79\,160 \\ \hline \end{array}$	c. $\begin{array}{r} 670\,000 \\ - 1\,300 \\ \hline \end{array}$
d. $\begin{array}{r} 234\,688 \\ - 167\,991 \\ \hline \end{array}$	e. $\begin{array}{r} 65\,570 \\ - 23\,677 \\ \hline \end{array}$	f. $\begin{array}{r} 90\,080 \\ - 5\,025 \\ \hline \end{array}$
g. $\begin{array}{r} 554\,600 \\ - 128\,000 \\ \hline \end{array}$	h. $\begin{array}{r} 600\,000 \\ - 223\,065 \\ \hline \end{array}$	i. $\begin{array}{r} 400\,000 \\ - 18\,344 \\ \hline \end{array}$

4. Match the calculations that have the same answer.

a. $419\,000 + 1000$ $500 + 36\,000$ $189\,000 + 1000$ $40\,500 + 500$ $177\,300 + 700$	$150\,000 + 40\,000$ $20\,000 + 400\,000$ $36\,100 + 400$ $180\,000 - 2000$ $36\,000 + 5000$
b. $500\,000 - 3000$ $189\,000 - 80\,000$ $40\,600 - 500$ $250\,000 - 40\,000$ $77\,700 - 7000$	$140\,000 + 70\,000$ $97\,000 + 400\,000$ $20\,000 + 20\,100$ $100\,000 + 9000$ $100\,000 - 29\,300$

Line up the different places (the ones, tens, hundreds, thousands and so on).

$$\begin{array}{r} 1\ 3\ 4\ 6\ 0\ 7 \\ +\ 3\ 0\ 6\ 5 \\ \hline \end{array}$$

NOT THIS WAY!
(numbers not lined up)

$$\begin{array}{r} 1\ 3\ 4\ 6\ 0\ 7 \\ +\ 3\ 0\ 6\ 5 \\ \hline \end{array}$$

This is good!
Complete the problem.

$$\begin{array}{r} 4\ 5\ 7\ 9\ 3\ 4 \\ 3\ 7\ 9\ 2\ 1 \\ +\ 2\ 4 \\ \hline \end{array}$$

THIS IS OFF!
(numbers not lined up)

$$\begin{array}{r} 4\ 5\ 7\ 9\ 3\ 4 \\ 3\ 7\ 9\ 2\ 1 \\ +\ 2\ 4 \\ \hline \end{array}$$

This is good!
Complete the problem.

5. Calculate. Line up all the places carefully.

a. $300\ 145 + 2399 + 345$

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

c. $23\ 000 + 456 + 3256$

d. $345 + 870\ 077 + 32 + 5801$

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

n	13 000	78 000	154 000	500 000	640 500
$n + 1000$					
$n + 10\ 000$					
$n + 100\ 000$					

Line up the different places (ones, tens, hundreds and so on).

$$\begin{array}{r} 509032 \\ - 219 \\ \hline \end{array}$$

NOT THIS WAY!
(numbers not lined up)

$$\begin{array}{r} 509032 \\ - \quad 219 \\ \hline \end{array}$$

This is correct!
Complete the problem.

$$\begin{array}{r} 245032 \\ - 37921 \\ \hline 118111 \end{array}$$

THIS IS WRONG
(errors in regrouping)

$$\begin{array}{r} 245032 \\ - 37921 \\ \hline \end{array}$$

You do the
problem correctly!

7. Calculate.

a. $509\,788 - 82\,345$

b. $30\,760 - 2906$

c. $26\,509 - 1208$

d. $984\,044 - 329$

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

a. $660\,000 + 30\,000$ $620\,000 + 40\,000$

b. $125\,000 - 4000$ $119\,000 + 2000$

c. $499\,000 + 2000$ $501\,000 - 1000$

d. $1990 + 11$ $1999 + 2$

e. $50\,000 - 3000$ $60\,000 - 12\,000$

f. $1\,000\,000$ $600\,000 + 400\,000$

Rounding and Estimating with Large Numbers

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

Rules of rounding whole numbers

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

- If that digit is 0, 1, 2, 3 or 4, then round **DOWN**.
- If that digit is 5, 6, 7, 8 or 9, then round **UP**.
- Change to zeros all the digits *after* the place you are rounding to.
- If rounding up, the digit in the place you are rounding to is increased by 1.

Remember the squiggly equals sign (“ $\approx$ ”) is read “is about ” or “is approximately.”

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

Rounding to the nearest TEN: $25\text{6}7 \approx 257\text{0}$ $395\text{ 849} \approx 395\text{ 850}$	Rounding to the nearest HUNDRED: $25\text{6}7 \approx 26\text{00}$ $395\text{ 849} \approx 395\text{ 800}$	Rounding to the nearest THOUSAND: $23\text{ 802} \approx 24\text{ 000}$ $980\text{ 097} \approx 980\text{ 000}$
Rounding to the nearest TEN THOUSAND: $72\text{6 }451 \approx 73\text{0 }000$ $95\text{3 }987 \approx 95\text{0 }000$	Rounding to the nearest HUNDRED THOUSAND: $8\text{67 }300 \approx 9\text{00 }000$ $1\text{26 }835 \approx 1\text{00 }000$	

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

a. $4\text{5}2\text{ }550 \approx$	b. $8\text{6}256 \approx$	c. $77\text{ 5}79 \approx$
d. $24\text{5 }250 \approx$	e. $8\text{9}4\text{ }077 \approx$	f. $38\text{5 }706 \approx$
g. $6\text{1}5\text{ }493 \approx$	h. $5\text{2}7\text{ }009 \approx$	i. $2\text{5}2\text{ }000 \approx$
j. $2\text{6}566 \approx$	k. $94\text{4 }032 \approx$	l. $33\text{5 }700 \approx$
m. $48\text{ 42 }1 \approx$	n. $8\text{5}55 \approx$	o. $40\text{9 }239 \approx$

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

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Multiplying by Whole Tens and Hundreds

We have studied the SHORTCUTS for multiplying any number by 10, 100 or 1000:

To multiply any number by **10**, just tag **ONE zero** to the end.

To multiply any number by **100**, just tag **TWO zeros** to the end.

