

Chapter 2: How Do I Read the Textbook?

Reading the Textbook

Most math courses are text driven. In other words, the content being covered in the lecture is closely tied to the material provided in the textbook. It is crucial, therefore, that you read the textbook for understanding as opposed to just looking at it.

Although students of all learning styles will utilize different techniques in the reading of the textbook, there are some common habits that everyone should form in order to be successful in a math course. These habits are provided below.

Getting to Know Your Textbook

To begin, you need to familiarize yourself with the textbook. First you should look inside the front and back covers of the textbook. Here you may find useful formula charts that could be utilized throughout the course (see Figure 2A). These will be very useful as quick references when you need them.

Moving slightly further into the book you should take a look at the table of contents at the front of the textbook. This will not only show you what the chapters are, but whether there are any appendices and solution sets included as well. Quickly notice the order in which the content will be presented as well as what information is provided in each appendix. If this information is not provided in the table of contents you can just turn to the back of the textbook and investigate it for yourself.

In addition, the last few pages of the textbook will oftentimes contain one or all of the following: 1) an index for easy reference for terms and topics discussed in the textbook, 2) a glossary of terms, and 3) solutions to selected exercises from each chapter and section. You should become familiar with each of these as well if they are provided.

Next, you should spend time reading through the preface and/or introduction included by the author. Some textbooks may even address you directly in a “For the Student” section as well. Some of the common elements you will read about include special features and resources provided in or with the textbook. In these days of technological advances, there is oftentimes a compact disc included that may contain special software, lecture videos, or study tools for your use. After reading the introduction you should quickly look through the textbook and notice the layout of each chapter. A description of this layout is sometimes provided near the front of the textbook as well (see Figure 2B.)

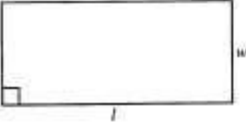
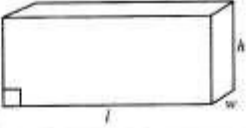
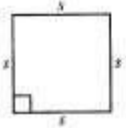
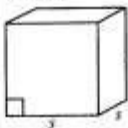
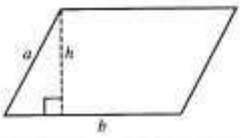

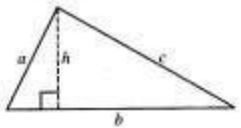
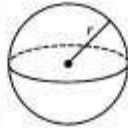

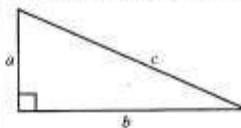
GEOMETRIC FORMULAS	
RECTANGLE  Perimeter $P = 2l + 2w$ Area $A = lw$	RECTANGULAR SOLID, OR BOX  Volume $V = lwh$
SQUARE  Perimeter $P = 4s$ Area $A = s^2$	CUBE  Volume $V = s^3$
PARALLELOGRAM  Perimeter $P = 2a + 2b$ Area $A = bh$	CYLINDER  $\pi \approx 3.14$ Volume $V = \pi r^2 h$
TRIANGLE  Perimeter $P = a + b + c$ Area $A = \frac{1}{2}bh$	SPHERE  $\pi \approx 3.14$ Volume $V = \frac{4}{3}\pi r^3$
CIRCLE  $\pi \approx 3.14$ Circumference $C = 2\pi r$ $C = \pi d$ Area $A = \pi r^2$	PYTHAGOREAN THEOREM  For any right triangle, $c^2 = a^2 + b^2$
KEY WORDS AND PHRASES	
ADDITION sum \rightarrow the sum of 3 and 5 is $3 + 5$ total \rightarrow the total of 6 and 4 is $6 + 4$ plus \rightarrow 4 plus 3 is $4 + 3$ gain \rightarrow 6 with a gain of 2 is $6 + 2$ increased by \rightarrow 5 increased by 2 is $5 + 2$ more than \rightarrow 3 more than 2 is $2 + 3$	SUBTRACTION difference \rightarrow the difference between 7 and 5 is $7 - 5$ minus \rightarrow 8 minus 5 is $8 - 5$ take away \rightarrow 6 take away 2 is $6 - 2$ decreased by \rightarrow 9 decreased by 4 is $9 - 4$ loss \rightarrow 8 with a loss of 3 is $8 - 3$ less than \rightarrow 4 less than 7 is $7 - 4$ subtract x from $y \rightarrow$ subtract 5 from 7 is $7 - 5$
MULTIPLICATION product \rightarrow the product of 4 and 7 is 4×7 times \rightarrow 5 times 6 is 5×6 @, read 'at' \rightarrow 5 pies @ \$4 is $5 \times \$4$ repeated addition \rightarrow 6 rows of seats with 10 seats per row is 10 added to itself 6 times, or 6×10 seats a fraction of a number \rightarrow $\frac{3}{4}$ of 12 is $\frac{3}{4} \times 12$	DIVISION quotient \rightarrow the quotient of 12 by 2 is $12 \div 2$ divided by \rightarrow 24 divided by 6 is $24 \div 6$ divided into \rightarrow 7 divided into 35 is $35 \div 7$ how many of one number are in another number \rightarrow how many 5's are in 40 is $40 \div 5$ split a into b equal parts \rightarrow split 28 into 4 equal parts is $28 \div 4$

