4
LEVEL

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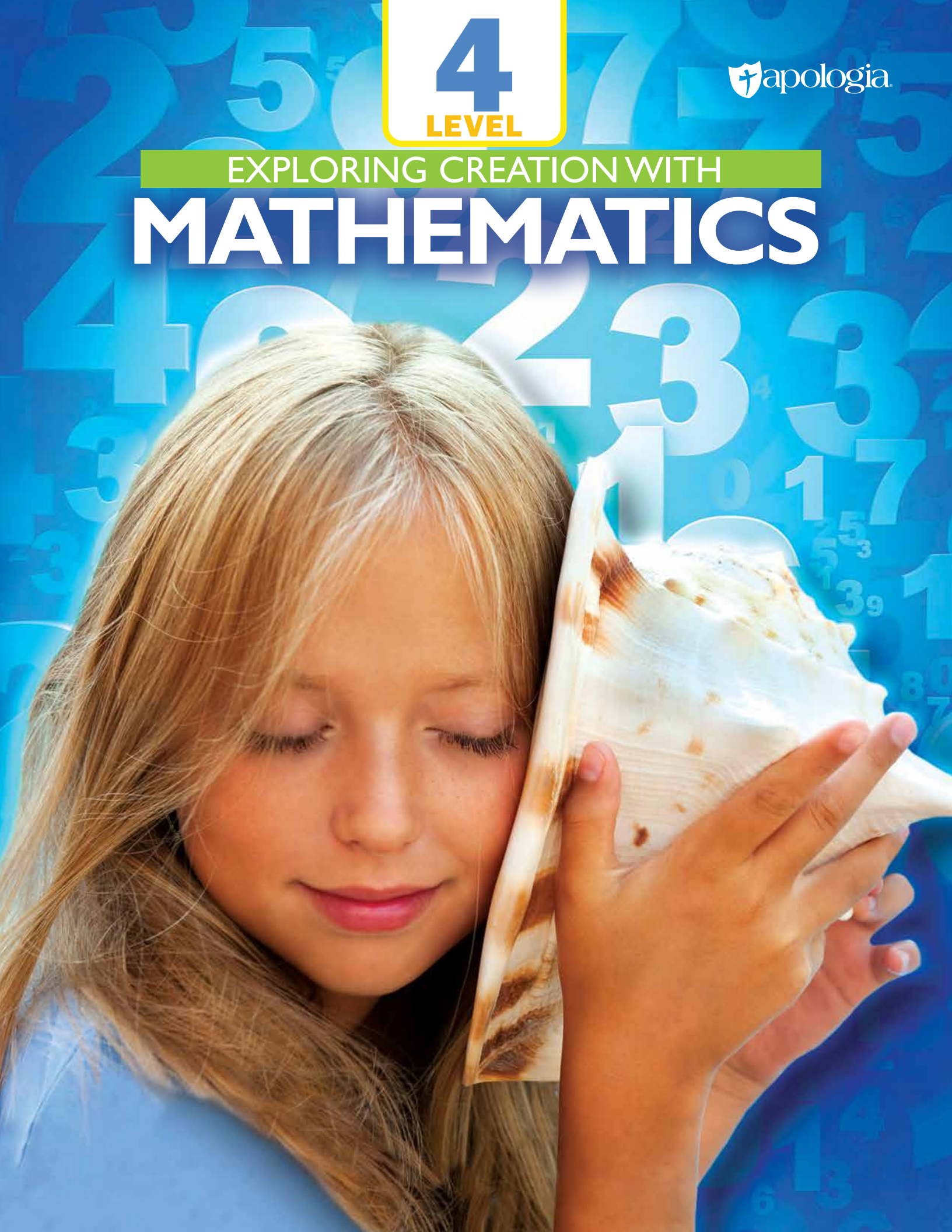
EXPLORING CREATION WITH

MATHEMATICS



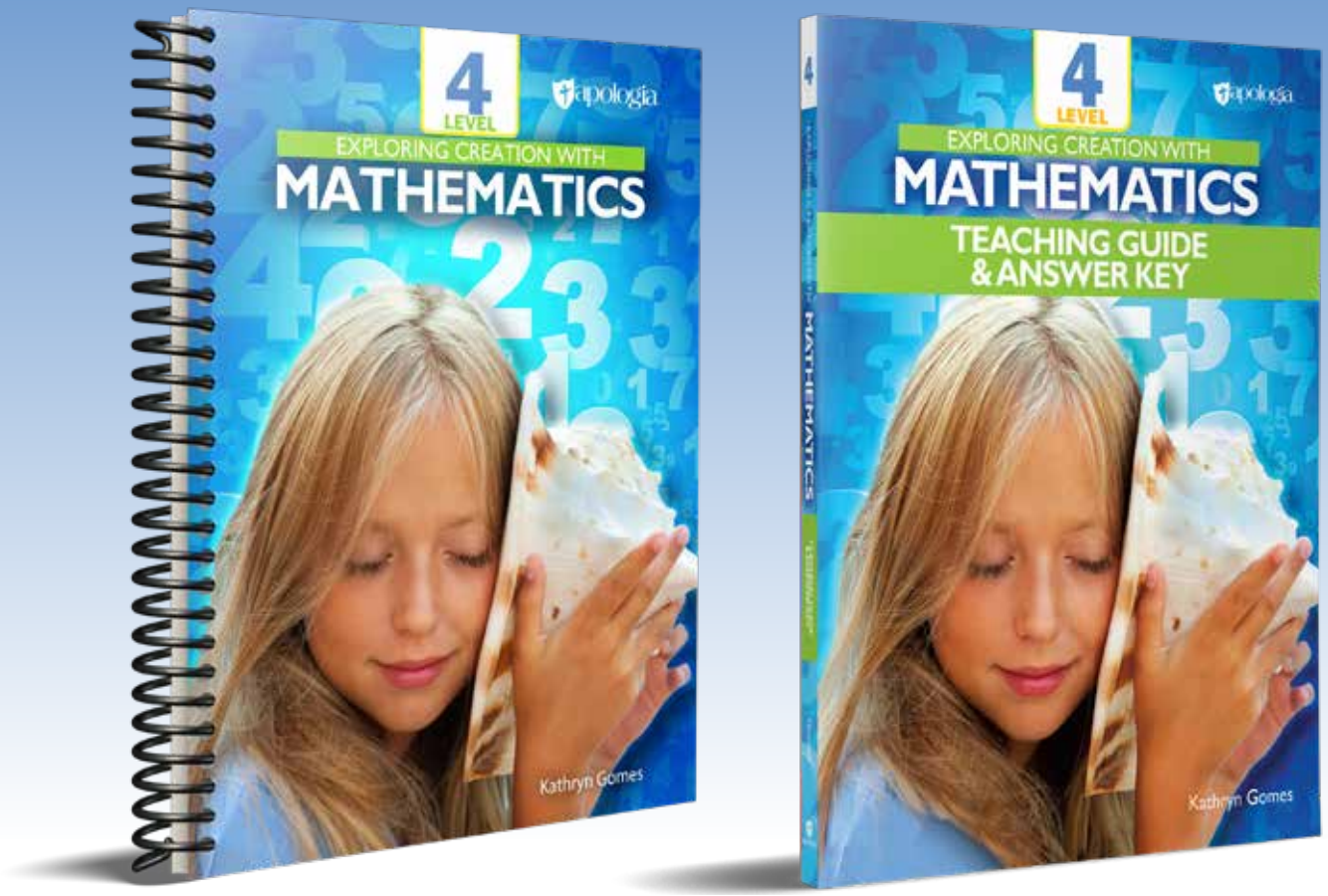


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TABLE OF CONTENTS

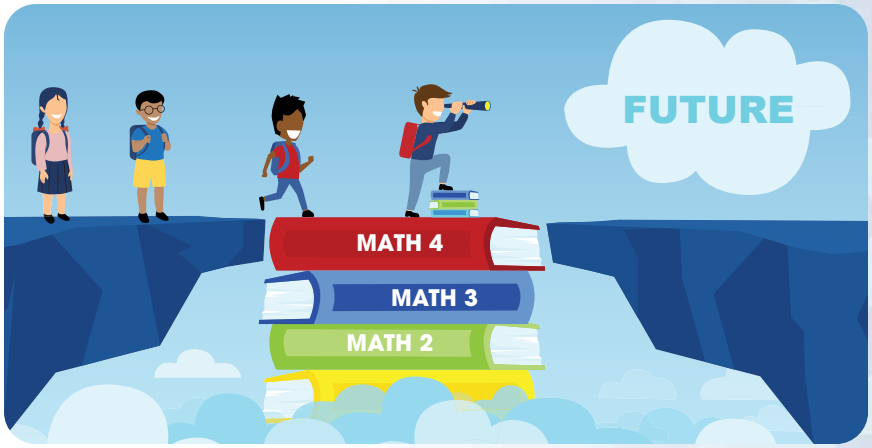
UNIT 1

NUMBERS AND PLACE VALUE

SEEING OUR CREATOR IN MATHEMATICS

Welcome to a new year of math! There are many exciting and interesting topics in this book and you are going to have a great year learning about all of them.

