## CHAPTER



## In this chapter, you will learn to:

O Use place value to write numbers up to one million

O Write numbers in expanded and written form
O Round numbers



## Math Scavenger Hunt

## You Will Need:

- Number Scavenger Hunt: Activity Sheet
- Magazines/flyers or a location with numbers displayed such as a library, grocery store, or bank
- Scissors
- Glue stick
- A timer
- Clipboard (optional)


## You Will Do:

1. Carefully tear out the Number Scavenger
 Hunt Activity Sheet from the back of the answer key. Set a timer for 10 minutes.
2. If you are using a magazine or flyer, flip through it looking for examples of the different kinds of numbers or math ideas. Cut out the examples and glue them in the correct section.
3. If you are looking for examples at a location instead, write them down or sketch a picture in the correct places.
4. Were you able to find everything before the timer went off? If not, you can write or draw in examples for what you could not find.

Math is all around us. We use math to count items and group shapes according to their properties. We also use math to measure lengths, capacity, and even time.

Numbers are how we record these amounts. Sometimes you can record amounts with a simple mark like the ones below which represent the number 6 .

Our universe is a huge place with big distances, lots of creatures, and enormous things to measure. So, we need a simple way to record really large numbers without taking up lots of space. Place value is what we use to do that.


$$
5,423
$$

1,104

The digit 4 in the number on the left represents 4 hundreds. The digit 4 in the number on the right represents 4 ones. That's because the place where the digit 4 is in the number represents its value.


## STANDARD FORM:

123,456,789

## EXPANDED FORM:

$$
\text { 100,000,000 + 20,000,000 + 3,000,000 + 400,000 + 50,000 + 6,000 + } 700 \text { + } 80 \text { + } 9
$$

## WORD FORM:

 one hundred twenty-three million, four hundred fifty-six thousand, seven hundred eighty-nineThis chart shows the place value of numbers all the way up to a hundred million. You can see that there is a pattern on the chart. Each group of 3 digits has ones, tens, and hundreds. These groups of 3 are called periods. When we write out numbers, we separate each period with a comma so that it is easier to read.


PERIODS:
Groups of 3 digits
designating ones, tens, and hundreds in place value

EXAMPLE 1: What does the $\mathbf{7}$ in the number 670,334 represent?
The 7 is in the ten thousands place. So the 7 represents 70,000 .


1. Write the value of the underlined digit.
a. 171,213
๖. $\mathbf{4}, 056$ $\qquad$
c. 913,456

ฮ. 661,583
2. Write an example of a number that has a 5 in the ten thousands place.
$\qquad$
3. Write an example of a number that has a 6 in the millions place.

## 182569

4. What is the smallest number you can make with the digits above?
5. What is the largest number you can make with the digits above?


It's estimated that there are about 6,000 coral species in the world.

## LESSON 2: UP TO ONE MILLION

How much is a million? Have you ever heard someone talking about a million dollars or a million grains of sand? Let's take a moment to try to picture how much one million paper towels would be.


1 pallet $=100$ cases $=100,000$ sheets


A million paper towel sheets is 10 pallets of paper towels!


In 2011, a powerful earthquake in Japan triggered a tsunami that traveled across the Pacific Ocean. The wave was so powerful that an estimated one million sea creatures were pushed all the way to the West Coast of the United States. The sea slugs here are just one example of some of the creatures.

It is important for you to understand the relationship between different positions on the place value
 chart. The first thing to notice is that there can only be a single digit in each spot. You will never find more than one number for each value. Numbers from 0-9 are acceptable.

Each new value is 10 times as much as the space to the right. Think about money for a minute. It takes 1 ten dollar bill to equal 10 one dollar bills. A 10 dollar bill is 10 times as much as a one dollar bill. And it takes 10 ten dollar bills to equal 1 one hundred dollar bill because 100 is 10 times as much as 10 . For example, one thousand is the same as 10 hundreds, but you can't put a 10 in the space since that would be 2 digits when only 1 is allowed.

One million is the same as 10 hundred thousands. From here you could count up to 9 million. What would come next? 10 million, of course.