Figure 2A

TEST YOURSELF pretests allow students to assess their strengths and weaknesses and decide which learning objectives require more in-depth study.

6 Ratio and Proportion

HOUSING PRICES AND FAMILY INCOME

Ratios are used in the housing table shown here. The table shows the average price of a new house and the average family income for each year listed. As you can see, average income has risen faster than new home prices from 1900 to 1970. But this trend reversed from 1970 to 1990. Comparisons of these two amounts are listed as ratios in the column on the far right. What does a ratio of 5:9 mean? This question will be answered in this chapter.

Year	Average Price for a New House*	Average Family Income	Price to Income Ratio (to 1)
1900	\$ 4,881	\$ 490	9.9
1910	5,377	630	8.5
1920	6,296	1,489	4.2
1930	7,146	1,360	5.2
1940	6,558	1,390	5.0
1950	9,446	3,319	2.8
1960	16,632	5,620	2.9
1970	23,400	9,867	2.3
1980	64,900	21,023	3.1
1990	122,900	35,191	3.5

*Average refers to the nation. (See Section 8.1.)

SOURCE: National Association of Home Builders and the U.S. Census Bureau.

Ratios are used to compare quantities. In the table, new home prices are compared to family income. Ratios are also used in unit pricing, the stock market, construction, business, and finance. Proportions are used to help you solve a wide variety of problems using ratios. In this chapter these problems deal with blueprints, recipes, and estimation, such as estimating the number of people in a city infected with a virus, or estimating the height of a building using the length of its shadow. Ratios also provide the foundation for Chapter 7 on percents.

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RELATED SECTIONS are cited in the objectives to point students to previous material they may need to review to understand the current section.

CONNECTIONS are presented to help students make the link between arithmetic and algebraic concepts.

YOU TRY IT exercises are provided for each worked-out example to give students an opportunity for immediate practice of new concepts.

CHAPTER 6 TEST YOURSELF

Work through each section in this chapter. Use this test to identify topics you are not familiar with. These topics may require additional study. You may not use a calculator.

1. A school has 74 teachers, 1,043 students, and 11 administrators. Write the following ratios.
 - a. students to teachers
 - b. teachers to administrators
 - c. teachers and administrators to students
2. Reduce the ratio to lowest terms: 32 feet to 4 feet.
3. Tom and Hal pay a \$32,490 loss according to a 5:3 ratio. How much of the loss does each man pay?
4. Ellen drove 380 miles on 16.3 gallons of gas M. She drove 245 miles on 11.3 gallons of gas Q, under the same driving conditions. Which gas gave Ellen the better mileage?

CHAPTER REVIEWS test the vocabulary learned in the chapter in a vocabulary and matching test. They also include additional review exercises organized by section, as well as a chapter test.

CUMULATIVE REVIEW TESTS follow every chapter except the first.

CHAPTER-OPENING APPLICATIONS present interesting, realistic problems designed to attract student interest. Each application is solved as the chapter progresses.

SECTION OBJECTIVES at the start of each section clearly define the topics to be studied.