Before we jump in, let's think about our motivation. Why are we learning math this year? Many people think of learning math as a bridge. It is something that allows them to get where they want to go.

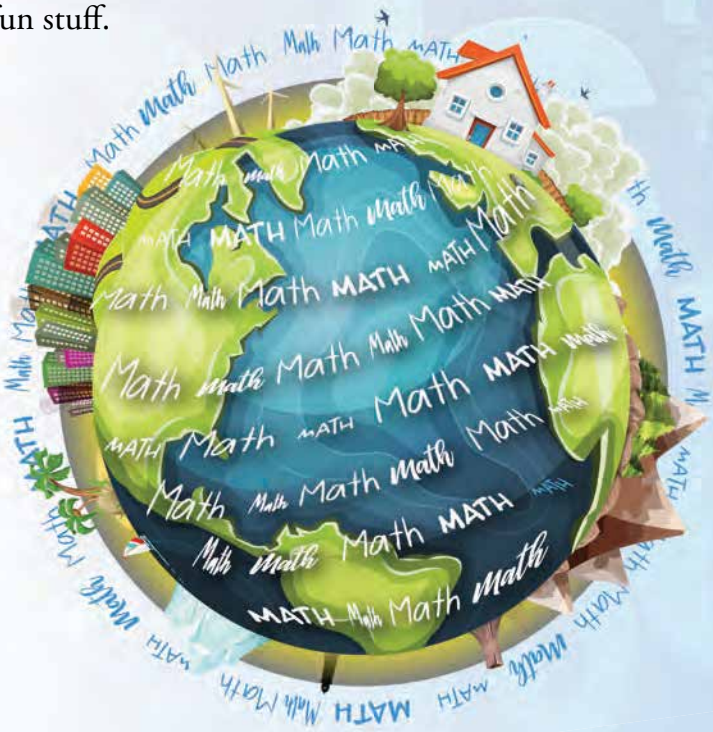


But math is so much more than that. It isn't just a requirement that allows you to get onto the fun stuff. It is an opportunity to learn about God.

You see, when God made the world He included math. He didn't have to; He chose for it to be a part of his design. And everything God made was good.

We find math in the world around us in the symmetry and patterns of creation. You will learn more about that throughout this book. When we look closely at these examples in creation, we catch a glimpse of the character of the Creator. In the beauty, order, and truth of creation we see the fingerprints of His beauty, order, and truth. That is why we learn math.

Let's get started!



Skills Practice for Unit 1:

Adding and Subtracting Three-Digit Numbers
(see answer key page 16 for more details)

TEXTBOOK
Unit 1

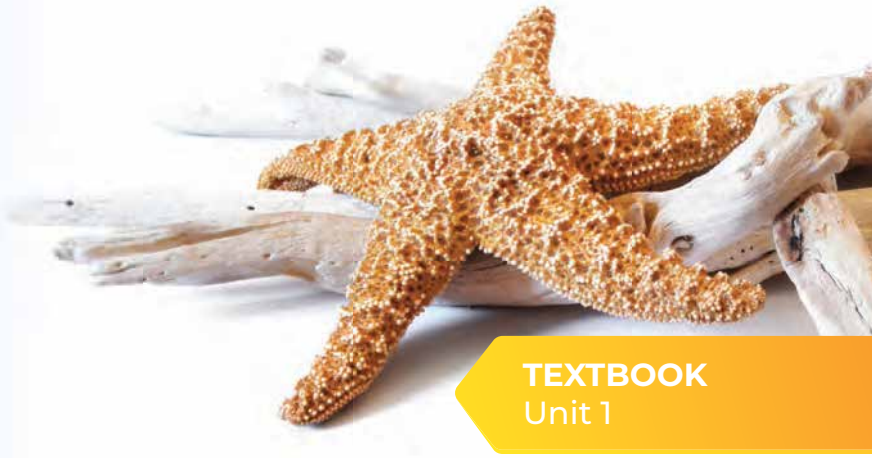
CHAPTER

1

PLACE VALUE

In this chapter, you will learn to:

- Use place value to write numbers up to one million
- Write numbers in expanded and written form
- Round numbers



LESSON 1: NUMBERS TO 100,000

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.

PLACE VALUE:
A system of writing numbers where the location of a digit affects its value

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.

PLACE VALUE CHART

Millions			Thousands			Ones		
Hundred Million	Ten Million	One Million	Hundred Thousand	Ten Thousand	One Thousand	Hundreds	Tens	Ones
1	2	3,	4	5	6,	7	8	9

STANDARD FORM:
123,456,789

EXPANDED FORM:
100,000,000 + 20,000,000 + 3,000,000 + 400,000 + 50,000 + 6,000 + 700 + 80 + 9

WORD FORM:
one hundred twenty-three million, four hundred fifty-six thousand, seven hundred eighty-nine

This 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 7 in the number 670,334 represent?**
The 7 is in the ten thousands place. So the 7 represents

1. Write the value of the underlined digit.

a. 171,213 _____

b. 4,056 _____

c. 913,456 _____

d. 661,583 _____

2. Write an example of a number that has a 5 in the ten thousands place.

_____

3. Write an example of a number that has a 6 in the millions place.

_____

1	8	2	5	6	9

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.

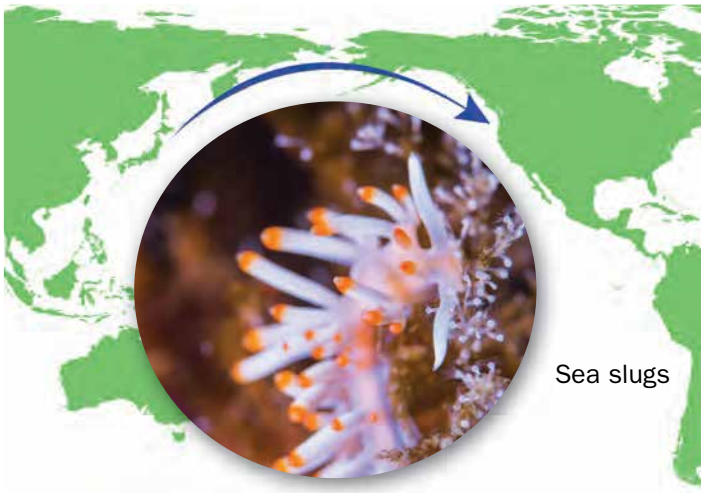
10 rolls = 1 case = 1,000 sheets

10 cases = 10,000 sheets

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.


Sea slugs

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.**

Millions			Thousands			Ones		
Hundred Million	Ten Million	One Million	Hundred Thousand	Ten Thousand	One 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. 2<u>9</u>,111 _____

b. 4,0<u>4</u>9 _____

c. <u>1</u>,223,780 _____

d. 1,<u>3</u>45,107 _____

2. 10 groups of ten is the same as

_____

3. 10 groups of a hundred is the same as

_____

4. 10 groups of a thousand is the same as

_____

5. 10 groups of ten thousand is the same as

_____

6. 10 groups of one hundred thousand is the same as

_____

7. What number is one less than one million?

_____

OCEAN SIZES	
OCEAN	Approximate Area in Square Kilometers
Arctic	15,558,000
Atlantic	85,133,000
Indian	70,560,000
Pacific	161,760,000
Southern Ocean	21,960,000

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?

_____

LESSON 3: EXPANDED FORM

Expanded Form Flip Book

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 numbers in written form.

EXPANDED FORM:
A way of writing numbers that shows the value of each digit

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.

a. 88123 b. 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 _____

b. 1,203,305 _____

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 after the lesson.

MY STATE:	AREA OF MY STATE:

Expanded Form _____

Written Form _____

A SECOND STATE:	AREA OF SECOND STATE:

Expanded Form _____

Written Form _____

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 say the name of the period. If you were reading 1,234 out loud, you would say "one thousand, two hundred thirty-four." Do you see how you say the name of the period when you get to the comma?

