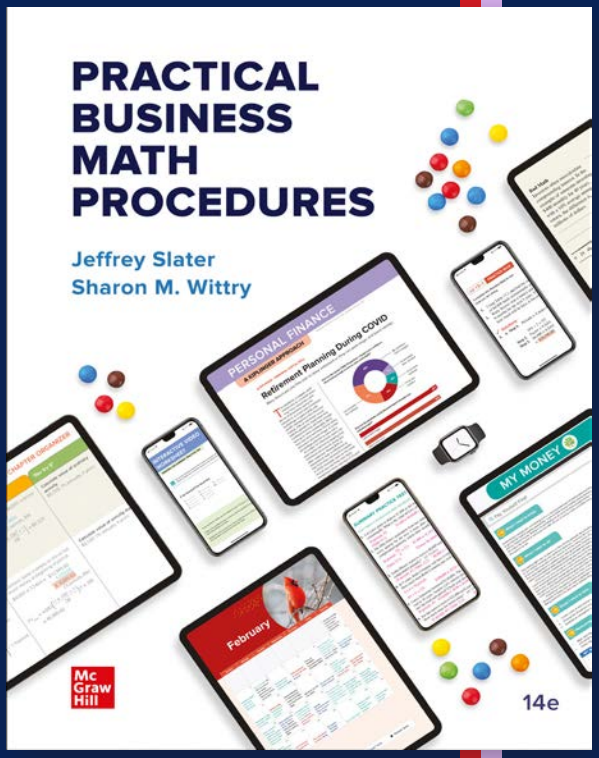
Practical Business Math Procedures, 14e

Jeffrey Slater | Sharon M. Wittry



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Practical Business Math Procedures

Teacher's Edition

Fourteenth Edition

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Mc Graw Hill

PRACTICAL BUSINESS MATH PROCEDURES, FOURTEENTH EDITION

This book is printed on acid-free paper.

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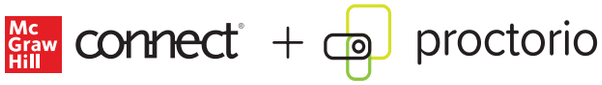
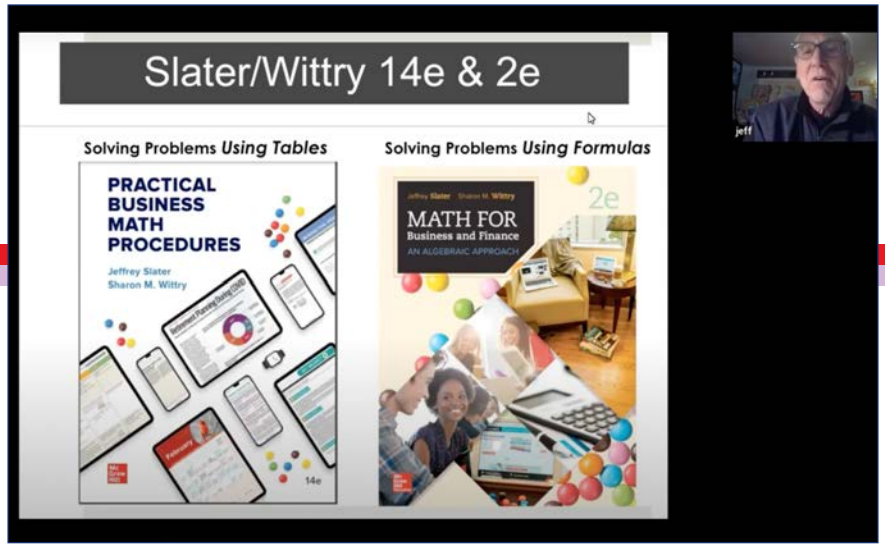
Remote Proctoring & Browser-Locking Capabilities



New remote proctoring and browser-locking capabilities, hosted by Proctorio within Connect, provide control of the assessment environment by enabling security options and verifying the identity of the student.

Seamlessly integrated within Connect, these services allow instructors to control students' assessment experience by restricting browser activity, recording students' activity, and verifying students are doing their own work.

Instant and detailed reporting gives instructors an at-a-glance view of potential academic integrity concerns, thereby avoiding personal bias and supporting evidence-based claims.



Click below to watch a video for the author:

Practical Business Math Procedures, 14e

Supplements Package

Instructor and Student Resources in Connect

The Business Math Instructor Resource Library in Connect contains text updates, the Instructors Resource Guide, test bank, and PowerPoint slides.

Students can access all of the necessary course materials, including Excel templates, calculator guides, the Fractions Extra Practice Worksheet, and more through the Library tab or Additional Student Resources page in Connect.

Business Math Handbook

This reference guide contains all tables found in the text and is available on the Additional Student Resource page. The Handbook is also available in print and can be packaged with the text.

Business Math Internet Resource Guide
(available in Connect)

The Business Math Internet Resource Guide takes students online and shows them and you interesting source materials for business math. Following an introduction on how to use the Internet, each chapter of the book has projects listed relating to the Internet. Additionally, for each chapter, there are suggestions for two mobile apps that relate to the chapter material.

Instructor's Resource Guide
(available in Connect)

This resource manual includes

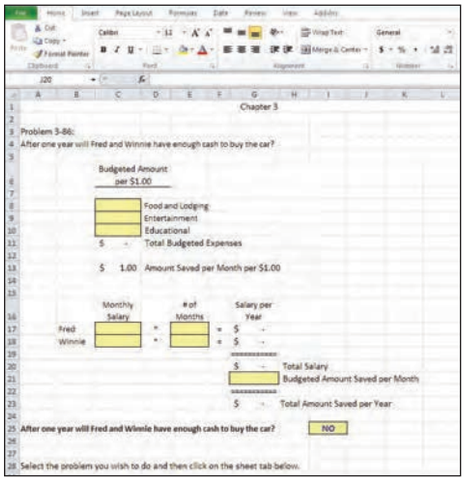
- Syllabus Preparation; Self-Paced Syllabus; Student Progress Chart
- Integrating the Electronic Calculator; Suggestions for Using Computers and Videos
- Suggestions for Regrouping Chapters
- Suggestions on Teaching Using the Business Math Internet Resource Guide
- Tips on Teaching Group Activities with *Kiplinger's Personal Finance* magazine
- Your Course versus Math Anxiety
- Sample Civil Service Exam with worked-out solutions
- Insight into Proportions supplement
- Excel Template Fact Sheet
- Check Figures for even-numbered end-of-chapter drill and word problems
- Appendix B Solutions (all chapters)

Each chapter includes

- Teaching Tips from Jeff Slater and Sharon Wittry
- Lecture Outline
- The Pocket Calculator Workshop
- Suggested Solutions to Critical Thinking Discussion Questions
- Teacher's Guide to Kiplinger Group Activity
- Additional Word Problems (not in the text)
- Worked-Out Solutions to Practice Quizzes found in the *Student Solutions Manual and Study Guide*
- *Vocabulary Crossword Puzzle*s with solutions

Excel Workbook
(available online)

This workbook helps your students to construct their own spreadsheets. It includes business topics such as inventory, interest, markup, and annuities using problems from the text. The workbook and templates for selected end-of-chapter problems are designated with an Excel logo in the book and are available in Connect or through your instructor. Students can run these templates as-is or add their own data.



Integrated Excel
(available online)

The power of Microsoft Excel meets the power of McGraw Hill Connect® in our all-new Integrated Excel assignments. In this new assignment type, Excel opens seamlessly inside Connect®, with no need for uploading or downloading any additional files or software. Instructors choose their preferred auto-graded solution, with the option for either grading for formula accuracy or for the solution value.

Financial Calculator Guide
(available online)

This guide covers using the HP 10BII and TI BAII PLUS financial calculators for Chapters 7, 8, and 10 through 15 in *Practical Business Math Procedures.* Many of the examples and practical quiz problems are illustrated. Selected end-of-chapter problems are also illustrated. This guide is divided into two sections. One section is devoted to the HP 10BII calculator and the other section covers the TI BAII PLUS calculator, also providing brief introductions to using each model.

Electronic Calculator Guide with Computer Applications
(available online)

This manual coordinates *Practical Business Math Procedures* applications with instruction in the 10-key calculator and computer keypad. It also reviews the touch method, includes speed drills, and helps students apply new skills to business math word problems. An introduction to Excel spreadsheets and how to enter data in spreadsheets is included.

Interactive Calendar

This 12-month calendar with daily personal recommendations for financial, health, personal and factoids is updatable to student preferences.

TI-83/TI-84 Graphing Calculator Guide
(available online)

For every chapter covered there are keystrokes with notes on how to use the graphing calculator, Practice Sets and Problems, as well as coverage on how to solve the Summary Practice Tests.

Assurance of Learning Ready

Many educational institutions today are focused on the notion of *assurance of learning,* an important element of some accreditation standards. *Practical Business Math Procedures* is designed specifically to support your assurance of learning initiatives with a simple, yet powerful solution.

Each test bank question for *Practical Business Math Procedures* maps to a specific chapter learning objective listed in the text. You can use our test bank software, EZ Test and EZ Test Online, or *Connect* to easily query for learning objectives that directly relate to the learning objectives for your course. You can then use the reporting features of EZ Test to aggregate student results in similar fashion, making the collection and presentation of assurance of learning data simple and easy.

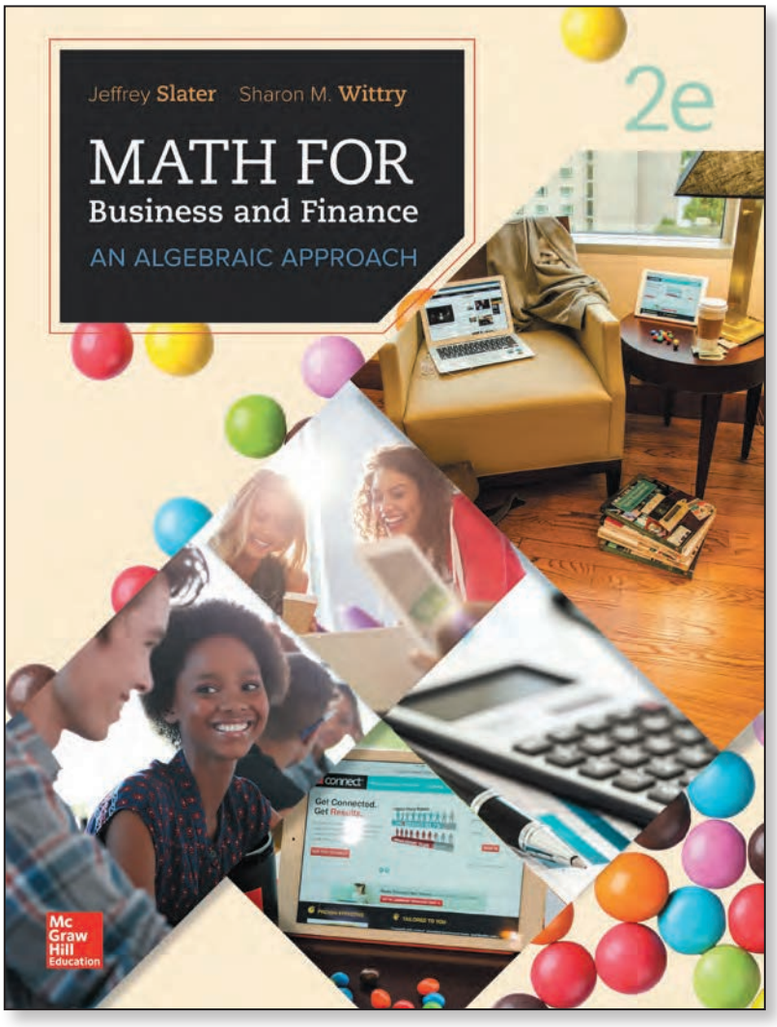
McGraw Hill Customer Care Contact Information

At McGraw Hill, we understand that getting the most from new technology can be challenging. That's why our services don't stop after you purchase our products. You can e-mail our Product Specialists 24 hours a day to get product-training online. Or you can search our knowledge bank of Frequently Asked Questions on our support website. For Customer Support, call **800-338-3987** or visit www.mhhe.com/support. One of our Technical Support Analysts will be able to assist you in a timely fashion.

Alternate Choices

Math for Business and Finance: An Algebraic Approach, **Second Edition**

If you prefer teaching your students business math with algebra and calculator applications, check out *Math for Business and Finance: An Algebraic Approach.* Algebra and calculator applications replace tables for a different approach to solving business math scenarios.



The Brief Edition of *Practical Business Math Procedures* is available in Create. This is the ideal text for a balanced, shorter business math course. McGraw Hill Create is a self-service website that allows you to quickly and easily create custom course materials by drawing upon McGraw Hill's comprehensive, cross-disciplinary content and other third-party resources. With Create, you can arrange the content from *Practical Business Math Procedures,* Thirteenth Edition, and/or *Math for Business and Finance: An Algebraic Approach,* Second Edition, in a way that makes sense for your course, you can combine material from different sources and upload your own content, and you can choose the best format for your students—print or e-book. Begin creating now at www.mcgrawhillcreate.com.

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Operations and Supply Chain Management
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Jacobs and Chase
Operations and Supply Chain Management: The Core
Sixth Edition

Schroeder and Goldstein
Operations Management in the Supply Chain: Decisions and Cases
Eighth Edition

Stevenson
Operations Management
Fourteenth Edition

Swink, Melnyk, and Hartley
Managing Operations Across the Supply Chain
Fourth Edition

Business Statistics

Bowerman, Drougas, Duckworth, Froelich, Hummel, Moninger, and Schur
Business Statistics and Analytics in Practice
Ninth Edition

Doane and Seward
Applied Statistics in Business and Economics
Seventh Edition

Doane and Seward
Essential Statistics in Business and Economics
Third Edition

Lind, Marchal, and Wathen
Basic Statistics for Business and Economics
Tenth Edition

Lind, Marchal, and Wathen
Statistical Techniques in Business and Economics
Eighteenth Edition

Jaggia and Kelly
Business Statistics: Communicating with Numbers
Fourth Edition

Jaggia and Kelly
Essentials of Business Statistics: Communicating with Numbers
Second Edition

Business Analytics

Jaggia, Kelly, Lertwachara, and Chen
Business Analytics: Communicating with Numbers
Second edition

Business Math

Slater and Wittry
Practical Business Math Procedures
Fourteenth Edition

Slater and Wittry
Math for Business and Finance: An Algebraic Approach
Second Edition

Dedication

To my loyal dogs Bernie and Fejji for fetching the *Wall Street Journal* for me so I could find new clips for this edition.
Love, Jeff

To Hanna, I could not be more proud.

Love, Sharon (Grandma D)

Note to Students

ROADMAP TO SUCCESS

How to use this book and the Total Slater/Wittry Learning System.

Step 1: **Read "Your Guide to Successfully Completing This Chapter" at the beginning of each chapter. Each chapter is broken down into Learning Units. Read and master one Learning Unit at a time.**

How do I know whether I understand it?

- Try the Practice Quiz. All the worked-out solutions are provided. If you still have questions, watch the author videos in Connect, or get the information from your instructor and work each problem out.
- Repeat the above until you understand.

Once you feel confident with the subject matter, go on to the next Learning Unit in the chapter.

Step 2: **Review the Interactive Chapter Organizer at the end of the chapter.**

How do I know if I understand it?

- The third column, "You try it," gives you the chance to do additional practice.

Step 3: **Do assigned problems at the end of the chapter (or Appendix A). These may include discussion questions, drill, word problems, challenge problems, as well as projects from My Money and Kiplinger's magazine.**

Can I check my homework?

- Appendix B has check figures for all the odd-numbered problems.

Step 4: **Complete the "Interactive Video Worksheet" near the end of the chapter while completing the Summary Practice Test.**

Can I check my progress?

- Complete the Summary Practice Test. Check solutions from videos in Connect.

What do I do if I do not match check figures?

- Review the video tutorial in Connect, or through information from your instructor—the authors work out each problem.

To aid you in studying the book, we have developed the following color code:

Blue: Movement, cancellations, steps to solve, arrows, blueprints

Purple and yellow: Formulas and steps

Green: Tables and forms

Red: Key items we are solving for

If you have difficulty with any text examples, pay special attention to the red and the blue. These will help remind you of what you are looking for as well as what the procedures are.

FEATURES

The following are the features students have told us have helped them the most.

Blueprint Aid Boxes

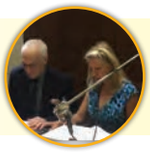
For the first eight chapters (not in Chapter 4), blueprint aid boxes are available to help you map out a plan to solve a word problem. We know the hardest part of solving word problems is often figuring out where to start. Use the blueprint as a model to get started.

Business Math Handbook

This reference guide contains all the tables found in the text. It makes homework, exams, etc., easier to deal with than flipping back and forth through the text.

Interactive Chapter Organizer

At the end of each chapter is a quick reference guide called the Interactive Chapter Organizer, in which key points, formulas, and examples are provided. A list of vocabulary terms is also included. A column called "You try it" gives you a chance to do additional practice. And solutions are provided in Appendix B. (A complete glossary is found at the end of the text.) Think of the Interactive Chapter Organizer as your set of notes and use it as a reference when doing homework problems and reviewing before exams.



*For **extra help** from your authors–Sharon and Jeff–see the videos in Connect.*

Additionally, a series of author-created tutorial videos are available in Connect, or you can check with your instructor for more information. The videos cover all of the Learning Unit Practice Quizzes and Summary Practice Tests.

Your Guide to Successfully Completing This Chapter

Each chapter begins with a plan for you to follow to help you master the content.

Group Activity: Personal Finance, a Kiplinger Approach

In each chapter you can debate a business math issue based on a *Kiplinger's Personal Finance* magazine article. This is great for critical thinking, as well as improving your writing skills.

Spreadsheet Templates

Excel® templates are available for selected end-of-chapter problems. You can run these templates as-is or enter your own data. The templates also include an interest table feature that enables you to input any percentage rate and any terms. The program then generates table values for you.

Cumulative Reviews

At the end of Chapters 3, 8, and 13 are word problems that test your retention of business math concepts and procedures. Check figures for *all* cumulative review problems are in Appendix B.

Vocabulary

Each chapter includes highlighted words covering the key terms in the chapter. The Interactive Chapter Organizer includes a list of the terms. There's also a glossary at the end of the text.

Interactive Video Worksheet

At the end of each chapter is an interactive worksheet allowing you to work through the Summary Practice Test to success.

My Money

Each chapter has a personal finance page applying the concepts from the chapter toward personal finance success.

Money Tips

Throughout each chapter are tips applying the concepts from the chapter toward personal finance.

Calendar

In the front of the text is a 12-month calendar with daily personal recommendations: financial, health, personal and factoids.

Acknowledgments

Academic Experts, Contributors

Sarah Alamilla
Marie Bok
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Derrick Cameron
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Joe Hanson
Kathy Johnson
Stephanie Klie
Cassie Koefod
Patty Kolarik
Michelle Laumb
Joseph Reihing
Tracy Smith
Ron Trucks

Company/*Applications*

Chapter 1

T-Mobile, Walmart—*Introduction*
Walt Disney—*Introduction; Multiplying and dividing whole numbers; Reading, writing and rounding whole numbers*

Chapter 2

Amazon—*Introduction; Types of fractions and conversion procedures*
M&Ms/Mars—*Fractions and multiplication*

Chapter 3

Lyft—*Introduction*
Netflix, Hulu—*Adding, subtracting, multiplying and dividing decimals*
Toyota, Sears—*Multiplication and division shortcuts for decimals*

Chapter 4

Ipswich Bank—*Checking account*

Chapter 5

Amazon—*Introduction*
Dunkin' Donuts—*Solving word problems for the unknown*

Chapter 6

Clorox—*Introduction*
Hershey—*Application of percents-portion formula*
Hasbro, PepsiCo—*Rounding percents*
Proctor & Gamble—*Calculating percent increases and decreases*

Chapter 7

UPS, Wal-Mart, Amazon—*Introduction*
Michael's—*Discounts*

Chapter 8

Gap—*Introduction*
Lululemon—*Markdowns and perishables*

Chapter 9

Hilton, Facebook—*Introduction*
IRS—*Computing payroll deductions*

Chapter 10

Consumer Federation of America—*Personal Finance: A Kiplinger Approach*

Chapter 11

JPMorgan, Wells Fargo—*Introduction*
The Gap—*Discounting an Interest-Bearing Note before Maturity*

Chapter 12

T.Rowe Price—*Personal Finance: A Kiplinger Approach*

Chapter 13

Boston Globe—*Introduction*
Fidelity—*Personal Finance: A Kiplinger Approach*

Chapter 14

Carvana—*Introduction*
Ford—*Amount financed, finance charge, and deferred payment*
Edmunds—*Truth in lending: APR defined and calculated*
Citibank—*Calculate finance charge on previous month's balance*

Chapter 15

Federal Reserve—*Introduction*

Chapter 16

Kraft Heinz—*Introduction*
Marriott, Macy's, Delta Airlines—*Ratio analysis*

Chapter 17

General Motors—*Introduction*

Chapter 18

Channel Capital Advisor—*Introduction*

Chapter 19

BDO U.S.A.—*Introduction*

Chapter 20

Zebra Insurance—*Personal Finance: A Kiplinger Approach*

Chapter 21

Tesla—*Introduction*
Hershey—*How to read stock quotations*
Franklin Templeton, Fidelity Investments—*How to read a mutual fund quotation*
GameStop—End of chapter

Chapter 22

National Small Business Association—*Introduction*
McKinsey—*Personal Finance: A Kiplinger Approach*

From Jeff's & Sharon's Desks

A BIG THANK YOU FROM SHARON AND JEFF TO ALL OUR LOYAL CUSTOMERS

Thank you for making our book the best-selling business math text in the United States. More than ONE MILLION students have used our book. Being number one means never taking our customers for granted.

Need help?

Jeff Slater
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- **781-910-5875 (cell phone)**

Sharon Wittry
- **sharonwittry@yahoo.com**
- **719-323-1243 (cell phone)**

Customer Service at 1-800-338-3987

Our promise to you: We will respond to your needs within 24 hours.

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DID YOU KNOW THIS ABOUT JEFF SLATER?

Jeff is now in his 51st year of teaching Business Math at North Shore Community College. He is currently teaching the course online using Connect® packaged with a loose-leaf version of the text. His students are exposed to Smartbook and have options of using the e-book or print version. What you see in the new 14th Edition is the result of student feedback Jeff has received. Jeff still wakes up at 5 a.m. with his dogs Bernie and Fejjie to read *The Wall Street Journal*, even during the pandemic, so he can find new clips and information for the book.

DID YOU KNOW THIS ABOUT SHARON WITTRY?

Sharon has been teaching at Pikes Peak Community College for 25 years. With over 30 years of teaching and 15 years as online business chair, she understands the need to provide students with around-the-clock learning tools such as Smartbook and Connect. Making the content easy to understand and applicable to students' lives continues to be Sharon's focus.

Our PASSION is to serve our students and instructors. Being number one in this market is a huge responsibility that we do not take lightly. We work on this book 365 days a year. It is our baby and we love doing it.

Best,

Jeffrey Slater **Sharon Wittry**

Highlights of Changes for 14e: A Transition Guide for All Our Loyal Adopters

All Chapters

- New chapter openers with new *Wall Street Journal* clips
- Each learning unit updated with new *Wall Street Journal* clips
- "Money tips" icons focusing attention on personal finance applications
- New real-world problems added to end-of-chapter problem material
- New *Kiplinger* articles at the end of each chapter
- Updated "My Money" pages applying content to personal finances
- Guide to successfully completing each chapter
- Interactive video worksheet
- Updated technology and trends
- Pandemic updates throughout
- New diversity, equity and inclusion focus

Chapter 3 Decimals

- New currency table with detailed explanation

Chapter 4 Banking

- More banking apps in mobile banking
- New using mobile and online banking section

Chapter 5 Solving for the Unknown: A How-to Approach for Solving Equations

- More real-world applications

Chapter 7 Discounts: Trade and Cash

- New discussions of using Internet to get discounts

Chapter 9 Payroll

- New payroll process
- New payroll tables
- New Social Security rates

Chapters 10–13 Simple Interest; Promissory Notes, Simple Discount Notes, and the Discount Process; Compound Interest and Present Value; Annuities and Sinking Funds

- Latest trends in borrowing with current rates

Chapter 15 The Cost of Home Ownership

- Latest trends in mortgage rates
- Latest trends in the housing market

Chapter 20 Life, Fire, and Auto Insurance

- Latest updates in insurance coverages

Chapter 21 Stocks, Bonds, and Mutual Funds

- New updates in stock quotations

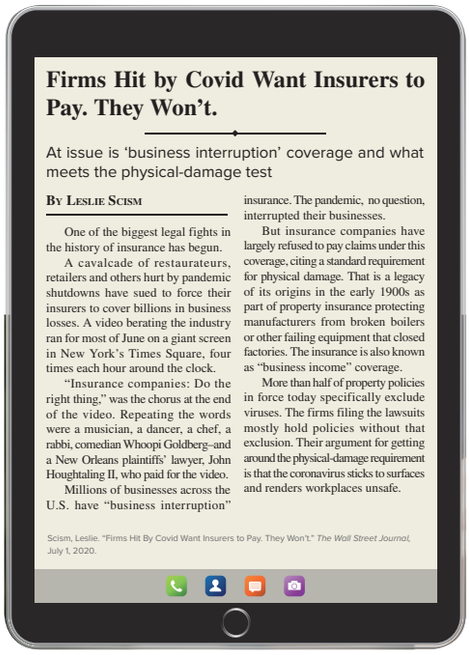
Chapter 22 Business Statistics

- Update of technology and relevant statistics

New Features of the Text

We'd like to thank the instructors and students who use our textbook. We listened to your feedback and have added the following new features to the Thirteenth Edition. These new features use technology to engage and motivate students to better understand business math. Our goal is to continually improve the book, making certain it serves you and your students effectively.

