

4TH EDITION

# BASIC COLLEGE MATHEMATICS

A REAL-WORLD APPROACH

IGNACIO BELLO



connect  
FOR SUCCESS

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Bello Basic College Mathematics

## How to Use this Book: A Manual for Success

*This brief guide shows you how to use the book effectively: Use It and Succeed!*

*It is as easy as 1, 2, 3.*

### BEGINNING OF THE SECTION

1. **To succeed:** Review the suggested topics at the beginning of each section
2. **Objectives:** Identify the tasks you should be able to perform (organized by section)
3. **Getting Started:** Preview the topics being discussed with a familiar application

### EXAMPLES AND PAIRED MARGIN PROBLEMS

1. **Examples:** Explain, expand and help you attain the stated Objectives
2. **Green Math Examples:** Usually the last Example in each section deals with the environment
3. **Paired Margin Problems:** Reinforce skills in the Examples. (Answers at the bottom of page)

### CHECK FOR MASTERY

1. **Concept Checker:** To reinforce key terms and get ready for the Mastery Test that follows
2. **Mastery Test:** Get a quick checkup to make sure you understand the material in the section
3. **Skill Checker:** Check in advance your understanding of the material in the next section

### CONNECT WITH THE EXERCISES

1. **Connect:** Boost your grade with Connect Practice Problems, Self Tests, and Videos.
2. **Exercises (Grouped by Objectives):** Practice by doing! Interesting Applications included
3. **Green Applications:** Marked with a Green bar in the margin; math applied to the Environment

### SUMMARY, REVIEW AND PRACTICE TEST

1. **Summary:** Easy-to-read grid details the items studied and their meaning and gives an Example
2. **Review:** Coded by Section number; do them and get extra reinforcement and practice!
3. **Practice Test:** Answers give Section, Example and Pages for easy reference to each question

### EXTRA, EXTRA

1. **Cumulative Review:** Covers topics from present and prior chapters. Review all the material!
2. **Solutions Manual:** Worked out odd numbered solutions, all Reviews and Cumulative Reviews
3. **Videos on the Web:** Authors working problems from the Practice Test step by step

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IGNACIO BELLO



BASIC COLLEGE

# mathematics

A REAL-WORLD APPROACH

FOURTH EDITION

*Ignacio Bello*

Hillsborough Community College/University of South Florida





BASIC COLLEGE MATHEMATICS: A REAL-WORLD APPROACH, FOURTH EDITION

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*Bello*

### Ignacio Bello

attended the University of South Florida (USF), where he earned a B.A. and M.A. in Mathematics. He began teaching at USF in 1967, and in 1971 became a member of the Faculty at Hillsborough Community College (HCC) and Coordinator of the Math and Sciences Department. Professor Bello instituted the USF/HCC

remedial program, a program that started with 17 students taking Intermediate Algebra and grew to more than 800 students with courses covering Developmental English, Reading, and Mathematics. Aside from the present series of books (*Basic College Mathematics*, *Introductory Algebra*, and *Intermediate Algebra*), Professor Bello is the author of more than 40 textbooks including *Topics in Contemporary Mathematics* (ninth edition), *College Algebra*, *Algebra and Trigonometry*, and *Business Mathematics*. Many of these textbooks have been translated into Spanish. With Professor Fran Hopf, Bello started the Algebra Hotline, the only live, college-level television help program in Florida. Professor Bello is featured in three television programs on the award-winning Education Channel. He has helped create and develop the USF Mathematics Department Website (<http://mathcenter.usf.edu>), which serves as support for the Finite Math, College Algebra, Intermediate Algebra, and Introductory Algebra, and CLAST classes at USF. You can see Professor Bello's presentations and streaming videos at this website, as well as at <http://www.ibello.com>. Professor Bello is a member of the MAA and AMATYC and has given many presentations regarding the teaching of mathematics at the local, state, and national levels.

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McGraw-Hill conducted in-depth research to create a new learning experience that meets the needs of students and instructors today. The result is a reinvented learning experience rich in information, visually engaging, and easily accessible to both instructors and students.

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Connect allows instructors to quickly and easily build and organize assignments utilizing various sorting features for questions.



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View scored work immediately and track individual or group performance with various assignment and grade reports

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Connect reinvents the textbook learning experience for the modern student. Each subject area is seamlessly integrated with ConnectPlus eBooks, which are designed to keep students focused on the concepts key to their success.



### ▶ From the Author

#### The Inspiration for My Teaching

I was born in Havana, Cuba, and I encountered some of the same challenges in mathematics that many of my current students face, all while attempting to overcome a language barrier. In high school, I failed my freshman math course, which at the time was a complex language for me. However, with hard work and perseverance, I scored 100% on the final exam the second time around. While juggling various jobs in high school (roofer, sheetrock installer, and dock worker), I graduated and received a college academic scholarship. I first enrolled in calculus and made a “C.” Never one to be discouraged, I became a math major and worked hard to excel in the courses that had previously frustrated me.

While a graduate student at the University of South Florida (USF), I taught at a technical school, Tampa Technical Institute, a decision that contributed to my resolve to teach math and make it come alive for my students the way brilliant instructors such as Jack Britton, Donald Rose, and Frank Cleaver had done for me. My math instructors instilled in me the motivation to work toward success. Through my teaching, I have learned a great deal about the way in which students learn and how the proper guidance through the developmental mathematics curriculum leads to student success. I believe I have developed a strong level of guidance in my textbook series by carefully explaining the language of mathematics and providing my students with the key fundamentals to help them reach success.