WRITTEN FORM:
A way of writing numbers using words instead of numerals

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

_____

_____

b. 1,456,000

_____

_____

c. 2,303

_____

_____

d. 765,555

_____

_____

e. 4000 + 500 + 5

_____

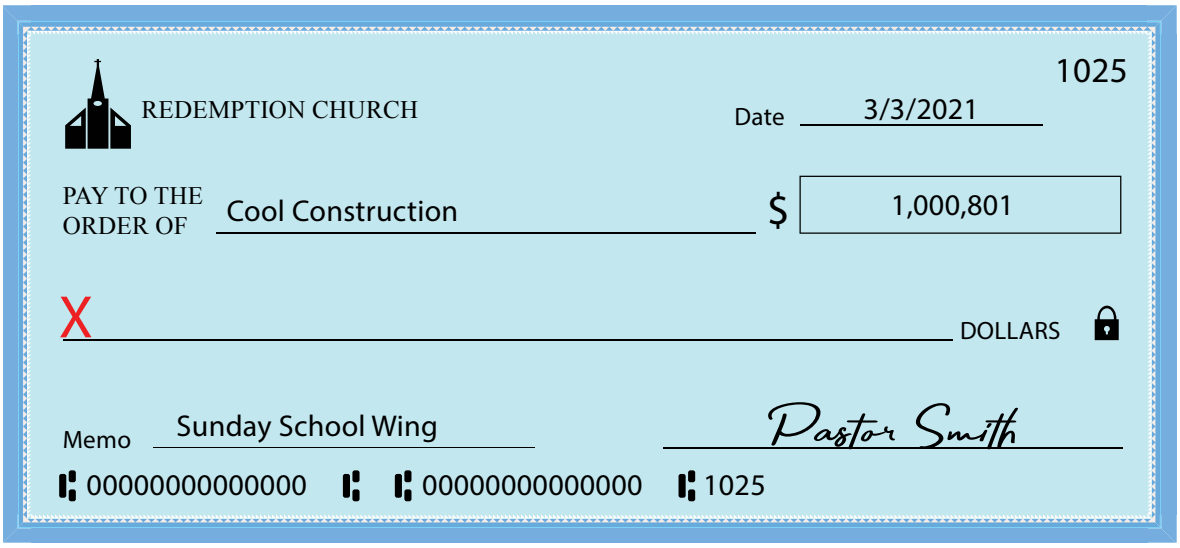
_____

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.

LESSON 5: COMPARING AND ORDERING

Place Value Math Search

You Will Need:

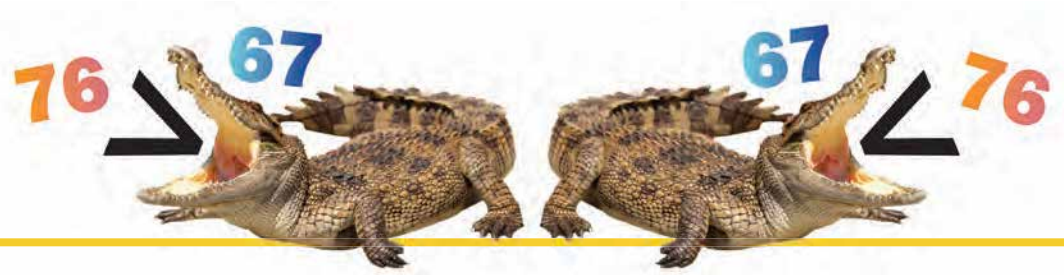
- Lesson 5: Activity Sheets
- Masking tape
- A notebook

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 ◯ 77,413**

Begin by comparing the ten thousands place. **70,000 = 70,000**

The thousands are equal too. **7,000 = 7,000**

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 78,551

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

143,005
75,991
78,551

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**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 ◯ 27 b. 51 ◯ 43 c. 123 ◯ 304

d. 650 ◯ 450 e. 761 ◯ 770 f. 230 ◯ 230

2. Fill in the correct symbol <, >, or = to complete the comparison.

a. 32,999 ◯ 102,033 b. 254,789 ◯ 254,789

c. 778,003 ◯ 778,030 d. 6,798 ◯ 6,777

e. 34,559 ◯ 304,559 f. 344,280 ◯ 340,289

3. Put the numbers in order from greatest to least.

a. 686,923 17,999 786,239

_____

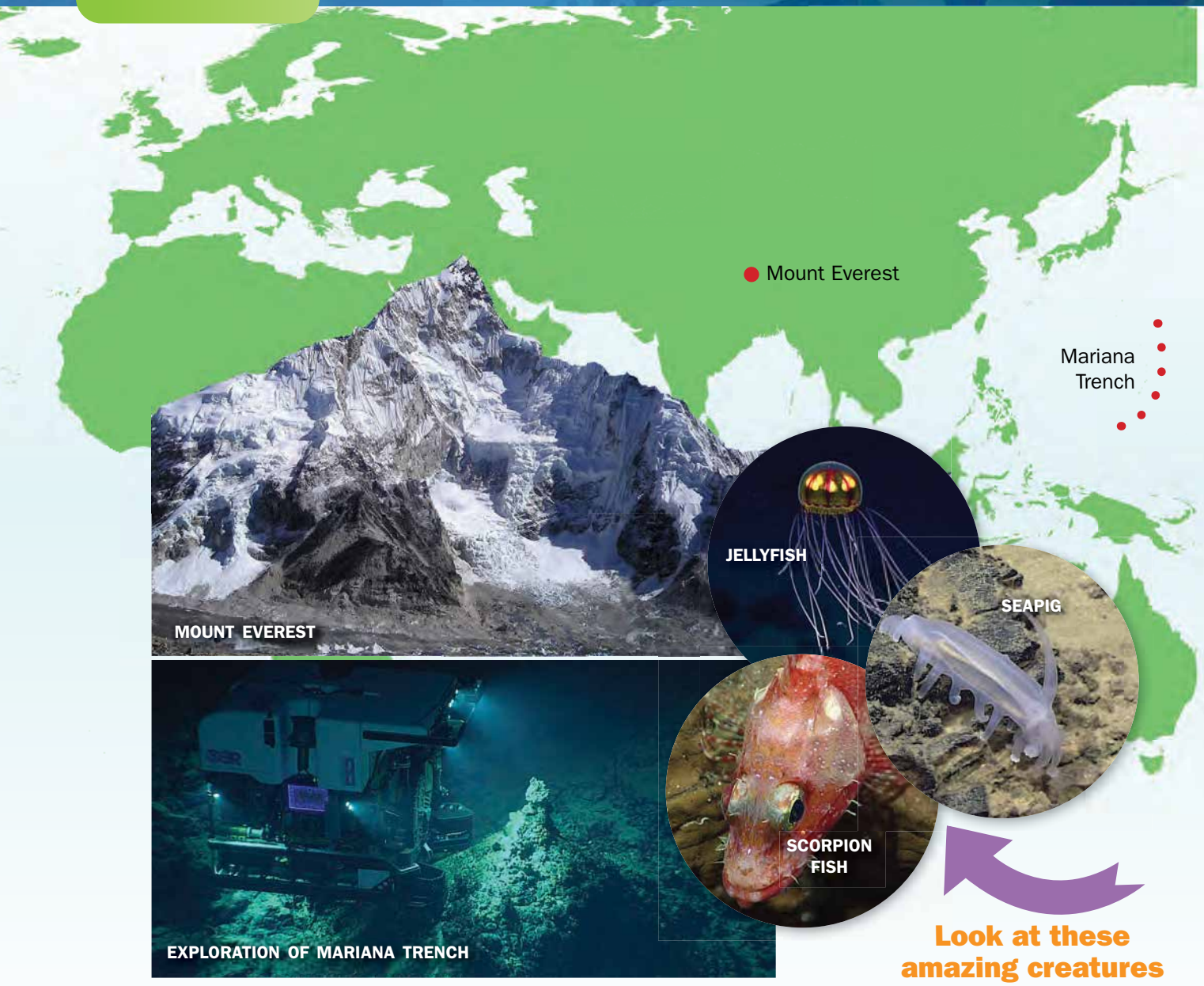
b. 85,717 87,900 86,999

_____

4. What digit could be placed in the blank to make the statement true?

a. 3072 < 30 ____ 1 < 3090

b. 440 < 4 ____ 4 < 451



Look at these amazing creatures found in the Mariana Trench!