## EXAMPLE: How many ten thousands do you need to make one hundred thousand? Picture the place value chart.

| MHilions |  |  | Thousands |  |  | Ones |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Hundred <br> Million | Ten <br> Million | One <br> Million | Hundred <br> Thousand | Ten <br> Thousand | One <br> Thousand | Hundreds | Tens | Ones |

You need 10 ten thousands to make one hundred thousand. The one hundred thousands place is one space to the left of the ten thousands. It is ten times as big.

1. Write the value of the underlined digit.
a. 229,111
b. 4,049 $\qquad$
c. $\mathbf{1}, \mathbf{2 2 3}, 780$
d. $\mathbf{1 , 3} 45,107$
2. $\mathbf{1 0}$ groups of ten is the same as
$\qquad$
3. 10 groups of a hundred is the same as
$\qquad$
4. $\mathbf{1 0}$ groups of a thousand is the same as
$\qquad$
5. 10 groups of ten thousand is the same as
$\qquad$
6. 10 groups of one hundred thousand is the same as
$\qquad$
7. What number is one less than one million?

| OCEAN SLZES |  |
| :---: | :---: |
| OCEAN | Approximate Area in <br> Square Kilometers |
| Arctic | $15,558,000$ |
| Atlantic | $85,133,000$ |
| Indian | $70,560,000$ |
| Pacific | $161,760,000$ |

Note: There is some debate over the boundary lines between the different oceans. This table is based on information provided on the NOAA website.

## 8. Look at the oceans chart to answer these questions.

a. Which ocean has a 3 in the ten thousands place?
b. Which 3 oceans have the same value in the ten thousands place?
c. Which ocean has a 1 in the hundreds thousands place?
d. According to this chart, which ocean has the greatest area?


## You Will Need:

- Expanded Form Flip Book: Activity Sheet
- Scissors
- Stapler


## You Will Do:

1. Carefully tear out the Expanded Form Flip Book: Activity Sheet from the back of the answer key.
2. Cut apart each of the rectangles on the activity sheet. Stack them with the largest number on the bottom and the smallest on the top.
3. Staple them together on the right side.

4. Flip through your number so you can see it in standard form and in expanded form.

Normally, we write numbers in standard form. All of the numbers in Lessons 1 and 2 were written in standard form. It is a nice way of writing numbers because it doesn't take up very much space. But sometimes it is also helpful to write a number in expanded form or written form. In this lesson, we will practice and review expanded form. In Lesson 4, you will learn how to write


EXPANDED FORM:
A way of writing numbers that shows the value of each digit numbers in written form.

EXAMPLE 1: Write the number 345,654 in expanded form.

$$
300,000+40,000+5,000+600+50+4
$$

## EXAMPLE 2: Write the number 4,056 in expanded form.

$4,000+50+6$
The number has no hundreds so you do not need to expand that part of the number.


1. Match each number in standard form on the left with its expanded form on the right.
a. 106,789

$$
90,000+800+10+7
$$

b. 65,112

$$
100,000+6,000+700+80+9
$$

c. 160,229
$3,000+2$
d. 56,702
$100,000+60,000+200+20+9$
e. 3,002
$60,000+5,000+100+10+2$
f. 90,817
$50,000+6,000+700+2$
2. Correct the numbers below by adding commas in the correct places to show the different periods.
а. 88123
ヶ. 2300699
3. Write each number in standard form.
a. $3,000+40+2$
b. $800,000+70,000+600+10+5$
4. Write each number in expanded form.
a. 234,515 $\qquad$
b. $1,203,305$ $\qquad$

## LESSON 4: NUMBERS IN WRITTEN FORM

## State Exploration

## You Will Need:

- Your parent's assistance


## You Will Do:

1. How big is your state in square miles? Have your parent look up the size in the teaching guide notes for this lesson. Write in your answers.
2. Choose one other state and find its area in square miles. Write it down on the table below. Come back and complete this table
 MY STATE:

## AREA OF MY STATE:

Expanded Form $\qquad$

Written Form $\qquad$

A SECOND STATE:
AREA OF SECOND STATE:

Expanded Form $\qquad$

Written Form $\qquad$

A third form for numbers is written form. This is exactly what it sounds like: it just means writing out the number with words instead of using numerals. We use the written form of numbers in certain types of writing or to avoid confusion. When your parent writes a check, they write the amount using numerals and also in the written form. Why do you think that is? Tell your parent.

