Practical Business Math Procedures

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Practical Business Math Procedures

Thirteenth Edition

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Dedication

To Shelley . . . My best pal.
Love, Jeff

To my mom, who did everything for me as a child.

To my dad, who paved the way.

Love, Sharon

Final PDF to printer

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.

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FEATURES

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

Blueprint Aid Boxes

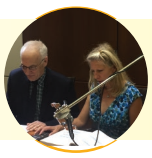
For the first eight chapters (not in Chapter 4), blueprint aid boxes are available to help you map out a plan to solve a word problem. We know the hardest part of solving word problems is often figuring out where to start. Use the blueprint as a model to get started.

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.

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Company/*Applications*

Chapter 1
Visa; McDonald's—*Problem solving*
Google—*Reading and writing numbers*
Volkswagen—*Rounding numbers* and *Adding and subtracting numbers*
Star Wars—*Multiplying and dividing numbers*

Chapter 2
Health industry—*Introduction*
M&M'S/Mars—*Fractions and multiplication*

Chapter 3
McDonald's; Brexit—*Introduction*
Apple—*Decimal applications*
Toyota—*Multiplication and division shortcuts for decimals*

Chapter 4
ATMs— *Introduction*
Smartphones—*Checking account*
Apps—*Bank reconciliation*

Chapter 5
Big Food—*Unknowns*
Dunkin' Donuts—*Equations*

Chapter 6
Tesla, Hershey—*Introduction*
Procter & Gamble; M&M'S/Mars—*Percent increase and decrease*

Chapter 7
FedEx; Walmart, Amazon—*Introduction*
Michael's—*Discounts*
FedEx United Parcel Service—*Shipping*
New Hampshire Propane Co.—*Cash discounts*

Chapter 8
Gap; Amazon; Walmart—*Introduction*
Gap—*Markup on cost and selling price*

Chapter 9
Walmart—*Introduction*
Internal Revenue Service—*Circular E*

Chapter 10
Auto Lenders—*Introduction*
Penn—*Discounting*

Chapter 11
Treasury Department—*Treasury bills*

Chapter 12
Investing—*Introduction*

Chapter 13
Dunkin' Donuts— *Introduction; Compounding*

Chapter 14
Federal Reserve; Wells Fargo—*Introduction*
Federal Trade Commission—*Installments*
Citibank; MasterCard—*Finance charge*

Chapter 15
Bank of America—*Mortgages*

Chapter 16
Boeing—*Introduction*
Apple—*Financial statements*
Toys "R" Us; McDonald's—*Ratio analysis*

Chapter 17
Toyota; Mazda—*Introduction*
Big Lots—*Depreciation*

Chapter 18
Home Depot—*Introduction*
Fruit of the Loom, Inc.—*LIFO*

Chapter 19
Tax Foundation—*Sales tax*
Amazon—*Money tip*

Chapter 20
Lyft; Uber—*Auto insurance*

Chapter 21
Disney—*Introduction*
Amazon, Texaco, GM—*Stocks*
J. Crew—*Bonds*
American Funds—*Mutual funds*

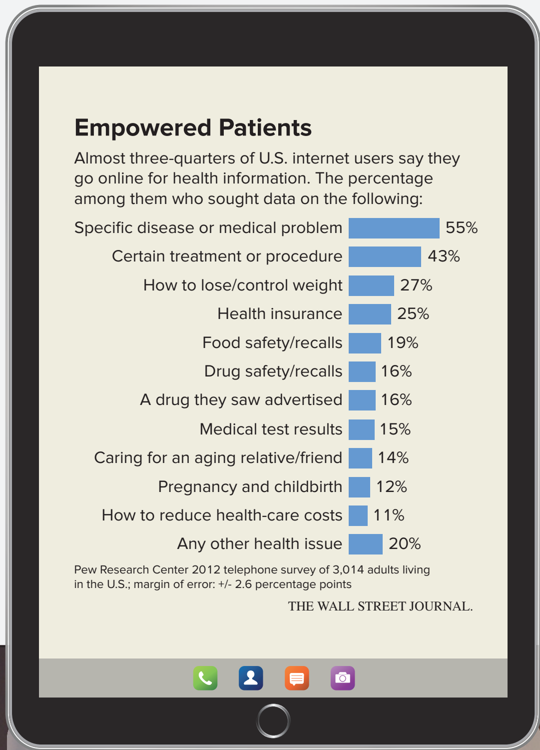
Chapter 22
Apple—*Introduction*
U.S. Census Bureau—*Median*

Contents

Practical Business Math Procedures

CHAPTER 2

Fractions



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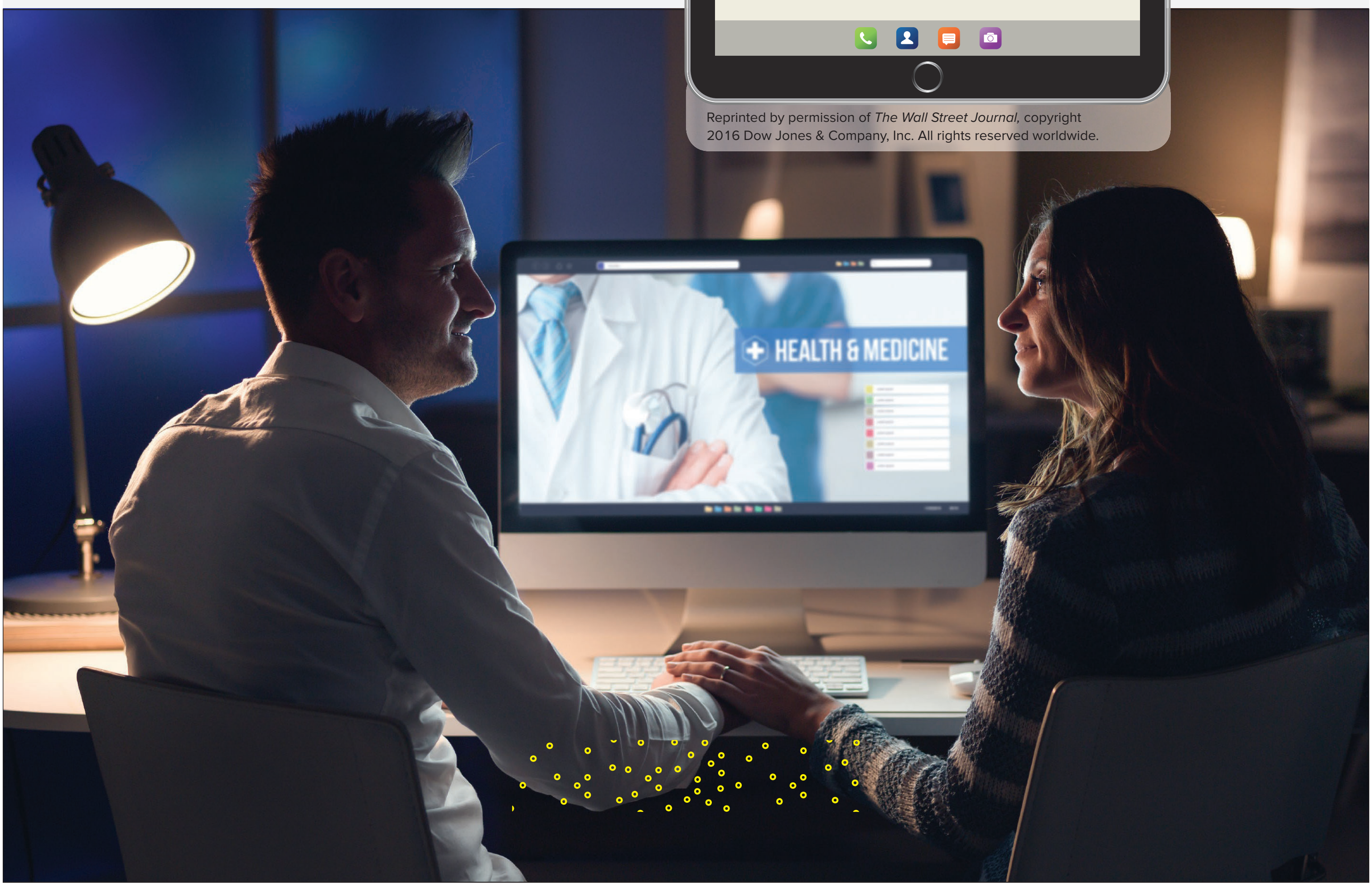


LEARNING UNIT OBJECTIVES

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.

☐ 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 "Empowered Patients" illustrates the use of a fraction. From the clipping you learn that almost $\frac{3}{4}$ of U.S Internet users say they go online for health information.

