LESSON 1 – WHOLE NUMBERS

INTRODUCTION

We will begin our study of Basic Arithmetic by learning about whole numbers. Whole numbers are the numbers used most often for counting and computation in everyday life.

The table below shows the specific whole-number related objectives that are the achievement goal for this lesson. Read through them carefully now to gain initial exposure to the terms and concept names for the lesson. Refer back to the list at the end of the lesson to see if you can perform each objective.

Lesson Objective	Related Examples
Identify the *place value* of a digit or digits in a given number.	1, YT7
Read and write *whole numbers*.	2, YT4
Round whole numbers to a given place.	3, YT5, YT6
Rewrite an *exponential* expression in factored form.	8
Compute *numerical expressions* using exponents.	12, 13, YT14
Use correct *order of operations* to evaluate numerical expressions.	9, 10, 11, YT15
Solve whole number *applications* with a problem-solving process	16, YT17

KEY TERMS

The key terms listed below will help you keep track of important mathematical words and phrases that are part of this lesson. Look for these words and circle or highlight them along with their definition or explanation as you work through the MiniLesson.

- Whole Numbers
- Number Line
- Place Value
- Round Whole Numbers
- Exponent
- Power
- Factor
- Factored Form
- Mathematical Operations
- Order of Operations (PEMDAS)
- Solution Work Flow
- Complete Solution
- Disjointed Solution
- Problem Solving Process

LESSON CHECKLIST

Use this page to track required components for your class and your progress on each one.

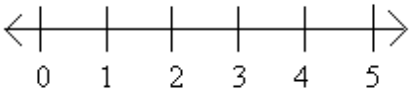
Component	Required? Y or N	Comments	Due	Score
Mini-Lesson				
Online Homework				
Online Quiz				
Online Test				
Practice Problems				
Lesson Assessment				

MINILESSON

WHOLE NUMBERS, PLACE VALUE, AND ROUNDING

Whole numbers are often referred to as "the counting numbers plus the number 0". The first few *whole numbers* are written as: 0, 1, 2, 3, 4, 5, 6, 7, …

We can place a representative set of these on a number line as follows:



Note that the arrows on the number line indicate that the numbers continue in both directions. We will learn in Lesson 12 about numbers to the left of 0!

We *read whole numbers* from left to right. To do this correctly, we need to know the *place value* of each digit in the number. The table below illustrates place values through the Billions place. You can use this table to help you properly identify number names.

BILLIONS			,	MILLIONS			,	THOUSANDS			,	ONES			.
100	10	1		100	10	1		100	10	1		100	10	1	

Example 1: Place each number in the chart above. What place value does the digit "0" occupy in each number?

a. 25,032 b. 105,243 c. 12, 340,412

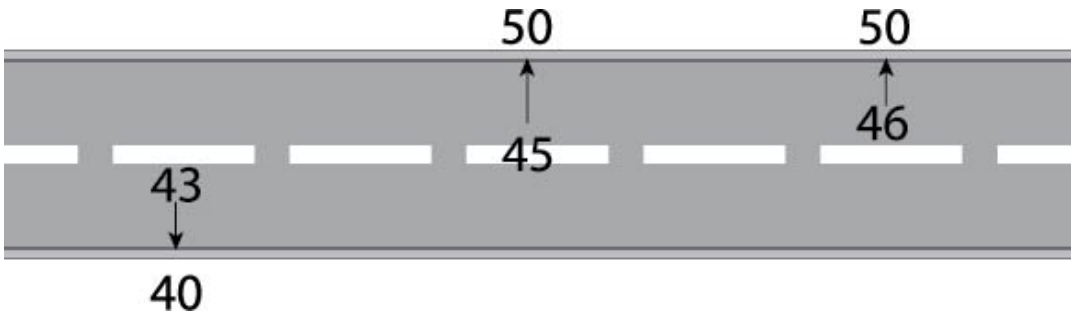
Example 2: Write each whole number below in words.

a. 275,345,201

b. 502,013

To *round* a number means to approximate that number by replacing it with another number that is "close" in value. Rounding is often used when estimating. For example, if I wanted to add 41 and 37, I could round each number to the nearest ten (40 and 40) then add to estimate the sum at 80.

When rounding, the analogy of a road may help you decide which number you are closer to. See the image below. The numbers 43, 45, and 46 are all rounded to the nearest tens place. Note that a number in the middle of the "road" is rounded up.



Example 3:

a. Round 40,963 to the nearest tens place.

b. Round 40,963 to the nearest hundreds place.

c. Round 40,963 to the nearest thousand

d. Round 40,963 to the nearest ten thousand

YOU TRY

4. Write the number 12,304,652 using words.

   _____

5. Round 12,304,652 to the nearest million. _____

6. Round 12,304,652 to the nearest hundred. _____

7. What place does the digit 3 occupy in the number 12,304,652? _____

EXPONENTS

Exponents are also called *powers* and indicate repeated multiplication.

Worked Example 8: $3^4 = 3 \cdot 3 \cdot 3 \cdot 3 = 9 \cdot 3 \cdot 3 = 27 \cdot 3 = 81$

Note: There are 4 *factors* of 3 in the exponential expression 3^4. When we write $3^4 = 3 \cdot 3 \cdot 3 \cdot 3$, we have written 3^4 in *factored form*.

On your calculator, you can compute exponents a couple of ways as follows:

a) If you are raising a number to the second power (for example 4^2), look for an x^2 key on your calculator. Then, enter $4x^2=$ or ENTER and you should get 16.

b) If you are raising a number to a power other than 2, look for a carrot key (^). For example $4^5=$ 4^5= and you should get 1024. Note that you can also use the (^) key even when raising to the 2nd power (also called "squaring").