To multiply any number by **1000**, just tag **THREE zeros** to the end.

$$1\mathbf{0} \times 481 = 481\mathbf{0}$$

$$1\mathbf{00} \times 47 = 47\mathbf{00}$$

$$1\mathbf{000} \times 578 = 578\mathbf{000}$$

Note especially what happens when the number you multiply already ends in a zero or zeros. The rule works the same way, and you *still* have to tag the zero or zeros.

$$1\mathbf{0} \times 800 = 800\mathbf{0}$$

$$1\mathbf{00} \times 6600 = 6600\mathbf{00}$$

$$1\mathbf{000} \times 40 = 40\mathbf{000}$$

1. Multiply.

a. $10 \times 315 = \underline{\hspace{2cm}}$

$$3560 \times 10 = \underline{\hspace{2cm}}$$

$$35 \times 100 = \underline{\hspace{2cm}}$$

b. $100 \times 6200 = \underline{\hspace{2cm}}$

$$10 \times 1200 = \underline{\hspace{2cm}}$$

$$100 \times 130 = \underline{\hspace{2cm}}$$

c. $1000 \times 250 = \underline{\hspace{2cm}}$

$$38 \times 1000 = \underline{\hspace{2cm}}$$

$$10 \times 5000 = \underline{\hspace{2cm}}$$

Shortcut for multiplying by 20 or 200 (You can probably guess this one!)

What is 20×14 ?

First solve the problem without the zero in 20:
 $2 \times 14 = 28$. Next, tag a zero to the answer,
 28, and you get 280. So, $20 \times 14 = 280$.

What is 200×31 ?

First solve the problem without the zeros:
 $2 \times 31 = 62$. Next, just add *two* zeros to
 the result, 62, to get 6200. In other
 words, $200 \times 31 = 6200$.

2. Now try it! Multiply by 20 and 200.

a.

$$20 \times 8 = \underline{\hspace{2cm}}$$

$$4 \times 20 = \underline{\hspace{2cm}}$$

$$20 \times 5 = \underline{\hspace{2cm}}$$

b.

$$200 \times 7 = \underline{\hspace{2cm}}$$

$$5 \times 200 = \underline{\hspace{2cm}}$$

$$11 \times 200 = \underline{\hspace{2cm}}$$

c.

$$20 \times 12 = \underline{\hspace{2cm}}$$

$$35 \times 20 = \underline{\hspace{2cm}}$$

$$200 \times 9 = \underline{\hspace{2cm}}$$

d.

$$20 \times 16 = \underline{\hspace{2cm}}$$

$$42 \times 200 = \underline{\hspace{2cm}}$$

$$54 \times 20 = \underline{\hspace{2cm}}$$

Why does the shortcut work? It is based on the fact that we can multiply numbers in any order.

When multiplying any number by 20, we can write the 20 as 10×2 . For example:

$$\underline{20} \times 14 = \underline{10 \times 2} \times 14$$

In that problem, first multiply $2 \times 14 = 28$. Then the problem becomes 10×28 , which equals 280. Notice again how we did it:

$$\begin{aligned} & \underline{20} \times 14 \\ &= \underline{10} \times \underline{2} \times 14 \\ &= 10 \times 28 \\ &= 280 \end{aligned}$$

Let's try the same idea with 200. We will write 200 as 100×2 . For example:

$$\underline{200} \times 31 = \underline{100 \times 2} \times 31$$

In that problem, first multiply $2 \times 31 = 62$. The problem now becomes 100×62 , which is 6200. Notice again how it was done:

$$\begin{aligned} & \underline{200} \times 31 \\ &= \underline{100} \times \underline{2} \times 31 \\ &= 100 \times \underline{62} \\ &= 6200 \end{aligned}$$

3. Try it yourself! Fill in.

a. 20×7

$$= \underline{\hspace{2cm}} \times 2 \times 7$$

$$= 10 \times \underline{\hspace{2cm}}$$

$$=$$

b. 20×5

$$= \underline{\hspace{2cm}} \times 2 \times 5$$

$$= 10 \times \underline{\hspace{2cm}}$$

c. 200×8

$$= \underline{\hspace{2cm}} \times 2 \times 8$$

$$= 100 \times \underline{\hspace{2cm}}$$

d. 200×25

$$= \underline{\hspace{2cm}} \times 2 \times 25$$

$$= 100 \times \underline{\hspace{2cm}}$$

$$=$$

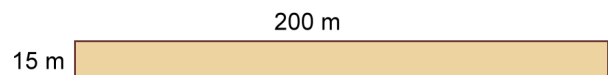
4. Sean's house measures 20 m by 15 m. Write and solve a number sentence for its area. ("A" means area.)

A = _____

Hint: To calculate the area of a rectangle, multiply its two sides.

5. Write a number sentence to find the area of Sean's garden, and solve it.

A = _____



6. Sean was told he needed four truckloads of topsoil to cover his garden. *One* truckload costs $5 \times \$20$ plus \$30 for the delivery. How much will it cost him to cover the garden with topsoil?

SHORTCUT for multiplying by whole tens and whole hundreds

The same principle works if you multiply by whole tens (30, 40, 50, 60, 70, 80 or 90): simply multiply by 3, 4, 5, 6, 7, 8 or 9, and then tag a zero to the result.

Similarly, if you multiply by some whole hundred, first solve the multiplication without the two zeros of the hundreds, and then tag two zeros to the result.

$$50 \times 8 = 400$$

$$90 \times 11 = 990$$

$$300 \times 8 = 2400$$

$$12 \times 800 = 9600$$

7. Multiply.

a. $40 \times 3 =$ _____ $8 \times 20 =$ _____	b. $70 \times 6 =$ _____ $50 \times 11 =$ _____	c. $80 \times 9 =$ _____ $30 \times 15 =$ _____
d. $60 \times 11 =$ _____ $12 \times 40 =$ _____	e. $200 \times 9 =$ _____ $7 \times 400 =$ _____	f. $700 \times 6 =$ _____ $600 \times 11 =$ _____
g. $200 \times 12 =$ _____ $15 \times 300 =$ _____	h. $3 \times 1100 =$ _____ $8 \times 900 =$ _____	i. $11 \times 120 =$ _____ $8 \times 300 =$ _____

It even works this way:

To multiply 40×70 , simply multiply 4×7 , and tag two zeros to the result:

$$40 \times 70 = 2800$$

To multiply 600×40 , simply multiply 6×4 , and tag three zeros to the result:

$$600 \times 40 = 24000$$

To multiply 700×800 , simply multiply 7×8 , and tag four zeros to the result.

$$700 \times 800 = 560000$$

8. Multiply.

a. $20 \times 90 =$ _____ $70 \times 300 =$ _____	b. $60 \times 80 =$ _____ $30 \times 900 =$ _____	c. $400 \times 50 =$ _____ $200 \times 200 =$ _____
d. $80 \times 800 =$ _____ $200 \times 500 =$ _____	e. $100 \times 100 =$ _____ $40 \times 30 =$ _____	f. $800 \times 300 =$ _____ $90 \times 1100 =$ _____

Write a number sentence for each question.