5. **Mount Everest is 29,029 feet tall at its summit. The Mariana Trench is 36,011 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?**

_____

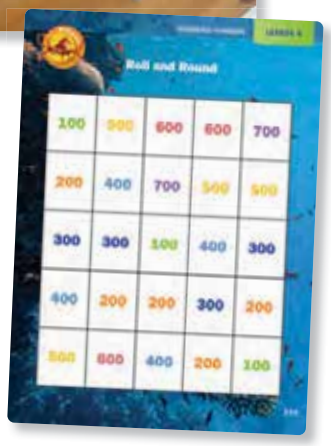
LESSON 6: ROUNDING NUMBERS

ACTIVITY

Roll and Round (to the nearest hundred)

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.

47̲2

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.

4̲72

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.

4̲,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.

29̲6,144

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

PRACTICE

1. Round each number to the nearest ten.

a. 453 _____ b. 695 _____

2. Round each number to the nearest hundred.

a. 6,571 _____ b. 891 _____

3. Round each number to the nearest thousand.

a. 15,001 _____ b. 97,773 _____

c. 67,195 _____ d. 2,918 _____

4. Round each number to the nearest ten thousand.

a. 56,915 _____ b. 19,781 _____

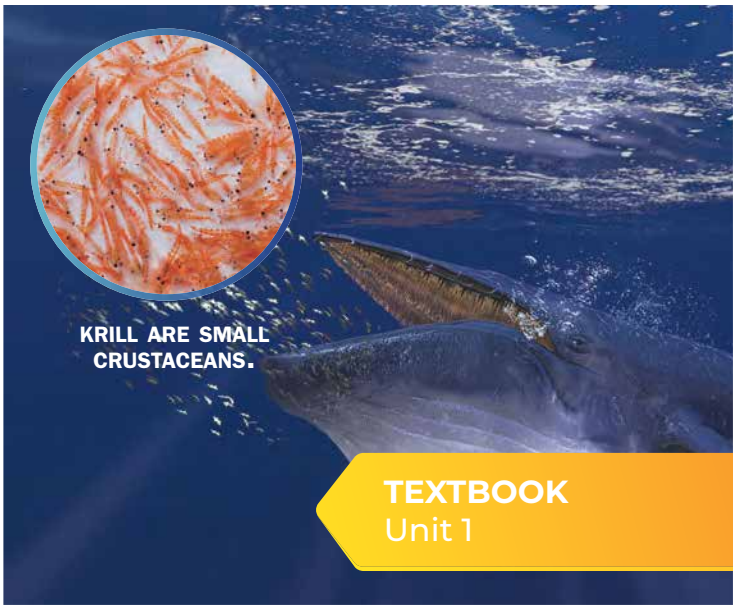
c. 89,562 _____ d. 197,205 _____

5. Give an example of a number that would round to 90,000.

_____

6. A blue whale eats 7,245 krill in one day. Round this number to the nearest hundred.

_____



LESSON 7: NUMBER LINES

Clothespin Number Line

You Will Need:

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

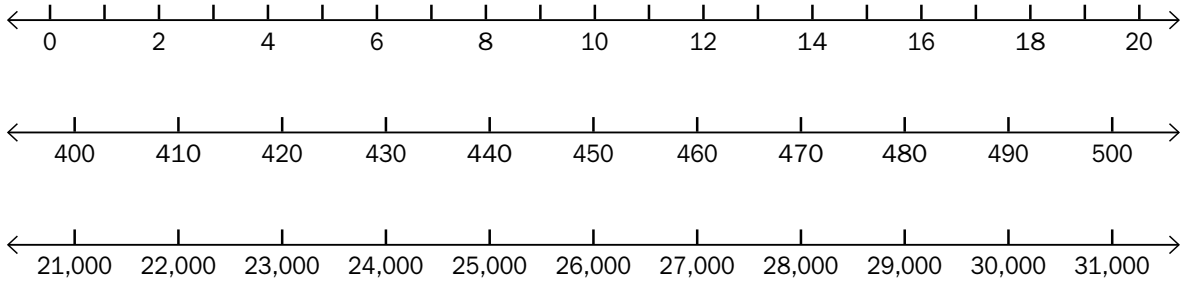
You Will Do:

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.

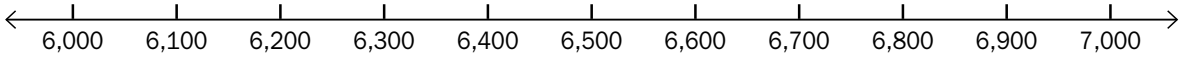
Number lines are a useful tool for mathematicians. They help us visualize the relationships between numbers. Just like in the opening activity, they help you compare numbers at a glance.

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.

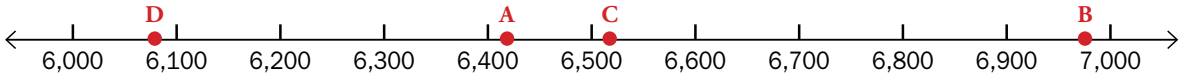


EXAMPLE 1: **Label the correct placement of each number on the number line.**

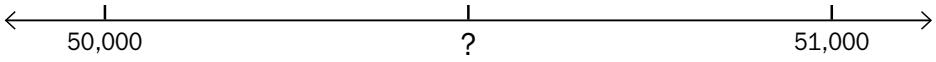


a. 6,413 b. 6,973 c. 6,509 d. 6,090

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



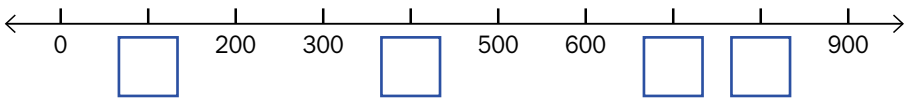
EXAMPLE 2: **What number is halfway between 50,000 and 51,000?**



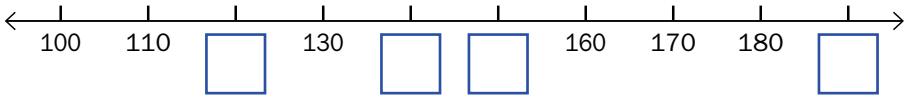
51,000 is 1,000 more than 50,000. Half of 1,000 is 500, so 50,500 is the number that is halfway between 50,000 and 51,000.

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

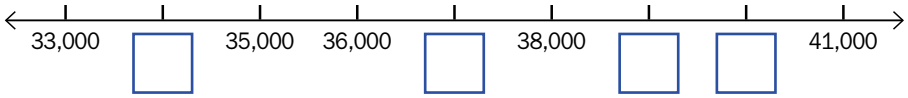
a.



b.

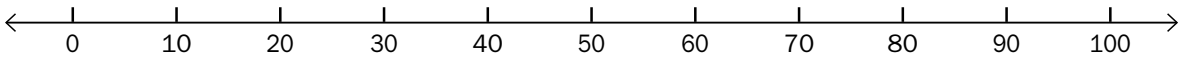


c.

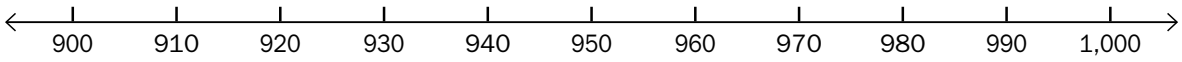


2. Draw a dot and label it with the correct placement of each number on the number lines.

a. 78 b. 55 c. 41 d. 7



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



3. What number is halfway between 10,000 and 20,000? _____

4. What number is halfway between 700,000 and 800,000? _____

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.

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.

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 given?" These questions will help you form a good strategy in step two.

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

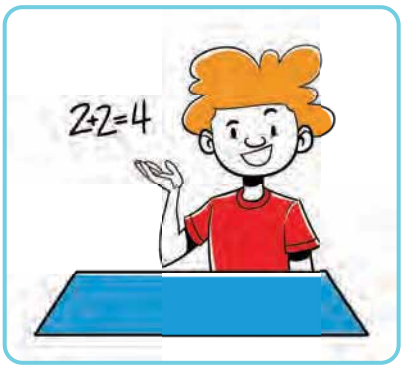
3. Work through your plan. Change your plan and try something else if necessary.

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.

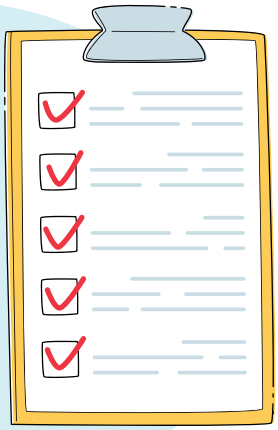
5. Present your solution verbally or in writing.



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 thinking for yourself and others.

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 = 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 + 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.

PRACTICE

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 12 blocks in the last stack.**

   How many total blocks will he need?

_____ 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?

_____ chickens

_____ 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 + 314

b. 569 + 277

c. 345 + 199

1. How many groups of ten thousand are in one hundred thousand?

_____

2. Round each number to the nearest thousand.

a. 17,890 _____ b. 109,123 _____

3. Round each number to the nearest ten thousand.

a. 27,789 _____ b. 324,111 _____

4. Write 567,198 in expanded form.

_____ + _____ + _____ + _____ + _____ + _____

5. Write 6,719 in written form.

_____

6. What number is halfway between 30,000 and 40,000? _____

4
LEVEL

apologia

EXPLORING CREATION WITH

MATHEMATICS

TEACHING GUIDE & ANSWER KEY

Kathryn Gomes

TABLE OF CONTENTS

WEEK-BY-WEEK DAILY SCHEDULE

Below is a suggested weekly schedule to help you stay on track. It uses a four-day week to leave room for a co-op day or a review day. This schedule covers 36 weeks, but please feel free to adjust it to the needs of your child and your family's calendar.

Week	Day 1	Day 2	Day 3	Day 4
1	☐ UNIT 1 INTRO CHAPTER 1 Lesson 1 Skills practice: adding three-digit numbers	☐ CHAPTER 1 Lesson 2 Skills practice: adding three-digit numbers	☐ CHAPTER 1 Lesson 3 Skills practice: adding three-digit numbers	☐ CHAPTER 1 Lesson 4 Skills practice: adding three-digit numbers
2	☐ CHAPTER 1 Lesson 5 Skills practice: adding three-digit numbers	☐ CHAPTER 1 Lesson 6 Skills practice: adding three-digit numbers	☐ CHAPTER 1 Lesson 7 Skills practice: adding three-digit numbers	☐ CHAPTER 1 Lesson 8 Skills practice: adding three-digit numbers
3	☐ CHAPTER 1 Chapter 1 Review Optional Chapter 1 Test	☐ CHAPTER 2 Lesson 9 Skills practice: subtracting three-digit numbers	☐ CHAPTER 2 Lesson 10 Skills practice: subtracting three-digit numbers	☐ CHAPTER 2 Lesson 11 Skills practice: subtracting three-digit numbers
4	☐ CHAPTER 2 Lesson 12 Skills practice: subtracting three-digit numbers	☐ CHAPTER 2 Lesson 13 Skills practice: subtracting three-digit numbers	☐ CHAPTER 2 Chapter 2 Review Optional Chapter 2 Test	☐ UNIT 1 PROJECT

TEACHER'S NOTES

UNIT 1: NUMBERS AND PLACE VALUE

This first unit covers a wide variety of topics all related to numbers and place value. We will review addition and subtraction and expand our skills to larger numbers. We will also be building on what we have learned about place value and looking at numbers up to one million. This unit is the springboard for what is to come next.

SUPPLY LIST

Skills Practice:

- Notecards
- Addition worksheets (on the Book Extras website)
- Uno® cards
- Subtraction worksheets (on the Book Extras website)
- Stapler
- 3 dice
- Pennies and dimes or two other kinds of markers
- 21 clothespins
- String

Chapter 1:

- Magazines and flyers
- Scissors
- Glue stick
- Clipboard

Chapter 2:

- Scissors
- Glue stick
- A paper clip

Unit 1 is a broad overview of place value, addition, subtraction, rounding and estimation. We are brushing up on these skills and expanding them to larger numbers. The connection to sea creatures is a lot of fun in this unit because we finally get to work with some big numbers from nature. I especially think your child will enjoy the project at the end.

SKILLS PRACTICE FOR UNIT 1: ADDITION AND SUBTRACTION

Skill 1: Adding three-digit numbers

In Chapter 2 of this unit, we will be practicing addition and subtraction with 4, 5, and 6-digit numbers. We will take some time now to review the steps with smaller numbers as a refresher.

1. Notecard facts. Write a three-digit addition problem for them on a notecard and have them solve it. Rotate between problems that require regrouping and those that don't.
2. Practice with the addition worksheets that are available on the Book Extras website.
3. Play "Make the Greatest Sum." Each player picks 6 Uno cards and uses them to write an addition problem. Whoever has the largest sum wins.
4. **Take It Further:** For an extra challenge, give kids part of the addition problem and the sum. They have to work backwards to find the missing part like in the example below.

$$\begin{array}{r} 729 \\ +\ \square\square\square \\ \hline 877 \end{array}$$

Skill 2: Subtracting three-digit numbers

A quick refresher in this is helpful before we jump into larger numbers in the next chapter. The most challenging problems are those where you need to regroup twice or where you subtract across zeros. Some examples of those are below, followed by some suggestions on how to practice.

$$\begin{array}{r} 210 \\ -\ 98 \\ \hline \end{array} \qquad \begin{array}{r} 800 \\ -\ 562 \\ \hline \end{array} \qquad \begin{array}{r} 912 \\ -\ 198 \\ \hline \end{array} \qquad \begin{array}{r} 502 \\ -\ 378 \\ \hline \end{array}$$

1. Notecard facts. Write a three-digit subtraction problem for them on a notecard and have them solve it. Rotate between problems that require regrouping and those that don't.
2. Practice with the subtraction worksheets that are available on the Book Extras website.
3. Play "Make the Greatest Difference." Each player picks 6 Uno cards and arranges them to make a subtraction problem. The player with the greatest difference wins.
4. **Take It Further:** For an extra challenge, give kids part of the subtraction problem and the difference. They have to work backwards to find the missing part like in the example below. These can be pretty tough, especially if there is regrouping involved. Start with one that doesn't have regrouping and work up from there.

$$\begin{array}{r} 803 \\ -\ \square\square\square \\ \hline 305 \end{array}$$

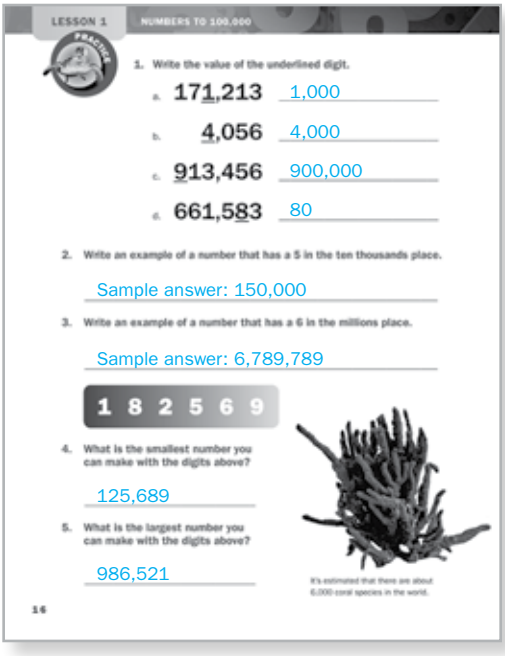
CHAPTER 1: PLACE VALUE

LESSON 1

For the opening activity, you may find it helpful to set a timer and have your child find as many examples as they can during that time period. When the time is up, they can write in examples for anything they did not find.

Some of the items on the scavenger hunt might be unfamiliar to your student. It is perfectly fine if they need some guidance in the activity. It will help get them ready for the content they will learn in detail this year.

Page 16 Answers



LESSON 1 NUMBERS TO 100,000

1. Write the value of the underlined digit.
   a. 171,213 — 1,000
   b. 4,056 — 4,000
   c. 913,456 — 900,000
   d. 661,583 — 80
2. Write an example of a number that has a 5 in the ten thousands place.
   Sample answer: 150,000
3. Write an example of a number that has a 6 in the millions place.
   Sample answer: 6,789,789

1 8 2 5 6 9

4. What is the smallest number you can make with the digits above?
   125,689
5. What is the largest number you can make with the digits above?
   986,521

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

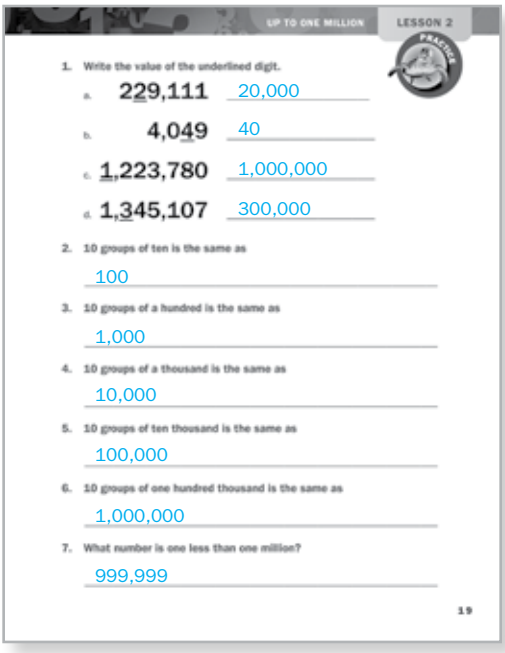
16

LESSON 2

A million is a big concept for kids to wrap their minds around. A wonderful resource is *How Much is a Million* by David M. Schwartz, with fascinating illustrations by Steven Kellogg. The book will help your child picture a million, and even introduces them to a billion and a trillion. There are other great resources on the Book Extras website.