Interactive 12-month calendar highlighting personal finances, health and well-being, a focus on the individual, and factoids.



Firms Hit by Covid Want Insurers to Pay. They Won't.

At issue is 'business interruption' coverage and what meets the physical-damage test

By Leslie Scism

One of the biggest legal fights in the history of insurance has begun.

A cavalcade of restaurateurs, retailers and others hurt by pandemic shutdowns have sued to force their insurers to cover billions in business losses. A video berating the industry ran for most of June on a giant screen in New York's Times Square, four times each hour around the clock.

"Insurance companies: Do the right thing," was the chorus at the end of the video. Repeating the words were a musician, a dancer, a chef, a rabbi, comedian Whoopi Goldberg–and a New Orleans plaintiffs' lawyer, John Houghtaling II, who paid for the video.

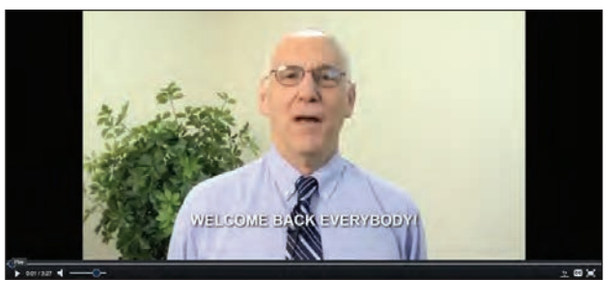
Millions of businesses across the U.S. have "business interruption" insurance. The pandemic, no question, interrupted their businesses.

But insurance companies have largely refused to pay claims under this coverage, citing a standard requirement for physical damage. That is a legacy of its origins in the early 1900s as part of property insurance protecting manufacturers from broken boilers or other failing equipment that closed factories. The insurance is also known as "business income" coverage.

More than half of property policies in force today specifically exclude viruses. The firms filing the lawsuits mostly hold policies without that exclusion. Their argument for getting around the physical-damage requirement is that the coronavirus sticks to surfaces and renders workplaces unsafe.

Scism, Leslie. "Firms Hit By Covid Want Insurers to Pay. They Won't." *The Wall Street Journal*, July 1, 2020.

Pandemic coverage throughout integrating *Wall Street Journal* clips highlighting how the pandemic has affected business and the economy pre- and post-pandemic.



Up-to-date author videos for each chapter learning unit and summary practice test giving students and teachers office hours with the authors.

The Wall Street Journal
Highlights

With over 100 clips from *The Wall Street Journal,* students can see the relevance of text topics to the business world.

Kiplinger's Personal Finance
Magazine Articles

These articles were completely updated this edition and include

CHAPTER 1 What You'll Pay to Adopt a Dog
CHAPTER 2 Farewell to the Office
CHAPTER 3 How to Surf the Net More Safely
CHAPTER 4 If You're Using Cash Less Often, You're Part of a Trend
CHAPTER 5 Buy Now, Pay Later Isn't a Slam Dunk
CHAPTER 6 Retirement Planning During COVID
CHAPTER 7 Americans are Stockpiling Cash
CHAPTER 8 $3000-Plus Upgrade to an E-Bike
CHAPTER 9 Keep Child Care Costs in Check
CHAPTER 10 Behind on Debts? Know Your Rights
CHAPTER 11 How to Keep Tabs on Your Credit Reports
CHAPTER 12 The Benefits of Being FIRE-ish
CHAPTER 13 Should You Borrow From Your 401(k)?
CHAPTER 14 Give Your Child Some Credit
CHAPTER 15 $10,000 Contribute to a Mortgage Down Payment
CHAPTER 16 Digesting Corporate Profits
CHAPTER 17 Save Money with an Electric Car
CHAPTER 18 A New Chapter for This Bookstore
CHAPTER 19 Moving to Lower-Tax States
CHAPTER 20 Time for an Insurance Review
CHAPTER 21 GameStop: What You Need to Know
CHAPTER 22 Prices Surge for Vacation Homes; U.S. gets an *F* for Work Benefits; Students Face Long-Term Challenges

Real-World Applications

Instructors asked for an even greater emphasis on the applications of business math in the United States and globally. The Fourteenth Edition includes references to companies such as Google, Twitter, Amazon, Facebook, and Walmart to illustrate chapter topics. Over 100 actual clippings from *The Wall Street Journal* and 22 *Kiplinger's Personal Finance* magazine articles give students a more complete view of real-world practices from the business press.

PERSONAL FINANCE

A KIPLINGER APPROACH

"Farewell to the Office," Kiplinger's, February 2021.

FROM THE EDITOR

MARK SOLHEIM

Farewell to the Office

We can all list numerous ways, good and bad, that the pandemic has altered our lives. It gets trickier to identify changes that will last long after the risk of COVID has faded. But for many people, working remotely is here to stay.

My wife, Allyson, and I have been working remotely since mid March—initially from Michigan and lately from our Washington, D.C., home. In our northern Michigan house, we each have our own home office. In D.C., I have ceded the spare bedroom/home office to Allyson because, unlike me, she typically has back-to-back video calls. My workday finds me perched on a stool at the kitchen island or slouched in one of the chairs next to the fireplace, having conversations with Alexa.

In theory, we get to recapture time we used to spend commuting. But I find myself rolling out of bed and turning on the computer, and it takes discipline to ignore work e-mails. We do appreciate the more-relaxed wardrobe demands. My go-to garb includes T-shirts, a couple of sweaters and a pair of blue jeans (the bit of stretchiness accommodates the extra pounds I attribute to the 5 p.m. drinks and hors d'oeuvres).

I miss the ergonomics of the office and the structure that working there gave to my day. I miss seeing colleagues face to face rather than in two dimensions in a Hollywood Squares grid. And I particularly worry about our younger staffers missing out on the collaboration and camaraderie that can be a crucial part of their professional development.

Lasting changes. Following another surge in COVID, fewer Americans are working from their offices now than in mid October, according to Kastle Systems, the security firm that provides badges to swipe into offices. In late November, fewer than 18% of workers had returned to the office, compared with 27% a month earlier.

A SURVEY OF HIRING MANAGERS FOUND THAT ONE-FIFTH OF THE WORKFORCE COULD BE ENTIRELY REMOTE AFTER THE PANDEMIC.

That more or less jibes with what we found in a nationwide survey Kiplinger commissioned, in partnership with Personal Capital, in early November (see page 58 for highlights). The survey asked how retirement savers were doing in the wake of coronavirus, and it accompanies our cover story on getting your nest egg back on track (see page 48). We sprinkled in a few questions about remote work. More than 70% of respondents confirmed they were working from another location besides their normal workplace: 56% from their primary residence, 10% from a second home, and 5% from "another location." Two-thirds said they "love it," and one-third said it was okay but they wanted to return to the office to see colleagues. Only 6% said they don't like it at all.

According to a recent survey of hiring managers by the global freelancing platform Upwork, one-fifth of the workforce could be entirely remote after the pandemic. And that trend has far-reaching, long-term ramifications, not only for retailers selling business clothes but also for real estate and transportation. White collar and tech workers in job-rich urban areas have been fleeing cramped, high-rent apartments and pricey condos for the suburbs and exurbs. Many offices sit almost empty. Mass transit systems are struggling. Here in D.C., Metro announced that it may have to curtail bus routes and completely end weekend subway service. That leaves lower-paid, front-line workers in the lurch, or at least the ones who are left with jobs as the service, travel and hospitality industries go through upheaval. Many downtown coffee shops, bars and restaurants are endangered species.

For workers who are telecommuting from another state—or even from abroad—we offer advice on taxes, health care and other considerations starting on page 38. The tax rules are hellishly complex. We'll be on the hook for Michigan income taxes for the time we worked there, but D.C. offers a credit. This may be the year I break a lifetime string of DIY tax returns and recruit an accountant. ■

Mark Solheim

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TWITTER: @MARKSOLHEIM

Poon Watchara-Amphaiwan

BUSINESS MATH ISSUE

Post Pandemic means $\frac{3}{5}$ of workers will still work.

1. List the key points of the article and information to support your position.
2. Write a group defense of your position using math calculations to support your view. If you are in an online course, post to a discussion board.

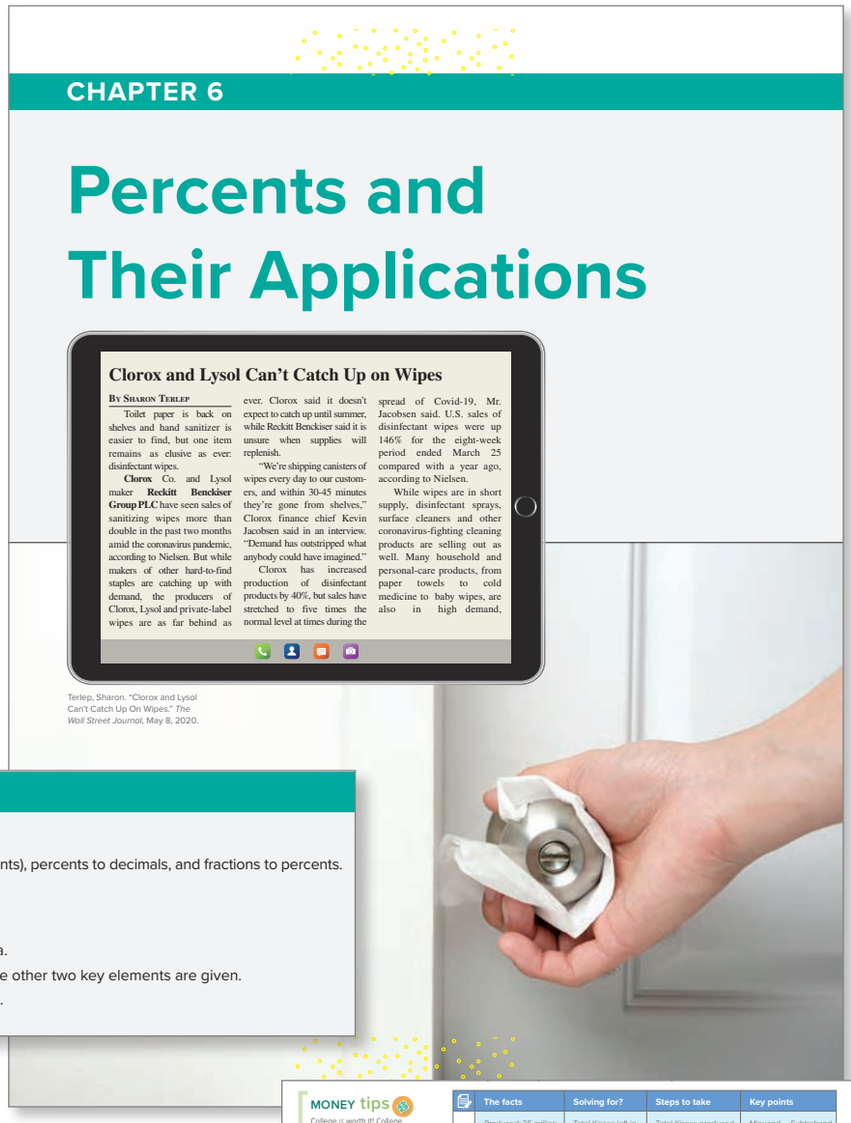
66

Hallmark Features

You can count on all of the key features developed for this book over the years remaining in the Fourteenth Edition. We have listened to instructors using the text, as well as our own students, in order to improve the book and make sure it serves you and your students effectively. Our goal was to make it as motivating and understandable as possible for both the young, just-out-of-high-school student and the older, returning student.

Chapter Openers

New chapter openers introduce students to the chapter's topics, and Learning Objectives for each unit provide an overview of the key material that will be covered. Students can see the real-world applications of business math through *The Wall Street Journal* clips, which make the topics relevant to them.

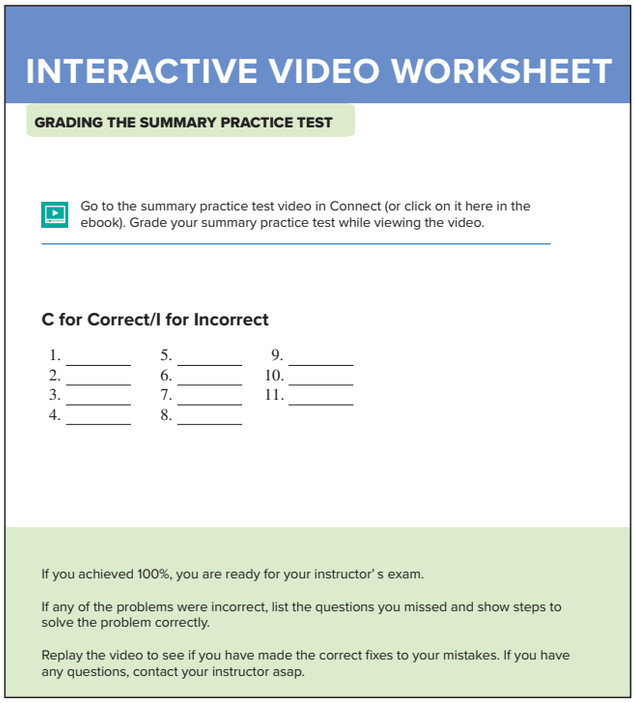


Money Tips

In each Learning Unit, we include a Money Tip to help students find practical ways to work with their money.

Interactive Video Worksheet

An interactive method of checking learning and encouraging retention by completing the summary practice test and reviewing author videos is included in each chapter.



INTERACTIVE VIDEO WORKSHEET

GRADING THE SUMMARY PRACTICE TEST

Go to the summary practice test video in Connect (or click on it here in the ebook). Grade your summary practice test while viewing the video.

C for Correct/I for Incorrect

1. _____ 5. _____ 9. _____
2. _____ 6. _____ 10. _____
3. _____ 7. _____ 11. _____
4. _____ 8. _____

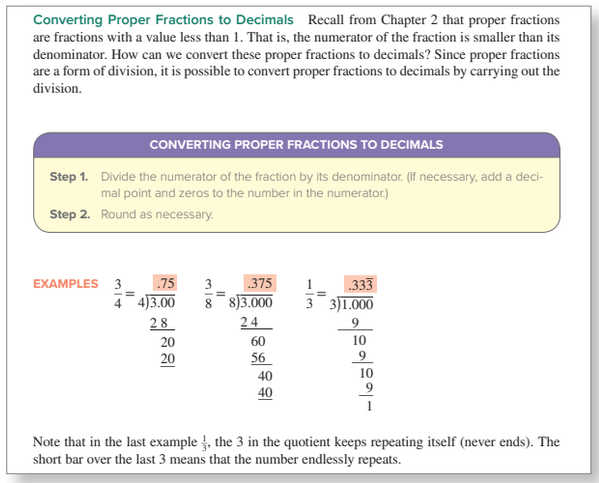
If you achieved 100%, you are ready for your instructor' s exam.

If any of the problems were incorrect, list the questions you missed and show steps to solve the problem correctly.

Replay the video to see if you have made the correct fixes to your mistakes. If you have any questions, contact your instructor asap.

Clear Explanations

Explanations are given in a step-by-step format that is easy to follow and remember, followed by understandable examples.



Converting Proper Fractions to Decimals Recall from Chapter 2 that proper fractions are fractions with a value less than 1. That is, the numerator of the fraction is smaller than its denominator. How can we convert these proper fractions to decimals? Since proper fractions are a form of division, it is possible to convert proper fractions to decimals by carrying out the division.

CONVERTING PROPER FRACTIONS TO DECIMALS

Step 1. Divide the numerator of the fraction by its denominator. (If necessary, add a decimal point and zeros to the number in the numerator.)

Step 2. Round as necessary.

EXAMPLES

$\frac{3}{4} = 4\overline{)3.00} = .75$ (20, 20)

$\frac{3}{8} = 8\overline{)3.000} = .375$ (24, 60, 56, 40, 40)

$\frac{1}{3} = 3\overline{)1.000} = .3\overline{3}$ (9, 10, 9, 10, 9, 1)

Note that in the last example $\frac{1}{3}$, the 3 in the quotient keeps repeating itself (never ends). The short bar over the last 3 means that the number endlessly repeats.

Functional Use of Color

Functional color-coding was first introduced in the Third Edition of the text. While many books use color, we set out from the beginning to use color to teach. We personally color-code each element to enhance the learning process. For example, when students see a number in red, they know it is a key item they are solving for.

Color Key

- **Blue:** Movement, cancellations, steps to solve, arrows, blueprints
- **Purple and yellow:** Formulas and steps
- **Green:** Tables and forms
- **Red:** Key items we are solving for
- **Magenta:** Worked-out solutions in Teacher's Edition only

Practice Quizzes

Practice Quizzes follow each Learning Unit in the book. These quizzes provide immediate feedback for students to check their progress. The logo lets students know that videos are available on YouTube, in Connect, or through the instructor. In these videos Jeff and Sharon carefully walk students through the material, reinforcing the content. These are accessible by each Learning Unit so students can go *directly* to the Practice Quiz they choose without searching cumbersome videotapes.

LU 6–1 PRACTICE QUIZ

Complete this Practice Quiz to see how you are doing.

Convert to percents (round to the nearest tenth percent as needed):

1. .6666 _____ **2.** .832 _____

3. .004 _____ **4.** 8.94444 _____

Convert to decimals (remember, decimals representing less than 1% will have at least 2 leading zeros before the number):

5. $\frac{1}{4}\%$ _____ **6.** $6\frac{3}{4}\%$ _____

7. 87% _____ **8.** 810.9% _____

Convert to percents (round to the nearest hundredth percent):

9. $\frac{1}{7}$ _____ **10.** $\frac{2}{9}$ _____

Convert to fractions (remember, if it is a mixed number, first convert to an improper fraction):

11. 19% _____ **12.** $71\frac{1}{2}\%$ _____ **13.** 130% _____

14. $\frac{1}{2}\%$ _____ **15.** 19.9% _____

*For **extra help** from your authors–Sharon and Jeff–see the videos in Connect.*

✓ Solutions

1. .66.66 = 66.7%

2. .83.2 = 83.2%

3. .00.4 = .4%

4. 8.94.444 = 894.4%

5. $\frac{1}{4}\% = .25\% = .0025$

6. $6\frac{3}{4}\% = 6.75\% = .0675$

7. 87% = .87. = .87

8. 810.9% = 8.10.9 = 8.109

9. $\frac{1}{7} = .14.285 = 14.29\%$

10. $\frac{2}{9} = .22.2\overline{2} = 22.22\%$

11. $19\% = 19 \times \frac{1}{100} = \frac{19}{100}$

12. $71\frac{1}{2}\% = \frac{143}{2} \times \frac{1}{100} = \frac{143}{200}$

13. $130\% = 130 \times \frac{1}{100} = \frac{130}{100} = 1\frac{30}{100} = 1\frac{3}{10}$

14. $\frac{1}{2}\% = \frac{1}{2} \times \frac{1}{100} = \frac{1}{200}$

15. $19\frac{9}{10}\% = \frac{199}{10} \times \frac{1}{100} = \frac{199}{1{,}000}$

Blueprint Aid for Dissecting and Solving a Word Problem

Students need help in overcoming their fear of word problems. The first eight chapters (except Chapter 4) provide a "blueprint" format for solving word problems. It shows students how to begin the problem-solving process, gets them actively involved in dissecting the word problem, shows visually what has to be done before calculating, and provides a structure for them to use.

3. Kellogg's sales and profit:

BLUEPRINT	The facts	Solving for?	Steps to take	Key points
	Sales: Five million, one hundred eighty-one thousand dollars. *Profit:* Five hundred two thousand dollars.	Sales and profit rounded all the way.	Express each verbal form in numeric form. Identify leftmost digit in each number.	Rounding all the way means only the left-most digit will remain. All other digits become zeros.

Steps to solving problem

1. Convert verbal to numeric.
Five million, one hundred eighty-one thousand → $5,181,000
Five hundred two thousand → $ 502,000

2. Identify leftmost digit of each number.
$5,181,000 $502,000

3. Round.
$5,000,000 $500,000

Interactive Chapter Organizer

This quick reference guide provides students with a complete set of notes, including color coding consistent with the text. Key points, formulas, examples, and vocabulary are included. The "You try it" column gives students the chance to do additional practice. Widely copied by other textbooks, this tool is useful as a reference for students as well as for reviews before exams.

INTERACTIVE CHAPTER ORGANIZER

Topic/Procedure/Formula	Examples	You try it*
Converting percents to decimals **1.** Drop percent symbol. **2.** Move decimal point two places to left. If necessary, add zeros. For fractional percents: **1.** Convert to decimal by dividing numerator by denominator. If necessary, round answer. **2.** If a mixed fractional percent, convert fractional percent first. Then combine whole number and fractional percent. **3.** Drop percent symbol; move decimal point two places to left.	$.89\% = .0089$ $95\% = .95$ $195\% = 1.95$ $8\frac{3}{4}\% = 8.75\% = .0875$ $\frac{1}{4}\% = .25\% = .0025$ $\frac{1}{5}\% = .20\% = .0020$	**Convert to decimal** .78% 96% 246% $7\frac{3}{4}\%$ $\frac{3}{4}\%$ $\frac{1}{2}\%$
Converting fractions to percents **1.** Divide numerator by denominator. **2.** Move decimal point two places to right; add percent symbol.	$\frac{4}{5} = .80 = 80\%$	**Convert to percent** $\frac{3}{5}$
Converting percents to fractions Whole percent (or fractional percent) to a fraction: **1.** Drop percent symbol. **2.** Multiply number by $\frac{1}{100}$. **3.** Reduce to lowest terms. Mixed or decimal percent to a fraction: **1.** Drop percent symbol. **2.** Change mixed percent to an improper fraction. **3.** Multiply number by $\frac{1}{100}$. **4.** Reduce to lowest terms. If you have a mixed or decimal percent, change decimal portion to fractional equivalent and continue with Steps 1 to 4.	$64\% \rightarrow 64 \times \frac{1}{100} = \frac{64}{100} = \frac{16}{25}$ $\frac{1}{4}\% \rightarrow \frac{1}{4} \times \frac{1}{100} = \frac{1}{400}$ $119\% \rightarrow 119 \times \frac{1}{100} = \frac{119}{100} = 1\frac{19}{100}$ $16\frac{1}{4}\% \rightarrow \frac{65}{4} \times \frac{1}{100} = \frac{65}{400} = \frac{13}{80}$ $16.25\% \rightarrow 16\frac{1}{4}\% = \frac{65}{4} \times \frac{1}{100} = \frac{65}{400} = \frac{13}{80}$	**Convert to fractions** 74% $\frac{1}{5}\%$ 121% $17\frac{1}{5}\%$ 17.75%

Critical Thinking Discussion Questions with Chapter Concept Check

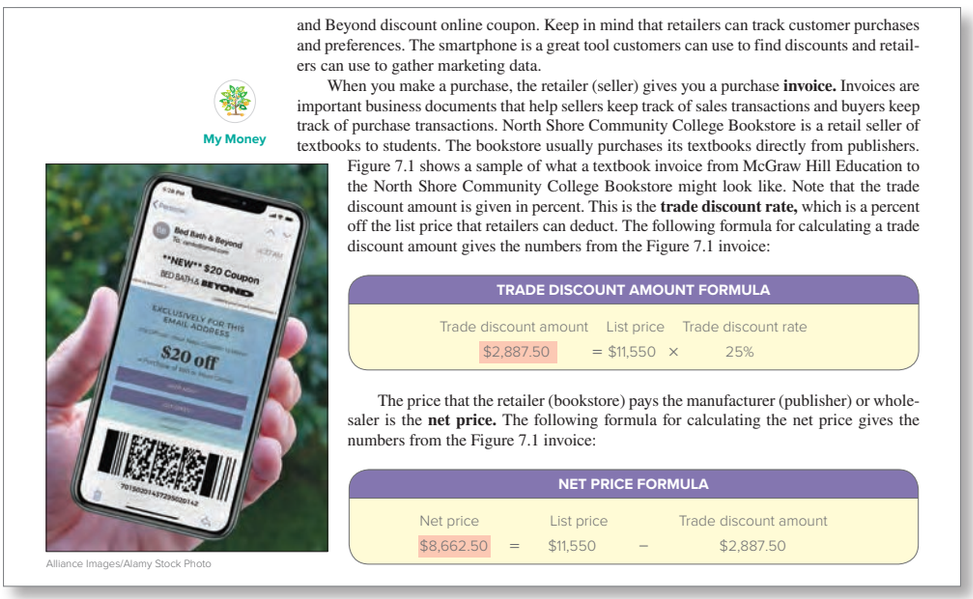
These thought-provoking questions follow the Interactive Chapter Organizer and are designed to get students thinking about the larger picture and the "why's" of business math. They go beyond the typical questions by asking students to explain, define, create, and so forth. The Chapter Concept Check questions let students find creative solutions to theory learned in the chapter.