NEW VOCABULARY lists at the beginning of each section preview the new words and phrases that students will learn in the section.

6.1 THE MEANING OF RATIO

- OBJECTIVES**
- 1 Define ratio.
 - 2 Reduce ratios (Section 3.3).
 - 3 Estimate like names in a ratio.

NEW VOCABULARY

ratio
order
terms of a ratio

- 1 Defining Ratios** A compact car is 12 feet long and 5 feet wide. The ratio of length to width is
- length to width
12 feet to 5 feet.

A ratio is a comparison of two quantities.

EXAMPLE 1 There are 10 men and 3 women on a committee. The ratio of men to women is

men to women
10 to 3.

The reverse ratio of women to men is

women to men
3 to 10. ■

Order is important when stating a ratio. Write the numbers in a ratio in the same order as the word names.

EXAMPLE 2 In a small school there are 55 male students, 70 female students, and 8 instructors.

- a. The ratio of female students to male students is 70 to 55.
- b. The ratio of instructors to male students is 8 to 55.
- c. The ratio of students to instructors is 125 to 8 ($55 + 70 = 125$ students). ■

► You Try It

1. There are 40 cars and 9 trucks on a lot.
 - a. What is the ratio of cars to trucks?
 - b. What is the ratio of trucks to cars?
2. A park has 33 acres of grass, 45 acres of trees, and a 12-acre pond.
 - a. What is the ratio of acres of grass to acres of trees?
 - b. What is the ratio of acres of pond to acres of grass?
 - c. What is the ratio of land acres to pond acres?

Suppose for every \$8 in income there are \$3 in taxes. The ratio of income to taxes can be written three ways.

Words	Colon	Fraction
8 to 3	8:3	$\frac{8}{3}$ or $8/3$
eight to three	—	Is the fraction read "to" or "over"?

Each is read "the ratio of eight to three."

The difference is in the way the word "to" is expressed. 8 and 3 are called the terms of the ratio. 8 is called the first term. 3 is called the second term.

Usually chapters begin with titles and headings for the entire chapter, along with a brief statement of the purpose of the chapter, i.e., how it may connect with what you've learned in previous chapters and what you will be expected to have learned after completing the current chapter. This introduction is followed by individual sections that will contain separate lists of objectives or goals. Within each objective there are new concepts presented along with supporting examples with solutions and unsolved practice exercises for you to attempt. This pattern is repeated until information for all objectives is presented. Then there may be a section review page followed by a large set of exercises from which your homework assignments will usually come. Finally, at the end of each chapter there will be a complete summary of the concepts from all sections, additional review problems, and a practice or chapter test.

When looking through the chapters you should be careful to notice the special features provided to help you to identify important information. This information is usually highlighted using tables, graphs, summary boxes, margin notes, special icons, and special printing formats (See Figure 2C.)

12.1 VARIABLES, TERMS, EXPRESSIONS, AND EQUATIONS

OBJECTIVES

- 1 Define algebraic terminology (Section 2.5).
- 2 Determine when a variable has a coefficient of $+1$ or -1 (Section 1.7).
- 3 Change the order of the terms in an expression.
- 4 Define an equation (Section 2.6).

NEW VOCABULARY

variable	constant
algebraic expression	equation
term	solution
coefficient	equivalent equation

1 Algebraic Terminology

Throughout this text you have seen letters represent numbers. These letters are called **variables**.

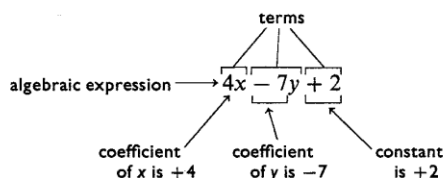
An **algebraic expression** is any collection of numbers, variables, and operations. For example,

$$4x - 7y + 2$$

is an algebraic expression. The variables are x and y .

An algebraic expression consists of one or more **terms**. Terms are separated by plus and minus signs. The expression $4x - 7y + 2$ has three terms: $+4x$, $-7y$, and $+2$.

OBSERVE $4x - 7y + 2$ is also written $4x + (-7y) + 2$.