#### A Lively Approach to Build Students’ Confidence

Teaching math at the University of South Florida was a great new career for me, but I found that students, professors, including myself, and administrators were disappointed by the rather imposing, mathematically correct but boring book we had to use. So, I took the challenge to write a book on my own, a book that was not only mathematically correct, but **student-oriented** with **interesting applications**—many suggested by the students themselves—and even, dare we say, entertaining! That book’s approach and philosophy proved an instant success and was a precursor to my current series.

Students fondly called my class “The Bello Comedy Hour,” but they worked hard, and they performed well. When my students ranked among the highest on the common final exam at USF, I knew I had found a way to motivate them through **common-sense language** and humorous, **realistic math applications**. I also wanted to show students they could overcome the same obstacles I had in math and become successful, too. If math has been a subject that some of your students have never felt comfortable with, then they’re not alone! This book was written with the **mathanxious** students in mind, so they’ll find it contains a jovial tone and explanations that are patient instead of making math seem mysterious, it makes it down-to-earth and easily digestible. For example, after explaining the different methods for simplifying fractions, readers are asked: “Which way should you simplify fractions? The way you understand!” Once students realize that math is within their grasp and not a foreign language, they’ll be surprised at how much more confident they feel.

#### A Real-World Approach: Applications, Student Motivation, and Problem Solving

What is a “real-world approach”? I found that most textbooks put forth “real-world” applications that meant nothing to the real world of my students. How many of my students would really need to calculate the speed of a bullet (unless they are in its

way) or cared to know when two trains traveling in different directions would pass by each other (disaster will certainly occur if they are on the same track)? For my students, both traditional and nontraditional, the real world consists of questions such as, “How do I find the best cell phone plan?” and “How will I pay my tuition and fees if they increase by  $x\%$ ?” That is why I introduce mathematical concepts through everyday applications with **real data** and give homework using similar, well-grounded situations (see the Getting Started application that introduces every section’s topic and the word problems in every exercise section). Putting math in a real-world context has helped me overcome one of the problems we all face as math educators: **student motivation**. Seeing math in the real world makes students perk up in a math class in a way I have never seen before, and realism has proven to be the best motivator I’ve ever used. In addition, the real-world approach has enabled me to enhance students’ **problem-solving skills** because they are far more likely to tackle a real-world problem that matters to them than one that seems contrived.

### Diverse Students and Multiple Learning Styles

We know we live in a pluralistic society, so how do you write one textbook for everyone? The answer is to build a flexible set of teaching tools that instructors and students can adapt to their own situations. Are any of your students members of a **cultural minority**? So am I! Did they learn **English as a second language**? So did I! You’ll find my book speaks directly to them in a way that no other book ever has, and fuzzy explanations in other books will be clear and comprehensible in mine.

Do your students all have the same **learning style**? Of course not! That’s why I wrote a book that will help students learn mathematics regardless of their personal learning style. **Visual learners** will benefit from the text’s clean page layout, careful use of color highlighting, “*Web Its*,” and the video lectures on the text’s website. **Auditory learners** will profit from the audio *e-Professor lectures* on the text’s website, and both **auditory** and **social learners** will be aided by the *Collaborative Learning* projects. **Applied** and **pragmatic learners** will find a bonanza of features geared to help them: *Pretests* can be found in MathZone providing practice problems by every example, and *Mastery Tests* appearing at the end of every section, to name just a few. **Spatial learners** will find the chapter *Summary* is designed especially for them, while **creative learners** will find the *Research Questions* to be a natural fit. Finally, **conceptual learners** will feel at home with features like “*The Human Side of Mathematics*” and the “*Write On*” exercises. Every student who is accustomed to opening a math book and feeling like they’ve run into a brick wall will find in my books that a number of doors are standing open and inviting them inside.

### Listening to Student and Instructor Concerns

McGraw-Hill has given me a wonderful resource for making my textbook more responsive to the immediate concerns of students and faculty. In addition to sending my manuscript out for review by instructors at many different colleges, several times a year McGraw-Hill holds symposia and focus groups with math instructors where the emphasis is *not* on selling products but instead on the **publisher listening** to the needs of faculty and their students. These encounters have provided me with a wealth of ideas on how to improve my chapter organization, make the page layout of my books more readable, and fine-tune exercises in every chapter so that students and faculty will feel comfortable using my book because it incorporates their specific suggestions and anticipates their needs.

### R-I-S-E to Success in Math

Why are some students more successful in math than others? Often it is because they know how to manage their time and have a plan for action. Students can use models similar to these tables to make a weekly schedule of their time (classes, study, work, personal, etc.) and a semester calendar indicating major course events like tests, papers, and so on. Have them try to do as many of the suggestions on the “**R-I-S-E**” list as possible. (Larger, printable versions of these tables can be found in MathZone at [www.mhhe.com/bello](http://www.mhhe.com/bello).)

**Weekly Time Schedule**

Time	S	M	T	W	R	F	S
8:00							
9:00							
10:00							
11:00							
12:00							
1:00							
2:00							
3:00							
4:00							
5:00							
6:00							
7:00							
8:00							
9:00							
10:00							
11:00							

**Semester Calendar**

Wk	M	T	W	R	F
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					

**R—Read and/or view** the material before and after each class. This includes the textbook, the videos that come with the book, and any special material given to you by your instructor.

**I—Interact and/or practice** using the CD that comes with the book or the Web exercises suggested in the sections, or seeking tutoring from your school.

**S—Study and/or discuss** your homework and class notes with a study partner/group, with your instructor, or on a discussion board if available.