ORDER of OPERATIONS

Addition, subtraction, multiplication, and division are called *mathematical operations*. When presented with more than one of these in an expression, we need to know which one to address first. The chart below will help us.

P	Simplify items inside Parenthesis ( ), brackets [ ] or other grouping symbols first.
E	Simplify items that are raised to powers (Exponents)
M D	Perform Multiplication and Division next (as they appear from **Left to Right**)
A S	Perform Addition and Subtraction on what is left. (as they appear from **Left to Right)**

Example 9: Evaluate $8 + 5 \bullet 2$

Example 10: Evaluate $24 \div (4 + 2)$

Example 11: Evaluate $20 - (8 - 2) \div 3 \bullet 4$

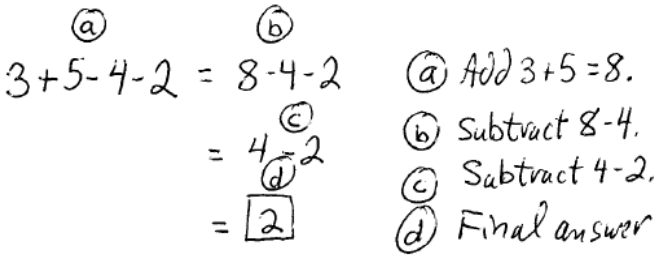
Example 12: Evaluate $10 \cdot 3^2 + \dfrac{10-4}{2}$

Example 13: Evaluate $\left(\dfrac{8+2}{7-2}\right)^2$

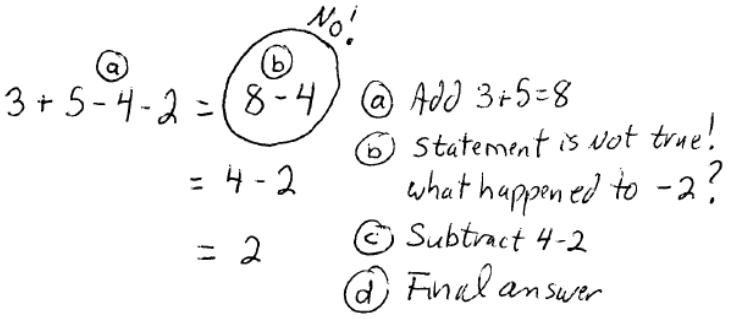
WORK FLOW AND WRITING SOLUTIONS

When you begin to do work that requires more than a single computation, the steps that you present in your solution should be equivalent. Try to provide a complete solution as seen in the videos as opposed to a series of disjointed computations. See the examples below.

COMPLETE SOLUTION – shows all work in neat, coherent, equivalent steps



DISJOINTED SOLUTION – shows work but steps are not equivalent, information is left out of the solution process



MATHEMATICS AND WRITING

When faced with a mathematical problem, you really have two goals. The first is to work the problem correctly and the second is to present a complete solution that can be read and understood by yourself and by others. Just because you know how to do a problem today does not mean that you will quickly remember how to do it when you look back on it in the future. Strive to present complete solutions following the examples and presentations that you see in the media links. Mathematics is really learned through writing. The better your solutions the more you will learn and retain. As you move forward in mathematics, learning to write a good solution may help you solve problems you would not have been able to otherwise.

YOU TRY

14. Evaluate by hand, showing all possible steps. Try to use good solution flow as discussed on the previous page.

$2+4\times8-(2+3)^2$

Insert check mark to verify same result via calculator: _____

15. Evaluate by hand, showing all possible steps. Try to use good solution flow as discussed on the previous page.

$$\frac{9+3\times7}{5\times2}$$

Insert check mark to verify same result via calculator: _____

APPLICATIONS WITH WHOLE NUMBERS

"Applications" ask you to use math to solve real-world problems. To solve these problems effectively, begin by identifying the information provided in the problem (GIVEN) and determine what end result you are looking for (GOAL). The GIVEN should help you write mathematics that will lead you to your GOAL. Once you have a result, CHECK that result for accuracy then present your final answer in a COMPLETE SENTENCE

Even if the math seems easy to you in this application, practice writing all the steps, as the process will help you with more difficult problems.

Example 16: Amy drives to Costco to buy supplies for an upcoming event. She is responsible for providing breakfast to a large group of Boy Scouts the next weekend. Hashed browns are on her list of supplies to purchase and she needs to buy enough to serve 100 people. The hashed browns are sold in packs of 8 boxes and each box in the pack will serve 4 people. A) How many packs should she buy minimum and B) How many people will she be able to serve with this purchase?

GIVEN: [Write down the information that is provided in the problem. Diagrams can be helpful as well.]

GOAL: [Write down what it is you are asked to find. This helps focus your efforts.]

MATH WORK: [Show your math work to set up and solve the problem.]

CHECK: [Is your answer reasonable? Does it seem to fit the problem? A check may not always be appropriate mathematically but you should always look to see if your result makes sense in terms of the goal.]

FINAL RESULT AS A COMPLETE SENTENCE: [Address the GOAL using a complete sentence.]

YOU TRY

17. You join a local center in your community that has a swimming pool and a group that swims laps each week. The initial enrollment fee is $105 and the group membership is $44 a month. What are your dues for the first year of membership?

GIVEN:

GOAL:

MATH WORK:

CHECK:

FINAL RESULT AS A COMPLETE SENTENCE: