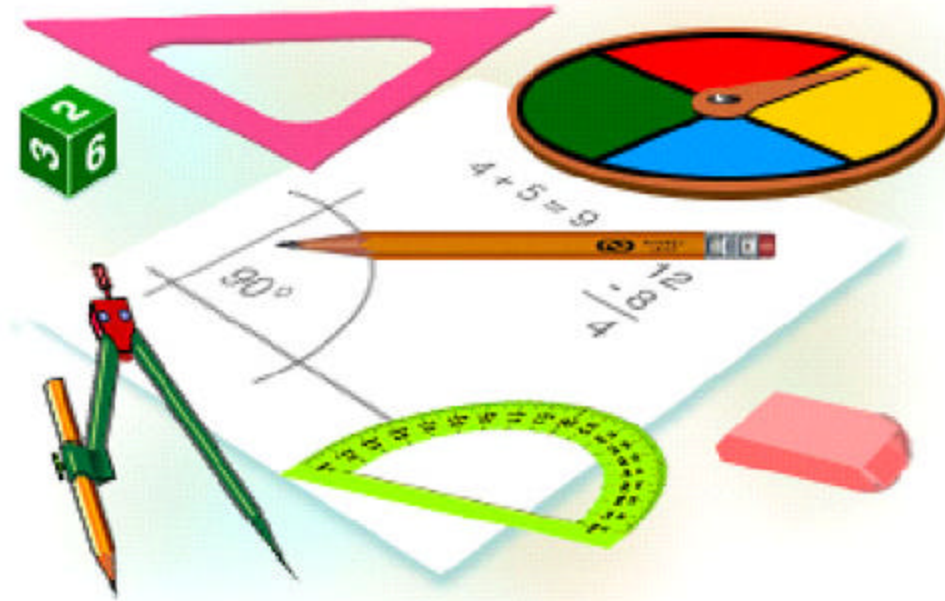


# The Next Step

## Mathematics Applications for Adults



**Book 14019 – Whole Numbers**

# INTRODUCTION

## Why Math?

The most important reason for learning math is that it teaches us how to think. Math is more than adding and subtracting, which can easily be done on a calculator; it teaches us how to organize thoughts, analyze information, and better understand the world around us.

Employers often have to re-educate their employees to meet the demands of our more complex technological society. For example, more and more, we must be able to enter data into computers, read computer displays, and interpret results. These demands require math skills beyond simple arithmetic.

## **Everyone Is Capable of Learning Math**

There is no **type** of person for whom math comes easily. Even mathematicians and scientists spend a lot of time working on a single problem. Success in math is related to practice, patience, confidence in ability, and hard work.

It is true that some people can solve problems or compute more quickly, but speed is not always a measure of understanding. Being “faster” is related to **more practice or experience**.

For example, the reason why math teachers can work problems quickly is because they've done them so many times before, not because they have "mathematical minds".

Working with something that is familiar is natural and easy. For example, when cooking from a recipe we have used many times before or playing a familiar game, we feel confident. We automatically know what we need to do and what to expect. Sometimes, we don't even need to think. However, when using a recipe for the **first** time or playing a game for the **first** time, we must concentrate on each step. We double-check that we have done everything right, and even then we fret about the outcome. The same is true with math. When encountering problems for the very first time, **everyone must have patience** to understand the problem and work through it correctly.

### **It's Never Too Late to Learn**

One of the main reasons people don't succeed in math is that they don't start at the right place. **IMPORTANT!** **You must begin where *you* need to begin.** Could you hit a homerun if you hadn't figured out which end of the bat had to make contact with the ball? Why should learning math be any different?

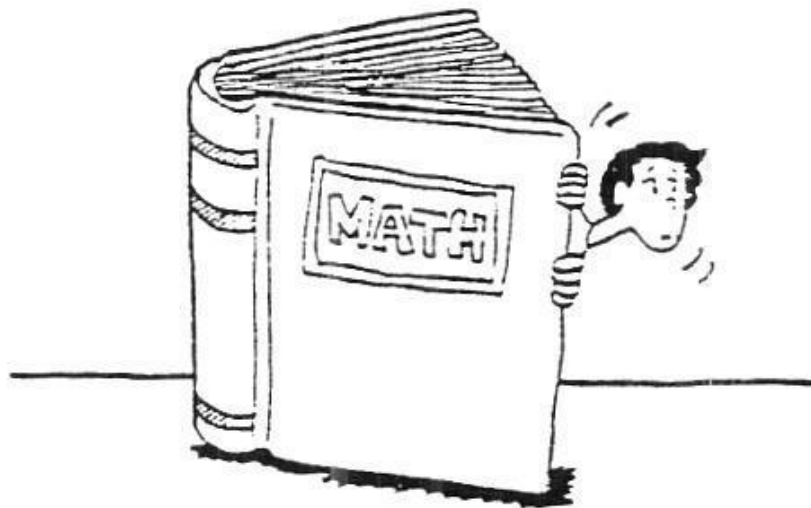
If it has been a while since your last math class, **you must determine what level math you should take.** A teacher or trained tutor can help determine this with a few placement tests and questions.

Sometimes a few tutoring sessions can help you fill gaps in your knowledge or help you remember some of the things you have simply forgotten. It could also be the case where your foundations may be weak and it would be better for you to relearn the basics. **Get some help** to determine what is best for you.

Feeling good about ourselves is what all of us are ultimately striving for, and nothing feels better than conquering something that gives us difficulty. This takes a great deal of courage and the ability to rebound from many setbacks. This is a natural part of the learning process, and when the work is done and we can look back at our success, nothing feels better.

*Where's the best place to hide if you're scared?*

Inside a math book because there is safety in numbers.



*Artist Unknown*

# **OUTLINE**

## **Mathematics - Book 14019**

<b>Whole Numbers</b>
<b><u>Problem Solving with Whole Numbers</u></b>
solve multi-step problems involving whole numbers, with or without a calculator

# THE NEXT STEP

## Book 14019

### Whole Numbers

#### Problem Solving with Whole Numbers

Within every story (word) problem are several *clue words*. These words tell you the kind of math sentence (equation) to write to solve the problem.

#### **Addition Clue Words**

add  
sum  
total  
plus  
in all  
both  
together  
increased by  
all together  
combined

#### **Subtraction Clue Words**

subtract  
difference  
take away  
less than  
are not  
remain  
decreased by  
have or are left  
change (money problems)  
more  
fewer

## **Multiplication Clue Words**

times  
product of  
multiplied by  
by (dimension)

## **Division Clue Words**

quotient of  
divided by  
half [or a fraction]  
split  
separated  
cut up  
parts  
shared equally

**⇒ *Division clue words are often the same as subtraction clue words. Divide when you know the total and are asked to find the size or number of “one part” or “each part.”***

Following a system of steps can increase your ability to accurately solve problems. Use these steps to solve word problems.

1. Read the problem carefully. Look up the meanings of unfamiliar words.
2. Organize or restate the given information.
3. State what is to be found.

4. Select a strategy (such as making a chart of working backward) and plan the steps to solve the problem.
5. Decide on an approximate answer before solving the problem.
6. Work the steps to solve the problem.
7. Check the final result. Does your answer seem reasonable?

The Problem Solving System was used to solve the following problem:

**Mary has ten marbles. Lennie has thirteen. How many marbles do they have in all?**

1. **Mary has ten marbles. Lennie has thirteen. How many marbles do they have in all?**
2. **Mary – 10 marbles  
Lennie – 13 marbles**
3. **How many marbles in all?**
4. **Add**
5. **A little over 20 marbles ( $10 + 10 = 20$ )**



6. 
$$\begin{array}{r} 10 \\ +13 \\ \hline 23 \text{ marbles} \end{array}$$

7. The final sum of 23 marbles is close to the estimated answer of 20 marbles. The final result is reasonable.

**P** *Be sure to label answers whenever possible. For example: marbles, grams, pounds, feet, dogs, etc.*

**P** *Some problems may require several steps to solve. Some may have more than one correct answer. And some problems may not have a solution.*

Have you ever tried to help someone else work out a word problem? Think about what you do. Often, you read the problem with the person, then discuss it or put it in your own words to help the person see what is happening. You can use this method---restating the problem---on your own as a form of “talking to yourself.”

Restating a problem can be especially helpful when the word problem contains no key words. Look at the following example:

**Example:** Susan has already driven her car 2,700 miles since its last oil change. She still plans to drive 600 miles before changing the oil. How many miles does she plan to drive between oil changes?

- Step 1:** *question:* How many miles does she plan to drive between oil changes?
- Step 2:** *necessary information:* 2,700 miles, 600 miles
- Step 3:** *decide what arithmetic to use:* Restate the problem in your own words: “You are given the number of miles Susan has already driven and the number of miles more that she plans to drive. You need to add these together to find the total number of miles between oil changes.”
- Step 4:** 2,700 miles + 600 miles = **3,300 miles** between oil changes.
- Step 5:** It makes sense that she will drive 3,300 miles between oil changes, since you are looking for a number larger than the 2,700 miles that she has already driven.

For some problems, you have to write two or three equations to solve the problem. For others, you may need to make charts or lists of information, draw pictures, find a pattern, or even guess and check. Sometimes you have to work backwards from a sum, product, difference, or quotient, or simply use your best logical thinking.

### List/Chart

**Marty’s library book was six days overdue. The fine is \$.05 the first day, \$.10, the second, \$.20 the third day, and so on. How much does Marty owe?**

Marty's library **book** was **six days overdue**. The **fine** is **\$.05** the first day, **\$.10**, the second, **\$.20** the third day, and so on. **How much does Marty owe?**

<b>Days</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<b>Fine</b>	<b>\$.05</b>	<b>\$.10</b>	<b>\$.20</b>	<b>\$.40</b>	<b>\$.80</b>	<b>\$1.60</b>

**Answer: \$1.60**

Veronica, Archie, and Betty are standing in line to buy tickets to a concert. How many different ways can they order themselves in line?

**Veronica, Archie, and Betty** are **standing in line** to buy tickets to a concert. **How many different ways can they order themselves in line?**

Veronica	Veronica	Archie	Archie
Archie	Betty	Veronica	Betty
Betty	Archie	Betty	Veronica
Betty	Betty		
Veronica	Archie		
Archie	Veronica		

**Answer: 6 ways**

## Find a Pattern

Jenny's friend handed her a code and asked her to complete it. The code read 1, 2, 3 Z 4, 5, 6 Y 7, 8, 9 X \_\_\_\_\_. How did Jenny fill in the blanks?

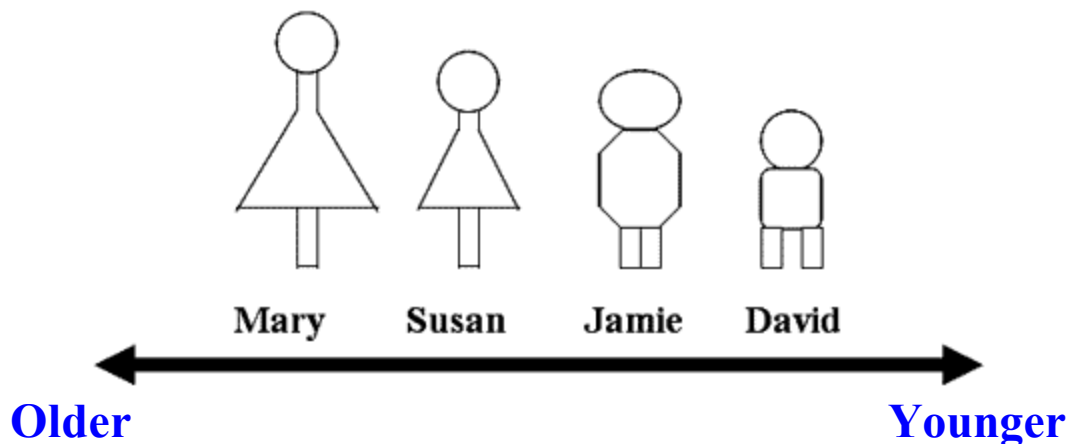
Jenny's friend handed her a code and asked her to complete it. The code read 1, 2, 3 Z 4, 5, 6 Y 7, 8, 9 X \_\_\_\_\_. How did Jenny fill in the blanks?

**Answer: 10, 11, 12 W**

## Draw a Picture

Mary is older than Jamie. Susan is older than Jamie, but younger than Mary. David is younger than Jamie. Who is oldest?

Mary is older than Jamie. Susan is older than Jamie, but younger than Mary. David is younger than Jamie. Who is oldest?



**Answer: Mary is oldest.**

### Guess and Check

Farmer Joe keeps cows and chickens in the farmyard. All together, Joe can count 14 heads and 42 legs. How many cows and how many chickens does Joe have in the farmyard?

Farmer Joe keeps **cows and chickens** in the farmyard. **All together**, Joe can count **14 heads** and **42 legs**. **How many cows and how many chickens** does Joe have in the farmyard?

<b>6 cows</b>	Guess a number of cows. Then add the number of chickens to arrive at the sum of 14 heads. Then check the total legs.	<b>6 cows</b>	<b>= 24 legs</b>
<b>+8 chickens</b>		<b>+8 chickens</b>	<b>= 16 legs</b>
<b>14 heads</b>		<hr/> <b>40 legs</b>	

<b>7 cows</b>	Adjust your guesses. Then check again until you solve the problem.	<b>7 cows</b>	<b>= 28 legs</b>
<b>+7 chickens</b>		<b>+7 chickens</b>	<b>= 14 legs</b>
<b>14 heads</b>		<hr/> <b>42 legs</b>	

**Answer: 7 cows and 7 chickens**

## Work Backwards

Marsha was banker for the school play. She took in \$175 in ticket sales. She gave Wendy \$75 for sets and costumes and Paul \$17.75 for advertising and publicity. After paying for the props, Marsha had \$32.25 left. How much did the props cost?

Marsha was banker for the school play. She **took in \$175** in ticket sales. She **gave Wendy \$75** for sets and costumes **and Paul \$17.75** for advertising and publicity. **After paying for the props, Marsha had \$32.25 left.** How much did the props cost?

$$\begin{array}{r} \$ 175.00 \text{ tickets} \\ - \quad 75.00 \text{ costumes} \\ \hline \$ 100.00 \\ - \quad 17.75 \text{ advertising} \\ \hline \$ 82.25 \end{array} \qquad \begin{array}{r} \$ 82.25 \\ - \quad 32.25 \\ \hline \$ 50.00 \text{ cost of props} \end{array}$$

## Logical Reasoning

Jim challenged Sheila to guess his grandmother's age in ten questions or less. It took her six. Here's what Sheila asked:

Jim challenged Sheila to **guess his grandmother's age** in ten questions or less. It took her six. Here's what Sheila asked:

<b>“Is she less than fifty?” “No.”</b>	<b>50+ years old</b>
<b>“Less than seventy-five?” “Yes.”</b>	<b>50 to 74 years old</b>
<b>“Is her age an odd or even number?” “Odd.”</b>	<b>ends in 1, 3, 5, 7 or 9</b>
<b>“Is the last number less than or equal to five?” “No.”</b>	<b>ends in 7 or 9</b>
<b>“Is it nine?” “No.”</b>	<b>ends in 7 – 57 or 67</b>
<b>“Is she in her sixties?” “No.”</b>	<b>57 years old</b>

## **Not Enough Information**

**Now that you know how to decide whether to add, subtract, multiply, or divide to solve a word problem, you should be able to recognize a word problem that cannot be solved because not enough information is given.**

**Look at the following example:**

**Problem: At her waitress job, Sheila earns \$4.50 an hour plus tips. Last week she got \$65.40 in tips. How much did she earn last week?**

Step 1: *question*: How much did she earn last week?

Step 2: *necessary information*: \$4.50/hour, \$65.40

Step 3: *decide what arithmetic to use*:

**tips + (pay per hour x hours worked) = total earned**

*missing information*: hours worked

**At first glance, you might think that you have enough information since there are 2 numbers. But when the solution is set up, you can see that you need to know the number of hours Sheila worked to find out what she earned. (Be Careful!!!)**

## **Mean, Median, and Mode**

Finding the “center” of a group of numbers helps us to make comparisons with numbers. There are three ways to measure the center of a group of numerical data: mean, median, and mode. Each of these measures adds to our understanding of the data.