Critical Thinking Discussion Questions with Chapter Concept Check

1. List the four steps of the decision-making process. Do you think all companies should be required to follow these steps? Give an example.
2. Explain the three steps used to round whole numbers. Pick a whole number and explain why it should not be rounded.
3. How do you check subtraction? If you were to attend a movie, explain how you might use the subtraction check method.
4. Explain how you can check multiplication. If you visit a local supermarket, how could you show multiplication as a short-cut to addition?
5. Explain how division is the reverse of multiplication. Using the supermarket example in question 4, explain how division is a timesaving shortcut related to subtraction.
6. **Chapter Concept Check.** Using all the math you learned in Chapter 1, compare the number of COVID-19 cases in your state to the entire country.

Photos

More than 50 photos are included to stimulate student interest and help students see business math with imagination and enthusiasm. Whether showing McDonald's in Asia, inventory systems, or online banking and bill paying, these photos bring business math to life.



My Money

Alliance Images/Alamy Stock Photo

and Beyond discount online coupon. Keep in mind that retailers can track customer purchases and preferences. The smartphone is a great tool customers can use to find discounts and retailers can use to gather marketing data.

When you make a purchase, the retailer (seller) gives you a purchase **invoice.** Invoices are important business documents that help sellers keep track of sales transactions and buyers keep track of purchase transactions. North Shore Community College Bookstore is a retail seller of textbooks to students. The bookstore usually purchases its textbooks directly from publishers. Figure 7.1 shows a sample of what a textbook invoice from McGraw Hill Education to the North Shore Community College Bookstore might look like. Note that the trade discount amount is given in percent. This is the **trade discount rate,** which is a percent off the list price that retailers can deduct. The following formula for calculating a trade discount amount gives the numbers from the Figure 7.1 invoice:

TRADE DISCOUNT AMOUNT FORMULA

Trade discount amount		List price		Trade discount rate
$2,887.50	=	$11,550	×	25%

The price that the retailer (bookstore) pays the manufacturer (publisher) or wholesaler is the **net price.** The following formula for calculating the net price gives the numbers from the Figure 7.1 invoice:

NET PRICE FORMULA

Net price		List price		Trade discount amount
$8,662.50	=	$11,550	–	$2,887.50

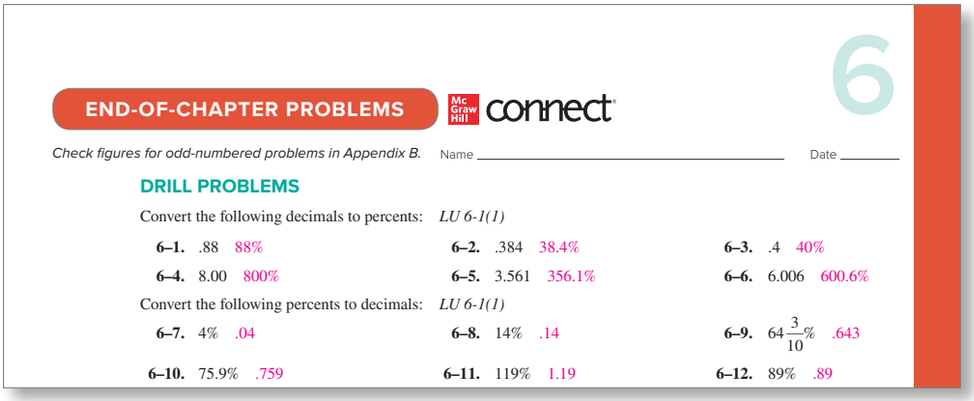
End-of-Chapter Problems

At the end of each chapter, Drill Problems are followed by Word Problems. We've added new problems in each chapter using material from newspapers such as *The Wall Street Journal* to help students see the relevance of the material.

An Excel logo next to a problem indicates an Excel template is available in Connect or through the instructor and in the Excel Workbook to help solve that problem.

Challenge Problems let your students stretch their understanding and ability to solve more complex problems. We've included two per chapter. A Summary Practice Test concludes the problem section and covers all the Learning Objectives in the chapter.

Drill Problems



6

END-OF-CHAPTER PROBLEMS Mc Graw Hill connect

Check figures for odd-numbered problems in Appendix B. Name _____ Date _____

DRILL PROBLEMS

Convert the following decimals to percents: *LU 6-1(1)*

6–1. .88 88%
6–2. .384 38.4%
6–3. .4 40%
6–4. 8.00 800%
6–5. 3.561 356.1%
6–6. 6.006 600.6%

Convert the following percents to decimals: *LU 6-1(1)*

6–7. 4% .04
6–8. 14% .14
6–9. $64\frac{3}{10}\%$ .643
6–10. 75.9% .759
6–11. 119% 1.19
6–12. 89% .89

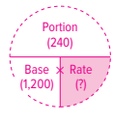
Word Problems

WORD PROBLEMS (First of Four Sets)

6–52. At a local Dunkin' Donuts, a survey showed that out of 1,200 customers eating lunch, 240 ordered coffee with their meal. What percent of customers ordered coffee? *LU 6-2(2)*

$\frac{240}{1{,}200} = .20 = 20\%$

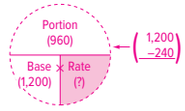
Note: Portion and rate must refer to same piece of the base.



6–53. What percent of customers in Problem 6–52 did not order coffee? *LU 6-2(2)*

$\frac{960}{1{,}200} = .80 = 80\%$

Note: Portion and rate must refer to same piece of the base.



Challenge Problems

CHALLENGE PROBLEMS

19–29. Ginny Fieg expanded her beauty salon by increasing her space by 20%. Ginny paid property taxes of $2,800 at 22 mills. The new rate is now 24 mills. As Ginny's accountant, estimate what she may have to pay for property taxes this year. Round the final answer to the nearest dollar. In the calculation, round assessed value to the nearest dollar. *LU 19-2(2)*

$22 \times .001 \times A = \$2{,}800;\ A = \frac{\$2{,}800}{.022} = \$127{,}272.72$

$\$127{,}273 \times 1.2 = \$152{,}728$

$24 \text{ mills} \times .001 \times \$152{,}728 = \$3{,}665.47 = \$3{,}665$

19–30. Art Neuner, an investor in real estate, bought an office condominium. The market value of the condo was $250,000 with a 70% assessment rate. Art feels that his return should be 12% per month on his investment after all expenses. The tax rate is $31.50 per $1,000. Art estimates it will cost $275 per month to cover general repairs, insurance, and so on. He pays a $140 condo fee per month. All utilities and heat are the responsibility of the tenant. Calculate the monthly rent for Art. Round your answer to the nearest dollar (at intermediate stages). *LU 19-2(2)*

$250,000 \times .70 = \$175{,}000$ assessed value

Tax = 175 × $31.50 = $ 5,512.50 tax
+ 3,300.00 ($275 × 12) repairs and insurance
+ 1,680.00 ($140 × 12) condo fee
$10,492.50 ÷ 12 = $874

$\$874 \times 1.12 = \$978.88 = \$979$

Summary Practice Test

You can access video tutorials of all Summary Practice Tests in McGraw Hill's Connect and through the instructor.

See Jeff and Sharon on the video tutorials in Connect as they show all worked-out solutions.

summary pra ctice test Do you need help? Connect videos have step-by-step worked-out solutions.

1. Translate the following verbal forms to numbers and add. *LU 1-1(1), LU 1-2(1)*

a. Four thousand, eight hundred thirty-nine 4,839
b. Seven million, twelve 7,000,012
c. Twelve thousand, three hundred ninety-two 12,392
7,017,243

2. Express the following number in verbal form. *LU 1-1(1)*

9,622,364 Nine million, six hundred twenty-two thousand, three hundred sixty-four

3. Round the following numbers. *LU 1-1(2)*

Nearest ten	Nearest hundred	Nearest thousand	Round all the way
a. 68 70	**b.** 888 900	**c.** 8,325 8,000	**d.** 14,821 10,000

My Money

A personal finance application of material presented in the text is at the end of every chapter. My Money encourages students to apply the chapter material to their personal finances while making use of the Internet's many resources. The sections of each My Money page get students involved in thinking about the topic in four ways:

1. What I need to know
2. What I need to do
3. Steps I need to take
4. Resources I can use

Instructors can engage students in conversations regarding how what they are learning in the text is applied directly to their own financial health.

Personal Finance: A Kiplinger Approach

A Kiplinger Group Project at the end of each chapter includes an article from *Kiplinger's Personal Finance* magazine. Each article presents a business math issue for students to debate and solve. Suggested answers are located in the Instructor's Resource Manual. This is an excellent tool to develop critical thinking and writing skills. It also provides opportunities for students to become involved in team projects. As stated in the AMATYC standards: "mathematics faculty will foster interactive learning through student writing, reading, speaking, and collaborative activities so that students can learn to work effectively in groups and communicate about mathematics both orally and in writing."


PERSONAL FINANCE

A KIPLINGER APPROACH

"Keep Child Care Costs in Check," Kiplinger's, March 2021

MILLENNIAL MONEY | Lisa Gerstner

Keep Child Care Costs in Check

The high price of child care is all too familiar to my family. The monthly cost of care for our toddler usually tops $1,000 and is second only to our mortgage payment. More than 70% of parents spend at least 10% of their income on child care, and more than half spend at least $10,000 per year, according to Care.com.

The coronavirus pandemic has added to the strain on working parents. Some have struggled to afford care following cuts in their pay or hours. Others have changed care providers or juggled job responsibilities and child care duties when schools and day care centers closed because of COVID-19. Parents have even left the workforce to care for their kids, removing care expenses from their budgets but losing income.

Choosing your care. Whether you're seeking child care for the first time or you're re-evaluating your options, be sure you understand the financial implications. A nanny, who comes to your home, is convenient. But the average weekly rate to have a nanny care for one infant is $565, according to Care.com—much higher than the $215-a-week average for a day care center and $201 for in-home day care. One way to reduce expenses is to share a nanny with another family, with whom you can split the cost.

Plus, hiring a nanny often comes with tax implications. If you pay a nanny at least $2,300 in 2021, the IRS requires you to treat him or her as a household employee. You must withhold Social Security and Medicare tax from the nanny's pay—and as the employer, you have to kick in Social Security and Medicare tax, too (you and the nanny each pay 7.65% of wages). You must also issue a Form W-2 each January and file other forms with the IRS. And you may be expected to cover transportation, meals and two weeks of vacation, says Dana Levin-Robinson, CEO of Upfront, a price-comparison website for child care services.

The expenses and tax complications that come with hiring a nanny were reason enough for me to take my son to day care instead. Consider other costs and savings, too. Day care centers and preschools may include snacks and meals in their rate. But they may also charge annual fees or penalties if you pick up your child late.

THE EXPENSES AND TAX COMPLICATIONS THAT COME WITH HIRING A NANNY WERE REASON ENOUGH FOR ME TO TAKE MY SON TO DAY CARE INSTEAD.

Don't overlook tax breaks. If you have earned income from employment during the year and pay for care while you work or look for work, you can take a federal tax credit of 20% to 35% of care expenses (the percentage depends on your income) for up to $3,000 paid for one child or $6,000 for two or more children younger than 13. You can claim the credit whether the care is in or out of your home, and you must report the care provider's name, address and tax identification number.

Your employer may allow you to stash up to $5,000 of pretax money annually in a dependent care flexible spending account. You can use the funds to pay for a nanny or day care while you work, as well as for before- and after-school programs or summer day camp. The recently passed COVID relief law includes provisions through which employers may permit unlimited carryovers of unused FSA funds from the 2020 plan year to 2021 (and from 2021 to 2022), or extend the grace period to use 2020 or 2021 FSA funds from 2.5 months to 12 months.

You may have until the end of 2021, for example, to use money that you put in an FSA in 2020, depending on your employer's rules. The law also temporarily raises the limit of a child's age of eligibility for dependent FSA coverage from 12 to 13. ■

TO SHARE THIS COLUMN, PLEASE GO TO KIPLINGER.COM/LINKS/MILLENNIALS. YOU CAN CONTACT THE AUTHOR AT LISA_GERSTNER@KIPLINGER.COM.

Poon Watchara-Amphaiwan

BUSINESS MATH ISSUE

Hiring a nanny has no tax implications.

1. List the key points of the article and information to support your position.
2. Write a group defense of your position using math calculations to support your view. If you are in an online course, post to a discussion board.

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Instructors: Student Success Starts with You

Tools to enhance your unique voice

Want to build your own course? No problem. Prefer to use an OLC-aligned, prebuilt course? Easy. Want to make changes throughout the semester? Sure. And you'll save time with Connect's auto-grading too.

65%
Less Time Grading

Laptop: McGraw Hill; Woman/dog: George Doyle/Getty Images

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Solutions for your challenges

A product isn't a solution. Real solutions are affordable, reliable, and come with training and ongoing support when you need it and how you want it. Visit **www.supportateverystep.com** for videos and resources both you and your students can use throughout the semester.

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"I really liked this app—it made it easy to study when you don't have your text-book in front of you."

- Jordan Cunningham,
Eastern Washington University

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Your Connect course has everything you need—whether reading on your digital eBook or completing assignments for class, Connect makes it easy to get your work done.

Learning for everyone

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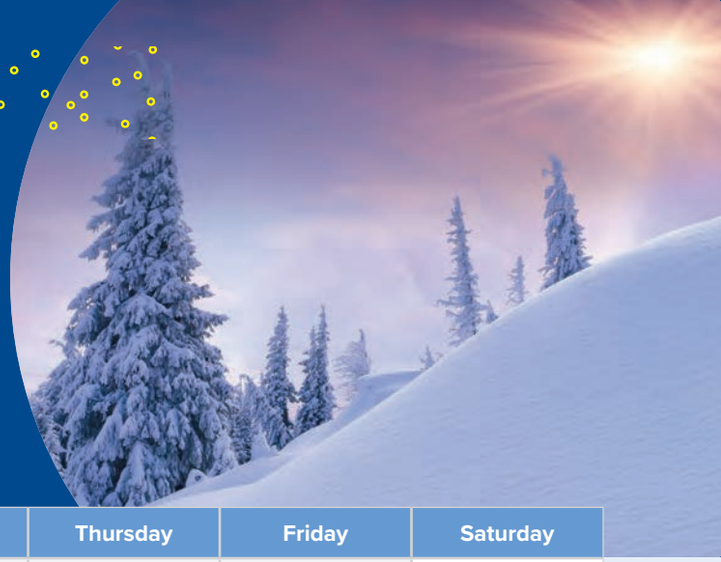
Top: Jenner Images/Getty Images, Left: Hero Images/Getty Images, Right: Hero Images/Getty Images

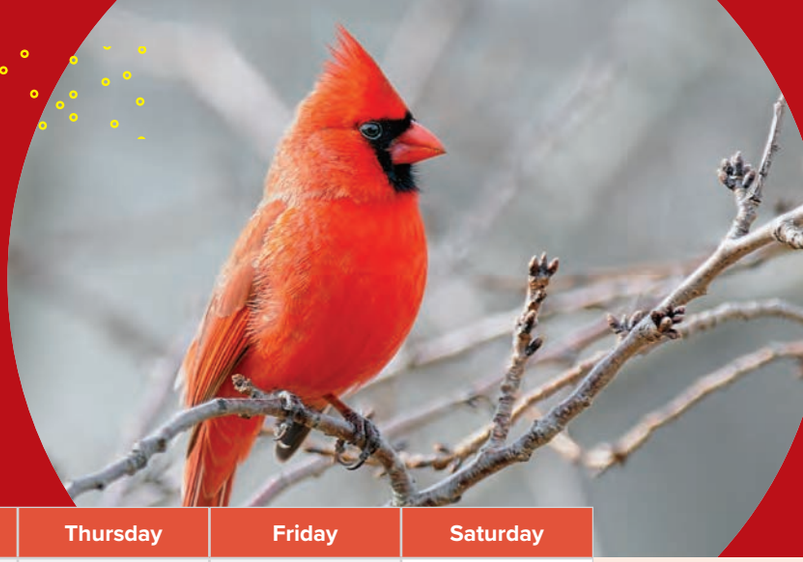
January



Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 New Year's Day: Sit back, relax, enjoy start to new year
2 Review last year's goals/ accomplishments	3 Start new receipt file. Save receipts as proof of purchase for all high dollar items; Drink 8 glasses of water per day	4 Start year's tax spreadsheet; Think about what your ideal retirement looks like	5 Make a snow/ sand angel; Recognize "Stronger together"	6 Plan bulk purchases for year: TP, tissue	7 Buy online day!!!; Recycle	8 Make a plan for how to pay each debt off; Set annual goals: specific, quantifiable, realistic, with due dates
9 Create vision board from goals set; Pay down debt	10 Set a personal milestone; Stretch daily	11 Reconcile last month's bank statement; Search online for coupons and savings	12 Make all health and beauty appointments for year	13 Create study plan; Get 7–9 hours of sleep each night	14 Buy a variety of cards for the year: birthday, thank you, wedding, anniversary	15 Review your will. Create a letter of instruction and write letters to your loved ones and keep with your will.; Martin Luther King (*"I Have a Dream"* speech August 28, 1963) born 1929
16 Netflix begins video streaming 2007; Buy online day!!!	17 Review beneficiaries for investment accounts and insurance policies; Wear warm socks; Study	18 Contribute to 9-month emergency fund; Exercise 3 times a week for 30 minutes	19 Get repaired what needs to be repaired: hem pants, clean upholstery, wash walls and windows, etc.	20 Schedule automatic payment of bills for the year; Franklin Delano Roosevelt inaugurated to 4th term	21 Eat a balanced diet; Set-up and contribute to investment account	22 Buy a stock of thank you gifts; One race: Human
23 Automate savings; Obtain free credit report from annualcreditreport.com for TransUnion	24 Build a credit score of greater than 740. Start today.; Winston Churchill died at 90 in 1965	25 Take your blood pressure; Recycle	26 Diversify your investment portfolio; Splurge!	27 Control your debt. Review your credit card's year-end summary; Mozart born in 1756	28 U.S. Space Shuttle Challenger exploded 1986	29 Buy online day!!!; Review each paystub
30 Manage your stress; Review budget for February	31 Review your credit card balances. Work to pay them off.; Jackie Robinson born 1919					

● "Financial" items ● "Health" items ● "Personal" items ● "Factoid" items

February



Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 The Space Shuttle Columbia broke apart sixteen minutes prior to landing 2003
2 Review budget and make necessary alterations	3 Pay down debt; The 15th Amendment was ratified guaranteeing the right for all citizens to vote 1870	4 Reconcile last month's bank statement; Study	5 Drink 8 glasses of water per day; Recycle	6 Princess Elizabeth becomes Queen Elizabeth II 1952	7 Make a video of the contents of your home for documentation and put this in a safe place offsite.; Charles Dickens born 1812	8 Buy online day!!!; Set a personal milestone.
9 Negotiate a large purchase saving you money	10 Stretch daily; Contribute to investment account	11 Nelson Mandela is released from prison at 71 after serving 27 years 1990	12 Abraham Lincoln born 1809	13 Do your part. Go Green. Recycle.	14 Review all insurance policies. Check you have the right coverages.; Don't text and drive.	15 Eat a balanced diet; Manage your stress
16 Drive carefully. Tickets and accidents greatly affect insurance premiums.; Buy online day!!!	17 Keep passwords safe and don't share; Apache Chief Geronimo dies in captivity 1909	18 Photograph VIN and serial #'s and keep on a memory card offsite.; Exercise 3 times a week for 30 minutes	19 Unplug electronics when they are not in use; Study	20 File your taxes early to prevent a scammer from collecting your refund.; Contribute to 9-month emergency fund	21 Protect against identity theft. Consider putting a freeze on your credit.	22 Always read thoroughly anything before signing. Read the fine print, too.
23 Review your financial institutions' interest rates and fees to ensure you have the best available	24 Get 7–9 hours of sleep each night	25 Take your blood pressure; Study	26 Recognize "Stronger together"	27 Buy online day!!!	28 Review budget for March; Review each paystub	29 Leap year: Buy online day bonus!!!