When we write a number in written form, we put a comma after each period, or group of three digits, just like we did with numerals. When you get to the comma, you


WRITTEN FORM:
A way of writing numbers using words instead of numerals say the name of the period. If you were reading 1,234 out loud, you would say "one thousand, two hundred thirtyfour." Do you see how you say the name of the period when you get to the comma?

## EXAMPLE 1: Say the number 980,122 out loud. You try first, and then have your parent read it to you.

"nine hundred eighty thousand, one hundred twenty-two."
When we write out the number in written form, we write a comma after each period of numbers to prevent confusion. Numbers between 21 and 99 have a hyphen in them.

EXAMPLE 2: Write 1,450,111 in written form.
One million, four hundred fifty thousand, one hundred eleven.

## EXAMPLE 3: Write the number 644,123 in expanded form and written form. How many periods does it have?

Expanded form:
$600,000+40,000+4,000+100+20+3$

Written form:
six hundred forty-four thousand, one hundred twenty-three

This number has two periods: thousands and ones.

1. Read each number below aloud to your parent.
a. 340,999
b. 1,299,123
2. Write each number in written form.
a. 65,072
$\qquad$
$\qquad$
b. 1,456,000
c. 2,303
$\qquad$
$\qquad$
d. 765,555
e. $4000+500+5$
f. $1,000,000+20,000+3,000+300+20+1$
3. Redemption Church is building a new Sunday School wing for $\$ 1,000,801$. They need some help completing the check below. Write out the written form of the cost where you see the red X.

4. Go back and complete your opening activity.


## Place Value Math Search

## You Will Need:

- Lesson 5: Activity Sheets
- Masking tape
- A notebook


## You Will Do:

1. Tear out the activity sheets from the back of the answer key.
2. Have your parent cut out the different math clues and tape them up according to the instructions in the answer key.
3. Start at any math clue. Ignore what is on the top of the flap. That is the answer to a
 different math question. Instead, lift the flap and read the question that is written underneath. Work out the answer to the question in your notebook.
4. Look at the other math clues and see if you can find the matching answer on the top flap. When you find it, move to that clue.
5. Lift the flap and begin answering the question posted below. If you answer all the questions correctly, you will travel to all 8 clues and end where you started.

In this lesson, you will learn how to compare and order 6 or 7-digit numbers. When we compare or order larger numbers, we use the same process we used with two or three digit numbers. Begin by comparing the largest place value and keep going from there.

For many kids, remembering which sign is which is harder than finding the greater number. You can think of the symbol as an alligators mouth eating the greater number (because alligator's are hungry, so they want to choose the bigger lunch). Or, you can remember that the symbol points to the smaller number.


EXAMPLE 1: Fill in the correct symbol <, >, or =.
77,623 $\bigcirc 77,413$
Begin by comparing the ten thousands place.
$70,000=70,000$

The thousands are equal too.
$\mathbf{7 , 0 0 0}=\mathbf{7 , 0 0 0}$
But the number on the left has more hundreds.
$600>400$
600 is greater than 400 . So, we use a > symbol. 77,623 © 77,413

## EXAMPLE 2: Put these three numbers in order from least to greatest:

 143,005 75,991 78,551It can be easier to compare the place values by lining up the numbers vertically. 143,005 is the only number with a digit in the hundred thousands place, so it is the largest. 5,000 is less than 8,000 , so

143,005
75,991
78,551 75,991 is the smallest number in the group. The numbers in order from least to greatest are
75,991; 78,551; 143,005.