Examples of a million could be stars, grains of sand, the price of an expensive house, etc.

Page 19 Answers

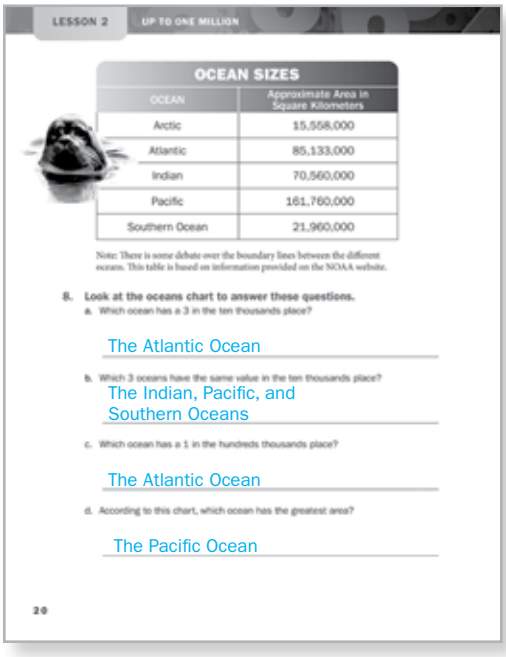


UP TO ONE MILLION LESSON 2

1. Write the value of the underlined digit.
   a. 229,111 — 20,000
   b. 4,049 — 40
   c. 1,223,780 — 1,000,000
   d. 1,345,107 — 300,000
2. 10 groups of ten is the same as
   100
3. 10 groups of a hundred is the same as
   1,000
4. 10 groups of a thousand is the same as
   10,000
5. 10 groups of ten thousand is the same as
   100,000
6. 10 groups of one hundred thousand is the same as
   1,000,000
7. What number is one less than one million?
   999,999

19

Page 20 Answers



LESSON 2 UP TO ONE MILLION

OCEAN SIZES

OCEAN	Approximate Area in Square Kilometers
Arctic	15,558,000
Atlantic	85,133,000
Indian	70,560,000
Pacific	161,760,000
Southern Ocean	21,960,000

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?

The Atlantic Ocean

b. Which 3 oceans have the same value in the ten thousands place?

The Indian, Pacific, and Southern Oceans

c. Which ocean has a 1 in the hundreds thousands place?

The Atlantic Ocean

d. According to this chart, which ocean has the greatest area?

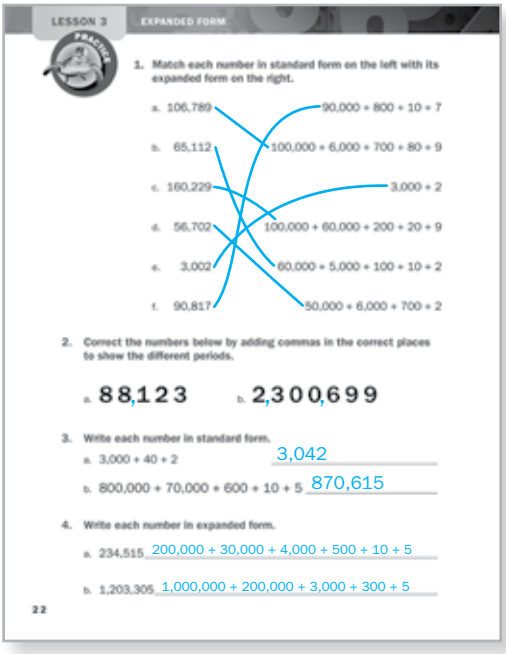
The Pacific Ocean

20

LESSON 3

Expanded form is a great way to really reinforce the concept of place value with kids. And the flip book in the opening activity provides an excellent visual.

Page 22 Answers



LESSON 3 EXPANDED FORM

1. **Match each number in standard form on the left with its expanded form on the right.**

a. 106,780 — 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.**

a. 88,123 b. 2,300,699

3. **Write each number in standard form.**

a. 3,000 + 40 + 2 3,042

b. 800,000 + 70,000 + 600 + 10 + 5 870,615

4. **Write each number in expanded form.**

a. 234,515 200,000 + 30,000 + 4,000 + 500 + 10 + 5

b. 1,203,305 1,000,000 + 200,000 + 3,000 + 300 + 5

22

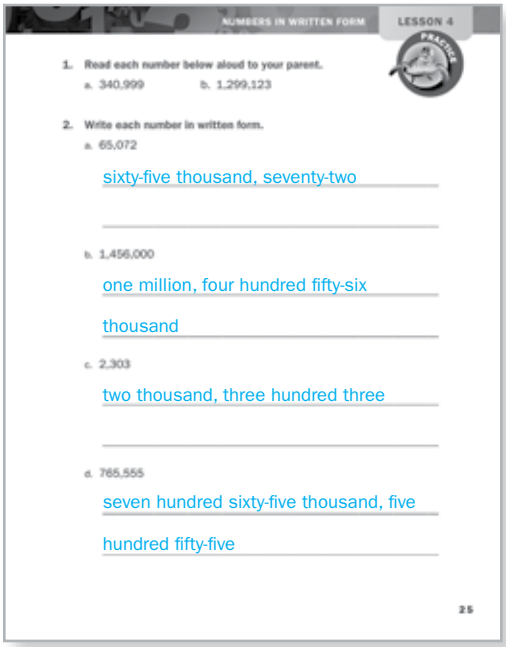
LESSON 4

Writing out numbers in written form can be tedious. We have them look up the area of two states to make it more interesting.

Take it Further: Have your child research a dream home they'd like to purchase with your help. Then have them practice writing out the check. There are blank check templates available on the Book Extras website.

Chart of State Sizes in Square Miles				
Alabama	Alaska	Arizona	Arkansas	California
52,420	665,384	113,990	53,179	163,695
Colorado	Connecticut	Delaware	Florida	Georgia
104,094	5,543	2,489	65,758	59,425
Hawaii	Idaho	Illinois	Indiana	Iowa
10,932	83,569	57,914	36,420	56,273
Kansas	Kentucky	Louisiana	Maine	Maryland
82,278	40,408	52,378	35,380	12,406
Massachusetts	Michigan	Minnesota	Mississippi	Missouri
10,554	96,714	86,936	48,432	69,707
Montana	Nebraska	Nevada	New Hampshire	New Jersey
147,040	77,348	110,572	9,349	8,723
New Mexico	New York	North Carolina	North Dakota	Ohio
121,590	54,555	53,819	70,698	44,826
Oklahoma	Oregon	Pennsylvania	Rhode Island	South Carolina
69,899	98,379	46,054	1,545	32,020
South Dakota	Tennessee	Texas	Utah	Vermont
77,116	42,144	268,596	84,897	9,616
Virginia	Washington	West Virginia	Wisconsin	Wyoming
42,775	71,298	24,230	65,496	97,813

Page 25 Answers

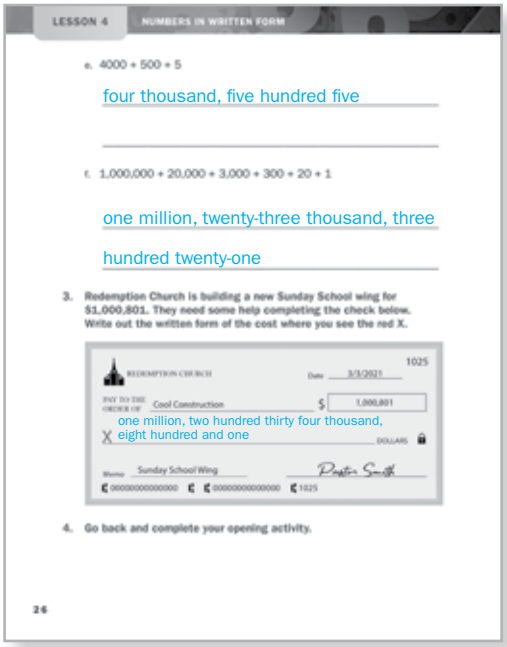

NUMBERS IN WRITTEN FORM LESSON 4

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
   sixty-five thousand, seventy-two
   b. 1,456,000
   one million, four hundred fifty-six thousand
   c. 2,303
   two thousand, three hundred three
   d. 765,555
   seven hundred sixty-five thousand, five hundred fifty-five

25

Page 26 Answers


LESSON 4 NUMBERS IN WRITTEN FORM

e. 4000 + 500 + 5
four thousand, five hundred five

f. 1,000,000 + 20,000 + 3,000 + 300 + 20 + 1
one million, twenty-three thousand, three hundred twenty-one

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.