● "Financial" items ● "Health" items ● "Personal" items ● "Factoid" items

March

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 Negativity is contagious, spend your valuable time with positive people; President John F. Kennedy established the Peace Corps in 1961
2 Social media hits 1 million users with My Space 2000	3 Drink 8 glasses of water per day	4 Reconcile last month's bank statement; Spanish Flu spreads to America 1918	5 Join suzeorman.com's email list; Stop overthinking	6 Earn your degree. It will pay off.; Michelangelo was born in 1475	7 Buy online day!!!; Study	8 Review vision board and goals set
9 Pay down debt; Recycle	10 Express gratitude; First issue of U.S. government paper money, $5, $10 and $20 1862	11 Protect your children and dependents. Buy life insurance.	12 Share household work and child caregiving with your spouse.; Get 7–9 hours of sleep each night	13 Teach your kids about money management, the dangers of drugs and alcohol, and healthy eating and exercise habits.; Contribute to investment account	14 Recognize "Stronger together"; Albert Einstein born 1879 and was behind the "Manhattan Project"	15 Once your child turns 18 make certain to complete these two legal docs: a Financial Power of Attorney and a Durable Power of Attorney for Health Care.; Ruth Bader Ginsburg, Supreme Court Justice, born 1933
16 One race: Human; Study	17 Buy online day!!!	18 Exercise 3 times a week for 30 minutes	19 Consider a living revocable trust for tax purposes and ease of asset transfer.; Swallows of Capistrano return	20 Set a personal milestone; Recycle	21 Eat a balanced diet; Johann Sebastian Bach born 1685	22 Gather documentation for income taxes due next month
23 Patrick Henry ignited the American Revolution with his famous speech, "...give me liberty, or give me death!" 1775	24 Contribute to 9-month emergency fund	25 Take your blood pressure; British Parliament abolished slave trade 1807	26 Vietnam Veterans Memorial 1982; "If you've lost yourself in the relationship; find yourself in the heartbreak." Unknown	27 Negotiate!!! 9 out of 10 who ask for a discount get it	28 Stretch daily; Manage your stress; Study	29 Buy online day!!!
30 Review budget for April; Vincent Van Gogh born 1853	31 Review each paystub; Boxing champion Jack Johnson born 1878					

● "Financial" items ● "Health" items ● "Personal" items ● "Factoid" items

April

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 Contribute to 9-month emergency fund
2 First U.S. mint established in Philadelphia 1792	3 Pony Express began in 1860 delivering letters 2,000 miles away within 10 days for $5 per ounce.	4 Drink 8 glasses of water per day; Study	5 "Plant trees under whose shade you do not plan to sit." Nelson Henderson	6 First Olympics held in Athens, Greece 1896 after a 1,500 year break; Explorer Robert E. Peary reaches North Pole 1909	7 Buy online day!!!	8 Contribute the maximum amount you can to your retirement plans to defer taxes and save for retirement; Recycle
9 Study; Civil War ends 1865	10 Recognize "Stronger together"	11 Reconcile last month's bank statement; Civil Rights Act of 1968 signed into law; Apollo 13 launched, astronauts return safely to earth in lunar module: "Houston, we've had a problem here." 1970	12 American Civil War began 1861 when Confederate troops opened fire on Fort Sumter	13 Pay down debt; Stretch daily	14 Review your W4. Are you having enough money withheld? Set a personal milestone	15 Submit income taxes; Titanic sinks at 2:27 am after hitting an iceberg 1912
16 Buy online day!!!	17 Review vision board and goals set	18 Exercise 3 times a week for 30 minutes; San Francisco Earthquake 1906	19 Study; Recycle	20 Contribute to investment account	21 Eat a balanced diet	22 Prepare or review your will, living revocable trust, advanced directive, durable power of attorney for healthcare, financial power of attorney
23 William Shakespeare born 1564	24 Check with your company to see if they match your investments in your 401(k) and if they offer flexible-spending accounts	25 Take your blood pressure; Get 7–9 hours of sleep each night	26 Nelson Mandela awarded Nobel Peace Price 1993, elected president in South Africa 1994	27 Review all monthly subscription charges and determine if what you pay is worth what you are using; Manage your stress	28 Should you refinance your mortgage? If you can reduce your interest rate by at least 1.5% it may be a good financial idea.	29 Study; Buy online day!!!
30 Review each paystub; Review budget for May						

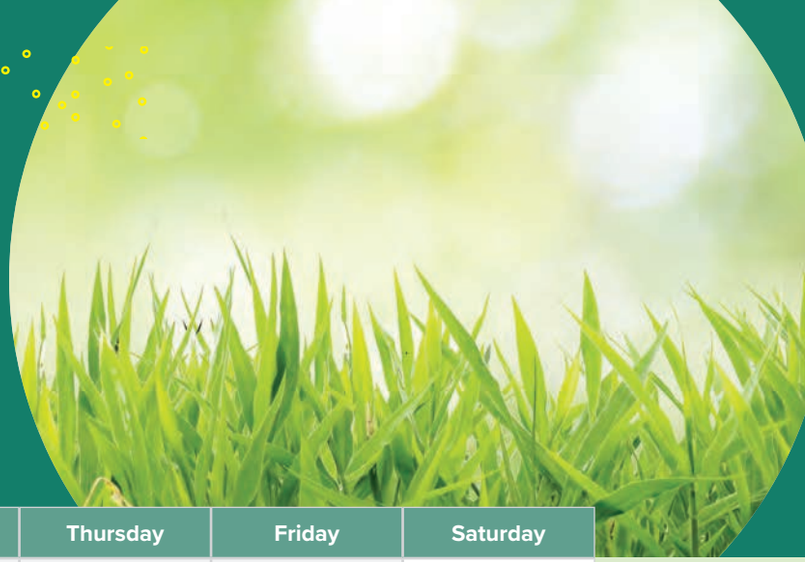
● "Financial" items ● "Health" items ● "Personal" items ● "Factoid" items

May

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 You are what you think you are, think BIG!
2 Stretch daily; Study	3 Check out 1st time homebuyers programs; Recycle	4 Protect what you have with insurance; Kent State, 1970	5 Wall Street Crash of 1893	6 Contribute to investment account	7 Buy online day!!!	8 Harry S. Truman born 1884
9 Set a personal milestone; Study	10 Union Pacific and Central Pacific railway tracks linked at Promontory Point, UT 1869	11 Reconcile last month's bank statement	12 Drink 8 glasses of water per day	13 "You don't have to have to give." Unknown	14 Recognize "Stronger together"; First permanent English settlement in America was established at Jamestown, VA 1607; Lewis and Clark depart on their 6,000 mile exploration 1804	15 Obtain free credit report from annualcreditreport.com for Experian; Study
16 Buy online day!!!	17 Brown v. Board of Education: U.S. Supreme Court unanimous rule: racial segregation in public schools is unconstitutional 1954	18 Exercise 3 times a week for 30 minutes; Mt. St Helens erupts 1980	19 Forgive yourself	20 "Lucky Lindy" Charles Lindbergh, 25, lands in Paris after first solo non-stop trans-Atlantic flight 1927; Amelia Earhart first woman to fly solo across the Atlantic 1932	21 Study; Eat a balanced diet; Get 7 – 9 hours of sleep each night	22 Forgive others
23 Determine if you can pay more toward your mortgage or installment loans; Recycle	24 Contribute to 9-month emergency fund	25 Take your blood pressure; Manage your stress	26 Dunkirk evacuation 1940	27 At 50 get a colonoscopy; Golden Gate Bridge opens 1937	28 Amnesty International founded by London barrister Peter Berenson 1961	29 Buy online day!!!
30 Review budget for June; Lincoln Memorial dedicated in Washington, D.C. 1922	31 Review each paystub; Pay down debt					

● "Financial" items ● "Health" items ● "Personal" items ● "Factoid" items

June



Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 "Fear does not prevent death, it prevents life." Buddha
2 Drink 8 glasses of water per day	3 Pay down debt; Stretch daily	4 Tiananmen Square in Beijing 1989	5 Adam Smith, "Wealth of Nations" born 1723	6 D-Day in Normandy 1944	7 Buy online day!!!	8 Have your cholesterol tested; Set a personal milestone
9 One race: Human	10 Recognize "Stronger together"; Silversmith John Hull opens first mint in America 1652	11 Reconcile last month's bank statement	12 Anne Frank born 1929	13 Get 7–9 hours of sleep each night	14 First commercial electronic computer unveiled 1951	15 Review vision board and goals set
16 Buy online day!!!; Recycle	17 Remind your executor where your estate planning documents are.; Contribute to investment account	18 Exercise 3 times a week for 30 minutes; Napolean defeated after 23 years of warfare in Europe near Waterloo 1815	19 Manage your stress; Contribute to 9-month emergency fund	20 Review burial or life insurance	21 Eat a balanced diet; Recycle	22 Double check invoices: 9 out of 10 contain errors
23 Review your smartphone contract to ensure it is meeting your needs	24 Look at what expenses you can eliminate	25 Take your blood pressure	26 Same sex marriages legalized by U.S. Supreme Court 2015; Splurge!	27 Mildred J. Hill, musician who wrote the melody for "*Happy Birthday to You*" born 1859	28 Archduke Francis Ferdinand, Crown Prince of Austria, is assassinated in Sarajevo escalating into WWI 1914; Treaty of Versailles signed ending WWI 1919	29 Make 13 mortgage payments every year; Buy online day!!!
30 Review each paystub; Review budget for July						

● "Financial" items ● "Health" items ● "Personal" items ● "Factoid" items

July

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 Sovereignty of Hong Kong reverts to China from Britain 1997; President Lincoln signed into law the first income tax bill levying 3%-5% tax on annual incomes. 1862
2 Civil Rights Act of 1964 signed by Lyndon B. Johnson	3 Drink 8 glasses of water per day	4 The Declaration of Independence approved 1776	5 Set a personal milestone; Recycle	6 Louis Pasteur gave the first successful anti-rabies shot to a child 1885	7 Buy online day!!!	8 Plan your estate; Get 7–9 hours of sleep each night
9 One race: Human; Smile	10 Contribute to investment account	11 Reconcile last month's bank statement; Take your blood pressure	12 Stretch daily; Protect your identity	13 Contribute to 9-month emergency fund	14 Recognize "Stronger together"; Fall of the Bastille beginning the French Revolution 1789	15 Manage your stress; Pay down debt
16 Buy online day!!!; Apollo 11 liftoff for Lunar landing mission 1969	17 Check to see if you have 20% equity in your home and contact your PMI carrier to get rid of it.	18 Exercise 3 times a week for 30 minutes	19 Want a second income? Explore business ideas.	20 Astronaut Neil Armstrong, Apollo 11, walked on the moon 1969	21 Eat a balanced diet; Ernest Hemingway born 1899	22 Recycle; Read
23 Calculate your net worth. It should be close to: (Your age x Pre-tax income)/10	24 Track overhead expenses. Make adjustments where needed	25 Italian luxury liner *Andrea Doria* sank after colliding with *Stockholm* 1956	26 Splurge!	27 Manage your stress; Korean War ended 1953	28 Review your property tax assessment annually and appeal if it is too high.	29 Buy online day!!!
30 Review budget for August; Henry Ford born 1863	31 Review each paystub					

● "Financial" items ● "Health" items ● "Personal" items ● "Factoid" items

August

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 One race: Human: Save 20% of all money received
2 Stretch daily; Read The Richest Man in Babylon by George S Clason	3 Contribute to investment account	4 Barack Obama born 1961, first African-American to become President	5 Recycle; Everything in moderation	6 Atomic bomb dropped over Hiroshima 1945; Alexander Fleming penicillin discoverer born 1881	7 Buy online day!!!; International spy Mata Hari born 1876	8 Contribute to 9-month emergency fund
9 Atomic bomb dropped over Nagasaki 1945; President Nixon resigns due to Watergate 1974	10 Set a personal milestone; take care of you	11 Reconcile last month's bank statement; Roots author Alex Haley born 1921	12 Drink 8 glasses of water per day	13 Recycle; Recognize how we spend our days is how we spend our lives	14 V-J (Victory over Japan) Day end of WWII: President Truman announced Japan surrendered 1945	15 Woodstock 1969
16 Buy online day!!!	17 Review vision board and goals set	18 Exercise 3 times a week for 30 minutes; 19th Amendment ratified giving women the right to vote 1920	19 Pay down debt; Study	20 Social media and mobile technology help develop the sharing economy-Airbnb launched 2008	21 Eat a balanced diet; Manage your stress	22 Recognize "Stronger together"
23 Create study plan	24 Mt. Vesuvius erupted destroying Pompeii 79 A.D.	25 Get 7–9 hours of sleep each night; Take your blood pressure	26 Splurge!	27 Study; Mother Teresa born 1910	28 Look into daveramsey.com's Financial Peace University	29 Buy online day!!!; Soviet Communist Party in Russia suspended 1991
30 Review budget for September	31 Review each paystub					

● "Financial" items ● "Health" items ● "Personal" items ● "Factoid" items

September

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 Study; Stretch daily
2 Recycle	3 The Treaty of Paris was signed ending the American Revolutionary War, 1783	4 Reconcile last month's bank statement	5 Set a personal milestone	6 Leningrad, named in honor of Lenin, was renamed Saint Petersburg 1991	7 Buy online day!!!	8 Get 7–9 hours of sleep each night
9 Obtain free credit report from annualcreditreport.com for Equifax	10 Recognize "Stronger together"	11 9/11 2001	12 Jesse Owens, 4-Olympic medal winner born 1913	13 Contribute to investment account	14 OPEC formed 1960	15 Contribute to 9-month emergency fund
16 Buy online day!!!; *Mayflower* set sail 1620 disembarking at Plymouth December 26	17 Study; Pay down debt	18 Exercise 3 times a week for 30 minutes	19 Keep the amount of all insurance policy deductibles in an interest-earning account with easy access.	20 Considering deferring/ suspending loan payments? Be aware this will affect your credit score.	21 Eat a balanced diet; Take your blood pressure	22 Recycle
23 Only financial advisors who operate as fiduciaries promise to always put the client's interest first.	24 Study; Cancel memberships you don't use.	25 Drink 8 glasses of water per day; Manage your stress	26 Splurge!	27 Continue to invest even when the stock market is falling. You can buy more shares for the price.	28 Buy online day!!!	29 Stock market crash-DJIA fell 777.68% 2008
30 Review each paystub; Review budget for October						

● "Financial" items ● "Health" items ● "Personal" items ● "Factoid" items

October

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 Model T goes on sale for the first time 1908; Panama Canal is controlled by Panama instead of the U.S. for first time 1979
2 Thurgood Marshall sworn in as first African-American U.S. Supreme Court associate justice 1967; Mahatma Gandhi born 1869	3 Study; East and West Germany are reunited 1990	4 Space Age began with first satellite sent into orbit: Russia's 184 pound Sputnik I 1957	5 Pay down debt; Recycle	6 Contribute to investment account	7 Buy online day!!!	8 Get 7–9 hours of sleep each night
9 Contribute to 9-month emergency fund	10 Set a personal milestone; Recycle	11 Study; Reconcile last month's bank statement	12 Calculate your debt to income ratio: should be less than 36%	13 George Washington lays cornerstone of White House 1792 which was burned by British in 1812 reconstructed and reoccupied 1817	14 Stretch daily; Take your blood pressure	15 Consider using a personal finance app such as Mint.com
16 Buy online day!!!; Yale University founded 1701	17 Calculate how much you would owe in the event of a car accident with your current insurance coverage.	18 Exercise 3 times a week for 30 minutes; Manage your stress	19 British Army surrender to Americans at Yorktown 1781; "Black Monday" occurred on Wall Street 1987	20 Study; Review vision board and goals set	21 Eat a balanced diet; Minimize or eliminate smoking	22 Recognize "Stronger together"
23 Don't share personal information with anyone you do not know; Spend less than you earn.	24 United Nations founded 1945	25 Protect yourself from scams. Do your homework.; Drink 8 glasses of water per day	26 Splurge!	27 The New York City subway began running 1904	28 Harvard University founded 1636; Prohibition began 1919 lasting 14 years	29 Buy online day!!!; "Black Tuesday" stock marked crashed leading to the Great Depression 1929
30 Review budget for November; rail tunnel under English Channel completed 1990	31 Study; Review each paystub					

● "Financial" items ● "Health" items ● "Personal" items ● "Factoid" items

November

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 European Union is created in Maastricht Treaty 1993
2 Study; Contribute to investment account	3 Reconcile last month's bank statement	4 Stretch daily; Manage your stress	5 Recognize "Stronger together"	6 Contribute to 9-month emergency fund	7 Buy online day!!!	8 Set a personal milestone; Recycle
9 The 27.9 mile Berlin Wall fell 1989	10 Minimize or eliminate alcohol intake; Pay down debt	11 Armistice ending WWI "the 11th hour of the 11th day of the 11th month" 1918; U.S. ended its participation in the Vietnam War 1972	12 Drink 8 glasses of water per day; Take your blood pressure	13 U.S. Supreme Court ruled racial segregation on public buses was unconstitutional 1956	14 Study; French painter Claude Monet born 1840	15 Do not overspend during the holidays. Give gifts you can afford.
16 Buy online day!!!	17 Suez Canal opened 1869; NAFTA approved 1993	18 Exercise 3 times a week for 30 minutes; Read "Millionaire Teacher" by Andrew Hallam	19 Study; Recycle	20 Buying a car? Consider a used car and never take a loan for more than 3 or 4 years.	21 Eat a balanced diet; Get 7–9 hours of sleep each night	22 Send your child to college with a credit card and help them build their credit. Monitor use.
23 Pass up purchases you don't need	24 Charles Darwin book on natural selection is published 1859 after a 5-year scientific expedition beginning in 1831	25 Wait until you are 70 to start collecting Social Security. You will receive 76% more than the benefit that you get if you claim at age 62.	26 Splurge!	27 Study; Conduct an annual review of your health insurance plan	28 Ensure you have overdraft protection for each checking or draft account	29 Buy online day!!!
30 Review each paystub; Review budget for the new year						

● "Financial" items ● "Health" items ● "Personal" items ● "Factoid" items

December

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 Rosa Parks was arrested in Montgomery, AL 1955
2 Contribute to investment account	3 Drink 8 glasses of water per day	4 Set a personal milestone	5 Study; Walt Disney born in Chicago, IL 1901	6 13th Amendment was ratified abolishing slavery 1865	7 "A day that will live in infamy", FDR. Pearl Harbor attacked 1941	8 U.S. and Britain declare war on Japan 1941; USSR ceases to exist 1991
9 Buy online day!!!	10 Reconcile last month's bank statement	11 Italy and Germany declare war on the U.S. 1941	12 Protect against identity theft. Consider putting a freeze on your credit.; Stretch daily	13 Pay down debt; Recycle	14 Recognize "Stronger together"; Norwegian explorer Roald Amundsen is the first person to reach the South Pole 1911	15 GATT approved by 117 countries 1993; Drive around looking at holiday lights with your favorite warm beverage
16 Ludwig van Beethoven born 1770; Jane Austen born 1775	17 Wilbur and Orville Wright first motor driven aircraft flight 1903	18 Exercise 3 times a week for 30 minutes	19 Buy online day!!!	20 Recycle	21 Eat a balanced diet	22 One race: Human
23 Splurge!	24 Contribute to 9-month emergency fund	25 Get 7–9 hours of sleep each night; Take your blood pressure	26 9.3 earthquake followed by tsunamis hit dozens of countries including Thailand 2004	27 IMF established 1945	28 Manage your stress	29 Buy online day!!!
30 Review each paystub; Review budget	31 New Year's Eve! Celebrate all the year's accomplishments.					

● "Financial" items ● "Health" items ● "Personal" items ● "Factoid" items

Contents

CHAPTER 2

Fractions

Amazon Prepares to Retrain A Third of Its U.S. Workforce

By Chip Cutter

U.S. companies are increasingly paying up to retrain workers as new technologies transform the workplace and companies struggle to recruit talent in one of the hottest job markets in decades.

Amazon.com Inc. is the latest example of a large employer committing to help its workers gain new skills. The online retailer said Thursday it plans to spend $700 million over about six years to retrain a third of its U.S. workforce as automation, machine learning and other technology upends the way many of its employees do their jobs.

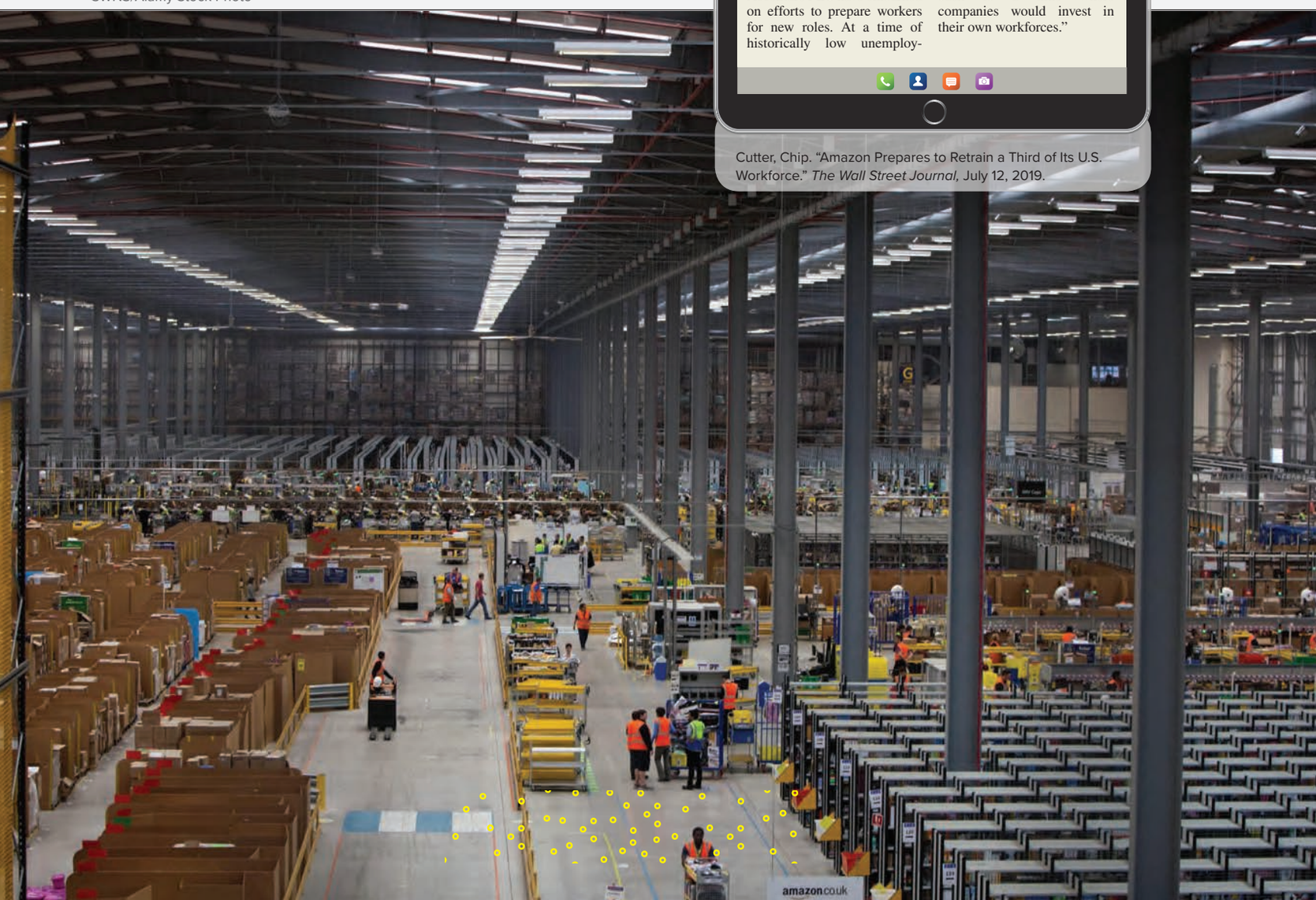
Companies as varied as AT&T Inc., Walmart Inc., JPMorgan Chase & Co. and Accenture PLC have embarked on efforts to prepare workers for new roles. At a time of historically low unemployment, coupled with rapid digital transformation that requires hightech job skills, more U.S. companies said they want to help their employees transition to new positions–and they have their bottom line squarely in focus.

Many have concluded that they must coach existing staff to take on different types of work, or face a dire talent shortage, said Ryan Carson, founder and chief executive of Treehouse, a firm that pairs tech apprentices, often from underrepresented groups, with employers and helps train them.

"It's the beginning of the flood," Mr. Carson said. "We're basically just going back to a time where companies would invest in their own workforces."

Cutter, Chip. "Amazon Prepares to Retrain a Third of Its U.S. Workforce." *The Wall Street Journal,* July 12, 2019.

SWNS/Alamy Stock Photo



LEARNING UNIT OBJECTIVES

LU 2–1: Types of Fractions and Conversion Procedures

1. Recognize the three types of fractions.
2. Convert improper fractions to whole or mixed numbers and mixed numbers to improper fractions.
3. Convert fractions to lowest and highest terms.

LU 2–2: Adding and Subtracting Fractions

1. Add like and unlike fractions.
2. Find the least common denominator by inspection and prime numbers.
3. Subtract like and unlike fractions.
4. Add and subtract mixed numbers with the same or different denominators.

LU 2–3: Multiplying and Dividing Fractions

1. Multiply and divide proper fractions and mixed numbers.
2. Use the cancellation method in the multiplication and division of fractions.

Your Guide to Successfully Completing This Chapter

Traditional book or ebook

Check box as you complete each step.

Steps

- ☐ Read learning unit.
  - ☐ Complete practice quiz at the end of the learning unit. (Videos available in Connect.)
- ☐ Grade practice quiz using provided solutions. (For more help, watch the learning unit video in Connect and have a Study Session with the authors. Then complete the additional practice quiz in Connect.)
- ☐ Repeat above for each of the three learning units in Chapter 2.
  - ☐ Review chapter organizer.
  - ☐ Complete assigned homework.
    - ☐ Finish summary practice test. (Go to Connect via the ebook link and do the interactive video worksheet to grade.)
- ☐ Complete instructor's exam.

My Money

The *Wall Street Journal* chapter opener clip "Amazon Prepares to Retrain a Third of Its U.S. Workforce" illustrates the use of a fraction. From the clipping you learn that Amazon plans to spend $700 million over the next six years to retrain $\frac{1}{3}$ of its workforce.

Now let's look at Milk Chocolate M&M'S® candies as another example of using fractions.

As you know, M&M'S® candies come in different colors. Do you know how many of each color are in a bag of M&M'S®? If you go to the M&M'S® website, you learn that a typical bag of M&M'S® contains approximately 17 brown, 11 yellow, 11 red, and 5 each of orange, blue, and green M&M'S®.[1]

The 1.69-ounce bag of M&M'S® shown on the next page contains 55 M&M'S®. In this bag, you will find the following colors:

18 yellow	9 blue	6 brown
10 red	7 orange	5 green

[1] Off 1 due to rounding.

55 pieces in the bag

Food Tree Images/Alamy Stock Photo

The number of yellow candies in a bag might suggest that yellow is the favorite color of many people. Since this is a business math text, however, let's look at the 55 M&M'S® in terms of fractional arithmetic.

Of the 55 M&M'S® in the 1.69-ounce bag, 5 of these M&M'S® are green, so we can say that 5 parts of 55 represent green candies. We could also say that 1 out of 11 M&M'S® is green. Are you confused?