9. One hour has _____ minutes.

How many minutes are in 12 hours? _____

How many minutes are in 24 hours? _____

10. One hour has _____ minutes, and one minute has _____ seconds.

How many seconds are there in one hour? _____

11. Ed earns \$30 per hour.

a. How much will he earn in an 8-hour workday? _____

b. How much will he earn in a 40-hour workweek? _____

c. How many days will he need to work in order to earn more than \$1000?

12. Find the missing factor. Think “backwards”: how many zeros do you need?

a. _____ $\times$ 3 = 360 _____ $\times$ 50 = 450	b. $40 \times$ _____ = 320 5 $\times$ _____ = 600	c. _____ $\times$ 40 = 400 _____ $\times$ 2 = 180
d. _____ $\times$ 30 = 4800 _____ $\times$ 200 = 1800	e. $40 \times$ _____ = 2000 6 $\times$ _____ = 4200	f. _____ $\times$ 800 = 56 000 _____ $\times$ 20 = 12 000

Puzzle Corner

John wanted to prove that 40×70 is indeed 2800 by breaking the multiplication into smaller parts. He wrote 40 as 4×10 and 70 as 7×10 , and then multiplied in a different order:

$$\begin{aligned}
 40 \times 70 &= 4 \times 10 \times 7 \times 10 \\
 &= 10 \times 10 \times (4 \times 7) = 100 \times \underline{28} = 2800.
 \end{aligned}$$

Do the same, and prove that 600×50 is indeed 30 000.

Multiply in Parts 1

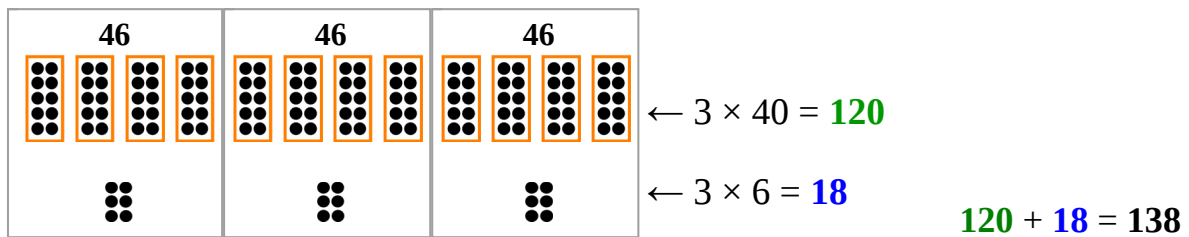
Example 1. To multiply 3×46 , break 46 into two parts: 40 and 6.

Then multiply those two parts separately by 3:
 3×40 is 120, and 3×6 is 18.

Lastly add these two partial results: $120 + 18 = 138$.

$$\begin{array}{c}
 3 \times 46 \\
 \quad \uparrow \\
 \quad 40 + 6 \\
 \hline
 (3 \times 40) \text{ and } (3 \times 6)
 \end{array}$$

Example 2. This illustration shows the same thing, 3×46 , using bundles of ten.



Study these examples. Multiply the tens and ones separately, then add:

$$\begin{array}{r}
 8 \times 13 \\
 (10 + 3)
 \end{array}$$

$$\begin{array}{l}
 8 \times 10 \text{ and } 8 \times 3 \\
 80 \text{ and } 24 \\
 = 104
 \end{array}$$

$$\begin{array}{r}
 5 \times 24 \\
 (20 + 4)
 \end{array}$$

$$\begin{array}{l}
 5 \times 20 \text{ and } 5 \times 4 \\
 100 \text{ and } 20 \\
 = 120
 \end{array}$$

$$\begin{array}{r}
 7 \times 68 \\
 (60 + 8)
 \end{array}$$

$$\begin{array}{l}
 7 \times 60 \text{ and } 7 \times 8 \\
 420 \text{ and } 56 \\
 = 476
 \end{array}$$

1. Multiply the tens and ones separately. Then add to get the final answer.

a. 6×27
 $(20 + 7)$

$$\begin{array}{l}
 6 \times \underline{\hspace{2cm}} \text{ and } 6 \times \underline{\hspace{2cm}} \\
 \underline{\hspace{2cm}} \text{ and } \underline{\hspace{2cm}} \\
 = \underline{\hspace{2cm}}
 \end{array}$$

b. 5×83
 $(\underline{\hspace{2cm}} + \underline{\hspace{2cm}})$

$$\begin{array}{l}
 5 \times \underline{\hspace{2cm}} \text{ and } 5 \times \underline{\hspace{2cm}} \\
 \underline{\hspace{2cm}} \text{ and } \underline{\hspace{2cm}} \\
 = \underline{\hspace{2cm}}
 \end{array}$$

c. 9×34
 $(\underline{\hspace{2cm}} + \underline{\hspace{2cm}})$

$$\begin{array}{l}
 9 \times \underline{\hspace{2cm}} \text{ and } 9 \times \underline{\hspace{2cm}} \\
 \underline{\hspace{2cm}} \text{ and } \underline{\hspace{2cm}} \\
 = \underline{\hspace{2cm}}
 \end{array}$$

d. 3×99

$$\begin{array}{l}
 3 \times \underline{\hspace{2cm}} \text{ and } 3 \times \underline{\hspace{2cm}} \\
 \underline{\hspace{2cm}} \text{ and } \underline{\hspace{2cm}} \\
 = \underline{\hspace{2cm}}
 \end{array}$$

e. 7×65

$$\begin{array}{l}
 7 \times \underline{\hspace{2cm}} \text{ and } 7 \times \underline{\hspace{2cm}} \\
 \underline{\hspace{2cm}} \text{ and } \underline{\hspace{2cm}} \\
 = \underline{\hspace{2cm}}
 \end{array}$$

f. 4×58

$$\begin{array}{l}
 4 \times \underline{\hspace{2cm}} \text{ and } 4 \times \underline{\hspace{2cm}} \\
 \underline{\hspace{2cm}} \text{ and } \underline{\hspace{2cm}} \\
 = \underline{\hspace{2cm}}
 \end{array}$$

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Estimating in Multiplication

If you don't need an exact result, you can estimate. To estimate the result of a multiplication, round some or all of the factors so that you can easily multiply *mentally*.

Estimate 8×189 .

189 can be rounded to 200.
The estimated product is
 $8 \times 200 = 1600$.

Estimate 42×78 .

$42 \approx 40$ and $78 \approx 80$.
The estimated product is
 $40 \times 80 = 3200$.

Estimate $21 \times \$4.52$.

First round the numbers to 20 and \$4.50.
Then, since $2 \times \$4.50$ is nine dollars,
 $20 \times \$4.50$ is ten times that, or \$90.

1. Estimate the results by rounding one or both factors. Don't round both numbers if you can multiply in your head just by rounding one factor.

a. 5×69 $\approx \underline{\quad} \times \underline{\quad} = \underline{\quad}$	b. 11×58 $\approx \underline{\quad} \times \underline{\quad} = \underline{\quad}$	c. 119×8 $\approx \underline{\quad} \times \underline{\quad} = \underline{\quad}$
d. 27×52 $\approx \underline{\quad} \times \underline{\quad} = \underline{\quad}$	e. $7 \times \$4.15$ $\approx \underline{\quad} \times \underline{\quad} = \underline{\quad}$	f. $8 \times \$11.79$ $\approx \underline{\quad} \times \underline{\quad} = \underline{\quad}$
g. $25 \times \$42.50$ $\approx \underline{\quad} \times \underline{\quad} = \underline{\quad}$	h. 9×17 $\approx \underline{\quad} \times \underline{\quad} = \underline{\quad}$	i. 63×897 $\approx \underline{\quad} \times \underline{\quad} = \underline{\quad}$

2. Estimate the total cost. Round one or both numbers so that you can multiply in your head. Write a number sentence to show your multiplication with rounded numbers.

a. 24 chairs at \$44.95 per chair	b. 512 popsicles at 19c each
c. 210 metres of wire at \$1.49 per metre	d. Six tennis balls that cost \$3.37 each and two rackets that cost \$11.90 each.

Example. If each bus can seat 57 passengers, how many buses do you need to seat 450 people?

Let's think:

One bus seats 57 passengers.	Ten buses seat 570 passengers.	<i>Etc.</i>
Two buses seat 114 passengers.	Eight buses seat 8×57 passengers.	

So how many buses will we need for our answer to be 450 or a little more?

This problem could be solved by division ($450 \div 57$), but it is easier to **use estimation and multiplication**. Round 57 to 60, and quickly calculate in your head this way:

$7 \times 60 = 420$ and $8 \times 60 = 480$. It *looks like* 8 buses are needed for 450 people.

Lastly, let's check our answer using the exact number 57:

$8 \times 57 = 400 + 56 = 456$, so yes, eight buses are enough to transport 450 people.

3. Solve the problems using estimation.

- a. An advertisement in a newspaper costs \$349.
How many ads can Bill buy with \$2000?

- b. It costs \$2.85 per hour to skate at a skating rink. Sandra has \$25. How many whole hours can she afford to skate?

- c. A can of beans costs \$0.29. A bag of lentils costs \$0.42.
Estimate which is cheaper: to buy eight cans of beans or to buy five bags of lentils.

- d. Jenny needs to buy three metres of string for each of the 28 students in the craft class. The string costs \$0.72 per metre. Estimate the total cost.

Multiply in Columns—the Easy Way

$$\begin{array}{r} 38 \\ \times 6 \\ \hline \end{array}$$

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

$$\begin{array}{r} 38 \\ \times 6 \\ \hline 48 \end{array}$$

First multiply 6×8 .

$$\begin{array}{r} 38 \\ \times 6 \\ \hline 48 \\ 180 \end{array}$$

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

$$\begin{array}{r} 38 \\ \times 6 \\ \hline 48 \\ + 180 \\ \hline 228 \end{array}$$

Lastly, add.

Multiply 9×2 .

$$\begin{array}{r} 82 \\ \times 9 \\ \hline 18 \end{array}$$

Then 9×80 .

$$\begin{array}{r} 82 \\ \times 9 \\ \hline 18 \\ 720 \end{array}$$

Add.

$$\begin{array}{r} 82 \\ \times 9 \\ \hline 18 \\ + 720 \\ \hline 738 \end{array}$$

Multiply 3×7 .

$$\begin{array}{r} 47 \\ \times 3 \\ \hline 21 \end{array}$$

Then 3×40 .

$$\begin{array}{r} 47 \\ \times 3 \\ \hline 21 \\ 120 \end{array}$$

Add.

$$\begin{array}{r} 47 \\ \times 3 \\ \hline 21 \\ + 120 \\ \hline 141 \end{array}$$

1. Multiply.

a.

$$\begin{array}{r} 76 \\ \times 6 \\ \hline \\ + \\ \hline \end{array}$$

b.

$$\begin{array}{r} 89 \\ \times 5 \\ \hline \\ + \\ \hline \end{array}$$

c.

$$\begin{array}{r} 43 \\ \times 7 \\ \hline \\ + \\ \hline \end{array}$$

d.

$$\begin{array}{r} 52 \\ \times 6 \\ \hline \\ + \\ \hline \end{array}$$

e.

$$\begin{array}{r} 83 \\ \times 5 \\ \hline \\ + \\ \hline \end{array}$$

f.

$$\begin{array}{r} 94 \\ \times 6 \\ \hline \\ + \\ \hline \end{array}$$

g.

$$\begin{array}{r} 32 \\ \times 9 \\ \hline \\ + \\ \hline \end{array}$$

h.

$$\begin{array}{r} 41 \\ \times 7 \\ \hline \\ + \\ \hline \end{array}$$

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

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

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

ones:
 7×6

$$\begin{array}{r} 52\text{ }6 \\ \times \quad 7 \\ \hline 42 \end{array}$$

tens:
 7×20

$$\begin{array}{r} 5\text{ }2\text{ }6 \\ \times \quad 7 \\ \hline 42 \\ 140 \end{array}$$

hundreds:
 7×500

$$\begin{array}{r} 5\text{ }2\text{ }6 \\ \times \quad 7 \\ \hline 42 \\ 140 \\ 3500 \end{array}$$

Add.

$$\begin{array}{r} 526 \\ \times \quad 7 \\ \hline 42 \\ 140 \\ + 3500 \\ \hline 3682 \end{array}$$

2. Multiply.

a.
$$\begin{array}{r} 137 \\ \times 6 \\ \hline \\ \\ + \\ \hline \end{array}$$

b.
$$\begin{array}{r} 218 \\ \times 4 \\ \hline \\ \\ + \\ \hline \end{array}$$

c.
$$\begin{array}{r} 313 \\ \times 7 \\ \hline \\ \\ + \\ \hline \end{array}$$

d.
$$\begin{array}{r} 564 \\ \times 4 \\ \hline \\ \\ + \\ \hline \end{array}$$

e.
$$\begin{array}{r} 902 \\ \times 4 \\ \hline \\ \\ + \\ \hline \end{array}$$

f.
$$\begin{array}{r} 695 \\ \times 3 \\ \hline \\ \\ + \\ \hline \end{array}$$

g.
$$\begin{array}{r} 780 \\ \times 8 \\ \hline \\ \\ + \\ \hline \end{array}$$

h.
$$\begin{array}{r} 324 \\ \times 6 \\ \hline \\ \\ + \\ \hline \end{array}$$

i.
$$\begin{array}{r} 927 \\ \times 6 \\ \hline \\ \\ + \\ \hline \end{array}$$

j.
$$\begin{array}{r} 566 \\ \times 3 \\ \hline \\ \\ + \\ \hline \end{array}$$

k.
$$\begin{array}{r} 257 \\ \times 8 \\ \hline \\ \\ + \\ \hline \end{array}$$

l.
$$\begin{array}{r} 608 \\ \times 5 \\ \hline \\ \\ + \\ \hline \end{array}$$

3. Solve the equations.

a. $\triangle \times 80 = 480$

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

b. $5 \times \underline{\hspace{1cm}} = 450$

$\underline{\hspace{1cm}} = \underline{\hspace{2cm}}$

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

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

4. Solve.

a. $58 \times 5 + 291$

b. $1000 - 3 \times 145$

5. Solve.

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

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

6. Solve the equations.

a. $50 \times \underline{\quad} = 2000$

$\underline{\quad} = \underline{\quad}$

b. $\triangle \times 60 = 2400$

$\triangle = \underline{\quad}$

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

$z = \underline{\quad}$

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

$\triangle = \underline{\quad}$

e. $5 \times \underline{\quad} \times 2 = 1000$

$\underline{\quad} = \underline{\quad}$

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

$p = \underline{\quad}$

Puzzle Corner

Figure out the missing numbers.

a.

×			7
	1	4	
	4	9	0
+	7	0	0

b.

×			4
	2	0	0
+	1	2	0
1	4	3	2

c.

×			9
	8	1	
+	6	3	0
6	3	8	1

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Elapsed Time 3

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

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

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

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

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

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

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

$$\begin{array}{r} 10 \text{ h } 53 \text{ m} \\ + 4 \text{ h } 40 \text{ m} \\ \hline 14 \text{ h } 93 \text{ m} \\ = 15 \text{ h } 33 \text{ m} \end{array}$$

1. When will it end?

- a. Guests will come at 3:40 p.m. and stay for two hours and 30 minutes.
- b. Mum will start cooking pizza at 13:45, and it will take her one hour and 40 minutes.
- c. The pool will open at 8 a.m. and be open for ten-and-a-half hours. When will it close?
- d. Jen's exam will take two-and-a-half hours, and start at 8:45 am.
- e. The aeroplane will take off at 18:08 and fly for three hours and 55 minutes.
- f. The food will be put into the oven at 5:47 p.m. for 35 minutes.

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

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

How many minutes do each two shifts overlap?

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

When did it start?

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

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

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

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

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

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

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

2. Find the starting time.

- a. From _____ : _____ p.m. till 2:00 p.m. is 40 minutes.
- b. From _____ : _____ p.m. till 8:12 p.m. is 30 minutes.
- c. From _____ : _____ a.m. till 4:15 a.m. is 1 hour 30 minutes.
- d. From _____ : _____ p.m. till 7:34 p.m. is 4 hours 10 minutes.
- e. From _____ : _____ a.m. till 5:00 p.m. is 6 hours 20 minutes.
- f. From _____ : _____ p.m. till 16:30 p.m. is 2 hours 40 minutes.

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

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

4. Solve.

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

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

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

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

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

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

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

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

Measuring Temperature: Celsius

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

The Celsius scale

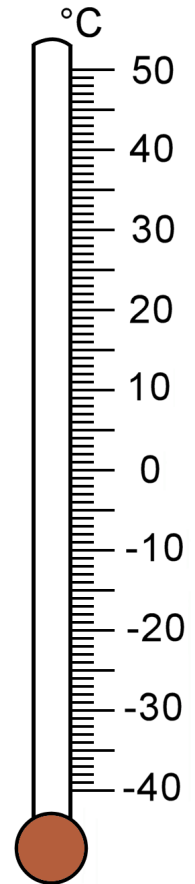
The Celsius scale gets its name from the Swedish astronomer Anders Celsius (1701 – 1744). He developed the scale two years before his death. He used 0 for the boiling point of water and 100 for the freezing point of water. These two were reversed in 1745, so the two defining points for the Celsius scale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

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

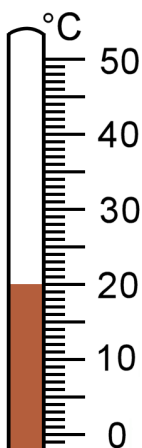
(under normal conditions)

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

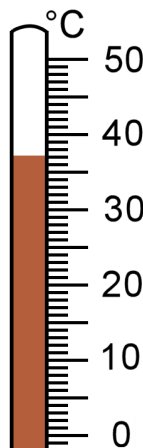
Normal body temperature	37°C
Hot summer weather	25...35°C
Nice inside temperature	19...23°C
Below freezing (icy and snowy)	-40...0°C (negative)



2. Write the temperatures.



a. _____°C



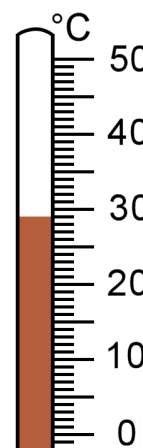
b. _____°C



c. _____°C



d. _____°C



e. _____°C

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

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

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

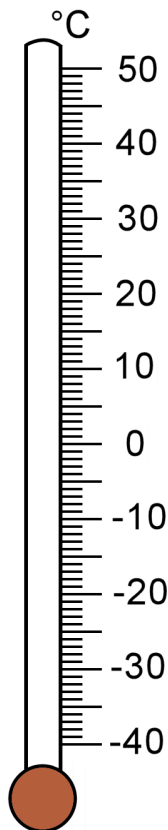
4. Check the weather forecast from the Internet: <https://www.bbc.com/weather/>

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

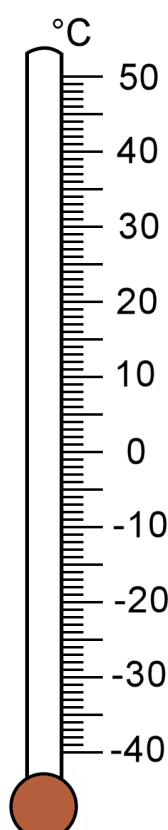
5. In the box on the right, match the temperatures with the descriptions.