**E—Evaluate** your progress by checking the odd numbered homework questions with the answer key in the back of the book, using the mastery questions in each section of the book as a selftest, and using the Chapter Reviews and Chapter Practice Tests as practice before taking the actual test.

As the items on this list become part of your regular study habits, you will be ready to “**R-I-S-E**” to success in math.

# GREEN MATH

## EXAMPLE 7 Water usage per day

How much water do you use each day? The average American uses as much as 101 gallons each day! The graph shows the water consumption at several locations in the home.

- In what location is the most water used?
- How many gallons per day are used in that location?
- What fraction of the total water is used in that location?

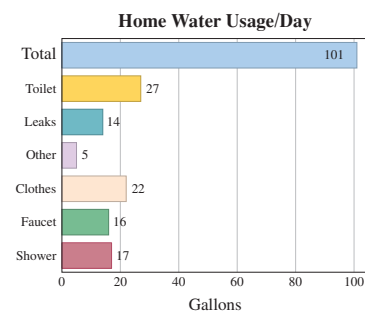
## SOLUTION 7

- Toilet (shown gold)
- 27 gallons
- $\frac{27}{101}$

You can save between 3 and 5 gallons of water by cutting your shower short by one minute or flushing your toilet unnecessarily.

## PROBLEM 7

- In what location is the least water used?
- How many gallons per day are used in that location?
- What fraction of the total water is used in that location?



# ▶ Preface

## ▶ Improvements in the Fourth Edition

### General

- Unique to this edition and to the Bello mathematics series is the innovative Real-World Approach, Green Math Applications. New to this text are 59 examples and 224 exercises utilizing this new feature.
- Due to the evolution of our users, the Algebra Bridge feature has been removed from this edition.

### Chapter 1

- Headers were added to application problems to clarify their objective.
- A new diagram was created to better illustrate the steps involved in Order of Operation problems.
- The rules for solving equations are now labeled as both Principles and Properties.
- Location of Divisibility of 4, 6, 8, 9, and 10 is now provided.

### Chapter 2

- Clarified the definition of Equivalent Fractions.
- Added the objective and the coverage of the objective “Solve applications involving LCD” to Section 2.4.
- Changed Getting Starting and Using Your Knowledge in Section 2.6 to a more relevant topic for the students.
- Added a section part to Example 4.
- Clarified the steps in the Order of Operations found in Section 2.7.
- Area of a rectangle, Fundamental Properties of Fractions, and reducing to lowest terms were added to the Chapter Summary.

### Chapter 3

- Added detail clarifying the steps involved in Order of Operations.
- Clarified the writing in the text and exercise sets.

### Chapter 4

- The emphasis of Section 4.4 is Problem Solving Involving Proportions.
- Revised the definition of Ratio.
- Revised the definition of Ratio Notation.
- Revised the definition of Rates.
- New Getting Started in Section 4.4 connects the material to Section 4.3.
- Revised Chapter 4 Summary.

### Chapter 5

- Updated the non–Green Math applications to reflect current data.
- Revised Chapter 5 Summary.

### Chapter 6

- Updated the non–Green Math applications to reflect current data.
- Clarified the writing in the text and exercise sets.
- Updated the exercise sets to reflect more current data.

### Chapter 7

- Clarified the writing in the text and exercise sets.
- Updated the exercise sets to reflect more current data.

### Chapter 8

- Added more explanation regarding radius and diameter of a circle.
- Clarified the writing in the text and exercise sets.
- Updated the exercise sets to reflect more current data.

### Chapter 9

- Revised the definition for Additive Inverse of a Number.
- Revised the definition for Dividends of Zero.
- Added Objective G: Solve applications involving rational numbers to Section 9.3.

### Chapter 10

- Clarified the writing in the text and exercise sets.
- Added a note to clarify the use of signs in scientific notation.



## Manuscript Review Panels

Teachers and academics from across the country reviewed the various drafts of the manuscript to give feedback on content, design, pedagogy, and organization. This feedback was summarized by the book team and used to guide the direction of the text.

Dr. Mohammed Abella, <i>Washtenaw Community College</i>	Annette Magyar, <i>Southwestern Michigan College</i>
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## ▶ Guided Tour

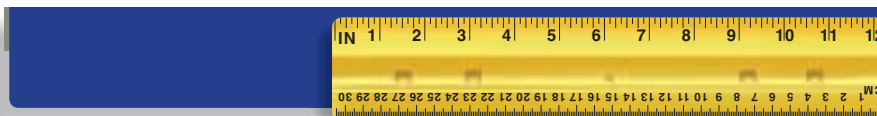
### ▶ Features and Supplements

#### Motivation for a Diverse Student Audience

A number of features exist in every chapter to motivate students' interest in the topic and thereby increase their performance in the course:

#### › The Human Side of Mathematics

To personalize the subject of mathematics, the origins of numerical notation, concepts, and methods are introduced through the lives of real people solving ordinary problems.



#### The Human Side of Mathematics

Here is a quiz for you: name one country that uses the metric system. Almost any country will do *except* the United States. Take a romantic vacation in France. It is a cool day; so you take a 30-minute walk to a nearby village, get some cheese and some wine. The temperature (in degrees Celsius, not Fahrenheit), the distance (kilometers, not miles), the cheese (kilograms, not pounds), and the wine (liters, not quarts) are all in the metric system. How did this happen?

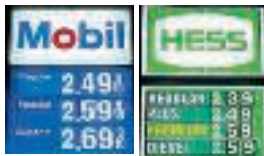
Weights and measures are among the earliest tools invented by humans. Babylonians and Egyptians measured length with the forearm, hand, or finger, but the system used in the United States is based on the English system. The need for a single, worldwide, coordinated system of measurement was recognized over 300 years ago by Gabriel Mouton, vicar of St. Paul's Church in Lyon, France. In 1790, the National Assembly of France requested the French Academy of Sciences to "deduce an invariable standard for all measures and weights." The result was the metric system, made compulsory in France in 1840. What about the United States? As early as 1789, Thomas Jefferson submitted a report proposing a decimal-based system of measurement. Congress took no action on his proposal, but later, in 1832, he directed the Treasury Department to standardize the measures used by customs officials at U.S. ports. Congress allowed this report to stand without taking any formal action. Finally, in 1866, Congress legalized the use of the metric system and in 1875, the United States became one of the original signers of the Treaty of the Meter.

#### › Getting Started

Each topic is introduced in a setting familiar to students' daily lives, making the subject personally relevant and more easily understood.

#### ▶ Getting Started

The sign on the left shows the price of 1 gallon of gasoline using the fraction,  $\frac{9}{10}$ . However, the sign on the right shows this price as the decimal 0.9. If we are given a fraction, we can sometimes find its decimal equivalent by multiplying the numerator and denominator by a number that will cause the denominator to be a power of 10 (10, 100, 1000, etc.) and then writing the decimal equivalent. For example,



$$\frac{2}{5} = \frac{2 \cdot 2}{5 \cdot 2} = \frac{4}{10} = 0.4$$

$$\frac{3}{4} = \frac{3 \cdot 25}{4 \cdot 25} = \frac{75}{100} = 0.75$$

$$\frac{3}{125} = \frac{3 \cdot 8}{125 \cdot 8} = \frac{24}{1000} = 0.024$$



▶ Web It

Appearing in the margin of the section exercises, this URL refers students to the abundance of resources available on the Web that can show them fun, alternative explanations, and demonstrations of important topics.

Exercises 1.1

[Practice Problems](#) > [Self-Tests](#)  
[Media-rich eBooks](#) > [e-Professors](#) > [Videos](#)

▶ **A** **Place Value** In Problems 1–6, what is the value of the circled number?

States with most registered boats

1.	Florida	946,072
2.	Michigan	944,800
3.	California	894,834
4.	Minnesota	653,448

Source: Data from National Marine Manufacturers Association.

5. 853,408

6. 853,048

▶ Web IT go to [mhhe.com/hello](http://mhhe.com/hello) for more lessons

▶ Write On

Writing exercises give students the opportunity to express mathematical concepts and procedures in their own words, thereby expressing and verbalizing what they have learned.

Write On

52. What are the three variables (factors) used when calculating simple interest?

54. Which investment is better for you: \$10,000 invested at 5% compounded semiannually or \$10,000 invested at 4% compounded monthly. Explain why.

53. Write in your own words which would be better for you: to take a 20% discount on an item, or to take 10% off and then 10% off the reduced price.

55. Most people give 10%, 15%, or 20% of the total bill as a tip. (See Problem 42.)

a. In your own words, give a rule to find 10% of any amount. (*Hint:* It is a matter of moving the decimal point.)

b. Based on the rule in part a, state a rule that can be used to find 15% of any amount.

c. Based on the rule in part a, state a rule that can be used to find 20% of any amount.

▶ Collaborative Learning

Concluding the chapter are exercises for collaborative learning that promote teamwork by students on interesting and enjoyable exploration projects.

Collaborative Learning

Planets	Time of Revolution Around the Sun	Weight	Multiplier	Factor
Mercury	88 days	Earth weight	×	0.38
Venus	224.7 days	Earth weight	×	0.91
Earth	365.25 days	Earth weight	×	1.00
Mars	687 days	Earth weight	×	0.38
Jupiter	11.86 years	Earth weight	×	2.60
Saturn	29.46 years	Earth weight	×	1.10
Uranus	84.01 years	Earth weight	×	0.90
Neptune	164.8 years	Earth weight	×	1.20
Pluto*	248.5 years	Earth weight	×	0.08

\* Pluto is not classified as a planet at this time.

Suppose you want to become younger (in age) and trimmer (in weight). We can help you with that, but it will require a little travel. Let us start with the age issue. On Earth, a year is 365 days long but the year on other planets is dependent on the distance the planet is away from the sun. The first table shows the time it takes each of the planets to go around the sun. Now, suppose you are 18 years old. What is your Mercurian age? Since Mercury goes around the sun every 88 days, you would be much older! (You have been around more!) As a matter of fact your Mercurian age  $M$  would be  $M = 18 \times \frac{365}{88} \approx 75$  years old.

In which planet will you become youngest? We will let you find out for yourself. *Hint:* The denominator has to be in days, for example, 88 days.

Now, for the weight issue. Suppose you weigh 130 pounds on Earth. How much would you weigh on Mercury? Since your weight is dependent on the laws of gravity of the planet you are visiting, your weight will change by the factor shown in the second table.

On Mercury, your weight would be:  $130 \times 0.38 \approx 49$  pounds.

## Research Questions

Research questions provide students with additional opportunities to explore interesting areas of math, where they may find the questions can lead to surprising results.

### Research Questions

1. Where did the decimal point first appear, in what year, and who used the decimal point?
2. Write a brief description of the decimal system we use, how it works, and how decimals are used.  
*Reference: <http://www.infoplease.com>*
3. Write a brief description of the Dewey decimal system, how it works, and for what it is used.  
*Reference: <http://www.mtsu.edu>*
4. Write a paragraph about Bartholomeus Pitiscus and the ways in which he used the decimal point.
5. Write a paragraph explaining where our decimal system comes from and its evolution throughout the years.  
*Reference: <http://www.scit.wlv.ac.uk>*

## Abundant Practice and Problem Solving

Bello offers students many opportunities and different skill paths for developing their problem-solving skills.

## Paired Examples/ Problems

Examples are placed adjacent to similar problems intended for students to obtain immediate reinforcement of the skill they have just observed. These are especially effective for students who learn by doing and who benefit from frequent practice of important methods. Answers to the problems appear at the bottom of the page.

### GREEN MATH

#### EXAMPLE 5 Windows and insulation

The return on investment ( $ROI = \frac{\text{savings}}{\text{added cost}}$ ) when you install Energy Star windows is 0.43. (See Example 8, Section 3.3.) If you insulate your basement walls, your added cost is \$750 and your annual electricity savings are \$300.

- a. What is your ROI written as a reduced fraction?
- b. Compare 0.43 and the ROI from part a.
- c. Which is the better ROI, new windows or insulating the basement walls?

#### SOLUTION 5

- a.  $\frac{300}{750} = \frac{2}{5}$
- b. We have to compare 0.43 and  $\frac{2}{5}$ . Convert  $\frac{2}{5}$  to a decimal by dividing 2 by 5, obtaining 0.40. Now it is easy to compare  $\frac{2}{5} = 0.40$  and 0.43; 0.43 is larger.
- c. The ROI when you install new windows (0.43) is better than insulating your basement walls (0.40).

#### PROBLEM 5

If you increase the insulation of your heating/AC ducts, the savings are \$180 at a cost of \$450.

- a. What is the ROI written as a reduced fraction?
- b. Compare the ROI of insulating your heating/AC ducts with the insulation of your basement walls (0.40).
- c. Which is the better ROI, insulating your heating/AC ducts or insulating your basement walls?

› Exercises

A wealth of exercises for each section are organized according to the learning objectives for that section, giving students a reference to study if they need extra help.

› Exercises 1.6

[Practice Problems](#)   [Self-Tests](#)  
[Media-rich eBooks](#)   [e-Professors](#)   [Videos](#)

◀ **A** ▶ **Writing Division as Multiplication** In Problems 1–20, divide and check using multiplication.

1. $30 \div 5$	2. $63 \div 9$	3. $28 \div 4$	4. $6 \div 1$
5. $21 \div 7$	6. $2 \div 0$	7. $0 \div 2$	8. $54 \div 9$
9. $7 \div 7$	10. $56 \div 8$	11. $\frac{36}{9}$	12. $54 \div 6$
13. $\frac{3}{0}$	14. $\frac{0}{3}$	15. $\frac{32}{8}$	16. $\frac{13}{13}$
17. $\frac{24}{1}$	18. $\frac{45}{9}$	19. $\frac{62}{6}$	20. $\frac{48}{5}$

“Applications have a greater percentage of problems from any section when compared to the skill and drill (problems objective by objective). They are current and applicable, especially 5.6 Consumer Credit. An excellent section for college students. Should be an assignment for student orientation!”—Chris McNally, Tallahassee Community College

› Applications


Students will enjoy the exceptionally creative applications in most sections that bring math alive and demonstrate that it can even be performed with a sense of humor.

››› Applications: Green Math

Converting sunshine into electricity by using solar panels will actually cost you more than burning fossil fuels, but there is hope. Grants and tax incentives are available to make the process more cost effective. To read more about this go to <http://tinyurl.com/ck8n62>.


*Area and cost of solar panels.* In Problems 97–100, find the **area** of the panel. The approximate cost of each panel is given in parentheses (prices vary).

**97.** 60-watt panel, 27 inches by  $30\frac{1}{2}$  inches. (\$350)



Source: <http://www.solarhome.org/60wattframedsolarpanel.aspx>.

**98.** 50-watt panel, 28 inches by  $21\frac{1}{4}$  inches. (\$420)



Source: <http://www.solarhome.org/aesolaroff-gridsolarmoduleae-50et.aspx>.

› Using Your Knowledge

Optional, extended applications give students an opportunity to practice what they’ve learned in a multistep problem requiring reasoning skills in addition to numerical operations.

››› Using Your Knowledge

*Orbital times* The table showing the approximate orbital time for Mars, Jupiter, Saturn, and Uranus will be used in Problems 51–53.

	Mars	Jupiter	Saturn	Uranus
Orbital period (Earth years)	2	12	30	84

**51.** You remember the planet alignment from the Getting Started? As you can see from the table it takes about 12 years for Jupiter to orbit around the sun once but it takes Saturn 30 years to do so. If Mars takes about 2 years to orbit the sun and the last planetary alignment of Jupiter, Mars, and Saturn was in the year 2000, in what year will the alignment of the three planets happen again?

**52.** If Jupiter, Uranus, and Mars were aligned today, how many years would it take for them to align again?

**53.** If Saturn and Uranus were aligned today, how many years will it take for them to align again?

# Guided Tour

## Study Aids to Make Math Accessible

Because some students confront math anxiety as soon as they sign up for the course, the Bello system provides many study aids to make their learning easier.

### Objectives

The objectives for each section not only identify the specific tasks students should be able to perform, they organize the section itself with letters corresponding to each section heading, making it easy to follow.