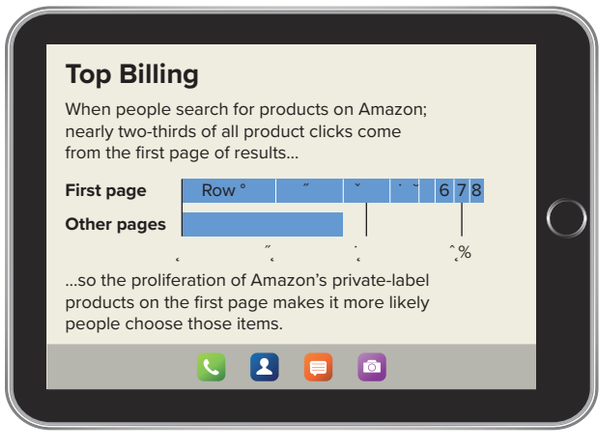
For many people, fractions are difficult. If you are one of these people, this chapter is for you. First you will review the types of fractions and the fraction conversion procedures. Then you will gain a clear understanding of the addition, subtraction, multiplication, and division of fractions.

LO 1

Learning Unit 2–1: Types of Fractions and Conversion Procedures

Note in the *Wall Street Journal* clip "Top Billing" that nearly $\frac{2}{3}$ of all product clicks are for Amazon's private-label products.

This chapter explains the parts of whole numbers called **fractions.** With fractions you can divide any object or unit—a whole—into a definite number of equal parts. For example, the bag of 55 M&M'S® described above contains 6 brown candies. If you eat only the brown M&M'S®, you have eaten 6 parts of 55, or 6 parts of the whole bag of M&M'S®. We can express this in the following fraction:



"Top Billing." *The Wall Street Journal,* September 17, 2019.

$$\frac{6}{55}$$

6 is the **numerator,** or top of the fraction. The numerator describes the number of equal parts of the whole bag that you ate.

55 is the **denominator,** or bottom of the fraction. The denominator gives the total number of equal parts in the bag of M&M'S®.

Before reviewing the arithmetic operations of fractions, you must recognize the three types of fractions described in this unit. You must also know how to convert fractions to a workable form.

Types of Fractions

There are three types of fractions: proper fractions, improper fractions, and mixed numbers.

PROPER FRACTIONS

A **proper fraction** has a value less than 1; its numerator is smaller than its denominator.

EXAMPLES $\frac{2}{3}, \frac{1}{4}, \frac{1}{2}, \frac{1}{10}, \frac{1}{12}, \frac{1}{3}, \frac{4}{7}, \frac{9}{10}, \frac{12}{13}, \frac{18}{55}, \frac{499}{1,000}, \frac{501}{1,000}$

Andrews Mcmeel Universal

IMPROPER FRACTIONS

An **improper fraction** has a value equal to or greater than 1; its numerator is equal to or greater than its denominator.

EXAMPLES $\frac{15}{15}, \frac{9}{8}, \frac{15}{14}, \frac{22}{19}$

MIXED NUMBERS

A **mixed number** is the sum of a whole number greater than zero and a proper fraction.

EXAMPLES $7\frac{1}{8}, 5\frac{9}{10}, 8\frac{7}{8}, 33\frac{5}{6}, 139\frac{9}{11}$

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Conversion Procedures

In Chapter 1 we worked with two of the division symbols (÷ and $\overline{)}$). The horizontal line (or the diagonal) that separates the numerator and the denominator of a fraction also indicates division. The numerator, like the dividend, is the number we are dividing into. The denominator, like the divisor, is the number we use to divide. Then, referring to the 6 brown M&M'S® in the bag of 55 M&M'S® $\left(\frac{6}{55}\right)$ shown at the beginning of this unit, we can say that we are

dividing 55 into 6, or 6 is divided by 55. Also, in the fraction $\frac{3}{4}$, we can say that we are dividing 4 into 3, or 3 is divided by 4. *Remember "The top dog gets the hat" when converting proper fractions to decimals. For example, in the fraction $\frac{3}{4}$, the 3 is the top dog. The division sign is the hat. Put the hat over the 3 and divide: $4\overline{)3} = .75$.*

Working with the smaller numbers of simple fractions such as $\frac{3}{4}$ is easier, so we often convert fractions to their simplest terms. In this unit we show how to convert improper fractions to whole or mixed numbers, mixed numbers to improper fractions, and fractions to lowest and highest terms.

Converting Improper Fractions to Whole or Mixed Numbers

Business situations often make it necessary to change an improper fraction to a whole number or mixed number. You can use the following steps to make this conversion:

LO 2

CONVERTING IMPROPER FRACTIONS TO WHOLE OR MIXED NUMBERS

Step 1. Divide the numerator of the improper fraction by the denominator.

Step 2. **a.** If you have no remainder, the quotient is a whole number.

b. If you have a remainder, the whole number part of the mixed number is the quotient. The remainder is placed over the original denominator as the proper fraction of the mixed number.

EXAMPLES

$$\frac{15}{15} = 1 \qquad \frac{16}{5} = 3\frac{1}{5} \qquad \begin{array}{r} 3\ \text{R}1 \\ 5\overline{)16} \\ \underline{15} \\ 1 \end{array}$$

Converting Mixed Numbers to Improper Fractions By reversing the procedure of converting improper fractions to mixed numbers, we can change mixed numbers to improper fractions.

CONVERTING MIXED NUMBERS TO IMPROPER FRACTIONS

Step 1. Multiply the denominator of the fraction by the whole number.

Step 2. Add the product from Step 1 to the numerator of the original fraction.

Step 3. Place the total from Step 2 over the denominator of the original fraction to get the improper fraction.

EXAMPLE $6\frac{1}{8} = \frac{(8 \times 6) + 1}{8} = \frac{49}{8}$ Note that the denominator stays the same.

Converting (Reducing) Fractions to Lowest Terms

When solving fraction problems, you always reduce the fractions to their lowest terms. This reduction does not change the value of the fraction. For example, in the bag of M&M'S®, 5 out of 55 were green. The fraction for this is $\frac{5}{55}$. If you divide the top and bottom of the fraction by 5, you have reduced the fraction to $\frac{1}{11}$ without changing its value. Remember, we said in the chapter introduction that 1 out of 11 M&M'S® in the bag of 55 M&M'S® represents green candies. Now you know why this is true.

To reduce a fraction to its lowest terms, begin by inspecting the fraction, looking for the largest whole number that will divide into both the numerator and the denominator without leaving a remainder. This whole number is the **greatest common divisor,** which cannot be zero. When you find this largest whole number, you have reached the point where the fraction is reduced to its **lowest terms.** At this point, no number (except 1) can divide evenly into both parts of the fraction.

LO 3

REDUCING FRACTIONS TO LOWEST TERMS BY INSPECTION

Step 1. By inspection, find the largest whole number (greatest common divisor) that will divide evenly into the numerator and denominator (does not change the fraction value).

Step 2. Divide the numerator and denominator by the greatest common divisor. Now you have reduced the fraction to its lowest terms, since no number (except 1) can divide evenly into the numerator and denominator.

EXAMPLE $\frac{24}{30} = \frac{24 \div 6}{30 \div 6} = \frac{4}{5}$

Using inspection, you can see that the number 6 in the above example is the greatest common divisor. When you have large numbers, the greatest common divisor is not so obvious. For large numbers, you can use the following step approach to find the greatest common divisor:

STEP APPROACH FOR FINDING GREATEST COMMON DIVISOR

Step 1. Divide the smaller number (numerator) of the fraction into the larger number (denominator).

Step 2. Divide the remainder of Step 1 into the divisor of S tep 1.

Step 3. Divide the remainder of Step 2 into the divisor of Step 2. Continue this division process until the remainder is a 0, which means the last divisor is the greatest common divisor.

EXAMPLE

$\frac{24}{30}$

Step 1

$24\overline{)30}$ quotient 1, remainder 6

Step 2

$6\overline{)24}$ quotient 4, remainder 0

$\frac{24 \div 6}{30 \div 6} = \frac{4}{5}$

Reducing a fraction by inspection is to some extent a trial-and-error method. Sometimes you are not sure what number you should divide into the top (numerator) and bottom (denominator) of the fraction. The following reference table on divisibility tests will be helpful. Note that to reduce a fraction to lowest terms might result in more than one division.

Will divide evenly into a number if the	2	3	4	5	6	10
	Last digit is 0, 2, 4, 6, 8.	Sum of the digits is divisible by 3.	Last two digits can be divided by 4.	Last digit is 0 or 5.	The number is even and 3 will divide into the sum of digits.	The last digit is 0.
Examples	$\frac{12}{14} = \frac{6}{7}$	$\frac{36}{69} = \frac{12}{23}$ $3 + 6 = 9 \div 3 = 3$ $6 + 9 = 15 \div 3 = 5$	$\frac{140}{160} = \frac{1(40)}{1(60)} = \frac{35}{40} = \frac{7}{8}$	$\frac{15}{20} = \frac{3}{4}$	$\frac{12}{18} = \frac{2}{3}$	$\frac{90}{100} = \frac{9}{10}$

Converting (Raising) Fractions to Higher Terms Later, when you add and subtract fractions, you will see that sometimes fractions must be raised to **higher terms.** Recall that when you reduced fractions to their lowest terms, you looked for the largest whole number (greatest common divisor) that would divide evenly into both the numerator and the denominator. When you raise fractions to higher terms, you do the opposite and multiply the numerator and the denominator by the same whole number. For example, if you want to raise the fraction $\frac{1}{4}$, you can multiply the numerator and denominator by 2.

EXAMPLE $\frac{1}{4} \times \frac{2}{2} = \frac{2}{8}$

MONEY tips

As a good rule of thumb, students should not borrow more for their education than their expected starting salary after they graduate. Students who borrow more than $25,000 for an associate's degree, $45,000 for a bachelor's degree, $75,000 for a master's degree, $100,000 for a PhD, $160,000 for a law degree, and $215,000 for an MD are probably over-borrowing.

The fractions $\frac{1}{4}$ and $\frac{2}{8}$ are **equivalent** in value. By converting $\frac{1}{4}$ to $\frac{2}{8}$, you only divided it into more parts.

Let's suppose that you have eaten $\frac{4}{7}$ of a pizza. You decide that instead of expressing the amount you have eaten in 7ths, you want to express it in 28ths. How would you do this?

To find the new numerator when you know the new denominator (28), use the steps that follow.

RAISING FRACTIONS TO HIGHER TERMS WHEN DENOMINATOR IS KNOWN

Step 1. Divide the *new* denominator by the *old* denominator to get the common number that raises the fraction to higher terms.

Step 2. Multiply the common number from Step 1 by the old numerator and place it as the new numerator over the new denominator.

EXAMPLE $\frac{4}{7} = \frac{?}{28}$

Step 1. Divide 28 by 7 = 4.

Step 2. Multiply 4 by the numerator 4 = 16.

Result:

$$\frac{4}{7} = \frac{16}{28} \quad \left(\textit{Note}\text{: This is the same as multiplying } \frac{4}{7} \times \frac{4}{4}.\right)$$

Note that $\frac{4}{7}$ and $\frac{16}{28}$ are equivalent in value, yet they are different fractions.

Now try the following Practice Quiz to check your understanding of this unit.

TEACHER'S TIP:
If you would like to assign homework by learning unit instead of at the end of the chapter, assign Appendix A for LU 2–1.

LU 2–1 PRACTICE QUIZ

Complete this **Practice Quiz** to see how you are doing.

1. Identify the type of fraction—proper, improper, or mixed:

a. $\frac{4}{5}$ **b.** $\frac{6}{5}$ **c.** $19\frac{1}{5}$ **d.** $\frac{20}{20}$

2. Convert to a mixed number:

$\frac{160}{9}$

3. Convert the mixed number to an improper fraction:

$9\frac{5}{8}$

4. Find the greatest common divisor by the step approach and reduce to lowest terms:

a. $\frac{24}{40}$ **b.** $\frac{91}{156}$

5. Convert to higher terms:

a. $\frac{14}{20} = \frac{}{200}$ **b.** $\frac{8}{10} = \frac{}{60}$

*For **extra help** from your authors–Sharon and Jeff–see the videos in Connect.*

✓ Solutions

1. **a.** Proper
b. Improper
c. Mixed
d. Improper

2.
$$9\overline{)160}\quad 17\tfrac{7}{9}$$
$$\underline{9}$$
$$70$$
$$\underline{63}$$
$$7$$

3. $\frac{(9 \times 8) + 5}{8} = \frac{77}{8}$

4. **a.**
$$24\overline{)40}\quad \underline{24}\quad 16 \qquad 16\overline{)24}\quad \underline{16}\quad 8 \qquad 8\overline{)16}\quad \underline{16}\quad 0$$

8 is greatest common divisor.

$$\frac{24 \div 8}{40 \div 8} = \frac{3}{5}$$

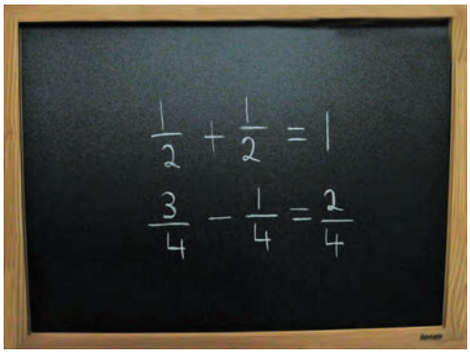
b.
$$91\overline{)156}\quad \underline{91}\quad 65 \qquad 65\overline{)91}\quad \underline{65}\quad 26 \qquad 26\overline{)65}\quad \underline{52}\quad 13 \qquad 13\overline{)26}\quad \underline{26}\quad 0$$

13 is greatest common divisor.

$$\frac{91 \div 13}{156 \div 13} = \frac{7}{12}$$

5. **a.** $20\overline{)200}\quad 10$ $\quad 10 \times 14 = 140$ $\quad \frac{14}{20} = \frac{140}{200}$

b. $10\overline{)60}\quad 6$ $\quad 6 \times 8 = 48$ $\quad \frac{8}{10} = \frac{48}{60}$



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Learning Unit 2–2: Adding and Subtracting Fractions

As a result of the pandemic, more teachers are using online video-sharing sites that are modeled after Google Inc.'s YouTube. As you can see in the blackboard illustration, these fractions can be added because the fractions have the same denominator. These are called *like fractions.*

In this unit you learn how to add and subtract fractions with the same denominators **(like fractions)** and fractions with different denominators **(unlike fractions).** We have also included how to add and subtract mixed numbers.

Addition of Fractions

LO 1

When you add two or more quantities, they must have the same name or be of the same denomination. You cannot add 6 quarts and 3 pints unless you change the denomination of one or both quantities. You must either make the quarts into pints or the pints into quarts. The same principle also applies to fractions. That is, to add two or more fractions, they must have a **common denominator.**

Adding Like Fractions

Earlier we stated that because the fractions had the same denominator, or a common denominator, they were *like fractions.* Adding like fractions is similar to adding whole numbers.

ADDING LIKE FRACTIONS

Step 1. Add the numerators and place the total over the original denominator.

Step 2. If the total of your numerators is the same as your original denominator, convert your answer to a whole number; if the total is larger than your original denominator, convert your answer to a mixed number.

EXAMPLE $\frac{1}{7}+\frac{4}{7}=\frac{5}{7}$

The denominator, 7, shows the number of pieces into which some whole was divided. The two numerators, 1 and 4, tell how many of the pieces you have. So if you add 1 and 4, you get 5, or $\frac{5}{7}$.

Adding Unlike Fractions Since you cannot add *unlike fractions* because their denominators are not the same, you must change the unlike fractions to *like fractions*—fractions with the same denominators. To do this, find a denominator that is common to all the fractions you want to add. Then look for the **least common denominator (LCD).**[2] The LCD is the smallest nonzero whole number into which all denominators will divide evenly. You can find the LCD by inspection or with prime numbers.

Finding the Least Common Denominator (LCD) by Inspection The example that follows shows you how to use inspection to find an LCD (this will make all the denominators the same).

EXAMPLE $\frac{3}{7}+\frac{5}{21}$

Inspection of these two fractions shows that the smallest number into which denominators 7 and 21 divide evenly is 21. Thus, 21 is the LCD.

You may know that 21 is the LCD of $\frac{3}{7}+\frac{5}{21}$, but you cannot add these two fractions until you change the denominator of $\frac{3}{7}$ to 21. You do this by building (raising) the equivalent of $\frac{3}{7}$, as explained in Learning Unit 2–1. You can use the following steps to find the LCD by inspection:

Step 1. Divide the new denominator (21) by the old denominator (7): $21 \div 7 = 3$.

Step 2. Multiply the 3 in Step 1 by the old numerator (3): $3 \times 3 = 9$. The new numerator is 9.

[2] Often referred to as the *lowest common denominator.*

Result:

$$\frac{3}{7}=\frac{9}{21}$$

Now that the denominators are the same, you add the numerators.

$$\frac{9}{21}+\frac{5}{21}=\frac{14}{21}=\frac{2}{3}$$

Note that $\frac{14}{21}$ is reduced to its lowest terms $\frac{2}{3}$. Always reduce your answer to its lowest terms.

You are now ready for the following general steps for adding proper fractions with different denominators. These steps also apply to the following discussion on finding LCD by prime numbers.

LO 2

ADDING UNLIKE FRACTIONS

Step 1. Find the LCD.

Step 2. Change each fraction to a like fraction with the LCD.

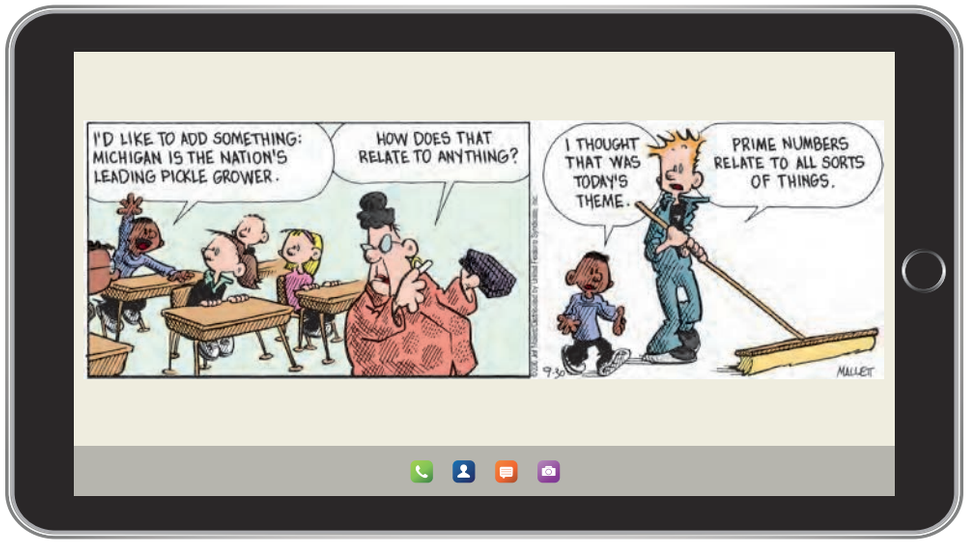
Step 3. Add the numerators and place the total over the LCD.

Step 4. If necessary, reduce the answer to lowest terms.

Finding the Least Common Denominator (LCD) by Prime Numbers When you cannot determine the LCD by inspection, you can use the prime number method. First you must understand prime numbers.

PRIME NUMBERS

A **prime number** is a whole number greater than 1 that is only divisible by itself and 1. The number 1 is not a prime number .



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EXAMPLES 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43

Note that the number 4 is not a prime number. Not only can you divide 4 by 1 and by 4, but you can also divide 4 by 2. A whole number that is greater than 1 and is only divisible by itself and 1 has become a source of interest to some people.

EXAMPLE $\frac{1}{3}+\frac{1}{8}+\frac{1}{9}+\frac{1}{12}$

Step 1. Copy the denominators and arrange them in a separate row.

3 8 9 12

Step 2. Divide the denominators in Step 1 by prime numbers. Start with the smallest number that will divide into at least two of the denominators. Bring down any number that is not divisible. Keep in mind that the lowest prime number is 2.

$$\begin{array}{r|llll} 2 & 3 & 8 & 9 & 12 \\ \hline & 3 & 4 & 9 & 6 \end{array}$$

Note: The 3 and 9 were brought down, since they were not divisible by 2.

Step 3. Continue Step 2 until no prime number will divide evenly into at least two numbers.

Note: The 3 is used, since 2 can no longer divide evenly into at least two numbers.

$$\begin{array}{r|llll} 2 & 3 & 8 & 9 & 12 \\ 2 & 3 & 4 & 9 & 6 \\ 3 & 3 & 2 & 9 & 3 \\ \hline & 1 & 2 & 3 & 1 \end{array}$$

Step 4. To find the LCD, multiply all the numbers in the divisors (2, 2, 3) and in the last row (1, 2, 3, 1).

$$\boxed{2\times2\times3}\times\boxed{1\times2\times3\times1}=72\ (\text{LCD})$$

Divisors × Last row

Step 5. Raise each fraction so that each denominator will be 72 and then add fractions.

$$\frac{1}{3}=\frac{?}{72}\qquad 72\div3=24,\quad 24\times1=24$$

$$\frac{1}{8}=\frac{?}{72}\qquad 72\div8=9,\quad 9\times1=9$$

$$\frac{24}{72}+\frac{9}{72}+\frac{8}{72}+\frac{6}{72}=\frac{47}{72}$$

The above five steps used for finding LCD with prime numbers are summarized as follows:

FINDING LCD FOR TWO OR MORE FRACTIONS

Step 1. Copy the denominators and arrange them in a separate row.

Step 2. Divide the denominators by the smallest prime number that will divide evenly into at least two numbers.

Step 3. Continue until no prime number divides evenly into at least two numbers.

Step 4. Multiply all the numbers in divisors and last row to find the LCD.

Step 5. Raise all fractions so each has a common denominator and then complete the computation.

Adding Mixed Numbers The following steps will show you how to add mixed numbers:

ADDING MIXED NUMBERS

Step 1. Add the fractions (remember that fractions need common denominators, as in the previous section).

Step 2. Add the whole numbers.

Step 3. Combine the totals of Steps 1 and 2. Be sure you do not have an improper fraction in your final answer. Convert the improper fraction to a whole or mixed number. Add the whole numbers resulting from the improper fraction conversion to the total whole numbers of Step 2. If necessary, reduce the answer to lowest terms.

Using prime numbers to find LCD of example

$$\begin{array}{r|lll} 2 & 20 & 5 & 4 \\ 2 & 10 & 5 & 2 \\ 5 & 5 & 5 & 1 \\ & 1 & 1 & 1 \end{array}$$

$2 \times 2 \times 5 = 20$ LCD

EXAMPLE

$$4\frac{7}{20} \qquad 4\frac{7}{20}$$
$$6\frac{3}{5} \qquad 6\frac{12}{20}$$
$$+\,7\frac{1}{4} \qquad +\,7\frac{5}{20}$$

$$\frac{3}{5} = \frac{?}{20}$$
$$20 \div 5 = 4$$
$$\times 3$$
$$12$$

Step 1 $\rightarrow \frac{24}{20} = 1\frac{4}{20}$

Step 2 $+\ 17 \qquad (4 + 6 + 7)$

Step 3 $\rightarrow = 18\frac{4}{20} = 18\frac{1}{5}$

Subtraction of Fractions

The subtraction of fractions is similar to the addition of fractions. This section explains how to subtract like and unlike fractions and how to subtract mixed numbers.

Subtracting Like Fractions To subtract like fractions, use the steps that follow.

LO 3

SUBTRACTING LIKE FRACTIONS

Step 1. Subtract the numerators and place the answer over the common denominator.

Step 2. If necessary, reduce the answer to lowest terms.

EXAMPLE

$$\frac{9}{10} - \frac{1}{10} = \frac{8 \div 2}{10 \div 2} = \frac{4}{5}$$

Step 1 **Step 2**

Subtracting Unlike Fractions Now let's learn the steps for subtracting unlike fractions.

SUBTRACTING UNLIKE FRACTIONS

Step 1. Find the LCD.

Step 2. Raise the fraction to its equivalent value.

Step 3. Subtract the numerators and place the answer over the LCD.

Step 4. If necessary, reduce the answer to lowest terms.

EXAMPLE

$$\frac{5}{8} \qquad \frac{40}{64}$$
$$-\frac{2}{64} \qquad -\frac{2}{64}$$
$$\frac{38}{64} = \frac{19}{32}$$

By inspection, we see that LCD is 64.
Thus $64 \div 8 = 8 \times 5 = 40$.

Subtracting Mixed Numbers When you subtract whole numbers, sometimes borrowing is not necessary. At other times, you must borrow. The same is true of subtracting mixed numbers.

LO 4

SUBTRACTING MIXED NUMBERS

When Borrowing Is Not Necessary

Step 1. Subtract fractions, making sure to find the LCD.