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

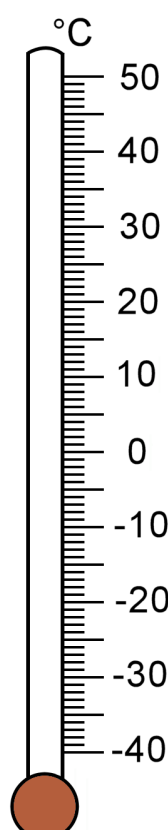
6. Draw the liquid in the thermometers. Write the right description underneath:
water freezing, a spring day, inside, a hot day



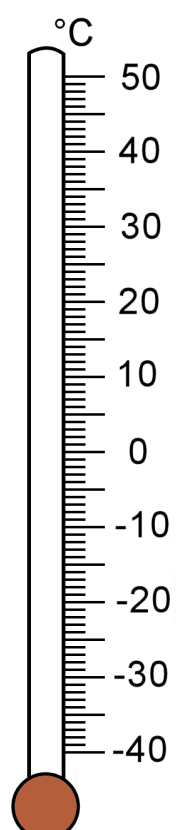
a. 0°C



b. 10°C



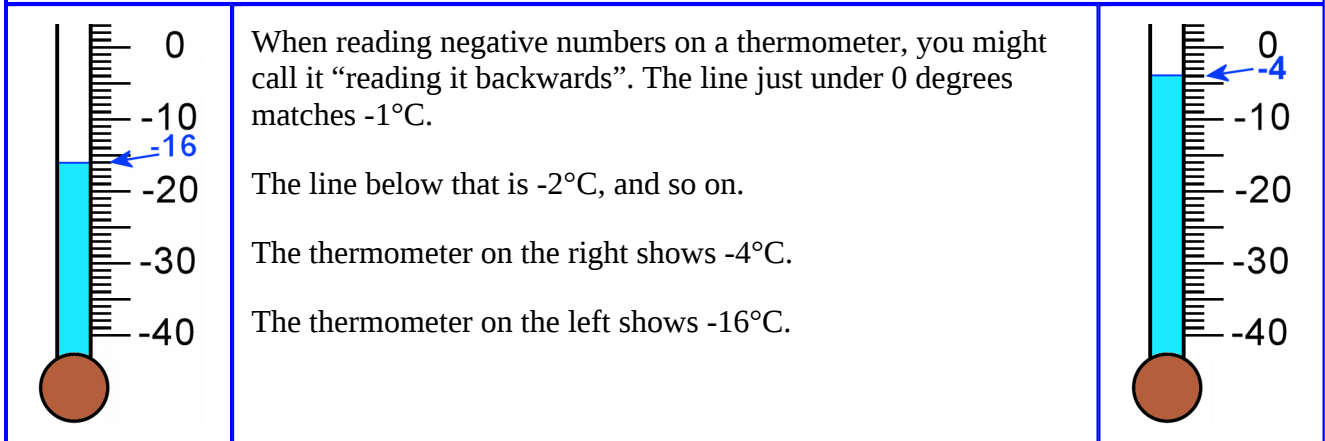
c. 20°C



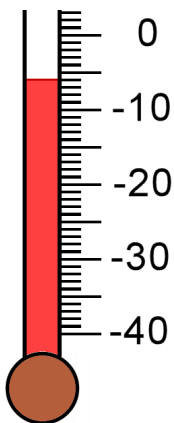
d. 30°C

Remember: **zero degrees Celsius is the freezing point of water.** Below that temperature, water turns to ice, and rain falls as snow.

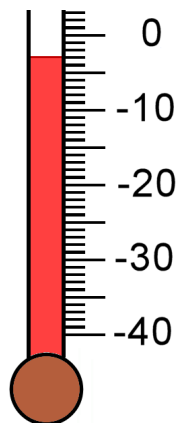
When the temperature drops below 0 degrees, we use **negative numbers**. The temperature just 1 degree below zero is “minus one degree Celsius” or -1°C .



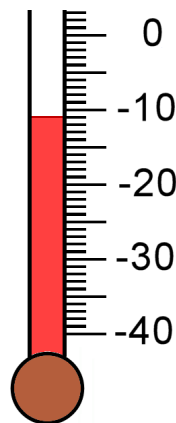
7. Read each thermometer and write the negative temperature it shows.