### 3.4 Decimals, Fractions, and Order of Operations

**Objectives**

You should be able to:

- A** > Compare two or more decimals and determine which is larger.
- B** > Compare fractions and decimals and determine which is larger.
- C** > Solve applications involving fractions, decimals, and the order of operations.


**To Succeed, Review How To . . .**

1. Write a fraction as a decimal. (pp. 223–225)
2. Divide a decimal by a whole number. (p. 216)
3. Understand the meaning of and notation for pure repeating decimals. (p. 226)
4. Work with the order of operations. (pp. 82–84)


**Getting Started**

Which of the two Pepsi offers is better? To answer this question, we can find the price of each can by dividing \$2.00 by 8 and \$2.99 by 12 and then comparing the individual price of each can.

$\begin{array}{r} 0.25 \\ 8 \overline{)2.00} \\ \underline{16} \phantom{00} \\ 40 \phantom{00} \\ \underline{40} \phantom{00} \\ 0 \phantom{00} \end{array}$	$\begin{array}{r} 0.24 \\ 12 \overline{)2.99} \\ \underline{24} \phantom{00} \\ 59 \phantom{00} \\ \underline{48} \phantom{00} \\ 11 \phantom{00} \end{array}$
--	--



**PEPSI 12oz Drink Choice**  
Pepsi or Diet Pepsi  
**12** for **2.99**



**PEPSI 12oz Drink Choice**  
Pepsi or Diet Pepsi  
**8** for **2.00**

### Reviews

Every section begins with “To succeed, review how to . . .,” which directs students to study key topics they need to understand to successfully begin that section.

### Concept Checker

This feature has been added to the end-of-section exercises to help students reinforce key terms and concepts.

#### >>> Concept Checker

Fill in the blank(s) with the correct word(s), phrase, or mathematical statement.

<p><b>81.</b> To convert a <b>percent</b> to a <b>decimal</b>, move the decimal point _____ places to the _____ and omit the % symbol.</p> <p><b>82.</b> To convert a <b>decimal</b> to a <b>percent</b>, move the decimal point _____ places to the _____ and attach the % symbol.</p> <p><b>83.</b> To convert a <b>percent</b> to a <b>fraction</b>, follow these steps:</p> <p style="margin-left: 20px;"><b>a.</b> Write the number over _____</p> <p style="margin-left: 20px;"><b>b.</b> _____ the resulting fraction</p>	<p><b>divide</b>      <b>attach</b></p> <p><b>left</b>        <b>reduce</b></p> <p><b>omit</b>       <b>multiply</b></p> <p><b>two</b>        <b>percent</b></p> <p><b>right</b>      <b>fraction</b></p> <p><b>100</b>        <b>%</b></p>
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### Mastery Tests

Brief tests in every section give students a quick checkup to make sure they’re ready to go on to the next topic.

#### >>> Mastery Test

<p><b>85.</b> Among taxpayers who owed the IRS money, 82% said they would use money from their savings or checking accounts to pay their taxes. Write 82% as</p> <p style="margin-left: 20px;"><b>a.</b> a reduced fraction.      <b>b.</b> a decimal.</p>	<p><b>86.</b> Write as a percent:</p> <p style="margin-left: 20px;"><b>a.</b> <math>\frac{3}{8}</math>                              <b>b.</b> <math>\frac{3}{5}</math></p>
<p><b>87.</b> Write as a reduced fraction:</p> <p style="margin-left: 20px;"><b>a.</b> <math>6\frac{1}{2}\%</math>                          <b>b.</b> 6.55%</p>	<p><b>88.</b> Write as a reduced fraction:</p> <p style="margin-left: 20px;"><b>a.</b> 19%                          <b>b.</b> 80%</p>

### Skill Checkers

These brief exercises help students keep their math skills well honed in preparation for the next section.

#### >>> Skill Checker

In Problems 44–47, find:

<b>44.</b> $\frac{1}{2}$ of 50 =	<b>45.</b> $\frac{1}{2}$ of 100 =	<b>46.</b> $3 \cdot 100 =$	<b>47.</b> $7 \cdot 100 =$
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### Calculator Corner

When appropriate, optional calculator exercises are included to show students how they can explore concepts through calculators and verify their manual exercises with the aid of technology.

#### Calculator Corner

A calculator is very convenient when doing taxes, interest, commissions, and discounts. Let us take each of the problems separately. For example, to solve Example 1: Find how much you have to pay for a pair of pants costing \$18.50 if the tax is 6% by simply pressing  $18.50 + 6 \%$  ENTER. The final answer, \$19.61, will be displayed.

If your calculator does not have a % key, you may have to use the **store** [M+] and **recall** [MR] keys. As their names imply, these keys *store* numbers in their memory and then *recall* them. Suppose you wish to solve Example 1 with a calculator. You press  $18.50$  [M+]  $0.06$  [M+] [M+] Here the calculator has **stored** the 18.50 and taken 6% of 18.50. The display shows 1.11. Now, press  $+$  [MR] ENTER and the calculator will add the number stored (18.50) to the 1.11, giving you \$19.61, as before.

If your calculator has a  $y^x$  key (a **power key**), then the quantity  $(1.03)^6$  appearing in Example 4 can be obtained as follows:  $1.03$  [y<sup>x</sup>]  $6$  [ENTER]. You will get 1.19405230.

▶ Summary

An easy-to-read grid summarizes the essential chapter information by section, providing an item, its meaning, and an example to help students connect concepts with their concrete occurrences.

