Lesson 4 Place Value and Expanded Notation; Reading and Writing Whole Numbers

Rules

Place Value Chart

hundred trillions	ten trillions	trillions	,	hundred billions	ten billions	billions	,	hundred millions	ten millions	millions	,	hundred thousands	ten thousands	thousands	,	hundreds	tens	ones	.	tenths	hundredths	thousandths

Writing numbers between 21 and 99

Put a hyphen between digits. For example, 21 = twenty-one, 22 = twenty-two, ... 99 = ninety-nine.

Never gunna give you up

No New Definitions

4A Place Value and Expanded Notation

Lesson 3B on place value was hopefully a little too easy for you! In Part 4A, we added more places, all the way out to the hundred trillions, which are pretty big numbers! We'll do more problems like those in Ex. 3.3, but asking a slightly different question. Answering this new question will help you better understand expanded notation.

Example 4.1 For each number shown, what is the numerical value of the 2?

a) 2,100 b) 42,000,000 c) 207,000,000,000,000 d) 0.32

solution: Use the Place Value Chart in the Lesson 4 Rules. Recall in Ex. 3.3, you found the location of the requested digit. In Ex. 4.1, you need to find the *value*. The value of a digit in a number is found with two steps:

1) Use the Place Value Chart to identify the digit's place value.
2) Add *placeholder zeros* to the left or right, until you reach the decimal point. Placeholder zeros are just that, they "hold" the place of the digit in question so that you can correctly write its numerical value.

a) The 2 is in the thousands place, so the value is **2,000**.
b) The 2 is in the millions place, so the value is **2,000,000**.
c) The 2 is in the hundred trillions place, so the value is **200,000,000,000,000**.
d) The 2 is in the hundredths place, so the value is **0.02**. Note also how we included a zero to the left of the decimal, too. This zero is optional. One reason to include it is because it is difficult to see the little decimal point, and putting a zero out front helps readers (and you) from getting confused.

Example 4.1 focused on one digit in a number and writing its numerical value. We use expanded notation if we want to write out the numerical values of all the digits in a number. All you do is put a plus sign between each value. This also helps you see the unity and diversity found in numbers. Remember from Lesson 1 that unity and diversity is an attribute of God. It's the idea that one thing can also be many things. One number actually consists of many parts, and we can separate those individual parts out using expanded notation.

Example 4.2 Write the following numbers using expanded notation.

a) 2,100 b) 34,053 c) 88 d) 0.32

solution: Use the methods in Ex. 4.1 to find the value of each digit. Start with the highest value, and write each one, putting a plus sign between them:

a) 2,100 = **2,000 + 100** NOTE: 0's occur in the tens and ones places. You don't need to write those.
b) 34,053 = **30,000 + 4,000 + 50 + 3**

c) 88 = **80 + 8**

d) 0.32 = **0.3 + 0.02**

4B Reading and Writing Whole Numbers

If you see a nice car that costs $70,000, normally you don't say " The car costs seven zero comma zero zero zero dollars." And you don't say "The car costs seven ten thousands dollars," even though the 7 is in the ten thousands place. You would say "The car costs seventy thousand dollars." But why?

Look back at your place value chart. Notice how it is broken into groups of 3. Each group of 3 (to the left of the decimal place) is separated by a comma. Notice that, to the left of the hundreds place, each group of three ends in the same word; thousands, millions, billions, trillions, etc. So, when we see a number like 70,000, we see that the 70 is in the thousands group, which is why we say "seventy thousand." If the number was 70,100, we would say "seventy thousand, one hundred." We would not say, or write "seventy thousand and one hundred." When we write numbers using words, *and* is only used for the decimal place. Notice also we wrote a comma in the same place as in the

number. When you write a large number using words, it is important to include commas in the same place they appear in the number. This allows you to separate the place values into their proper groups of three.

In our examples, we will write numbers using words instead of digits, and vice-versa. We will follow normal rules for this, ones you probably learned already. One final note, some values in the thousands have an alternative form. For example, the standard way to say/write 1,000 is "one thousand." But sometimes you will hear someone say "ten hundred," or "eleven hundred" for 1,100 (or 1100), "twelve hundred" for 1,200 (or 1200), and so on. Think about it, ten, one hundred dollar bills equals $1,000, right? We will practice writing these both the "thousands way" and the "hundreds way."

Example 4.3 Use words to write each number.

a) 527 b) 42000000 c) 805900633218

solution: Use your Place Value Chart to help you put commas where needed. **To correctly place commas, start from the right and put a comma after every third digit**.Then, look at each group of separated digits and start writing that group's value. Separate the words with commas in the same places you put commas in between digits.

a) 527 = **five hundred twenty-seven**

b)Add commas first: 42,000,000. The 42 is in the "millions group," and the rest of the digits are zeros, so there is nothing to say about them. Therefore,

42,000,000 = **forty-two million**

NOTE: See the Lesson 4 Rules about placing a hyphen between digits from 21 to 99.

c) Add commas first: 805,900,633,218 = **Eight hundred five billion, nine hundred million, six hundred thirty-three thousand, two hundred eighteen.**

Example 4.4 Write 1,310 the normal, "thousands way" and the "hundreds way."

solution: Thousands way: **one thousand, three hundred ten**
Hundreds way: **thirteen hundred ten**

Example 4.5 Use digits to write each number.

a) three million, seventeen
b) twenty-four thousand, five hundred fifty-five
c) eighty-seven billion, two hundred sixty-nine million, seven hundred thirty-three thousand, nine hundred

solution: Consider the value of each place. Note also that the word form doesn't always include a comma between every group of 3 digits. You will need to add placeholder zeros when this occurs:

a) There is a 3 in the millions place, then a 17. Add placeholder zeros as needed:
3,000,017

b) There is a 24 in the thousands group, followed by 555:
24,555

c) This is a large number with lots of nonzero digits! Read the number, think of your groups of three place values, separated by commas:
87,269,733,900

Practice Set 4

NOTE: The small subscripted number next to each question number tells you what lesson the question came from.

1_3. Find the numerical value of the 4 in 804,388,219,600.

2_3. Find the numerical value of the 6 in 804,388,219,600.

3_3. Write 84,250 in expanded notation.

4_3. Write 7.345 in expanded notation.

5_3. Use words to write 40,000,510,318,000.

6_3. Use words to write 857.

7_3. Use words to write 1511 the "normal" way.

8_3. Use words to write 1511 the "hundreds" way.

9_3. Use digits to write three hundred trillion, fifty-six.

10_3. Use digits to write forty-five thousand, eight hundred thirty-two.

11_3. A _____ is a symbol used to describe a number.

12_3. Convert the Roman numerals CIV to regular numerals.

13_3. Convert the Roman numerals CMLXII to regular numerals.

14_3. Convert 457 to Roman numerals.

15_3. Convert 2,049 to Roman numerals.

16_3. Identify the place value of the 3 in 832,000.

17_2. In Lesson 2, one conclusion drawn from the numbers-worshiping _____ cult was that God can use anyone he wishes to discover something great.

18$_2$. The Hindus, Arabs, and Mayans all discovered the number _____ around the time of Christ's birth.

19$_1$. In Lesson 1A, arithmetic is described as being more _____, while algebra is more abstract.

20$_1$. In Shormann Math, we define mathematics as the _____ of science, and a God-given tool for measuring and classifying pattern and shape.