Step 2. Subtract whole numbers.

Step 3. Reduce the fraction(s) to lowest terms.

When Borrowing Is Necessary

Step 1. Make sure the fractions have the LCD.

Step 2. Borrow from the whole number of the minuend (top number).

Step 3. Subtract the whole numbers and fractions.

Step 4. Reduce the fraction(s) to lowest terms.

EXAMPLE Where borrowing is not necessary:

$$6\frac{1}{2} \quad\quad 6\frac{4}{8}$$
$$-\frac{3}{8} \quad\quad -\frac{3}{8}$$

Find LCD of 2 and 8. LCD is 8.

$$6\frac{1}{8}$$

MONEY tips

Create an emergency fund for the unexpected. Having at least six months of monthly expenses in a liquid account will provide you with a great cushion in the event of an unforeseen expense.

EXAMPLE Where borrowing is necessary:

$$3\frac{1}{2} = \quad 3\frac{2}{4} = \quad 2\frac{6}{4} \left(\frac{4}{4}+\frac{2}{4}\right)$$
$$-1\frac{3}{4} = \quad -1\frac{3}{4} = \quad -1\frac{3}{4}$$
$$\text{LCD is } 4. \qquad\qquad 1\frac{3}{4}$$

Since $\frac{3}{4}$ is larger than $\frac{2}{4}$, we must borrow 1 from the 3. This is the same as borrowing $\frac{4}{4}$. A fraction with the same numerator and denominator represents a whole. When we add $\frac{4}{4}+\frac{2}{4}$, we get $\frac{6}{4}$. Note how we subtracted the whole number and fractions, being sure to reduce the final answer if necessary.

How to Dissect and Solve a Word Problem

Let's now look at how to dissect and solve a word problem involving fractions.

The Word Problem Albertsons grocery store has $550\frac{1}{4}$ total square feet of floor space. Albertsons' meat department occupies $115\frac{1}{2}$ square feet, and its deli department occupies $145\frac{7}{8}$ square feet. If the remainder of the floor space is for groceries, what square footage remains for groceries?

BLUEPRINT	The facts	Solving for?	Steps to take	Key points
	Total square footage: $550\frac{1}{4}$ sq. ft. *Meat department:* 115 $\frac{1}{2}$ sq. ft. *Deli department:* 145 $\frac{7}{8}$ sq. ft.	Total square footage for groceries.	Total floor space – Total meat and deli floor space = Total grocery floor space.	Denominators must be the same before adding or subtracting fractions. $\frac{8}{8}=1$ Never leave improper fraction as final answer.

Steps to solving problem

1. Calculate total square footage of the meat and deli departments.

$$\begin{array}{rl} \text{Meat:} & 115\ \frac{1}{2} = 115\ \frac{4}{8} \\ \text{Deli:} & +145\ \frac{7}{8} = +145\ \frac{7}{8} \\ \hline & 260\frac{11}{8} = 261\ \frac{3}{8}\text{ sq. ft.} \end{array}$$

2. Calculate total grocery square footage.

$$\begin{array}{l} 550\frac{1}{4} = 550\frac{2}{8} = 549\frac{10}{8} \\ \underline{-261\ \frac{3}{8} = -261\ \frac{3}{8} = -261\ \frac{3}{8}} \qquad \left(\frac{2}{8}+\frac{8}{8}\right) \\ 288\frac{7}{8}\text{ sq. ft.} \end{array}$$

Check

$$\begin{array}{l} 261\ \frac{3}{8} \\ \underline{+288\frac{7}{8}} \\ 549\frac{10}{8} = 550\frac{2}{8} = 550\frac{1}{4}\text{ sq. ft.} \end{array}$$

TEACHER'S TIP:
If you would like to assign homework by learning unit instead of at the end of the chapter, assign Appendix A for LU 2–2.

Note how the above blueprint aid helped to gather the facts and identify what we were looking for. To find the total square footage for groceries, we first had to sum the areas for meat and deli. Then we could subtract these areas from the total square footage. Also note that in Step 1 above, we didn't leave the answer as an improper fraction. In Step 2, we borrowed from the 550 so that we could complete the subtraction.

It's your turn to check your progress with a Practice Quiz.

LU 2–2 PRACTICE QUIZ

Complete this Practice Quiz to see how you are doing.

1. Find LCD by the division of prime numbers:

12, 9, 6, 4

2. Add and reduce to lowest terms if needed:

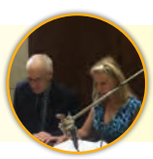
a. $\frac{3}{40}+\frac{2}{5}$ **b.** $2\frac{3}{4}+6\frac{1}{20}$

3. Subtract and reduce to lowest terms if needed:

a. $\frac{6}{7}-\frac{1}{4}$ **b.** $8\frac{1}{4}-3\frac{9}{28}$ **c.** $4-1\frac{3}{4}$

4. Computerland has $660\frac{1}{4}$ total square feet of floor space. Three departments occupy this floor space: hardware, $201\frac{1}{8}$ square feet; software, $242\frac{1}{4}$ square feet; and customer service, _____ square feet. What is the total square footage of the customer service area? You might want to try a blueprint aid, since the solution will show a completed blueprint aid.

✓ Solutions



*For **extra help** from your authors–Sharon and Jeff–see the videos in Connect.*

1.

$$\begin{array}{r|llll} 2 & 12 & 9 & 6 & 4 \\ 2 & 6 & 9 & 3 & 2 \\ 3 & 3 & 9 & 3 & 1 \\ & 1 & 3 & 1 & 1 \end{array}$$

$\text{LCD} = 2 \times 2 \times 3 \times 1 \times 3 \times 1 \times 1 = 36$

2. a. $\frac{3}{40}+\frac{2}{5}=\frac{3}{40}+\frac{16}{40}=\frac{19}{40}$

$\left(\frac{2}{5}=\frac{?}{40}\right.$
$\left.40 \div 5 = 8 \times 2 = 16\right)$

b.

$$\begin{array}{rr} 2\frac{3}{4} & 2\frac{15}{20} \\ +6\frac{1}{20} & +6\frac{1}{20} \\ \hline & 8\frac{16}{20}=8\frac{4}{5} \end{array}$$

$\frac{3}{4}=\frac{?}{20}$

$20 \div 4 = 5 \times 3 = 15$

3. a.

$$\begin{array}{r} \frac{6}{7} = \frac{24}{28} \\ -\frac{1}{4} = -\frac{7}{28} \\ \hline \frac{17}{28} \end{array}$$

b.

$$\begin{array}{r} 8\frac{1}{4} = 8\frac{7}{28} = 7\frac{35}{28} \quad \longleftarrow \left(\frac{28}{28} + \frac{7}{28}\right) \\ -3\frac{9}{28} = -3\frac{9}{28} = -3\frac{9}{28} \\ \hline 4\frac{26}{28} = 4\frac{13}{14} \end{array}$$

c.

$$\begin{array}{r} 3\frac{4}{4} \\ -1\frac{3}{4} \\ \hline 2\frac{1}{4} \end{array}$$

Note how we showed the 4 as $3\frac{4}{4}$.

4. Computerland's total square footage for customer service:

BLUEPRINT	The facts	Solving for?	Steps to take	Key points
	Total square footage: $660\frac{1}{4}$ sq. ft. *Hardware:* $201\frac{1}{8}$ sq. ft. *Software:* $242\frac{1}{4}$ sq. ft.	Total square footage for customer service.	Total floor space – Total hardware and software floor space = Total customer service floor space.	Denominators must be the same before adding or subtracting fractions.

Steps to solving problem

1. Calculate the total square footage of hardware and software.

$$\begin{array}{r} 201\frac{1}{8} = 201\frac{1}{8} \text{ (hardware)} \\ +\,242\frac{1}{4} = +\,242\frac{2}{8} \text{ (software)} \\ \hline 443\frac{3}{8} \end{array}$$

2. Calculate the total square footage for customer service.

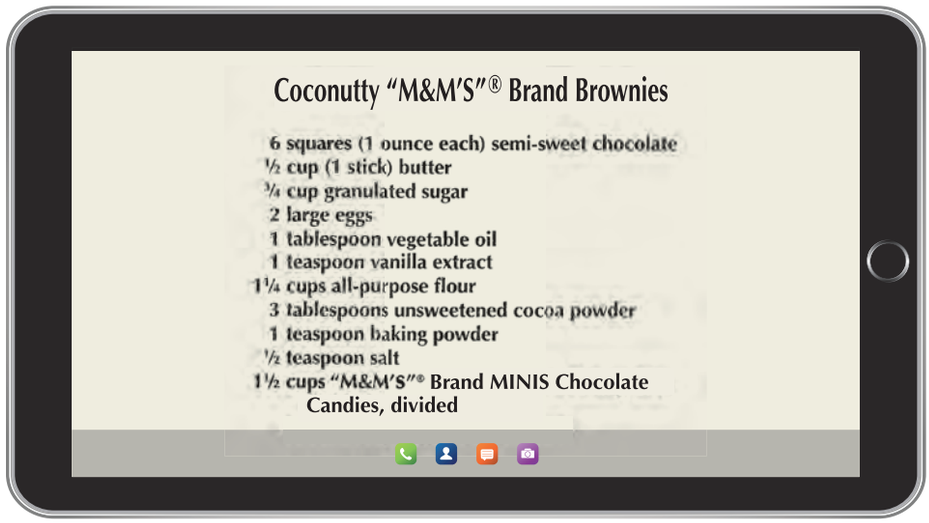
$$\begin{array}{r} 660\frac{1}{4} = 660\frac{2}{8} = 659\frac{10}{8} \text{ (total square footage)} \\ -\,443\frac{3}{8} = -\,443\frac{3}{8} = -\,443\frac{3}{8} \text{ (hardware plus software)} \\ \hline 216\frac{7}{8} \text{ sq. ft. (customer service)} \end{array}$$

Learning Unit 2–3: Multiplying and Dividing Fractions

LO 1

The following recipe for Coconutty "M&M'S"® Brand Brownies makes 16 brownies. What would you need if you wanted to triple the recipe and make 48 brownies?

Roberts Publishing Services



Source: Adapted from Mars, Inc.

In this unit you learn how to multiply and divide fractions.

LO 2

Multiplication of Fractions

Multiplying fractions is easier than adding and subtracting fractions because you do not have to find a common denominator. This section explains the multiplication of proper fractions and the multiplication of mixed numbers.

MULTIPLYING PROPER FRACTIONS[3]

Step 1. Multiply the numerators and the denominators.

Step 2. Reduce the answer to lowest terms or use the cancellation method.

First let's look at an example that results in an answer that we do not have to reduce.

EXAMPLE $\frac{1}{7} \times \frac{5}{8} = \frac{5}{56}$

In the next example, note how we reduce the answer to lowest terms.

EXAMPLE $\frac{5}{1} \times \frac{1}{6} \times \frac{4}{7} = \frac{20}{42} = \frac{10}{21}$ Keep in mind $\frac{5}{1}$ is equal to 5.

We can reduce $\frac{20}{42}$ by the step approach as follows:

$$\begin{array}{r} 2 \\ 20\overline{)42} \\ \underline{40} \\ 2 \end{array} \qquad \begin{array}{r} 10 \\ 2\overline{)20} \\ \underline{20} \\ 0 \end{array}$$

$$\frac{20 \div 2}{42 \div 2} = \frac{10}{21}$$

We could also have found the greatest common divisor by inspection.

As an alternative to reducing fractions to lowest terms, we can use the **cancellation** technique. Let's work the previous example using this technique.

EXAMPLE $\frac{5}{1} \times \frac{1}{\cancel{6}_{3}} \times \frac{\overset{2}{\cancel{4}}}{7} = \frac{10}{21}$

2 divides evenly into 4 twice and into 6 three times.

Note that when we cancel numbers, we are reducing the answer before multiplying. We know that multiplying or dividing both numerator and denominator by the same number gives an equivalent fraction. So we can divide both numerator and denominator by any number that divides them both evenly. It doesn't matter which we divide first. Note that this division reduces $\frac{10}{21}$ to its lowest terms.

Multiplying Mixed Numbers

The following steps explain how to multiply mixed numbers:

MULTIPLYING MIXED NUMBERS

Step 1. Convert the mixed numbers to improper fractions.

Step 2. Multiply the numerators and denominators.

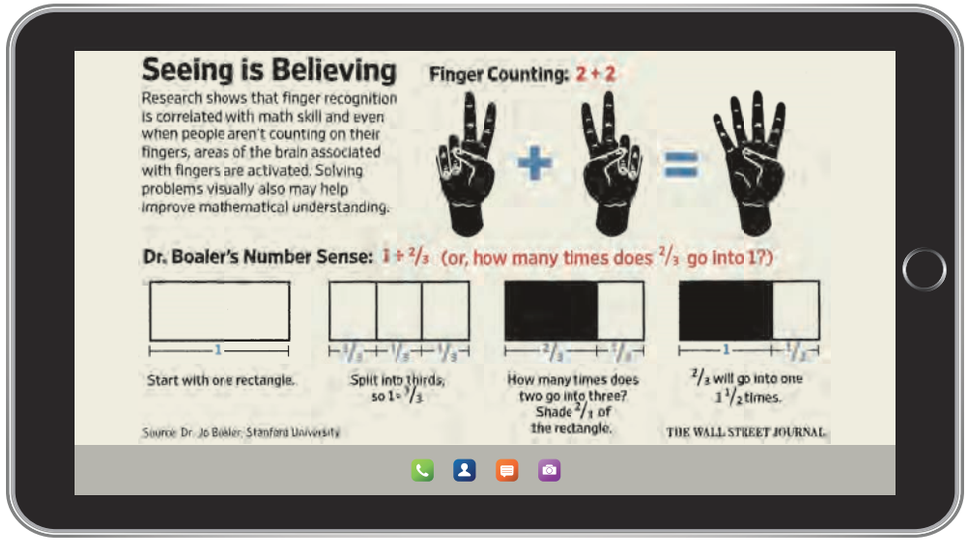
Step 3. Reduce the answer to lowest terms or use the cancellation method.

[3] You would follow the same procedure to multiply improper fractions.

EXAMPLE $2\frac{1}{3} \times 1\frac{1}{2} = \frac{7}{\cancel{3}^{1}} \times \frac{\cancel{3}^{1}}{2} = \frac{7}{2} = 3\frac{1}{2}$

Step 1 **Step 2** **Step 3**

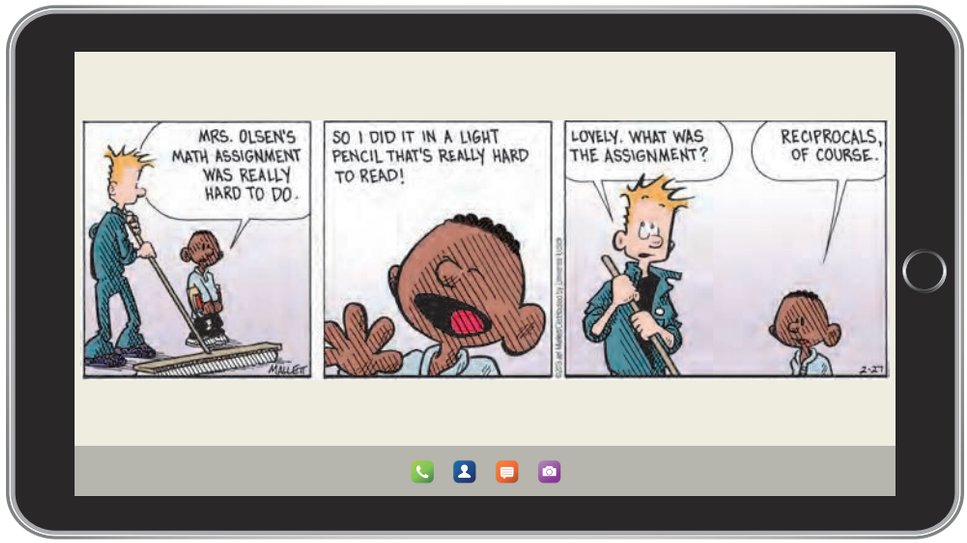
Before we look at dividing fractions, reference the article below from the *Wall Street Journal*, "Seeing is Believing," showing research of the brain and its relationship to your fingers and math skills.



Division of Fractions

When you studied whole numbers in Chapter 1, you saw how multiplication can be checked by division. The multiplication of fractions can also be checked by division, as you will see in this section on dividing proper fractions and mixed numbers.

Dividing Proper Fractions The division of proper fractions introduces a new term—the **reciprocal.** To use reciprocals, we must first recognize which fraction in the problem is the divisor—the fraction that we divide by. Let's assume the problem we are to solve is $\frac{1}{8} \div \frac{2}{3}$. We read this problem as "$\frac{1}{8}$ divided by $\frac{2}{3}$." The divisor is the fraction after the division sign (or the second fraction). The steps that follow show how the divisor becomes a reciprocal.



DIVIDING PROPER FRACTIONS

Step 1. Invert (turn upside down) the divisor (the second fraction). The inverted number is the *reciprocal.*

Step 2. Multiply the fractions.

Step 3. Reduce the answer to lowest terms or use the cancellation method.

Do you know why the inverted fraction number is a reciprocal? Reciprocals are two numbers that when multiplied give a product of 1. For example, 2 (which is the same as $\frac{2}{1}$) and $\frac{1}{2}$ are reciprocals because multiplying them gives 1.

EXAMPLE $\frac{1}{8} \div \frac{2}{3} \qquad \frac{1}{8} \times \frac{3}{2} = \frac{3}{16}$

Dividing Mixed Numbers Now you are ready to divide mixed numbers by using improper fractions.

DIVIDING MIXED NUMBERS

Step 1. Convert all mixed numbers to improper fractions.

Step 2. Invert the divisor (take its reciprocal) and multiply. If your final answer is an improper fraction, reduce it to lowest terms. You can do this by finding the greatest common divisor or by using the cancellation technique.

EXAMPLE $8\frac{3}{4} \div 2\frac{5}{6}$

Step 1. $\frac{35}{4} \div \frac{17}{6}$

Step 2. $\frac{35}{\cancel{4}_{2}} \times \frac{\overset{3}{\cancel{6}}}{17} = \frac{105}{34} = 3\frac{3}{34}$ Here we used the cancellation technique.

How to Dissect and Solve a Word Problem

The Word Problem Jamie ordered $5\frac{1}{2}$ cords of oak. The cost of each cord is $150. He also ordered $2\frac{1}{4}$ cords of maple at $120 per cord. Jamie's neighbor, Al, said that he would share the wood and pay him $\frac{1}{5}$ of the total cost. How much did Jamie receive from Al?

Note how we filled in the blueprint aid columns. We first had to find the total cost of all the wood before we could find Al's share—$\frac{1}{5}$ of the total cost.

MONEY tips

Make good buying decisions. Do not spend more money than you make. In fact, remember to pay yourself first by putting away money each paycheck for your retirement—even $10 each paycheck adds up.

BLUEPRINT	The facts	Solving for?	Steps to take	Key points
	Cords ordered: $5\frac{1}{2}$ at $150 per cord; $2\frac{1}{4}$ at $120 per cord. *Al's cost share:* $\frac{1}{5}$ the total cost.	What will Al pay Jamie?	Total cost of wood × $\frac{1}{5}$ = Al's cost	Convert mixed numbers to improper fractions when multiplying. Cancellation is an alternative to reducing fractions.

Steps to solving problem

1. Calculate the cost of oak. $5\frac{1}{2} \times \$150 = \frac{11}{\cancel{2}_{1}} \times \overset{\$75}{\cancel{\$150}} = \$825$

2. Calculate the cost of maple. $2\frac{1}{4} \times \$120 = \frac{9}{\cancel{4}_{1}} \times \overset{\$30}{\cancel{\$120}} = \$270$

3. What Al pays. $\$1{,}095$ (total cost of wood)

$$\frac{1}{\cancel{5}_{1}} \times \overset{\$219}{\cancel{\$1{,}095}} = \$219$$

TEACHER'S TIP:
If you would like to assign homework by learning unit instead of at the end of the chapter, assign Appendix A for LU 2–3.

You should now be ready to test your knowledge of the final unit in the chapter.

LU 2–3 PRACTICE QUIZ

Complete this Practice Quiz to see how you are doing.

*For **extra help** from your authors–Sharon and Jeff–see the videos in Connect.*

1. Multiply (use cancellation technique):

a. $\frac{4}{8} \times \frac{4}{6}$ **b.** $35 \times \frac{4}{7}$

2. Multiply (do not use canceling; reduce by finding the greatest common divisor):

$\frac{14}{15} \times \frac{7}{10}$

3. Complete the following. Reduce to lowest terms as needed.

a. $\frac{1}{9} \div \frac{5}{6}$ **b.** $\frac{51}{5} \div \frac{5}{9}$

4. Jill Estes bought a mobile home that was $8\frac{1}{8}$ times as expensive as the home her brother bought. Jill's brother paid $16,000 for his mobile home. What is the cost of Jill's new home?

✓ Solutions

1. a. $\frac{\overset{1}{\cancel{2}}}{\cancel{8}_{\cancel{2}_{1}}} \times \frac{1}{\cancel{6}_{3}} = \frac{1}{3}$ **b.** $\overset{5}{\cancel{35}} \times \frac{4}{\underset{1}{\cancel{7}}} = 20$

2. $\frac{14}{15} \times \frac{7}{10} = \frac{98 \div 2}{150 \div 2} = \frac{49}{75}$

$98\overline{)150}$ R 52; $52\overline{)98}$ R 46; $46\overline{)52}$ R 6; $6\overline{)46}$ R 4; $4\overline{)6}$ R 2; $2\overline{)4}$ R 0

3. a. $\frac{1}{9} \times \frac{6}{5} = \frac{6 \div 3}{45 \div 3} = \frac{2}{15}$ **b.** $\frac{51}{5} \times \frac{9}{5} = \frac{459}{25} = 18\frac{9}{25}$

4. Total cost of Jill's new home:

BLUEPRINT	The facts	Solving for?	Steps to take	Key points
	Jill's mobile home: $8\frac{1}{8}$ as expensive as her brother's. *Brother paid:* $16,000.	Total cost of Jill's new home.	$8\frac{1}{8}$ × Total cost of Jill's brother's mobile home = Total cost of Jill's new home.	Canceling is an alternative to reducing.

Steps to solving problem

1. Convert $8\frac{1}{8}$ to a mixed number. $\frac{65}{8}$
2. Calculate the total cost of Jill's home. $\frac{65}{\underset{1}{\cancel{8}}} \times \overset{\$2{,}000}{\cancel{\$16{,}000}} = \$130{,}000$

INTERACTIVE CHAPTER ORGANIZER

Topic/Procedure/Formula	Example	You try it*
Types of fractions *Proper:* Value less than 1; numerator smaller than denominator. *Improper:* Value equal to or greater than 1; numerator equal to or greater than denominator. *Mixed:* Sum of whole number greater than zero and a proper fraction.	$\frac{3}{5}, \frac{7}{9}, \frac{8}{15}$ $\frac{14}{14}, \frac{19}{18}$ $6\frac{3}{8}, 9\frac{8}{9}$	**Identify type of fraction** $\frac{3}{10}, \frac{9}{8}, 1\frac{4}{5}$
Fraction conversions *Improper to whole or mixed:* Divide numerator by denominator; place remainder over old denominator. *Mixed to improper:* $\frac{\text{Whole number} \times \text{Denominator} + \text{Numerator}}{\text{Old denominator}}$	$\frac{17}{4} = 4\frac{1}{4}$ $4\frac{1}{8} = \frac{32+1}{8} = \frac{33}{8}$	**Convert to mixed number** $\frac{18}{7}$ **Convert to improper fraction** $5\frac{1}{7}$
Reducing fractions to lowest terms **1.** Divide numerator and denominator by largest possible divisor (does not change fraction value). **2.** When reduced to lowest terms, no number (except 1) will divide evenly into both numerator and denominator.	$\frac{18 \div 2}{46 \div 2} = \frac{9}{23}$	**Reduce to lowest terms** $\frac{16}{24}$
Step approach for finding greatest common denominator **1.** Divide smaller number of fraction into larger number. **2.** Divide remainder into divisor of Step 1. Continue this process until no remainder results. **3.** The last divisor used is the greatest common divisor.	$\frac{15}{65} \rightarrow 15\overline{)65}\ 4\ \ 60\ \ 5$ $5\overline{)15}\ 3\ \ 15\ \ 0$ 5 is greatest common divisor.	**Find greatest common denominator** $\frac{20}{50}$
Raising fractions to higher terms Multiply numerator and denominator by same number. Does not change fraction value.	$\frac{15}{41} = \frac{?}{410}$ $410 \div 40 = 10 \times 15 = 150$	**Raise to higher terms** $\frac{16}{31} = \frac{?}{310}$
Adding and subtracting like and unlike fractions When denominators are the same (like fractions), add (or subtract) numerators, place total over original denominator, and reduce to lowest terms. When denominators are different (unlike fractions), change them to like fractions by finding LCD using inspection or prime numbers. Then add (or subtract) the numerators, place total over LCD, and reduce to lowest terms.	$\frac{4}{9} + \frac{1}{9} = \frac{5}{9}$ $\frac{4}{9} - \frac{1}{9} = \frac{3}{9} = \frac{1}{3}$ $\frac{4}{5} + \frac{2}{7} = \frac{28}{35} + \frac{10}{35} = \frac{38}{35} = 1\frac{3}{35}$	**Add** $\frac{3}{7} + \frac{2}{7}$ **Subtract** $\frac{5}{7} - \frac{2}{7}$ **Add** $\frac{5}{8} + \frac{3}{40}$

(continues)

INTERACTIVE CHAPTER ORGANIZER

Topic/Procedure/Formula	Example	You try it*
Prime numbers Whole numbers larger than 1 that are only divisible by itself and 1.	2, 3, 5, 7, 11	**List the next two prime numbers after 11**
LCD by prime numbers **1.** Copy denominators and arrange them in a separate row. **2.** Divide denominators by smallest prime number that will divide evenly into at least two numbers. **3.** Continue until no prime number divides evenly into at least two numbers. **4.** Multiply all the numbers in the divisors and last row to find LCD. **5.** Raise fractions so each has a common denominator and complete computation.	$\frac{1}{3}+\frac{1}{6}+\frac{1}{8}+\frac{1}{12}+\frac{1}{9}$ 2 / 3 6 8 12 9 2 / 3 3 4 6 9 3 / 3 3 2 3 9 1 1 2 1 3 $2 \times 2 \times 3 \times 1 \times 1 \times 2 \times 1 \times 3 = 72$	**Find LCD** $\frac{1}{2}+\frac{1}{4}+\frac{1}{5}$
Adding mixed numbers **1.** Add fractions. **2.** Add whole numbers. **3.** Combine totals of Steps 1 and 2. If denominators are different, a common denominator must be found. Answer cannot be left as improper fraction.	$1\frac{4}{7}+1\frac{3}{7}$ Step 1: $\frac{4}{7}+\frac{3}{7}=\frac{7}{7}$ Step 2: $1 + 1 = 2$ Step 3: $2\frac{7}{7} = 3$	**Add mixed numbers** $2\frac{1}{4}+3\frac{3}{4}$
Subtracting mixed numbers **1.** Subtract fractions. **2.** If necessary, borrow from whole numbers. **3.** Subtract whole numbers and fractions if borrowing was necessary. **4.** Reduce fractions to lowest terms. If denominators are different, a common denominator must be found.	$12\frac{2}{5}-7\frac{3}{5}$ $11\frac{7}{5}-7\frac{3}{5}$ $=4\frac{4}{5}$ Due to borrowing $\frac{5}{5}$ from number 12 $\frac{5}{5}+\frac{2}{5}=\frac{7}{5}$ The whole number is now 11.	**Subtract mixed numbers** $11\frac{1}{3}$ $-2\frac{2}{3}$
Multiplying proper fractions **1.** Multiply numerators and denominators. **2.** Reduce answer to lowest terms or use cancellation method.	$\frac{4}{\cancel{7}_1}\times\frac{\cancel{7}^1}{9}=\frac{4}{9}$	**Multiply and reduce** $\frac{4}{5}\times\frac{25}{26}$
Multiplying mixed numbers **1.** Convert mixed numbers to improper fractions. **2.** Multiply numerators and denominators. **3.** Reduce answer to lowest terms or use cancellation method.	$1\frac{1}{8}\times 2\frac{5}{8}$ $\frac{9}{8}\times\frac{21}{8}=\frac{189}{64}=2\frac{61}{64}$	**Multiply and reduce** $2\frac{1}{4}\times 3\frac{1}{4}$
Dividing proper fractions **1.** Invert divisor. **2.** Multiply. **3.** Reduce answer to lowest terms or use cancellation method.	$\frac{1}{4}\div\frac{1}{8}=\frac{1}{\cancel{4}_1}\times\frac{\cancel{8}^2}{1}=2$	**Divide** $\frac{1}{8}\div\frac{1}{4}$

(continues)

INTERACTIVE CHAPTER ORGANIZER

Topic/Procedure/Formula	Example	You try it*
Dividing mixed numbers 1. Convert mixed numbers to improper fractions. 2. Invert divisor and multiply. If final answer is an improper fraction, reduce to lowest terms by finding greatest common divisor or using the cancellation method.	$1\frac{1}{2} \div 1\frac{5}{8} = \frac{3}{2} \div \frac{13}{8}$ $= \frac{3}{\cancel{2}_{1}} \times \frac{\cancel{8}^{4}}{13}$ $= \frac{12}{13}$	**Dividing mixed numbers** $3\frac{1}{4} \div 1\frac{4}{5}$

KEY TERMS			
	Cancellation	Higher terms	Mixed numbers
	Common denominator	Improper fraction	Numerator
	Denominator	Least common denominator (LCD)	Prime numbers
	Equivalent	Like fractions	Proper fraction
	Fraction	Lowest terms	Reciprocal
	Greatest common divisor		Unlike fractions

*Worked-out solutions are in Appendix B.

Critical Thinking Discussion Questions with Chapter Concept Check

1. What are the steps to convert improper fractions to whole or mixed numbers? Give an example of how you could use this conversion procedure when you eat at Pizza Hut.
2. What are the steps to convert mixed numbers to improper fractions? Show how you could use this conversion procedure when you order doughnuts at Dunkin' Donuts.
3. What is the greatest common divisor? How could you use the greatest common divisor to write an advertisement showing that 35 out of 60 people prefer MCI to AT&T?
4. Explain the step approach for finding the greatest common divisor. How could you use the MCI–AT&T example in question 3 to illustrate the step approach?
5. Explain the steps of adding or subtracting unlike fractions. Using a ruler, measure the heights of two different-size cans of food and show how to calculate the difference in height.
6. What is a prime number? Using the two cans in question 5, show how you could use prime numbers to calculate the LCD.
7. Explain the steps for multiplying proper fractions and mixed numbers. Assume you went to Staples (a stationery superstore). Give an example showing the multiplying of proper fractions and mixed numbers.
8. **Chapter Concept Check.** Using all the information you have learned about fractions, search the web to find out how many cars are produced in the United States in a year and what fractional part represents cars produced by foreign-owned firms. Finally, present calculations using fractions.
9. Explain how you can use fractions to summarize the pandemic in the United States.

END-OF-CHAPTER PROBLEMS

Check figures for odd-numbered problems in Appendix B. Name _____ Date _____

DRILL PROBLEMS

Identify the following types of fractions: *LU 2-1(1)*

2–1. $\frac{9}{10}$ Proper **2–2.** $\frac{12}{11}$ Improper **2–3.** $\frac{25}{13}$ Improper

Convert the following to mixed numbers: *LU 2-1(2)*

2–4. $\frac{91}{10} = 9\frac{1}{10}$ **2–5.** $\frac{921}{15} = 61\frac{6}{15} = 61\frac{2}{5}$

Convert the following to improper fractions: *LU 2-1(2)*

2–6. $8\frac{7}{8} = \frac{71}{8}$ **2–7.** $19\frac{2}{3} = \frac{59}{3}$

Reduce the following to the lowest terms. Show how to calculate the greatest common divisor by the step approach. *LU 2-1(3)*

2–8. $\frac{16}{38} = \frac{16 \div 2}{38 \div 2} = \frac{8}{19}$

$16\overline{)38}\ 2$, 32, 6; $6\overline{)16}\ 2$, 12, 4; $4\overline{)6}\ 1$, 4, 2; $2\overline{)4}\ 2$, 4, 0

2–9. $\frac{44}{52} = \frac{44 \div 4}{52 \div 4} = \frac{11}{13}$

$44\overline{)52}\ 1$, 44, 8; $8\overline{)44}\ 5$, 40, 4; $4\overline{)8}\ 2$, 8, 0

Convert the following to higher terms: *LU 2-1(3)*

2–10. $\frac{9}{10} = \frac{63}{70}$ $70 \div 10 = 7 \times 9 = 63$

Determine the LCD of the following (a) by inspection and (b) by division of prime numbers: *LU 2-2(2)*

2–11. $\frac{3}{4}, \frac{7}{12}, \frac{5}{6}, \frac{1}{5}$

Inspection 60

$2 \times 2 \times 3 \times 5 = 60$

Check

2	4	12	6	5
2	2	6	3	5
3	1	3	3	5
	1	1	1	5

2–12. $\frac{5}{6}, \frac{7}{18}, \frac{5}{9}, \frac{2}{72}$

Inspection 72

$2 \times 3 \times 3 \times 4 = 72$

Check

2	6	18	9	72
3	3	9	9	36
3	1	3	3	12
	1	1	1	4

2–13. $\frac{1}{4}, \frac{3}{32}, \frac{5}{48}, \frac{1}{8}$

Inspection 96

$2 \times 2 \times 2 \times 2 \times 2 \times 3 = 96$

Check

2	4	32	48	8
2	2	16	24	4
2	1	8	12	2
2	1	4	6	1
	1	2	3	1

Add the following and reduce to lowest terms: *LU 2-2(1), LU 2-1(3)*

2–14. $\frac{3}{9} + \frac{3}{9} = \frac{6}{9} = \frac{2}{3}$ **2–15.** $\frac{3}{7} + \frac{4}{21} = \frac{9}{21} + \frac{4}{21} = \frac{13}{21}$

2–16. $6\frac{1}{8} + 4\frac{3}{8} = 10\frac{4}{8} = 10\frac{1}{2}$ **2–17.** $6\frac{3}{8} + 9\frac{1}{24} = 6\frac{9}{24} + 9\frac{1}{24} = 15\frac{10}{24} = 15\frac{5}{12}$

2–18. $9\frac{9}{10} + 6\frac{7}{10} = 15\frac{16}{10} = 16\frac{6}{10} = 16\frac{3}{5}$

Subtract the following and reduce to lowest terms: *LU 2-2(3), LU 2-1(3)*

2–19. $\frac{11}{12} - \frac{1}{12} = \frac{10}{12} = \frac{5}{6}$

2–20. $14\frac{3}{8} - 10\frac{5}{8}$

$13\frac{11}{8}$

$-10\frac{5}{8}$

$3\frac{6}{8} = 3\frac{3}{4}$

2–21. $12\frac{1}{9} - 4\frac{2}{3}$

$12\frac{1}{9} = 11\frac{10}{9}\left(\frac{9}{9} + \frac{1}{9}\right)$

$-4\frac{6}{9} = -4\frac{6}{9}$

$7\frac{4}{9}$

Multiply the following and reduce to lowest terms. Do not use the cancellation technique for these problems. *LU 2-3(1), LU 2-1(3)*

2–22. $17 \times \frac{4}{2} = \frac{68}{2} = 34$

2–23. $\frac{5}{6} \times \frac{3}{8} = \frac{15}{48} = \frac{5}{16}$

2–24. $8\frac{7}{8} \times 64 = \frac{71}{8} \times \frac{64}{1} = \frac{4{,}544}{8} = 568$

Multiply the following. Use the cancellation technique. *LU 2-3(1), LU 2-1(2)*

2–25. $\frac{4}{10} \times \frac{30}{60} \times \frac{6}{10} = \frac{\cancel{4}^{\,1}}{\cancel{10}_{\,5}} \times \frac{\cancel{30}^{\,3}}{\cancel{60}_{\,\cancel{10}_{\,5}}} \times \frac{\cancel{6}^{\,1}}{\cancel{10}_{\,1}} = \frac{3}{25}$

2–26. $3\frac{3}{4} \times \frac{8}{9} \times 4\frac{9}{12} = \frac{\cancel{15}^{\,5}}{\cancel{4}_{\,1}} \times \frac{\cancel{8}^{\,2}}{\cancel{9}_{\,\cancel{3}_{\,1}}} \times \frac{\cancel{57}^{\,19}}{\cancel{12}_{\,6}} = \frac{95}{6} = 15\frac{5}{6}$

Divide the following and reduce to lowest terms. Use the cancellation technique as needed. *LU 2-3(2), LU 2-1(2)*

2–27. $\frac{12}{9} \div 4 = \frac{\cancel{12}^{\,4}}{\cancel{9}_{\,3}} \times \frac{1}{\cancel{4}_{\,1}} = \frac{1}{3}$

2–28. $18 \div \frac{1}{5} = 18 \times \frac{5}{1} = 90$

2–29. $4\frac{2}{3} \div 12 = \frac{\cancel{14}^{\,7}}{3} \times \frac{1}{\cancel{12}_{\,6}} = \frac{7}{18}$

2–30. $3\frac{5}{6} \div 3\frac{1}{2} = \frac{23}{\cancel{6}_{\,3}} \times \frac{\cancel{2}^{\,1}}{7} = \frac{23}{21} = 1\frac{2}{21}$

WORD PROBLEMS

My Money

2–31. Michael Wittry has been investing in his Roth IRA retirement account for 20 years. Two years ago, his account was worth $215,658. After losing $\frac{1}{3}$ of its original value, it then gained $\frac{1}{2}$ of its new value back. What is the current value of his Roth IRA? *LU 2-3(1)*

$\$215{,}658 \times \frac{1}{3} = \$71{,}886$ $\$215{,}658 - \$71{,}886 = \$143{,}772$

$\$143{,}772 \times 1\frac{1}{2} = \$215{,}658$

2–32. Delta pays Pete Rose $180 per day to work in the maintenance department at the airport. Pete became ill on Monday and went home after $\frac{1}{6}$ of a day. What did he earn on Monday? Assume no work, no pay. *LU 2-3(1)*

$\frac{1}{6} \times \$180 = \$30$

GLOBAL

2–33. The Spanish flu infected $\frac{1}{3}$ of the worldwide population in 1918–1919. If the worldwide population was 1,500,000, how many people contracted the disease?

Population: $1{,}500{,}000 \times \frac{1}{3} = 500{,}000$ infected

2–34. Joy Wigens, who works at Putnam Investments, received a check for $1,600. She deposited $\frac{1}{4}$ of the check in her Citibank account. How much money does Joy have left after the deposit? *LU 2-3(1)*

$\frac{3}{\cancel{4}_{\,1}} \times \cancel{\$1{,}600}^{\,\$400} = \$1{,}200$

2–35. Lee Jenkins worked the following hours as a manager for a local Pizza Hut: $14\frac{1}{4}, 5\frac{1}{4}, 8\frac{1}{2}$ and $7\frac{1}{4}$. How many total hours did Lee work? *LU 2-2(1)*

$$14\frac{1}{4}+5\frac{1}{4}+8\frac{2}{4}+7\frac{1}{4}=34\frac{5}{4}=35\frac{1}{4}\text{ hours}$$

2–36. Lester bought a piece of property in Vail, Colorado. The sides of the land measure $115\frac{1}{2}$ feet, $66\frac{1}{4}$ feet, $106\frac{1}{8}$ feet, and $110\frac{1}{4}$ feet. Lester wants to know the perimeter (sum of all sides) of his property. Can you calculate the perimeter for Lester? *LU 2-2(1)*

$$115\frac{4}{8}+66\frac{2}{8}+106\frac{1}{8}+110\frac{2}{8}=397\frac{9}{8}=398\frac{1}{8}\text{ feet}$$

2–37. Tiffani Lind got her new weekly course schedule from Roxbury Community College in Boston. Following are her classes and their length: Business Math, $2\frac{1}{2}$ hours; Introduction to Business, $1\frac{1}{2}$ hours; Microeconomics, $1\frac{1}{2}$ hours; Spanish, $2\frac{1}{4}$ hours; Marketing, $1\frac{1}{4}$ hours; and Business Statistics, $1\frac{3}{4}$ hours. How long will she be in class each week? *LU 2-2(1)*

$$2\frac{1}{2}+1\frac{1}{2}+1\frac{1}{2}+2\frac{1}{4}+1\frac{1}{4}+1\frac{3}{4}=$$

$$2\frac{2}{4}+1\frac{2}{4}+1\frac{2}{4}+2\frac{1}{4}+1\frac{1}{4}+1\frac{3}{4}=8\frac{11}{4}=10\tfrac{3}{4}\text{ hours in class each week}$$

2–38. Seventy-seven million people were born between 1946 and 1964. The U.S. Census classifies this group of individuals as baby boomers. It is said that today and every day for the next 18 years, 10,000 baby boomers will reach 65. If $\frac{1}{4}$ of the 65 and older age group uses e-mail, $\frac{1}{5}$ obtains the news from the Internet, and $\frac{1}{6}$ searches the Internet, find the LCD and determine total technology usage for this age group as a fraction. *LU 2-2(1, 2)*

$$\text{LCD}=60$$

$$\frac{1}{4}+\frac{1}{5}+\frac{1}{6}=\frac{15}{60}+\frac{12}{60}+\frac{10}{60}=\frac{37}{60}$$

2–39. At a local Walmart store, a Coke dispenser held $19\frac{1}{4}$ gallons of soda. During working hours, $12\frac{3}{4}$ gallons were dispensed. How many gallons of Coke remain? *LU 2-2(2, 3)*

$$19\frac{1}{4}=\quad 18\frac{5}{4}\longleftarrow\left(\frac{4}{4}+\frac{1}{4}\right)$$

$$-12\frac{3}{4}=-12\frac{3}{4}$$

$$6\frac{2}{4}=6\frac{1}{2}\text{ gallons}$$

2–40. If two coronavirus vaccines have been administered to a total of 398,675,414 people in the United States, and the Pfizer-BioNTech vaccine was administered to $\frac{9}{17}$ of the U.S. population, how many people received the Moderna vaccine? Round to the nearest whole person.

$$\frac{17}{17}-\frac{9}{17}=\frac{8}{17}\times 398{,}675{,}414=187{,}611{,}959.5=187{,}611{,}960$$

2–41. A local garden center charges \$250 per cord of wood. If Logan Grace orders $3\frac{1}{2}$ cords, what will the total cost be? *LU 2-3(1)*

$$\$250\times 3\frac{1}{2}=\$250\times\frac{7}{2}=\$875$$

2–42. A local Target store bought 90 pizzas at Pizza Hut for its holiday party. Each guest ate $\frac{1}{6}$ of a pizza and there was no pizza left over. How many guests did Target have for the party? *LU 2-3(1)*

$$90\div\frac{1}{6}=90\times 6=540\text{ guests}$$

2–43. Marc, Steven, and Daniel entered into a Subway sandwich shop partnership. Marc owns $\frac{1}{9}$ of the shop and Steven owns $\frac{1}{4}$. What part does Daniel own? *LU 2-2(1, 2)*

$$\frac{4}{36}+\frac{9}{36}=\frac{13}{36}\quad 1-\frac{13}{36}=\frac{23}{36}\text{ for Daniel or }\frac{36}{36}-\frac{13}{36}=\frac{23}{36}$$

2–44. Lionel Sullivan works for Burger King. He is paid time and one-half for Sundays. If Lionel works on Sunday for 6 hours at a regular pay of \$8 per hour, what does he earn on Sunday? *LU 2-3(1)*

$$1\frac{1}{2}\times\$8=\frac{3}{2}\times\$8=\$12\quad\$12\times 6=\$72$$

My Money

2–45. DaveRamsey.com's "Baby Step 3" out of "7 Baby Steps" for financial health recommends a $1,000 emergency fund if you have debt; and, once you are free of debt, he recommends a fully funded emergency fund of at least six months of monthly expenses depending on your job situation. If your starting goal is to have a 4-month emergency fund and your monthly expenses total $2,750, how much more do you have to save if you currently have $\frac{2}{3}$ of your fund saved? Round to the nearest dollar.

$4 \times \$2{,}750 = \$11{,}000 \times \frac{1}{3} = \$3{,}666.67 = \$3{,}667$

eXcel

2–46. A trip to the White Mountains of New Hampshire from Boston will take you $2\frac{3}{4}$ hours. Assume you have traveled $\frac{1}{11}$ of the way. How much longer will the trip take? *LU 2-3(1, 2)*

$\frac{\cancel{10}^{5}}{\cancel{11}_{1}} \times \frac{\cancel{11}^{1}}{\cancel{4}_{2}} = \frac{5}{2} = 2\frac{1}{2}$ hours

eXcel

2–47. Andy, who loves to cook, makes apple cobbler for his family. The recipe (serves 6) calls for $1\frac{1}{2}$ pounds of apples, $3\frac{1}{4}$ cups of flour, $\frac{1}{4}$ cup of margarine, $2\frac{3}{8}$ cups of sugar, and 2 teaspoons of cinnamon. Since guests are coming, Andy wants to make a cobbler that will serve 15 (or increase the recipe $2\frac{1}{2}$ times). How much of each ingredient should Andy use? *LU 2-3(1, 2)*

$\frac{3}{2} \times \frac{5}{2} = \frac{15}{4} = 3\frac{3}{4}$ pounds of apples

$\frac{13}{4} \times \frac{5}{2} = \frac{65}{8} = 8\frac{1}{8}$ cups of flour

$\frac{1}{4} \times \frac{5}{2} = \frac{5}{8}$ cup of margarine

$\frac{19}{8} \times \frac{5}{2} = \frac{95}{16} = 5\frac{15}{16}$ cups of sugar

$2 \times \frac{5}{2} = 5$ teaspoons of cinnamon

2–48. Mobil allocates $1{,}692\frac{3}{4}$ gallons of gas per month to Jerry's Service Station. The first week, Jerry sold $275\frac{1}{2}$ gallons; second week, $280\frac{1}{4}$ gallons; and third week, $189\frac{1}{8}$ gallons. If Jerry sells $582\frac{1}{2}$ gallons in the fourth week, how close is Jerry to selling his allocation? *LU 2-2(4)*

$$\begin{array}{r} 275\frac{4}{8} \\ 280\frac{2}{8} \\ 189\frac{1}{8} \\ +\ 582\frac{4}{8} \\ \hline 1{,}326\frac{11}{8} = 1{,}327\frac{3}{8} \text{ gallons} \end{array} \qquad \begin{array}{r} 1{,}692\frac{6}{8} \\ -\ 1{,}327\frac{3}{8} \\ \hline 365\frac{3}{8} \text{ gallons} \end{array}$$

2–49. A marketing class at North Shore Community College conducted a viewer preference survey. The survey showed that $\frac{5}{6}$ of the people surveyed preferred Apple's iPhone over the Blackberry. Assume 2,400 responded to the survey. How many favored using a Blackberry? *LU 2-3(1, 2)*

$\frac{1}{\cancel{6}_{1}} \times \cancel{2{,}400}^{400} = 400$ people

2–50. The price of a used Toyota LandCruiser has increased to $1\frac{1}{4}$ times its earlier price. If the original price of the LandCruiser was $30,000, what is the new price? *LU 2-3(1, 2)*

$1\frac{1}{4} \times \$30{,}000 = \frac{5}{4} \times \$30{,}000 = \$37{,}500$

2–51. Tempco Corporation has a machine that produces $12\frac{1}{2}$ baseball gloves each hour. In the last 2 days, the machine has run for a total of 22 hours. How many baseball gloves has Tempco produced? *LU 2-3(2)*

$$22 \times 12\frac{1}{2} = \overset{11}{\cancel{22}} \times \frac{25}{\cancel{2}_{1}} = 275 \text{ gloves}$$

2–52. Alicia, an employee of Dunkin' Donuts, receives $23\frac{1}{4}$ days per year of vacation time. So far this year she has taken $3\frac{1}{8}$ days in January, $5\frac{1}{2}$ days in May, $6\frac{1}{4}$ days in July, and $4\frac{1}{4}$ days in September. How many more days of vacation does Alicia have left? *LU 2-2(1, 2, 3)*

$$3\frac{1}{8} + 5\frac{4}{8} + 6\frac{2}{8} + 4\frac{2}{8} = 18\frac{9}{8} = 19\frac{1}{8}$$

$$\begin{array}{r} 23\frac{2}{8} \\ -\ 19\frac{1}{8} \\ \hline 4\frac{1}{8} \text{ days left} \end{array}$$

2–53. A Hamilton multitouch watch was originally priced at \$600. At a closing of the Alpha Omega Jewelry Shop, the watch is being reduced by $\frac{1}{4}$. What is the new selling price? *LU 2-3(1)*

$$\$600 \times \frac{3}{4} = \$450$$

2–54. Shelly Van Doren hired a contractor to refinish her kitchen. The contractor said the job would take $49\frac{1}{2}$ hours. To date, the contractor has worked the following hours:

Monday	$4\frac{1}{4}$	$4\frac{2}{8}$
Tuesday	$9\frac{1}{8}$	$9\frac{1}{8}$
Wednesday	$4\frac{1}{4}$	$4\frac{2}{8}$
Thursday	$3\frac{1}{2}$	$3\frac{4}{8}$
Friday	$10\frac{5}{8}$	$+\ 10\frac{5}{8}$
		$30\frac{14}{8} = 31\frac{6}{8} = 31\frac{3}{4}$ hours

$$\begin{array}{r} 49\frac{2}{4} \\ -\ 31\frac{3}{4} \\ \hline \end{array} \qquad \begin{array}{r} 48\frac{6}{4} \\ -\ 31\frac{3}{4} \\ \hline 17\frac{3}{4} \text{ hours to go} \end{array}$$

How much longer should the job take to be completed? *LU 2-2(4)*

2–55. An issue of *Taunton's Fine Woodworking* included plans for a hall stand. The total height of the stand is $81\frac{1}{2}$ inches. If the base is $36\frac{5}{16}$ inches, how tall is the upper portion of the stand? *LU 2-2(4)*

$$\begin{array}{r} 81\frac{1}{2} = \quad 81\frac{8}{16} \\ -36\frac{5}{16} = -36\frac{5}{16} \\ \hline 45\frac{3}{16} \text{ inches} \end{array}$$

2–56. Albertsons grocery planned a big sale on apples and received 750 crates from the wholesale market. Albertsons will bag these apples in plastic. Each plastic bag holds $\frac{1}{9}$ of a crate. If Albertsons has no loss to perishables, how many bags of apples can be prepared? *LU 2-3(1)*

$$750 \div \frac{1}{9} = 750 \times 9 = 6{,}750 \text{ bags}$$

2–57. Frank Puleo bought 6,625 acres of land in ski country. He plans to subdivide the land into parcels of $13\frac{1}{4}$ acres each. Each parcel will sell for $125,000. How many parcels of land will Frank develop? If Frank sells all the parcels, what will be his total sales? *LU 2-3(1)*

$$6{,}625 \div 13\frac{1}{4} = 6{,}625 \times \frac{4}{53} = 500 \text{ parcels} \times \$125{,}000 = \$62{,}500{,}000$$

If Frank sells $\frac{3}{5}$ of the parcels in the first year, what will be his total sales for the year?

$$\frac{3}{\cancel{5}_{1}} \times \overset{100}{\cancel{500}} = 300 \times \$125{,}000 = \$37{,}500{,}000$$

2–58. A local Papa Gino's conducted a food survey. The survey showed that $\frac{1}{9}$ of the people surveyed preferred eating pasta to hamburger. If 5,400 responded to the survey, how many actually favored hamburger? *LU 2-3(1)*

$$\frac{8}{\cancel{9}_{1}} \times \overset{600}{\cancel{5{,}400}} = 4{,}800 \text{ people}$$

2–59. Tamara, Jose, and Milton entered into a partnership that sells men's clothing on the web. Tamara owns $\frac{3}{8}$ of the company and Jose owns $\frac{1}{4}$. What part does Milton own? *LU 2-2(1, 3)*

$$\frac{3}{8} + \frac{2}{8} = \frac{5}{8} \quad 1 - \frac{5}{8} = \frac{3}{8} \text{ for Milton or } \frac{8}{8} - \frac{5}{8} = \frac{3}{8}$$

2–60. *Quilters Newsletter Magazine* gave instructions on making a quilt. The quilt required $4\frac{1}{2}$ yards of white-on-white print, 2 yards blue check, $\frac{1}{2}$ yard blue-and-white stripe, $2\frac{3}{4}$ yards blue scraps, $\frac{3}{4}$ yard yellow scraps, and $4\frac{7}{8}$ yards lining. How many total yards are needed? *LU 2-2(1, 2)*

$$4\frac{1}{2} + 2 + \frac{1}{2} + 2\frac{3}{4} + \frac{3}{4} + 4\frac{7}{8} = 4\frac{4}{8} + 2 + \frac{4}{8} + 2\frac{6}{8} + \frac{6}{8} + 4\frac{7}{8} = 12\frac{27}{8} = 15\frac{3}{8} \text{ yards}$$

2–61. A trailer carrying supplies for a Krispy Kreme from Virginia to New York will take $3\frac{1}{4}$ hours. If the truck traveled $\frac{1}{5}$ of the way, how much longer will the trip take? *LU 2-3(1, 2)*

$$\frac{\overset{1}{\cancel{4}}}{5} \times \frac{13}{\cancel{4}_{1}} = \frac{13}{5} = 2\frac{3}{5} \text{ hours}$$

2–62. Land Rover has increased the price of a FreeLander by $\frac{1}{5}$ from the original price. The original price of the FreeLander was $30,000. What is the new price? *LU 2-3(1, 2)*

$$1\frac{1}{5} = \frac{6}{\cancel{5}_{1}} \times \overset{\$6{,}000}{\cancel{\$30{,}000}} = \$36{,}000$$

CHALLENGE PROBLEMS

2–63. *Woodsmith* magazine gave instructions on how to build a pine cupboard. Lumber will be needed for two shelves $10\frac{1}{4}$ inches long, two base sides $12\frac{1}{2}$ inches long, and two door stiles $29\frac{1}{8}$ inches long. Your lumber comes in 6 foot lengths. **(a)** How many feet of lumber will you need? **(b)** If you want $\frac{1}{2}$ a board left over, is this possible with two boards? *LU 2-2(1, 2, 3, 4)*

a. $2 \times 10\frac{1}{4} \text{ inches} = \overset{1}{\cancel{2}} \times \frac{41}{\cancel{4}_{2}} = \frac{41}{2} = 20\frac{1}{2} \text{ inches}$

$2 \times 12\frac{1}{2} \text{ inches} = \overset{1}{\cancel{2}} \times \frac{25}{\cancel{2}_{1}} = 25 \text{ inches}$

$2 \times 29\frac{1}{8} \text{ inches} = 2 \times \frac{233}{8} = \frac{466}{8} = 58\frac{2}{8} = 58\frac{1}{4} \text{ inches}$

$20\frac{1}{2} + 25 + 58\frac{1}{4} = 103\frac{3}{4} \text{ inches needed}$

$103\frac{3}{4} \text{ inches} \div \frac{12}{1} = \frac{415}{4} \times \frac{1}{12} = \frac{415}{48} = 8\frac{31}{48} \text{ feet}$

b. Board No. 1: 6 feet (72 inches)

$$\begin{aligned} 2 \text{ at } 29\tfrac{1}{8} &= \quad 58\tfrac{1}{4} = \quad 58\tfrac{1}{4} \\ +1 \text{ at } 12\tfrac{1}{2} &= +\,12\tfrac{1}{2} = +\,12\tfrac{2}{4} \end{aligned}$$

$70\frac{3}{4}$ inches is most you can cut from board No. 1

$72 \text{ inches} - 70\frac{3}{4} = 1\frac{1}{4}$ inches left from board No. 1

Board No. 2: 6 feet (72 inches)

$103\frac{3}{4}$ inches needed

$-70\frac{3}{4}$ used

33 inches needed to complete job

72 inches board No. 2
-33
39 inches left from board No. 2

Yes, you will have at least 3 feet (36 inches).

2–64. Jack MacLean has entered into a real estate development partnership with Bill Lyons and June Reese. Bill owns $\frac{1}{4}$ of the partnership, while June has a $\frac{1}{5}$ interest. The partners will divide all profits on the basis of their fractional ownership. The partnership bought 900 acres of land and plans to subdivide each lot into $2\frac{1}{4}$ acres. Homes in the area have been selling for \$240,000. By time of completion, Jack estimates the price of each home will increase by $\frac{1}{3}$ of the current value. The partners sent a survey to 12,000 potential customers to see whether they should heat the homes with oil or gas. One-fourth of the customers responded by indicating a 5-to-1 preference for oil. From the results of the survey, Jack now plans to install a 270-gallon oil tank at each home. He estimates that each home will need five fills per year. The current price of home heating fuel is \$1 per gallon. The partnership estimates its profit per home will be $\frac{1}{8}$ the selling price of each home. From the above, please calculate the following: *LU 2-1(1, 2, 3), LU 2-2(1, 2, 3, 4), LU 2-3(1, 2)*

a. Number of homes to be built.

$$900 \div 2\frac{1}{4} = \overset{100}{\cancel{900}} \times \frac{4}{\cancel{9}_{1}} = 400 \text{ homes}$$

b. Selling price of each home.

$$1\frac{1}{3} \times \$240{,}000 = \frac{4}{\cancel{3}_{1}} \times \overset{\$80{,}000}{\cancel{\$240{,}000}} = \$320{,}000$$

c. Number of people responding to survey.

$$\frac{1}{4} \times 12{,}000 = 3{,}000 \text{ people}$$

d. Number of people desiring oil.

$$\frac{5}{6} \times 3{,}000 = 2{,}500 \text{ people}$$

e. Average monthly cost per house to heat using oil.

$$270 \times 5 = 1{,}350 \times \$1 = \frac{\$1{,}350}{12} = \$112.50$$

f. Amount of profit Jack will receive from the sale of homes.

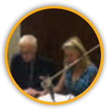
$$\frac{1}{4} + \frac{1}{5} = \frac{5}{20} + \frac{4}{20} = \frac{9}{20}$$

$$\frac{1}{\cancel{8}_{1}} \times \overset{\$40{,}000}{\cancel{\$320{,}000}} = \$40{,}000$$

$1 - \frac{9}{20} = \frac{11}{20}$ for Jack

\$40,000
$\times \quad 400$
\$16,000,000

$$\frac{11}{20} \times \$16{,}000{,}000 = \$8{,}800{,}000$$



summary practice test

Do you need help? Connect videos have step-by-step worked-out solutions.

Identify the following types of fractions. *LU 2-1(1)*

1. $5\frac{1}{8}$ Mixed **2.** $\frac{2}{7}$ Proper **3.** $\frac{20}{19}$ Improper

4. Convert the following to a mixed number. *LU 2-1(2)*

$\frac{163}{9} = 18\frac{1}{9}$

5. Convert the following to an improper fraction. *LU 2-1(2)*

$8\frac{1}{8} = \frac{64+1}{8} = \frac{65}{8}$

6. Calculate the greatest common divisor of the following by the step approach and reduce to lowest terms. *LU 2-2(1, 2)*

$\frac{63}{90} =$ 63)90 = 1, remainder 27 (90 − 63 = 27); 27)63 = 2, remainder 9 (63 − 54 = 9); 9)27 = 3, remainder 0 (27 − 27 = 0)

$\frac{63 \div 9}{90 \div 9} = \frac{7}{10}$

7. Convert the following to higher terms. *LU 2-1(3)*

$\frac{16}{94} = \frac{?}{376}$ $376 \div 94 = 4 \times 16 = 64$

8. Find the LCD of the following by using prime numbers. Show your work. *LU 2-2(2)*

$\frac{1}{8} + \frac{1}{3} + \frac{1}{2} + \frac{1}{12}$

2	8	3	2	12
2	4	3	1	6
3	2	3	1	3
	2	1	1	1

$2 \times 2 \times 3 \times 2 \times 1 \times 1 \times 1 = 24$

9. Subtract the following. *LU 2-2(4)*

$$15\frac{4}{5} = 15\frac{16}{20} = 14\frac{36}{20}\left(\frac{16}{20} + \frac{20}{20}\right)$$

$$-8\frac{19}{20} = -8\frac{19}{20} \qquad 8\frac{19}{20}$$

$$6\frac{17}{20}$$

Complete the following using the cancellation technique. *LU 2-3(1, 2)*

10. $\frac{3}{4} \times \frac{2}{4} \times \frac{6}{9} = \frac{\not{3}^{1}}{\not{4}_{2}} \times \frac{\not{2}^{1}}{\not{4}_{2}} \times \frac{\not{6}^{\not{3}\,1}}{\not{9}_{\not{3}\,1}} = \frac{1}{4}$

11. $7\frac{1}{9} \times \frac{6}{7} = \frac{64}{\not{9}_{3}} \times \frac{\not{6}^{2}}{7} = \frac{128}{21} = 6\frac{2}{21}$

12. $\frac{3}{7} \div 6 = \frac{\not{3}^{1}}{7} \times \frac{1}{\not{6}_{2}} = \frac{1}{14}$

13. A trip to Washington from Boston will take you $5\frac{3}{4}$ hours. If you have traveled $\frac{1}{3}$ of the way, how much longer will the trip take? *LU 2-3(1)*

$\frac{23}{4} \times \frac{2}{3} = \frac{46}{12} = 3\frac{10}{12} = 3\frac{5}{6}$ hours

14. Quiznos produces 640 rolls per hour. If the oven runs $12\frac{1}{4}$ hours, how many rolls will the machine produce? *LU 2-3(1, 2)*

$\frac{\not{640}^{160}}{1} \times \frac{49}{\not{4}_{1}} = 7{,}840$ rolls

15. A taste-testing survey of Zing Farms showed that $\frac{2}{3}$ of the people surveyed preferred the taste of veggie burgers to regular burgers. If 90,000 people were in the survey, how many favored veggie burgers? How many chose regular burgers? *LU 2-3(1)*

Veggie burgers: $\frac{2}{3} \times 90{,}000 = 60{,}000$ Regular burgers: $\frac{1}{3} \times 90{,}000 = 30{,}000$

16. Jim Janes, an employee of Enterprise Co., worked $9\frac{1}{4}$ hours on Monday, $4\frac{1}{2}$ hours on Tuesday, $9\frac{1}{4}$ hours on Wednesday, $7\frac{1}{2}$ hours on Thursday, and 9 hours on Friday. How many total hours did Jim work during the week? *LU 2-2(1, 2)*

$9\frac{1}{4} + 4\frac{2}{4} + 9\frac{1}{4} + 7\frac{2}{4} + 9 = 39\frac{1}{2}$

17. JCPenney offered a $\frac{1}{3}$ rebate on its $39 hair dryer. Joan bought a JCPenney hair dryer. What did Joan pay after the rebate? *LU 2-3(1)*

$\frac{2}{3} \times \$39 = \$26$

INTERACTIVE VIDEO WORKSHEET

GRADING THE SUMMARY PRACTICE TEST

Go to the summary practice test video in Connect (or click on it here in the ebook). Grade your summary practice test while viewing the video.

C for Correct/I for Incorrect

1. _____	6. _____	11. _____	16. _____
2. _____	7. _____	12. _____	17. _____
3. _____	8. _____	13. _____	
4. _____	9. _____	14. _____	
5. _____	10. _____	15. _____	

If you achieved 100%, you are ready for your instructor' s exam.

If any of the problems were incorrect, list the questions you missed and show steps to solve the problem correctly.

Replay the video to see if you have made the correct fixes to your mistakes. If you have any questions, contact your instructor asap.

Notes on Watching Videos

MY MONEY

Landing Your Dream Job!

What I need to know

As you work through your college courses, you aspire to attaining a degree or credential to get you the job, promotion, or career move you are seeking. As you prepare for that eventual career it is important to understand and anticipate the level of salary you will earn upon your graduation. Additionally, assess the types of employment matching closest to your career aspirations. The potential job market has changed due to the coronavirus pandemic. As you consider your career options you may discover your ideal position is not what you had originally anticipated. This newfound flexibility can be used to your advantage to pursue a variety of career options.

What I need to do

Research expected salaries before committing to a desired course of study. This information is available through your institution and is provided based upon the program of study you pursue. Although only a range may be given from your college, it will give you a rough estimate from which to determine your educational path. Compare the cost you will incur to attain your degree to the expected salary upon graduation to determine the cost effectiveness of each degree option you are considering. Ultimately you will want to determine whether a career field will fit into your financial plans. How does this salary range compare to your financial goals and will you be able to meet these goals with such earnings? Place the salary expectation against your budget to see how it will meet your expenses. Furthermore, determine what salary range will allow for spending opportunities outside of your expenses such as investments, savings, entertainment, etc.

Seek out advice from professionals in the field you are considering for some insights on the career. Ask these professionals about their personal experiences within this career field. What do they like best about their chosen profession? What do they see as the future opportunities within this career? Are there other factors to consider outside of just salary such as benefits, personal growth, contribution to a greater cause, etc.? If these professionals had it to do all over again, what might they do differently as it relates to career preparedness? The knowledge you gain will assist you in selecting an educational field of study to achieve your desired career.

Steps I need to take

1. Be flexible with your job search and open yourself to a variety of career options.
2. Know the financial impact of your chosen career to determine best fit.
3. Learn from others by gaining valuable insights from within your desired career field.

Resources I can use

- Indeed Job Search (mobile app)—find your next career and express your interest directly with employers.
- https://www.payscale.com/—salary expectations by education level, job title and much more.
- https://www.themuse.com/advice/job-search-coronavirus—tips for how your job search has changed because of the coronavirus pandemic.

MY MONEY ACTIVITY

- Search for job openings related to your degree.
- Compare the expected salaries to obtain a range for this position.
- How does the expected salary fit into your financial goals?

"Farewell to the Office." Kiplinger's. February 2021.

FROM THE EDITOR

MARK SOLHEIM

Farewell to the Office

We can all list numerous ways, good and bad, that the pandemic has altered our lives. It gets trickier to identify changes that will last long after the risk of COVID has faded. But for many people, working remotely is here to stay.

My wife, Allyson, and I have been working remotely since mid March—initially from Michigan and lately from our Washington, D.C., home. In our northern Michigan house, we each have our own home office. In D.C., I have ceded the spare bedroom/home office to Allyson because, unlike me, she typically has back-to-back video calls. My workday finds me perched on a stool at the kitchen island or slouched in one of the chairs next to the fireplace, having conversations with Alexa.

In theory, we get to recapture time we used to spend commuting. But I find myself rolling out of bed and turning on the computer, and it takes discipline to ignore work e-mails. We do appreciate the more-relaxed wardrobe demands. My go-to garb includes T-shirts, a couple of sweaters and a pair of blue jeans (the bit of stretchiness accommodates the extra pounds I attribute to the 5 p.m. drinks and hors d'oeuvres).

I miss the ergonomics of the office and the structure that working there gave to my day. I miss seeing colleagues face to face rather than in two dimensions in a Hollywood Squares grid. And I particularly worry about our younger staffers missing out on the collaboration and camaraderie that can be a crucial part of their professional development.

Poon Watchara-Amphaiwan

Lasting changes. Following another surge in COVID, fewer Americans are working from their offices now than in mid October, according to Kastle Systems, the security firm that provides badges to swipe into offices. In late November, fewer than 18% of work ers had returned to the office, compared with 27% a month earlier.

A SURVEY OF HIRING MANAGERS FOUND THAT ONE-FIFTH OF THE WORKFORCE COULD BE ENTIRELY REMOTE AFTER THE PANDEMIC.

That more or less jibes with what we found in a nationwide survey Kiplinger commissioned, in partnership with Personal Capital, in early November (see page 58 for highlights). The survey asked how retirement savers were doing in the wake of coronavirus, and it accompanies our cover story on getting your nest egg back on track (see page 48). We sprinkled in a few questions about remote work. More than 70% of respondents confirmed they were working from another location besides their normal workplace: 56% from their primary residence, 10% from a second home, and 5% from "another location." Two-thirds said they "love it," and one-third said it was okay but they wanted to return to the office to see colleagues. Only 6% said they don't like it at all.

According to a recent survey of hiring managers by the global freelancing platform Upwork, one-fifth of the workforce could be entirely remote after the pandemic. And that trend has far-reaching, long-term ramifications, not only for retailers selling business clothes but also for real estate and transportation. White collar and tech workers in job-rich urban areas have been fleeing cramped, high-rent apartments and pricey condos for the suburbs and exurbs. Many offices sit almost empty. Mass transit systems are struggling. Here in D.C., Metro announced that it may have to curtail bus routes and completely end weekend subway service. That leaves lower-paid, front-line workers in the lurch, or at least the ones who are left with jobs as the service, travel and hospitality industries go through upheaval. Many downtown coffee shops, bars and restaurants are endangered species.

For workers who are telecommuting from another state—or even from abroad—we offer advice on taxes, health care and other considerations starting on page 38. The tax rules are hellishly complex. We'll be on the hook for Michigan income taxes for the time we worked there, but D.C. offers a credit. This may be the year I break a lifetime string of DIY tax returns and recruit an accountant. ■

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BUSINESS MATH ISSUE

Post Pandemic means $\frac{3}{5}$ of workers will still work.

1. List the key points of the article and information to support your position.
2. Write a group defense of your position using math calculations to support your view. If you are in an online course, post to a discussion board.

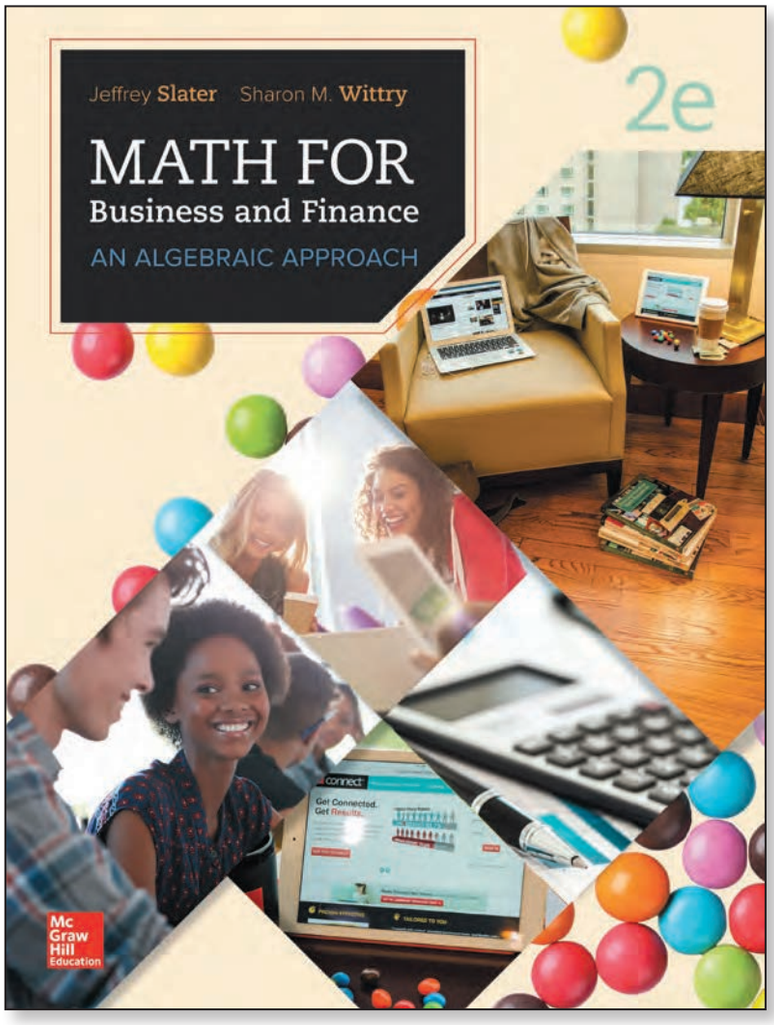
Classroom Notes

Design elements: Mobile Phone and Tablet PC Vector illustration: Can Yesil/Shutterstock; Colorful spheres with spots and stripes: edge69/Getty Images; Paper Money Vector Icon: Pro Symbols/Shutterstock; Puzzle solution: frender/Getty Images; Icon money tree with leaves in dollars. Vector Illustration: Cherkas/Shutterstock; Single gold nugget or stone vector: JonahWong/Shutterstock; Set of flat icons for mobile app and web: PureSolution/Shutterstock

Alternate Choices

Math for Business and Finance: An Algebraic Approach, **Second Edition**

If you prefer teaching your students business math with algebra and calculator applications, check out *Math for Business and Finance: An Algebraic Approach.* Algebra and calculator applications replace tables for a different approach to solving business math scenarios.



The Brief Edition of *Practical Business Math Procedures* is available in Create. This is the ideal text for a balanced, shorter business math course. McGraw Hill Create is a self-service website that allows you to quickly and easily create custom course materials by drawing upon McGraw Hill's comprehensive, cross-disciplinary content and other third-party resources. With Create, you can arrange the content from *Practical Business Math Procedures,* Fourteenth Edition, and/or *Math for Business and Finance: An Algebraic Approach,* Second Edition, in a way that makes sense for your course, you can combine material from different sources and upload your own content, and you can choose the best format for your students—print or e-book. Begin creating now at www.mcgrawhillcreate.com.