▶ Summary Chapter 3

Section	Item	Meaning	Example
3.1A	Word names	The word name for a number is the number written in words.	The word name for 4.7 is four and seven tenths.
3.1B	Expanded form	Numeral written as a sum indicating the value of each digit.	$78.2 = 70 + 8 + \frac{2}{10}$
3.2B	Multiplying by powers of 10	A product involving 10, 100, 1000, and so on as a factor.	$93.78 \times 100 = 9378$

“Great Review material. I like the fact that chapter tests at the end have the answers on the next page and corresponding pages for those problems students miss to go back and review the material.”—Vivian Zimmerman, Prairie State College.

▶ Review Exercises

Chapter review exercises are coded by section number and give students extra reinforcement and practice to boost their confidence.

▶ Review Exercises Chapter 3

(If you need help with these exercises, look in the section indicated in brackets.)

1. < 3.1A > Give the word name.	2. < 3.1B > Write in expanded form.	3. < 3.1C > Add.
a. 23.389	a. 37.4	a. $8.51 + 13.43$
b. 22.34	b. 59.09	b. $9.6457 + 15.78$
c. 24.564	c. 145.035	c. $5.773 + 18.0026$
	d. 150.309	d. $6.204 + 23.248$
	e. 234.003	e. $9.24 + 14.28$

▶ Practice Test with Answers

The chapter Practice Test offers students a nonthreatening way to review the material and determine whether they are ready to take a test given by their instructor. The answers to the Practice Test give students immediate feedback on their performance, and the answer grid gives them specific guidance on which section, example, and pages to review for any answers they may have missed.

▶ Practice Test Chapter 3

(Answers on page 252)  
Visit [www.mhhe.com/bello](http://www.mhhe.com/bello) to view helpful videos that provide step-by-step solutions to several of the problems below.

1. Give the word name for 342.85.	2. Write 24.278 in expanded form.
3. $9 + 12.18 = \underline{\hspace{2cm}}$	4. $46.654 + 8.69 = \underline{\hspace{2cm}}$
5. $447.42 - 18.5 = \underline{\hspace{2cm}}$	6. $5.34 \cdot 0.013 = \underline{\hspace{2cm}}$

▶ Answers to Practice Test Chapter 3

Answer	If You Missed		Review	
	Question	Section	Examples	Page
1. Three hundred forty-two and eighty-five hundredths	1	3.1	1	201
2. $20 + 4 + \frac{2}{10} + \frac{7}{100} + \frac{8}{1000}$	2	3.1	2	202
3. 21.18	3	3.1	3	203
4. 55.344	4	3.1	4, 5	203–204

## ▶ Guided Tour

### ▶ Cumulative Review

The Cumulative Review covers material from the present chapter and any of the chapters prior to it and can be used for extra homework or for student review to improve their retention of important skills and concepts.

#### ▶ Cumulative Review Chapters 1–3

1. Write  $300 + 90 + 4$  in standard form.
2. Write three thousand, two hundred ten in standard form.
3. Write the prime factors of 20.
4. Write 60 as a product of primes.
5. Multiply:  $2^2 \times 5 \times 5^0$
6. Simplify:  $49 \div 7 \cdot 7 + 8 - 5$
7. Classify  $\frac{5}{4}$  as proper or improper.
8. Write  $\frac{11}{2}$  as a mixed number.
9. Write  $5\frac{3}{8}$  as an improper fraction.
10.  $\frac{2}{3} = \frac{?}{27}$
11.  $\frac{5}{7} = \frac{25}{?}$
12. Multiply:  $\frac{1}{2} \cdot 5\frac{1}{6}$

## Supplements for Instructors

### Annotated Instructor's Edition

This version of the student text contains **answers** to all odd- and even-numbered exercises in addition to helpful **teaching tips**. The answers are printed on the same page as the exercises themselves so that there is no need to consult a separate appendix or answer key.

### Computerized Test Bank (CTB) Online

Available through McGraw-Hill Connect™ Mathematics, this **computerized test bank** utilizes Brownstone Diploma®, an algorithm-based testing software to quickly create customized exams. This user-friendly program enables instructors to search for questions by topic, format, or difficulty level; to edit existing questions or to add new ones; and to scramble questions and answer keys for multiple versions of the same test. Hundreds of text-specific open-ended and multiple-choice questions are included in the question bank. Sample chapter tests and final exams in Microsoft Word® and PDF formats are also provided.

### Instructor's Solutions Manual

Available on McGraw-Hill Connect™ Mathematics, the Instructor's Solutions Manual provides comprehensive, **worked-out solutions** to all exercises in the text. The methods used to solve the problems in the manual are the same as those used to solve the examples in the textbook.



McGraw-Hill Connect™ Mathematics is a complete online tutorial and homework management system for mathematics and statistics, designed for greater ease of use than any other system available. Instructors have the flexibility to create and share courses and assignments with colleagues, adjunct faculty, and teaching assistants with only a few clicks of the mouse. All algorithmic exercises, online tutoring, and a variety of video and animations are directly tied to text-specific materials. Completely customizable, Connect Mathematics suits individual instructor and student needs. Exercises can be easily edited, multimedia is assignable, importing additional content is easy, and instructors can even control the level of help available to students while doing their homework. Students have the added benefit of full access to the study tools to individually improve their success without having to be part of a Connect Mathematics course. Connect Mathematics allows for automatic

grading and reporting of easy-to-assign algorithmically generated homework, quizzes and tests. Grades are readily accessible through a fully integrated grade book that can be exported in one click to Microsoft Excel, WebCT, or BlackBoard.