EXAMPLE 3: What digit could be placed in the blank to make the statement true? 45,702 < 4_, 233 < 47,111

The number in the middle needs to be greater than 45,702 and less than 47,111 . Comparing just the thousands place means that it needs to have 6 thousands. So a 6 should go in the blank.
$45,702<4 \underline{6}, 233<47,111$

1. Below are several comparison problems to help you review how to use the symbols correctly. Fill in <, >, or $=$ in each example. Have your parent check your answers to this section before you move on to section 2.
a. $23 \bigcirc 27$
b. 51
〇 43
c. $123 \bigcirc 304$
d. $650 \bigcirc 450$
e. $761 \bigcirc 770$
f. $230 \bigcirc 230$
2. Fill in the correct symbol $<,>$, or $=$ to complete the comparison.
a. $32,999 \bigcirc 102,033$
b. $254,789 \bigcirc 254,789$
c. 778,003
778,030
d. $6,798 \bigcirc 6,777$
e. 34,559
304,559
f. $344,280 \bigcirc 340,289$
3. Put the numbers in order from greatest to least.
a. 686,923
17,999
786,239
b. $85,717 \quad 87,900 \quad 86,999$
4. What digit could be placed in the blank to make the statement true?
a.

b.


5. Mount Everest is 29,029 feet tall at its summit. The Mariana Trench is $\mathbf{3 6 , 0 1 1}$ feet deep. Which is greater, the height of Mount Everest or the depth of the Mariana Trench?
6. Which do you think would be more exciting to explore?

## You Will Need:

- 3 dice
- Pennies and dimes or two other kinds of markers
- Lesson 6 Gameboard
- 2 players


## You Will Do:

1. Carefully tear out the gameboard from the back of the answer key. Player 1 rolls the dice. They use the numbers on the dice to make a three-digit number. They can choose the order of the digits.
2. Player 1 rounds the three-digit number to the nearest hundred and covers a space with that number on the board.
3. Player 2 rolls the dice and makes a three-digit number.
 They can choose the order of the digits.
4. Player 2 rounds the three-digit number to the nearest hundred and covers a space with that number on the board.
5. The players continue to take turns rolling. The first player to cover 5 spaces in a row, column, or diagonal, wins.

When we are working with large numbers, it can be very helpful to round them to the nearest ten, hundred, or thousand. This makes it easier to make estimations or even to compare numbers.

## Steps for Rounding:

1. Underline the digit you are rounding to.
2. Look at the digit to the right of the underlined digit.
3. If it is 5 or above, give it a shove! (round up)
4. If it is 4 or below, let it go. (round down)

## EXAMPLE 1: Round 472 to the nearest ten and then to the nearest hundred.

First, we will round 472 to the nearest ten. Begin by underlining the digit we are rounding to.
$4 \underline{72}$
The digit to the right is a 2 , so we let it go. To round to the nearest ten, we round down to 470 and change the 2 to a zero.
472 rounded to the nearest ten is 470 .
Now let's round it to the nearest hundred following the same steps. Underline the digit we are rounding to.
472
The digit to the right is a 7 , so we need to round up.
472 rounded to the nearest hundred is 500 .

## EXAMPLE 2: Round 4,511 to the nearest thousand.

First, underline the digit we are rounding to.
4,511
The digit to the right is 5 , so we need to round up.
5,000

## EXAMPLE 3: Round 296,144 to the nearest ten thousand.

First, underline the digit we are rounding to.
296,144
The digit to the right is a 6 , so we need to round up. But we are already at 90,000, so if we round up it bumps us up to the next hundred thousand.

300,000

1. Round each number to the nearest ten.
a. 453
b. 695
$\qquad$
2. Round each number to the nearest hundred.
a. 6,571 $\qquad$ b. 891
$\qquad$
3. Round each number to the nearest thousand.
a. 15,001 $\qquad$ b. 97,773 $\qquad$
c. 67,195 $\qquad$
d. 2,918 $\qquad$
4. Round each number to the nearest ten thousand.
a. 56,915 $\qquad$ b. 19,781 $\qquad$
c. 89,562 $\qquad$
d. 197,205 $\qquad$
5. Give an example of a number that would round to $\mathbf{9 0 , 0 0 0}$.
6. A blue whale eats $\mathbf{7 , 2 4 5}$ krill in one day. Round this number to the nearest hundred.

KRILL ARE SMALL CRUSTACEANS.

## LESSON 7: NUMBER LINES

## Glothespin Number Line

## You Will Need:

- 21 clothespins
- Lesson 7: Number Line Activity Sheets
- String
- Scissors


## You Will Do:

1. Measure a piece of string that is about 5 feet long. Hang it across a doorway or have two friends hold it up.
2. Tear the activity sheets out of the back of the answer key. Cut out all of the numbers on the first activity sheet. Stick them onto the string in order from least to greatest. Slide them so that they are evenly spaced.
3. Cut out all of the numbers on the second activity sheet. Use rounding to help you place them in between the correct numbers on the string.
4. When you are done, check your work by looking to see if all the numbers go from least to greatest.

Number lines are a useful tool for mathematicians. They help us visualize the relationships between numbers. Just like in the opening activity, they help you compare numbers at a glance.

Number lines can start and stop at any number. They just have to increase by the same amount. The numbers need to be spaced evenly on the line. If the numbers aren't spaced evenly, then we won't get an accurate picture of their relationship to each other. The even spacing helps us visualize how they line up from least to greatest.

Below are three examples of number lines. One increases by 2 each time, one by 10 each time, and one by 1000 each time. Notice that they also start at different numbers.


EXAMPLE 1: Label the correct placement of each number on the number line.

a. 6,413
b. 6,973
c. 6,509
d. 6,090

Think carefully about where each number fits on the number line.


EXAMPLE 2: What number is halfway between 50,000 and $51,000 ?$


51,000 is 1,000 more than 50,000 . Half of 1,000 is 500 , so 50,500 is the number that is halfway between 50,000 and 51,000.


1. Finish labeling each number line by filling in the blanks.
a.

b.

c.

2. Draw a dot and label it with the correct placement of each number on the number lines.
a. 78
b. 55
c. 41
d. 7

a. 919
b. 968
c. 931
d. 982

3. What number is halfway between $\mathbf{1 0 , 0 0 0}$ and $\mathbf{2 0 , 0 0 0}$ ? $\qquad$
4. What number is halfway between $\mathbf{7 0 0}, 000$ and $\mathbf{8 0 0}, \mathbf{0 0 0}$ ? $\qquad$

## LESSON 8: INTRODUCTION TO PROBLEM SOLVING

In math, it is important to master certain skills like adding and subtracting. But to be a great mathematician, you also have to learn how to problem solve. Problem solving is a skill you develop when you work on problems that can be solved in many different ways. There isn't a certain set of steps you have to follow to get the correct answer, and you might even try several different things before you find the strategy that works for you.

Throughout this book, you will work through problem solving lessons like this one. These lessons will include one or two problems, but the problems are longer than the ones you have in a regular lesson. It will take more mathematical muscle to find the right answer, but you will also find that this pays off in a big thrill when you find the correct solution.

Each problem cannot be solved using the same set of steps, but there is a process to use that is helpful.

Learning this problem solving process takes time and practice. Every time you work on one of these problems, you will not only be focused on solving it, but you will be getting better at this process as well. Before jumping into the problems in the lesson, take some time to learn the steps of the problem solving process.

## 1. Read and understand the problem.

This step might sound obvious, but it really is important. Read the problem slowly and carefully. You may want to read it through twice. I like to read problems out loud to make sure I don't rush and miss something. Underline anything you think is important information. Ask yourself, "What are they asking me to find?" and "What information was I are they asking me to find?" and "What information was I
given?" These questions will help you form a good strategy in step two.

## Problem Solving Process

1. Read and understand the problem.
2. Choose your strategy and make a plan.
3. Work through your plan. Change your plan and try something else if necessary.
4. Check your answer. Does it make sense?
5. Present your solution verbally or in writing.


## 2. Choose your strategy and make a plan.

You will be learning and practicing many different problem solving strategies throughout this book. You are probably already using many of them now even if you didn't know they had a specific name. The strategy you choose is up to you, but some work better with certain problems. Here are five suggested strategies.

- Make a list or table
- Act it out

- Guess and check
- Draw a picture
- Work backwards


## 3. Work through your plan. Change your plan and try something else if necessary.

This is a fancy way of saying "solve the problem." Try your plan and see if you can get an answer. If you get stuck, don't get frustrated. That is all just part of the process. Mathematicians often have to try several different strategies before they get the right answer.


## 4. Check your answer. Does it make sense?

You did all that hard work, so don't let a little addition error or something like that keep you from getting the correct answer. Double check your work and make sure your answer makes sense in the context of the problem. If you found that a person was 190 years old or that a brand new car cost $\$ 5$, you probably should look for possible mistakes.


## 5. Present your solution verbally or in writing.

Communication is a part of being a mathematician. Good mathematicians can clearly explain what they did so that they can work together with other mathematicians. Also, presenting your solution to someone else helps you really understand the process you went through. You may have used a piece of scratch paper to scribble out your different ideas. That is just fine, but take some time to rewrite your work neatly with the steps in order. This clarifies your


What if I did the work in my head?
Mental math is a great skill. However, it can make it easy for you to make mistakes and not realize it. After you solve the problem, write down a few notes to show the steps you did in your head.


## EXAMPLE: The Smith family is going on a bike ride. There are 8 people in their family and everyone rides either a bicycle or a tricycle. Altogether there are 18 wheels. How many people are riding tricycles and how many are riding bicycles?

## 1. Read and understand the problem.

What we need to find is how many bicycles and tricycles they took on their trip.
There are 8 people total, so the number of bicycles and tricycles needs to add up to 8. We also know that all of the wheels need to add up to 18 .

## 2. Choose your strategy and make a plan.

You could choose a variety of strategies for this problem and get the right answer. For this example, we will show the "draw a picture" strategy.
3. Work through your plan. Change your plan and try something else if necessary. We can start anywhere for our first picture. I am going to imagine that 4 Smiths rode on bikes and 4 rode on tricycles. I'll label the number of wheels underneath so I can add that up.

2

2

2

2

3

3

3

3
$2+2+2+2+3+3+3+3=20$

I have too many wheels. Bicycles have less wheels than tricycles, so I am going to swap a bicycle for a tricycle. If you were solving this problem yourself, you could just erase one tricycle and change it to a bicycle.

2

2

2

2

2

3

3

3
$2+2+2+2+2+3+3+3=19$
I am getting closer to the correct answer. In fact, I just noticed that changing one tricycle for a bicycle gives me one less wheel. That makes sense because bicycles have one less wheel than tricycles. Now I am just 1 away from the correct number of wheels. Let me swap another bicycle for a tricycle.

2

2


2

2

3

3
$2+2+2+2+2+2+3+3=18$

Hooray! I have the correct number of wheels.

## 4. Check your answer. Does it make sense?

Let me see, do I have something for each family member to ride? Yes, I have 8 items total. And I can double check and count up the wheels again to see that I have 18.

## 5. Present your solution verbally or in writing.

I have shown my work clearly step by step and another person could understand exactly what I did. Now I am finished.

Ok, are you ready to jump in and try some problems? You only have two problems today. Keep these steps in front of you as you work and try your best to solve each problem. If you like, you can try them on a piece of scrap paper first and then copy your work into your book. Do your best. Even if you don't find the correct answer on your first try, you are learning and sharpening your problem-solving skills.

1. Joseph is stacking his wooden blocks in a pattern. The first stack has one block, the second stack has two blocks, and so on. He wants to continue the pattern until he has $\mathbf{1 2}$ blocks in the last stack.

How many total blocks will he need?
$\qquad$ blocks

2. Farmer Ben raises pigs and chickens. He likes to tell riddles about his animals. He tells you that there are 32 animal legs in the barn and 11 animals altogether.

How many chickens and how many pigs does Farmer Ben have in his barn?

$\qquad$ chickens
$\qquad$ pigs

## SKILL CHECK

You should have been practicing adding three-digit numbers each day as part of your skills practice. Here are a few more for you to try.

a. 406
b.
569
c. 345
$+314$
$+277$
$+199$

1. How many groups of ten thousand are in one hundred thousand?
2. Round each number to the nearest thousand.
a. 17,890 $\qquad$ b. 109,123
$\qquad$
3. Round each number to the nearest ten thousand.
a. 27,789 $\qquad$ b. 324,111
$\qquad$
4. Write 567,198 in expanded form.
$\qquad$
$\qquad$ $+$ $\qquad$ $+$ $\qquad$ $+$ $\qquad$ $+$ $\qquad$
5. Write $\mathbf{6 , 7 1 9}$ in written form.
$\qquad$
6. What number is halfway between $\mathbf{3 0 , 0 0 0}$ and $\mathbf{4 0 , 0 0 0}$ ? $\qquad$