You may know the mean as the average. The average is generally thought of as typical or normal. To find the mean of a group of numbers, add the values and divide the sum by the number of items in the list. Remember: average means the mean.



**Example** David has scores of 82, 92, 75, 82, and 84 on five tests. What was his average score?

**Step 1** Add the data values.

$$82 + 92 + 75 + 82 + 84 = 415$$

**Step 2** Divide by 5, the number of scores.

$$415 \div 5 = 83$$

The median is the middle value in a set of numbers. To find the median, arrange the data in order from lowest to highest or highest to lowest and find the middle number. The median value is often used when one value would dramatically affect the average of a group of values.

**Example** For five days Paula recorded the time it took to drive to work: 25 minutes, 40 minutes, 30 minutes, 25 minutes and 32 minutes. Paula's average or mean driving time is 31 minutes. Find her median driving time.

**Step 1** Arrange the driving times in order.

$$40, 32, 30, 25, 25$$

**Step 2** Find the middle value.

$$40, 32, \mathbf{30}, 25, 25$$

Paula's median driving time is **30 minutes**.

If there is an even number of data items, the median is the average (mean) of the two middle numbers.

**Example** Amy's point totals for six games of basketball were 24, 16, 19, 22, 6, and 12 points. Find the median of her point totals.

**Step 1** Arrange the data in order.

24, 22, 19, 16, 12, 6

**Step 2** The two middle numbers are 19 and 16. Average these to find the median.

$$19 + 16 = 35$$

$$35 \div 2 = 17.5$$

Amy's median point total is **17.5 points**.

The mode of a group of numbers is the number that occurs most often. A set of data may have no mode, one mode, or several modes. Mode is often used in business to find out which size, price, or style is most popular.

**Example** During the first five weeks of her junior bowling league, Debbie had these scores: 107, 150, 152,

154, 155, 156, 160, 158, 155, 154, 152, 150, 155, 150, and 155. Find the mode.

**Step 1** Arrange the data in order.

107, 150, 150, 150, 152, 152, 154, 154, **155, 155, 155, 155,**  
158, 158, 160

155 occurs most frequently in the list.

The mode is **155**.

## Practice Exercise

Solve for each of the given problems.

1. Brad and Michael want to share the cost of buying a game. The game costs \$56. How much should each pay?
2. The store manager at Joe's Coffee wants to calculate how many cups can be made at once. He has twelve pots. Each pot can make 25 cups of coffee. How many cups of coffee can he make at once?

3. A crate of plums weighs 155 pounds. A crate of apples weighs 130 pounds. How many pounds do both crates weigh?
  
4. If Brad drives at 50 miles per hour, how many hours will it take to drive 450 miles?
  
5. A math book has 243 pages. If Greg has finished reading 55 pages, how many more pages are left to read?
  
6. Jane drove 1,192 miles on Friday. Michael drove 379 miles on Sunday. How many more miles did Jane drive?
  
7. For the past five days the high temperatures in Vancouver were 64.4 degrees, 59.3 degrees, 68 degrees, 48.8 degrees, and 53.6 degrees. What was the average (mean) high temperature for those days, rounded to the nearest tenth of a degree?
  
8. Karen's electric bills for six months were \$28.84, \$18.96, \$29.32, \$16.22, \$17.98, and \$21.80. What was the median bill for these months, rounded to the nearest cent?

9. George bowled four games and had scores of 128, 157, 155, and 160. He computed his average correctly at 150. What is his median score?
10. Mark runs each morning before going to work. His recorded times for 7 days are 45 minutes, 35 minutes, 30 minutes, 42 minutes, and 55 minutes on the other 3 days. What is the mean (average) of his running times rounded to the nearest minute?

## Answer Key

### Book 14019 – Whole Numbers

#### Page 19

1. \$28 each
2. 300 cups of coffee
3. 285 pounds
4. 9 hours
5. 188 pages
6. 813 miles
7. 58.8 degrees
8. \$20.38
9. 156
10. 45 minutes