### Connect Mathematics Offers

- Practice exercises, based on the text's end-of-section material, generated in an unlimited number of variations, for as much practice as needed to master a particular topic.
- Subtitled videos demonstrating text-specific exercises and reinforcing important concepts within a given topic.
- Assessment capabilities, powered through ALEKS, which provide students and instructors with the diagnostics to offer a detailed knowledge base through advanced reporting and remediation tools.
- Faculty with the ability to create and share courses and assignments with colleagues and adjuncts, or to build a course from one of the provided course libraries.
- An Assignment Builder that provides the ability to select algorithmically generated exercises from any McGraw-Hill math textbook, edit content, as well as assign a variety of Connect Mathematics material including an ALEKS Assessment.
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ALEKS® ([www.aleks.com](http://www.aleks.com))

ALEKS (Assessment and Learning in Knowledge Spaces) is a dynamic online learning system for mathematics education, available over the Web 24/7. ALEKS assesses students, accurately determines their knowledge, and then guides them to the material that they are most ready to learn. With a variety of reports, Textbook Integration Plus, quizzes, and homework assignment capabilities, ALEKS offers flexibility and ease of use for instructors.

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- ALEKS offers a dynamic classroom management system that enables instructors to monitor and direct student progress toward mastery of course objectives.

## Supplements for Students

### Student's Solutions Manual

This supplement contains complete worked-out solutions to all odd-numbered exercises and all odd- and even-numbered problems in the Review Exercises and

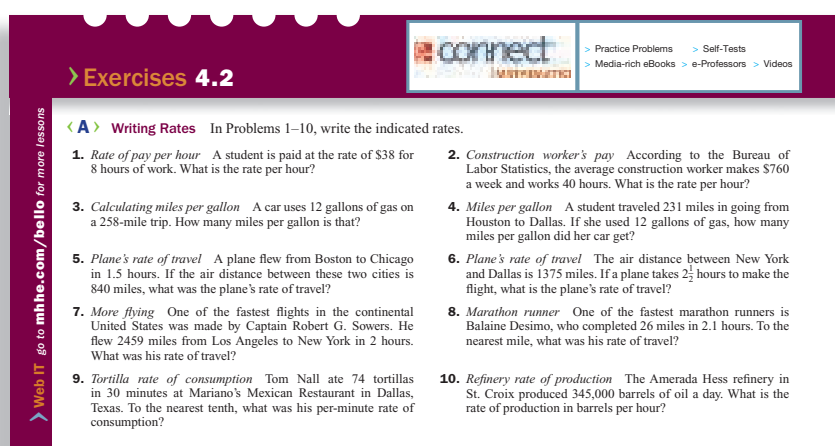


## ▶ Guided Tour

Cumulative Reviews in the textbook. The methods used to solve the problems in the manual are the same as those used to solve the examples in the textbook. This tool can be an invaluable aid to students who want to check their work and improve their grades by comparing their own solutions to those found in the manual and finding specific areas where they can do better.



McGraw-Hill Connect Mathematics is a complete online tutorial and homework management system for mathematics and statistics, designed for greater ease of use than any other system available. All algorithmic exercises, online tutoring, and a variety of video and animations are directly tied to text-specific materials.



**Exercises 4.2**

**Writing Rates** In Problems 1–10, write the indicated rates.

- Rate of pay per hour** A student is paid at the rate of \$38 for 8 hours of work. What is the rate per hour?
- Construction worker's pay** According to the Bureau of Labor Statistics, the average construction worker makes \$760 a week and works 40 hours. What is the rate per hour?
- Calculating miles per gallon** A car uses 12 gallons of gas on a 258-mile trip. How many miles per gallon is that?
- Miles per gallon** A student traveled 231 miles in going from Houston to Dallas. If she used 12 gallons of gas, how many miles per gallon did her car get?
- Plane's rate of travel** A plane flew from Boston to Chicago in 1.5 hours. If the air distance between these two cities is 840 miles, what was the plane's rate of travel?
- Plane's rate of travel** The air distance between New York and Dallas is 1375 miles. If a plane takes  $2\frac{1}{2}$  hours to make the flight, what is the plane's rate of travel?
- More flying** One of the fastest flights in the continental United States was made by Captain Robert G. Sowers. He flew 2459 miles from Los Angeles to New York in 2 hours. What was his rate of travel?
- Marathon runner** One of the fastest marathon runners is Balaine Desimo, who completed 26 miles in 2.1 hours. To the nearest mile, what was his rate of travel?
- Tortilla rate of consumption** Tom Nall ate 74 tortillas in 30 minutes at Mariano's Mexican Restaurant in Dallas, Texas. To the nearest tenth, what was his per-minute rate of consumption?
- Refinery rate of production** The Amerada Hess refinery in St. Croix produced 345,000 barrels of oil a day. What is the rate of production in barrels per hour?

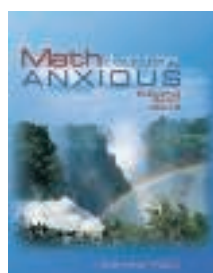


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### Bello Video Series

The video series is available online and features the authors introducing topics and working through selected odd-numbered exercises from the text, explaining how to complete them step by step. They are **closed-captioned** for the hearing impaired and are also **subtitled in Spanish**.



### **Math for the Anxious: Building Basic Skills, by Rosanne Proga**

*Math for the Anxious: Building Basic Skills* is written to provide a practical approach to the problem of math anxiety. By combining strategies for success with a pain-free introduction to basic math content, students will overcome their anxiety and find greater success in their math courses.



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