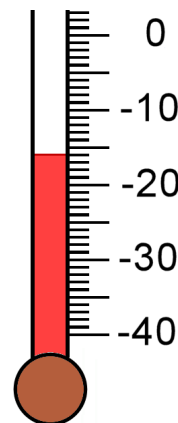
a. _____ $^{\circ}\text{C}$



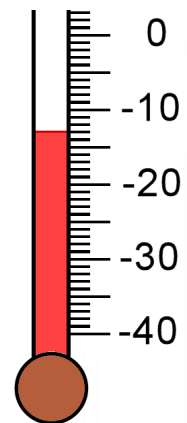
b. _____ $^{\circ}\text{C}$



c. _____ $^{\circ}\text{C}$



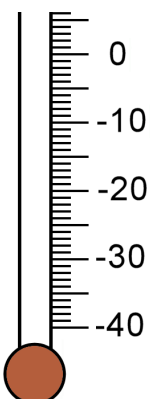
d. _____ $^{\circ}\text{C}$



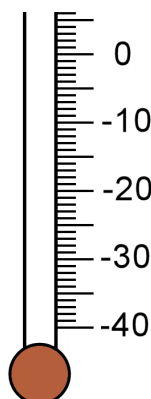
e. _____ $^{\circ}\text{C}$

8. Colour the thermometers to show the given temperatures on the thermometers.

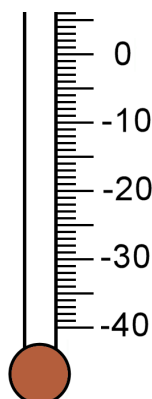
a. -5°C



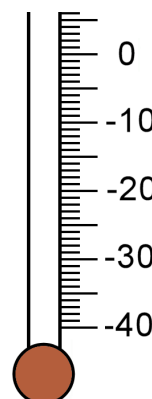
b. -8°C



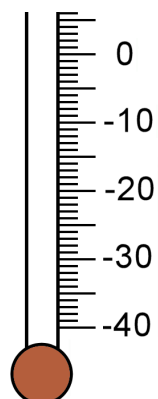
c. -12°C



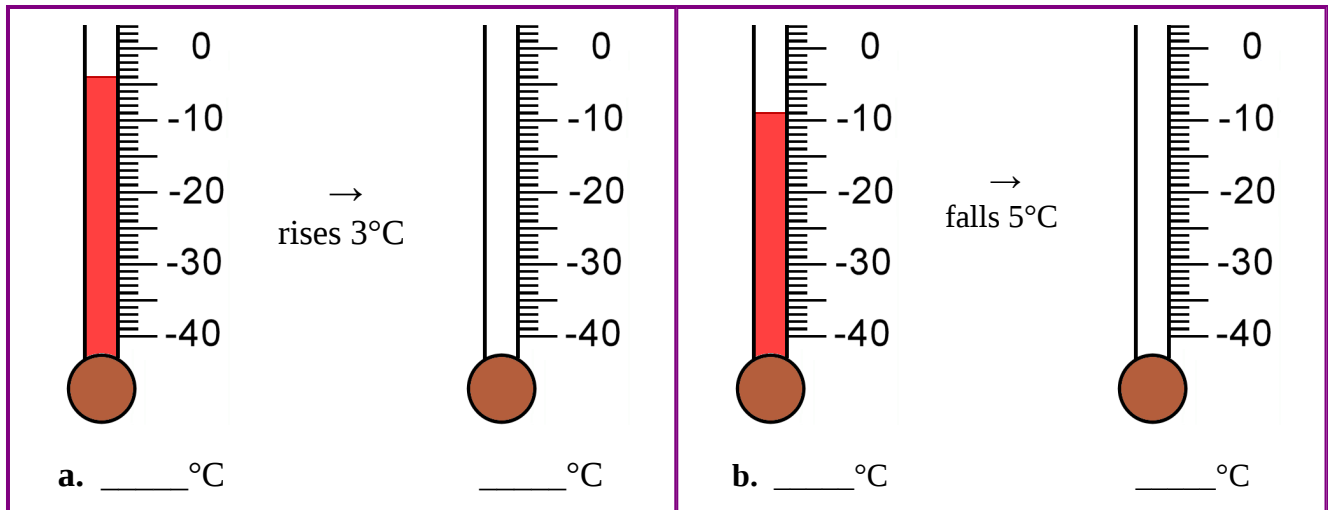
d. -19°C



e. -23°C



9. First write the temperature the thermometer shows. Then the temperature rises or falls. Colour in the empty thermometer to show the new temperature.



10. *Challenge.* The temperature rises or falls. Write the new temperature.

Now temperature rises 1°C After a. -9°C _____	Now temperature falls 1°C After b. -9°C _____	Now temperature rises 3°C After c. -1°C _____
Now temperature rises 3°C After d. -13°C _____	Now temperature falls 5°C After e. -7°C _____	Now temperature falls 4°C After f. 2°C _____
Now temperature rises 5°C After g. -5°C _____	Now temperature falls 5°C After h. 2°C _____	Now temperature falls 3°C After i. -13°C _____

11. The temperature inside a fridge is 5°C. The temperature inside the freezer is 20 degrees lower, and the temperature inside the room is 20 degrees higher than in the fridge.

- a. What is the temperature inside the freezer?
- b. What is the difference between the room temperature and that of the freezer?

Tuesday was a weird day. In the morning, the temperature was _____°C. Then, it fell 7°C and it started snowing. At noon, the temperature rose 8°C and the snow started melting!

Lastly, late in the evening, the temperature dropped 3°C and it was down to 0°C. What was the temperature in the morning?

Puzzle Corner

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More Measuring in Centimetres

1. Spread one hand wide open and let someone measure the distance from your thumb tip to the tip of your little finger. This distance is the definition for the measure *span*.

My *span* is _____ cm. (The official span is about 23 cm.)

Now use your *span* to measure the height of a table (or chair): Table height = about _____ spans.

Use that to estimate the height of the table *in centimetres*. Height estimate = _____ cm.

Lastly measure with a measuring tape to check. Height: _____ cm.

You can repeat this for other objects.

2. Find five small things. BEFORE you measure, make a guess of the length or width. Then, measure them in centimetres.

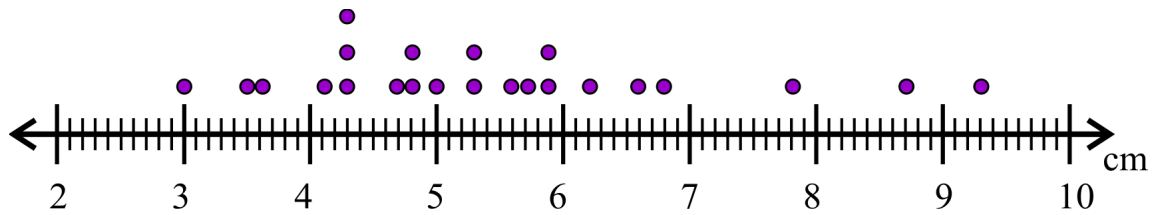
Item	Guess (cm)	Reality (cm)

3. One centimetre is 10 millimetres. Convert between centimetres and millimetres.

a. 2 cm = _____ mm	b. 3 cm 6 mm = _____ mm	c. 43 mm = ____ cm ____ mm
7 cm = _____ mm	15 cm 1 mm = _____ mm	96 mm = ____ cm ____ mm
13 cm = _____ mm	20 cm 8 mm = _____ mm	254 mm = ____ cm ____ mm

4. *Challenge.* The perimeter of a rectangle is 8 cm. Its one side measures 2 cm 6 mm. How long is the other side? (Hint: Make a sketch.)

5. Mary measured the wing span of the butterflies in her butterfly collection, and recorded the results in the line plot below.



- How many butterflies have a wingspan from 2 to 4 cm?
 - How many butterflies have a wingspan from 3 to 5 cm?
 - How long is the wingspan of the largest butterfly?
 - How long is the wingspan of the smallest butterfly?
 - What is the difference between the wingspan of the largest and of the smallest butterfly?
6. Find many small things you can measure to the nearest centimetre, and make a line plot. For example, you could measure some pencils, paper clips, the length of the small finger of many people, or the length of tree leaves.