1025
Redemption Church
Date 3/3/2021
Pay to the order of Cool Construction $ 1,000,801
one million, two hundred thirty four thousand, eight hundred and one Dollars
Memo Sunday School Wing
Pastor Smith

4. Go back and complete your opening activity.

26

LESSON 5

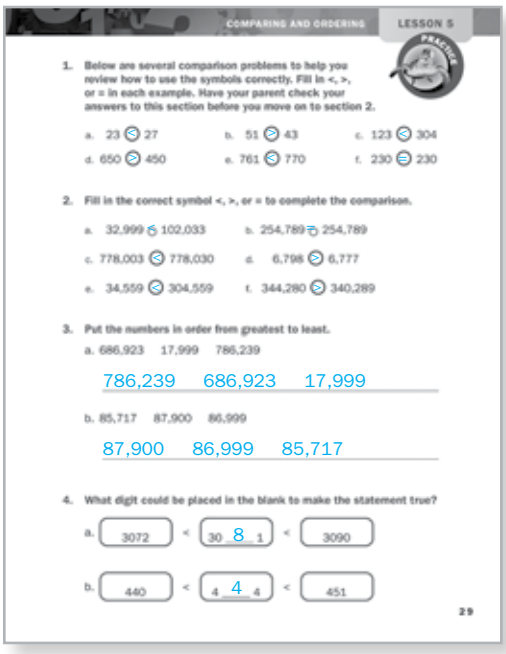
To set up the opening activity, first tear out the activity sheets. Cut out the cards and fold them down along the yellow line so that the answers are showing on top. You can reference the list of answers on the right if needed. Tape them up on a wall, refrigerator, or whiteboard in any order. Your child will solve the problem underneath the fold and then search for the correct answer. They move from paper to paper until they have found them all.

Lesson 5 Activity Answers

Question	Answer
Three digits separated by a comma.	A period
How many hundreds are in one thousand?	10
Write the number in standard form: one million, seven hundred two thousand, two hundred thirteen	1,702,213
Write the number in expanded form: 1,617,222	1,000,000 + 600,000 + 10,000 + 7,000 + 200 + 20 + 2
Write the number in standard form: 1,000,000 + 700,000 + 20,000 + 200 + 10 + 3	1,720,213
How many ten thousands are in one million?	100
What does the 5 in the number 150,672 represent?	50,000
Write 53,112 in expanded form	50,000 + 3,000 + 100 + 10 + 2

Be sure to have your student review the notation and the direction of the inequality sign. This is normally the trickiest part of comparing two numbers for students. If your child has trouble, have them first circle the greater number. Then you can tell if they are struggling with comparing the numbers or just the sign.

Page 29 Answers



COMPARING AND ORDERING LESSON 5

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 < 27 b. 51 > 43 c. 123 < 304
d. 650 > 450 e. 761 < 770 f. 230 = 230

2. Fill in the correct symbol <, >, or = to complete the comparison.

a. 32,999 < 102,033 b. 254,789 = 254,789
c. 778,003 < 778,030 d. 6,798 < 6,777
e. 34,559 < 304,559 f. 344,280 > 340,289

3. Put the numbers in order from greatest to least.

a. 686,923 17,999 786,239

786,239 686,923 17,999

b. 85,717 87,900 86,999

87,900 86,999 85,717

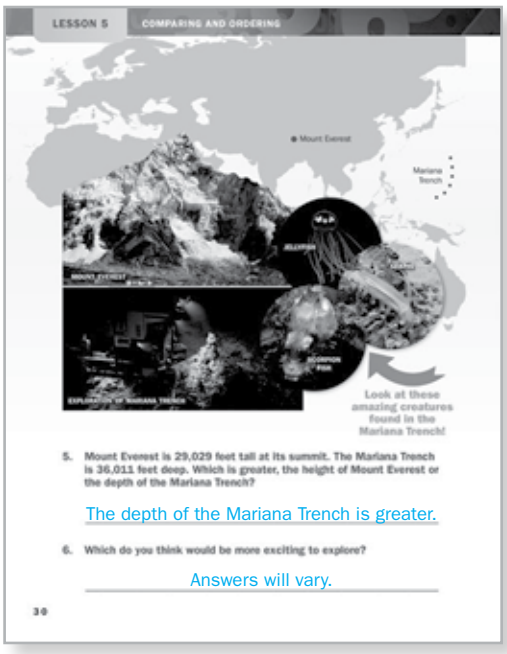
4. What digit could be placed in the blank to make the statement true?

a. 3072 < 30 8 1 < 3090

b. 440 < 4 4 4 < 451

29

Page 30 Answers



LESSON 5 COMPARING AND ORDERING

Look at these amazing creatures found in the Mariana Trench!

5. Mount Everest is 29,029 feet tall at its summit. The Mariana Trench is 36,011 feet deep. Which is greater, the height of Mount Everest or the depth of the Mariana Trench?

The depth of the Mariana Trench is greater.

6. Which do you think would be more exciting to explore?

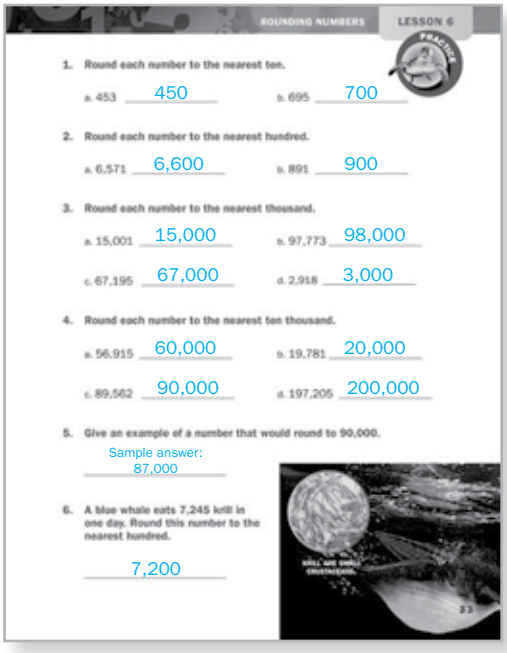
Answers will vary.

30

LESSON 6

Rounding is a key skill in measurement and also in estimation. Students will be using estimation in Chapter 2.

Page 33 Answers



ROUNDING NUMBERS LESSON 6

1. Round each number to the nearest ten.

a. 453 450 b. 695 700

2. Round each number to the nearest hundred.

a. 6,571 6,600 b. 891 900

3. Round each number to the nearest thousand.

a. 15,001 15,000 b. 97,773 98,000
c. 67,195 67,000 d. 2,918 3,000

4. Round each number to the nearest ten thousand.

a. 56,915 60,000 b. 19,781 20,000
c. 89,562 90,000 d. 197,205 200,000

5. Give an example of a number that would round to 90,000.

Sample answer: 87,000

6. A blue whale eats 7,245 krill in one day. Round this number to the nearest hundred.

7,200

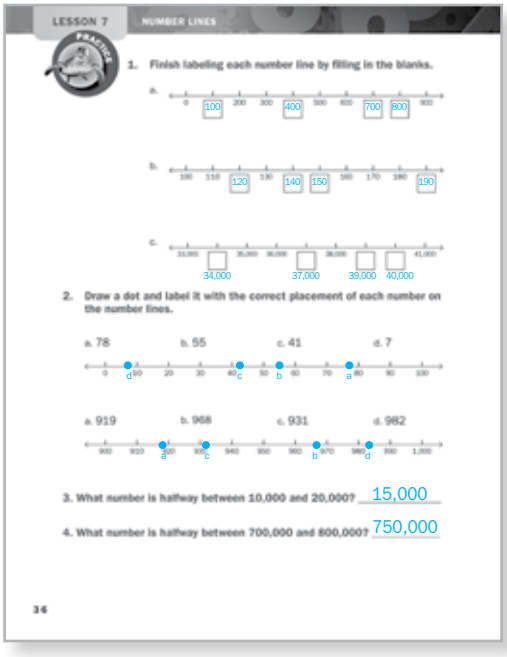
33

LESSON 7

Students don't need to perfectly space the numbers on the number line in the opening activity. This is just a way of making it hands-on for them and to help them grasp the concept of even spacing later in the lesson. The beauty of the clothesline style number line is that it is easy to correct their answers.