A **coefficient** is the number in a term that is multiplied by the variable. The coefficient of the term $+4x$ is $+4$. The coefficient of the term $-7y$ is -7 . $+2$ is not a coefficient. It has no letter. It is called a **constant** term.

CAUTION A coefficient consists of a number and its sign.

EXAMPLE 1 Identify each variable, term, and coefficient.

- a. $3x - 8w$
 - variables: x and w
 - terms: $3x$ and $-8w$
 - coefficients: $+3$ is the coefficient of x
 -8 is the coefficient of w
- b. $-4 + 6x - 3y + 1.2z$
 - variables: x , y , and z
 - terms: -4 (constant term), $6x$, $-3y$, and $1.2z$
 - coefficients: $+6$ is the coefficient of x
 -3 is the coefficient of y
 $+1.2$ is the coefficient of z ■

► **You Try It** Identify each variable, term, and coefficient.

1. $5x - 3w$
2. $-6s + 3t - 8$
3. $-5x - 4 + 2y - 1.5z$

What to Read and When to Read It

At the beginning of a course, the professor will provide you with a syllabus. In this syllabus you will find general information about the course and college policies. In addition, the professors may specify which chapters, sections, and objectives will be covered in the course. You should familiarize yourself with this document by reading through it and making comparisons with your textbook. Not all content presented in the textbook will necessarily be covered in the course. Be sure to notice any missing chapters, sections, or objectives from the syllabus. This will save you time and effort in the future if you know what you are expected to learn.

It is recommended that you spend time quickly reading through the appropriate sections in the textbook before and/or after each class period making your own annotations directly on the textbook pages (e.g., in the margin.) This activity contains multiple steps that can be summarized as follows:

1. Preview the entire section to be read before actually reading. Look for things that stand out like definitions of new terms, steps to a solution procedure, and special warnings or notes.
2. Formulate questions about the section using the headings and figures as a guide.
3. Read through the textbook for comprehension while looking for the answers to the questions posed in previous step, making annotations and taking notes as you read. Any question not answered should be saved to be answered in the upcoming class lecture or outside of class using the professor (during office hours), other students (in a study group), or with a tutor.

In Figure 2D, it is demonstrated how Figure 2C can be marked up with personal annotations. Figure 2E is also provided for further demonstration of the annotations that may be made.

12.1 VARIABLES, TERMS, EXPRESSIONS, AND EQUATIONS

OBJECTIVES

- 1 Define algebraic terminology (Section 2.5).
- 2 Determine when a variable has a coefficient of +1 or -1 (Section 1.7).
- 3 Change the order of the terms in an expression.
- 4 Define an equation (Section 2.6).

NEW VOCABULARY

variable	constant
algebraic expression	equation
term	solution
coefficient	equivalent equation

remember to make flash cards for these!

1 Algebraic Terminology

Throughout this text you have seen letters represent numbers. These letters are called variables.

An algebraic expression is any collection of numbers, variables, and operations. For example,

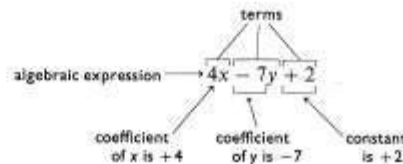
$$4x - 7y + 2$$

is an algebraic expression. The variables are x and y .

An algebraic expression consists of one or more terms. Terms are separated by plus and minus signs. The expression $4x - 7y + 2$ has three terms: $+4x$, $-7y$, and $+2$.

OBSERVE $4x - 7y + 2$ is also written $4x + (-7y) + 2$.

??? I thought - meant negative only.



Ask about this one to

A **coefficient** is the number in a term that is multiplied by the variable. The coefficient of the term $+4x$ is $+4$. The coefficient of the term $-7y$ is -7 . $+2$ is not a coefficient. It has no letter. It is called a **constant** term.

or maybe not...

CAUTION A coefficient consists of a number and its sign.

EXAMPLE 1 Identify each variable, term, and coefficient.

- a. $3x - 8w$ variables: x and w
 terms: $3x$ and $-8w$
 coefficients: $+3$ is the coefficient of x
 -8 is the coefficient of w
- b. $-4 + 6x - 3y + 1.2z$ variables: x , y , and z
 terms: -4 (constant term), $6x$, $-3y$, and $1.2z$
 coefficients: $+6$ is the coefficient of x
 -3 is the coefficient of y
 $+1.2$ is the coefficient of z ■

► You Try It Identify each variable, term, and coefficient.

1. $5x - 3w$ 2. $-6s + 3t - 8$ 3. $-5x - 4 + 2y - 1.5z$

① VARIABLES → x & w
 TERMS → $5x$ & $-3w$

COEFFICIENTS → 5 & -3



Figure 2D

The Addition Rule (or SUBTRACTION)

If you add or subtract the same quantity on each side of an equation, you get an equivalent equation.

2 Solving Equations of the Form $x + a = b$

REMEMBER THIS FOR QUIZ

To solve the equation $x + a = b$ for x :

1. Locate the constant term on the same side of the equation as x .
2. Add the opposite of this term to both sides (addition rule).
3. Simplify. The variable $x = 1x$ will be on one side of the equation, by itself. The solution is on the other side.

EXAMPLE 4 Solve for x : $x + 7 = 2$

$$\begin{aligned} x + 7 &= 2 \\ x + 7 + (-7) &= 2 + (-7) \\ x + 0 &= -5 \\ x &= -5 \end{aligned}$$

The term on the same side as x is $+7$.

Add the opposite of $+7$, or -7 , to each side.

Simplify. The sum of a number and its opposite is 0.

By the zero property of addition, $x + 0 = x$.

Check: $x + 7 = 2$
 $-5 + 7 \stackrel{?}{=} 2$
 $2 = 2 \quad \blacksquare$

The solution is $x = -5$.

$$x + 4 = 1$$

► You Try It

2. Solve for x and check: $x + 4 = 1$

$$\begin{aligned} x + 4 + (-4) &= 1 + (-4) \\ x + 0 &= -3 \end{aligned}$$

$$x = -3$$

$$-3 + 4 = 1$$

$$1 = 1 \quad \checkmark$$

EXAMPLE 5 Solve for x : $x - 7 = -4$

$$\begin{aligned} x - 7 &= -4 \\ x + (-7) &= -4 \\ x + (-7) + 7 &= -4 + 7 \\ x + 0 &= 3 \\ x &= 3 \end{aligned}$$

Write the subtraction $x - 7$ as addition of the opposite, $x + (-7)$.

The term on the same side as x is -7 . Add the opposite of -7 , or 7 , to each side.

The solution is $x = 3$.

Check: $x - 7 = -4$
 $3 - 7 \stackrel{?}{=} -4$
 $-4 = -4 \quad \blacksquare$

► You Try It

3. Solve for x and check: $x - 9 = -1$

REVIEW IN STUDY GROUP

Summary

Properties used to solve equations are:

The sum of a number and its opposite is 0: $a + (-a) = 0$

The additive identity property of 0: $a + 0 = a$ and $0 + a = a$

The multiplicative identity property of 1: $1x = x$ and $x1 = x$

► Answers to You Try It 1. 8 2. -3 3. 8

Figure 2E

Ready, Set, Read

To begin, you must realize that it is extremely important for you to be prepared for class. Reading the textbook is one of the most useful tools that will help you be prepared for class. At the very least you should skim through the sections to be covered in class before it begins, taking note of any new information that is to be discussed.

Once class begins, it is important for you to be actively engaged in the class. Having read through the section will help you recognize information when the professor speaks on it. You may have your textbook open to the appropriate section and quickly making notes in it while the class period progresses.

When class ends, it is crucial for you to remain engaged by continuing the learning process after each class. You should look again at your textbook as soon as possible after class so that the information provided is fresh in your mind.

Following the format of what reading activities can be done before, during, and after class, some suggestions are provided in the following pages that are specific to each of the three learning styles used in this guide.

Visual Learners

Before Class

- If you have time, read the textbook sections silently to yourself using text annotation techniques in the margins of the pages to remind you where potentially important information is found.
- Read through the examples provided. Reason along with the explanations or solution steps (if provided) to see the “whys” in the processes.

During Class

- Play close attention to what is being written in class for you to see (see Chapter 4, on taking notes.) Follow along in the textbook by noting the pages where the information being provided is found. Wherever possible, look at charts and tables that may summarize what the professor is providing. Mark up your textbook as much as needed with charts and flow- diagrams of your own.

After Class

- Reflect on the information by using your “mind’s eye” to bring to your remembrance how the lecture went. Recall anything special about the lecture, and where you may have seen it in the textbook.
- Rehearse the information by reading the textbook sections again.
- Review the information by using the textbook as a guide for identifying definitions, procedures, and other key concepts.
- Make and use flash cards to practice definitions of key phrases, terms, rules, and other procedures to visually match information (e.g., match a term on one card with its definition)

on another, or order the steps of a procedure properly with each step on a separate card, etc.)

- Actively view any available video for the material to be covered in the next lecture, formulating questions for information you do not understand. Pay close attention to the information that is written in the video for you to see. (This could include software and other resources that have examples with animation.)

Auditory Learners

Before Class

- Skim through the section to be covered while reading pieces of information out loud to yourself.
- Use the highlighting features provided as a guide to identify what is important.
- Talk yourself through the examples provided. Reason along with the explanations or solution steps (if provided) to hear the “whys” in the processes. This may include filling in the gaps when solution steps are skipped in the textbook.

During Class

- Take “light” notes. Listen more closely to what is being said in the class, making note of the clearly important information and the answers to the questions you formed before class from the textbook. Note that other students may have had similar questions, so listen to the all discussion involving another student that pertains to the material.

After Class

- Read the text out loud to yourself (or listen to recorded versions of text if available) making sure you understand what you are hearing and paying close attention to any special features used to set information apart from the rest of the material.
- Reflect on the information by talking yourself through your thoughts. Listen to the recording of the lecture again, or view the video on the sections covered in class again, without taking notes.
- Rehearse the information by reading your notes, repeating what the instructor said, and reading the textbook sections again.
- Review the information by using the textbook as a guide for identifying definitions, procedures, and other key concepts.
- Practice definitions of key phrases, terms, rules, and other procedures audibly using flash cards (e.g., have phrase read to you, then rehearse the meaning out loud, or verbally express a rule and when it should be used, etc.)

Tactile Learners

Before Class

- While skimming through the section, write out the terms, definitions, and procedures. Work yourself through the examples provided in the textbook. Reason along with the explanations or solution steps (if provided) to work out the “whys” in the processes.

- Practice definitions of key phrases, terms, rules, and other procedures physically using note cards (e.g., rewrite words and definitions multiple times to become familiar with them before class.)

During Class

- If can be done easily, follow along with the lecture while finding the corresponding information in the textbook. Actively mark up your textbook during the lecture, highlighting important information.

After Class

- Reflect on the information by rewriting your lecture notes while using the text to fill in gaps. Rehearse the information by writing additional notes from the textbook that support the lecture notes taken in class. Write and rewrite as much as necessary until you remember the information.
- Review the information by using the textbook as a guide for identifying definitions, procedures, and other key concepts. Write information again from memory.
- Read through the textbook sections and use different highlighting techniques to bring focus to certain portions of the material (i.e., underline new words, highlight key phrases, circle difficult concepts, etc) Use multiple colors whenever possible. Be sure not to highlight the entire section, but only what looks to be important now.
- As you read through the text make notes in the margins from your own thoughts to reinforce ideas and questions you may form.
- In addition to margin notes write or type a separate set of notes for important definitions, concepts, or solution processes. The act of writing it yourself will reinforce the material.

It is hoped that by making use of some of these activities that your experience with your textbook will be a fruitful one and you will have more success in your math course.

Chapter 2: How Do I Read the Textbook?

Reading the Textbook

Review Questions

1. Define ***text driven***.
2. Where may you find a formula chart in your textbook? Is there one in the textbook you are using in this course?
3. According to Chapter 2: *How Do I read the Textbook*, what will you find at the end of each chapter in your textbook?
4. What is a syllabus?
5. What type of information can you find in a syllabus?
6. Why is it important to spend time reading through the appropriate sections in the textbook before and/or after each class period?
7. List four things you can do after class to help you remember and understand the material presented that day.