Metric Units for Measuring Length

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

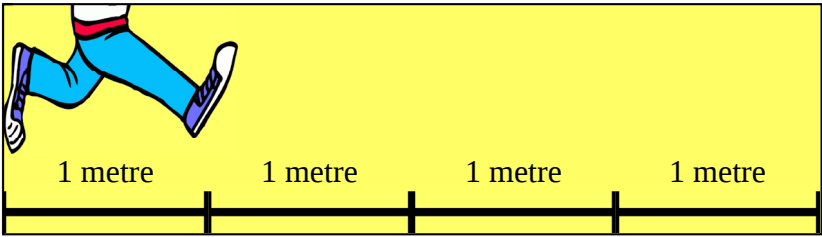
Each unit in the metric system is 10 times the smaller unit. For example, 1 kilometre is 10 hectometres and 1 centimetre is 10 millimetres. However, we don’t commonly use hectometres, decametres, or decimetres. You need to learn only the units that are bolded in the chart.

Units of length in the metric system		
10 →	kilometre km	“Kilo” means 1000.
10 →	hectometre hm	(not used)
10 →	dekametre dam	(not used)
10 →	metre m	the basic unit
10 →	decimetre dm	(not used much)
10 →	centimetre cm	This is 1/100 of a metre.
10 →	millimetre mm	This is 1/10 of a centimetre.

1. Draw a line at least 4 m long (outside, in a hallway, or a large room). Using a tape measure or a measuring tape, make marks on that line for 1 m, 2 m, 3 m, and 4 m.



Can you take “hops” that are one metre long?



If not, take hops that are half a metre long — in other words, two hops for each metre.

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

Name	Height
	_____ cm = <u>1</u> m _____ cm.

Conversions between units

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

Then verify from a measuring tape that **100 centimetres makes one metre**. “Centi” means one hundred (from the Latin word *centum*). That is why 1 dollar has 100 *cents*, and 1 metre has 100 *centimetres*.

Lastly, **1 kilometre is 1000 metres**, because “kilo” means one thousand.

$$1 \text{ km} = 1000 \text{ m}$$

$$1 \text{ m} = 100 \text{ cm}$$

$$1 \text{ cm} = 10 \text{ mm}$$

3. One metre is 100 cm. Convert between metres and centimetres.

a. $5 \text{ m} = \underline{\hspace{2cm}} \text{ cm}$

b. $4 \text{ m } 6 \text{ cm} = \underline{\hspace{2cm}} \text{ cm}$

c. $800 \text{ cm} = \underline{\hspace{2cm}} \text{ m}$

$8 \text{ m} = \underline{\hspace{2cm}} \text{ cm}$

$9 \text{ m } 19 \text{ cm} = \underline{\hspace{2cm}} \text{ cm}$

$239 \text{ cm} = \underline{\hspace{1cm}} \text{ m } \underline{\hspace{1cm}} \text{ cm}$

$12 \text{ m} = \underline{\hspace{2cm}} \text{ cm}$

$10 \text{ m } 80 \text{ cm} = \underline{\hspace{2cm}} \text{ cm}$

$407 \text{ cm} = \underline{\hspace{1cm}} \text{ m } \underline{\hspace{1cm}} \text{ cm}$

4. One centimetre is 10 mm. Convert between centimetres and millimetres.

a. $5 \text{ cm} = \underline{\hspace{2cm}} \text{ mm}$

b. $2 \text{ cm } 8 \text{ mm} = \underline{\hspace{2cm}} \text{ mm}$

c. $50 \text{ mm} = \underline{\hspace{1cm}} \text{ cm } \underline{\hspace{1cm}} \text{ mm}$

$8 \text{ cm} = \underline{\hspace{2cm}} \text{ mm}$

$7 \text{ cm } 5 \text{ mm} = \underline{\hspace{2cm}} \text{ mm}$

$72 \text{ mm} = \underline{\hspace{1cm}} \text{ cm } \underline{\hspace{1cm}} \text{ mm}$

$14 \text{ cm} = \underline{\hspace{2cm}} \text{ mm}$

$10 \text{ cm } 4 \text{ mm} = \underline{\hspace{2cm}} \text{ mm}$

$145 \text{ mm} = \underline{\hspace{1cm}} \text{ cm } \underline{\hspace{1cm}} \text{ mm}$

5. One kilometre is 1,000 m. Convert between kilometres and metres.

a. $5 \text{ km} = \underline{\hspace{2cm}} \text{ m}$

b. $2 \text{ km } 800 \text{ m} = \underline{\hspace{2cm}} \text{ m}$

c. $2000 \text{ m} = \underline{\hspace{2cm}} \text{ km}$

$23 \text{ km} = \underline{\hspace{2cm}} \text{ m}$

$6 \text{ km } 50 \text{ m} = \underline{\hspace{2cm}} \text{ m}$

$4300 \text{ m} = \underline{\hspace{1cm}} \text{ km } \underline{\hspace{1cm}} \text{ m}$

$1 \text{ km } 200 \text{ m} = \underline{\hspace{2cm}} \text{ m}$

$13 \text{ km } 579 \text{ m} = \underline{\hspace{2cm}} \text{ m}$

$18\,700 \text{ m} = \underline{\hspace{1cm}} \text{ km } \underline{\hspace{1cm}} \text{ m}$

6. Calculate. Give your answer using whole kilometres and metres.

a. $5 \text{ km } 200 \text{ m} + 8 \text{ km } 900 \text{ m}$

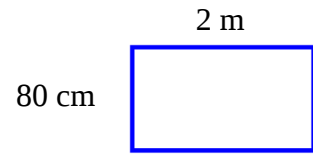
b. $3 \text{ km } 600 \text{ m} + 2 \text{ km } 800 \text{ m}$

c. $1500 \text{ m} + 2 \text{ km } 600 \text{ m}$

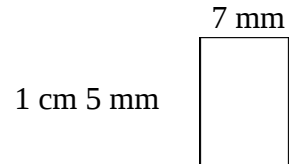
d. $6 \times 700 \text{ m}$

7. Solve.

a. Find the perimeter of this rectangle.



b. Find the perimeter of this rectangle.



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

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

8. Solve the problems.

a. How many millimetres are in a *metre*?

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

In a week?

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

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

How about if the wall is 3 metres long?

Puzzle Corner