Number lines are so important in math. They are one of the primary ways middle school and high school level math is represented. They are used consistently throughout this book to help kids picture the relationship between large numbers as well as fractions. This will also help familiarize them with how number lines work in general.

Page 36 Answers


LESSON 7 NUMBER LINES

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

a. 100, 400, 700, 800

b. 120, 140, 150, 190

c. 34,000, 37,000, 39,000, 40,000

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 10,000 and 20,000? 15,000

4. What number is halfway between 700,000 and 800,000? 750,000

36

LESSON 8

Teaching problem solving will set your kids up to confidently tackle all kinds of problems in the future. For details on how to coach them through open-ended problems, see the section on page 13 of the answer key. The main thing is to keep in mind that it is a process. Starting a problem counts for a lot, even if they get stuck and cannot get all the way to the correct answer. Trying a problem and then looking over the solutions provided below with you will still expand their thinking.

Working on these problems with a partner or in a group is also a big help. If you have an opportunity to get your child together with another young mathematician, that is a great opportunity for them to glean from the ideas of others.

Below are some different solutions to the problems. These are just some of the different approaches you can take. If your child arrived at the correct answer in a different way, that's great. Creativity is a big part of mathematics and should be encouraged.

The Block Problem

The correct answer is 78 blocks.

Solution #1: Act it Out

Use blocks or another object to make a model. You can build the whole thing and count up the total. Or, you may notice a pattern and a shortcut. For instance, you can combine stacks to make tens which are easier to add up. Move the stack of 1 on top of the stack of 9, and the stack of 2 on top of the stack of 8. This leaves stacks of 5, 10, 11, and 12 left over.

Add your 5 stacks of 10 first.

10 + 10 + 10 + 10 + 10 = 50

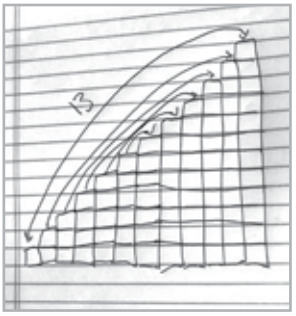
Now add on the leftover stacks.

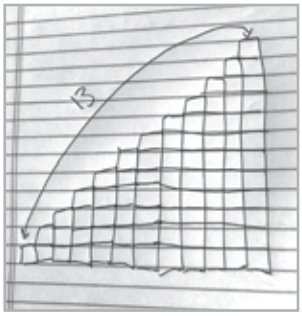
50 + 5 + 11 + 12 = 78

Solution #2: Draw a Picture

Start by drawing a picture of all of the stacks. From here, you can combine stacks so that you have 6 stacks of 13.

6 × 13 = 78





Farmer Ben Problem

There are 6 chickens and 5 pigs.

Solution #1: Guess and Check

Start by just making a guess. In this case, we guessed that he had all pigs.

11 pigs = 44 legs

That's too high, so we need to have some chickens. We will guess 9 pigs and 2 chickens.

9 × 4 + 2 × 2

36 + 4 = 40

There are still too many legs. We need to swap out more pigs for chickens.
Let's guess 7 pigs and 4 chickens.

7 × 4 + 4 × 2

28 + 8 = 36

We are very close. Let's guess 5 pigs and 6 chickens.

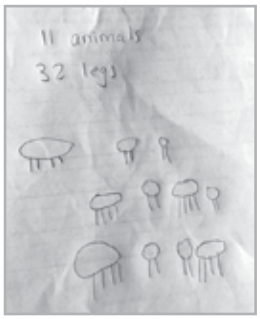
5 × 4 + 6 × 2

20 + 12 = 32

We got it!

Solution #2: Draw a Picture

There are 11 animals, so draw 11 circles to represent the animals in the barn. Add lines to show the possible legs. Try different things until you arrive at the right amount. Special thanks to William Bartkowiak for providing this photo.



Solution #3: Make a Table

Use a table to organize the different possibilities. The cool thing about tables is they help us see patterns. Notice that every time we change a chicken to a pig, the legs increase by two. That means we could even skip ahead to the correct answer instead of filling out the whole table.

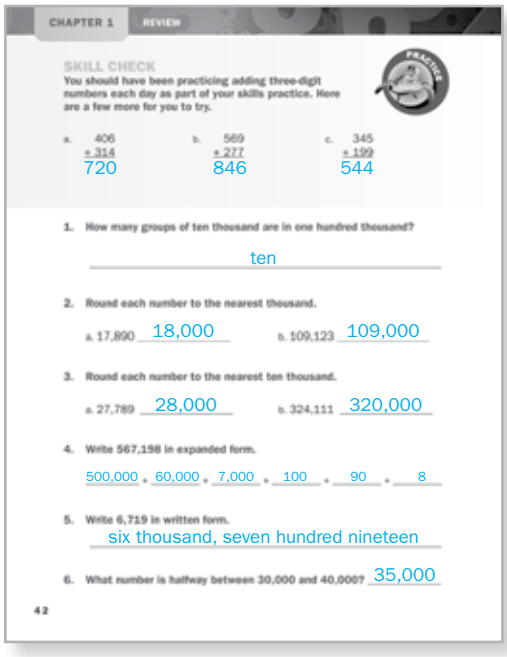
Pigs	Chickens	Total
0	11	22
1	10	24
2	9	26
3	8	28
4	7	30
5	6	32

CHAPTER 1 REVIEW

These chapter reviews are a chance for your child to check and see how they are doing with retaining the different concepts. The skills check is a snapshot of how they are doing with the skills practice.

An optional chapter 1 test is provided in the back of this answer key. If you plan on using it, give it to your child after they have completed the chapter 1 review.

Page 42 Answers


CHAPTER 1 REVIEW

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 + 314 = 720

b. 569 + 277 = 846

c. 345 + 199 = 544

1. How many groups of ten thousand are in one hundred thousand?
ten

2. Round each number to the nearest thousand.
a. 17,890 18,000 b. 109,123 109,000

3. Round each number to the nearest ten thousand.
a. 27,789 28,000 b. 324,111 320,000

4. Write 567,198 in expanded form.
500,000 + 60,000 + 7,000 + 100 + 90 + 8

5. Write 6,719 in written form.
six thousand, seven hundred nineteen

6. What number is halfway between 30,000 and 40,000? 35,000

42

COMPLETE SUPPLY LIST

- A four-operation calculator
- Linking cubes
- Base ten blocks
- A protractor
- A compass (the kind used to draw a circle)
- Fraction tiles
- Pattern blocks
- Notecards
- Uno® cards
- Magazines and store flyers
- Scissors
- Glue stick
- Clipboard
- Stapler
- 3 dice
- 10 clothespins
- String
- A paper clip
- Multiplication flashcards with facts up to 10 × 10
- Division flashcards up to 100 ÷ 10
- Timer
- Colored pencils
- Gridded paper
- Glue
- A marker
- Construction paper or poster paper
- Play dough
- Tape
- A ruler
- A map of your state with the key printed on it
- Toothpicks
- Several different buildings to look at (either outside or in photos)
- A highlighter
- 50 Inch Squares (or another type of tile)
- Play Money (Ten $100 bills, twenty $10 bills, and twenty $1 bills)
- A small snack like raisins, goldfish crackers, etc.
- A ruler with inches and centimeters
- A tape measure
- A yardstick (or a length of string pre-cut to 3 feet)
- A length of string measured to 1 meter
- A scale (digital or spring)
- Various liquid containers
- 1 liter of water (about 4 and 1/4 cups of water)
- 1 milliliter of water (about 1/5 of a teaspoon)
- A stopwatch (most phones have this capability)
- Books and internet resources on sea creatures
- A deck of numbered cards
- Multiplication songs
- A times table
- A round fruit or vegetable (such as an apple, orange, tomato, or peach)
- A knife and the help of an adult
- An envelope
- 1 dollar
- 10 dimes
- 100 pennies
- A hole punch
- 2 graham crackers
- 1 orange cut into six equal parts
- Recipes
- Measuring cups
- Water or rice
- 2 bowls
- A brown paper bag
- 1 poster
- Markers