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

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

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:

©Monkey Business Images/Shutterstock

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

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.

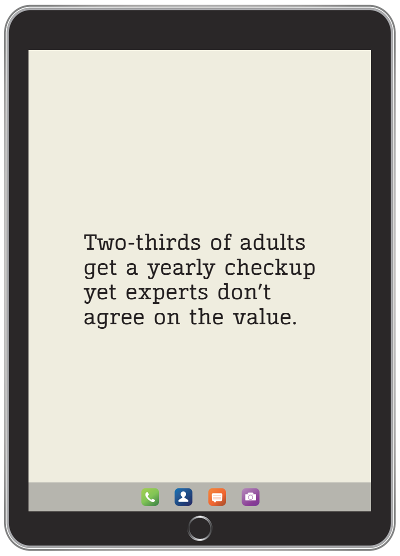
Types of Fractions

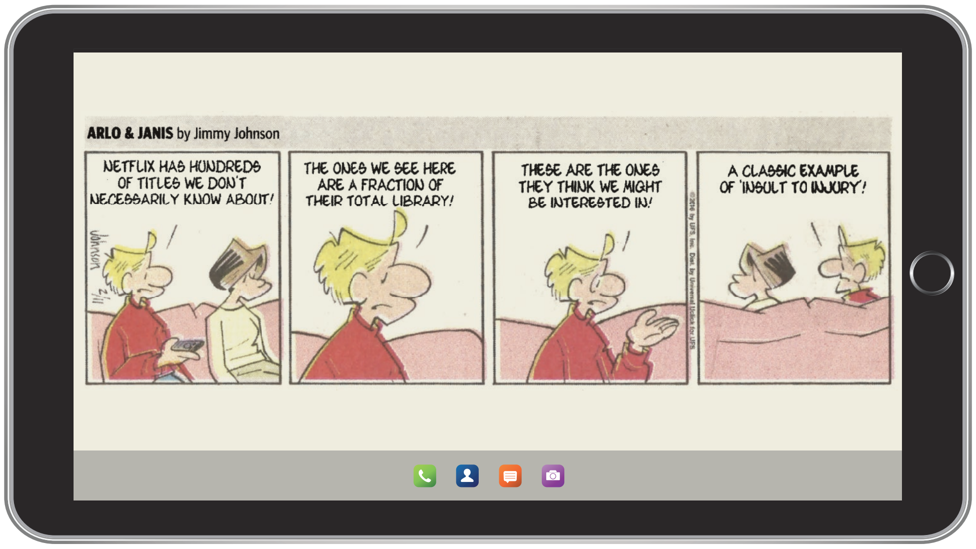
In the following *Wall Street Journal* clip, "Two-thirds of adults get a yearly checkup," the $\frac{2}{3}$ is a proper fraction.

PROPER FRACTIONS

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

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





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

Conversion Procedures

In Chapter 1 we worked with two of the division symbols ($\div$ 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® ($\frac{6}{55}$) 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 old 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 old fraction.

Step 3. Place the total from Step 2 over the denominator of the old 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 $\frac{24}{30} = \frac{24 \div 6}{30 \div 6} = \boxed{\frac{4}{5}}$

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 Step 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

$$\begin{array}{r} 1 \\ 24\overline{)30} \\ \underline{24} \\ 6 \end{array}$$

Step 2

$$\begin{array}{r} 4 \\ 6\overline{)24} \\ \underline{24} \\ 0 \end{array}$$

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

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.

	2	3	4	5	6	10
Will divide evenly into a number if the	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 $\frac{1}{4} \times \frac{2}{2} = \frac{2}{8}$

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.

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.

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.

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

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. $\boxed{17\frac{7}{9}}$

$$\begin{array}{r} 17\frac{7}{9} \\ 9\overline{)160} \\ \underline{9} \\ 70 \\ \underline{63} \\ 7 \end{array}$$

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

4. a.

$$\begin{array}{r} 1 \\ 24\overline{)40} \\ \underline{24} \\ 16 \end{array} \quad \begin{array}{r} 1 \\ 16\overline{)24} \\ \underline{16} \\ 8 \end{array} \quad \begin{array}{r} 2 \\ \boxed{}\overline{)16} \\ \underline{16} \\ 0 \end{array}$$

$\boxed{8}$ is greatest common divisor.

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

b.

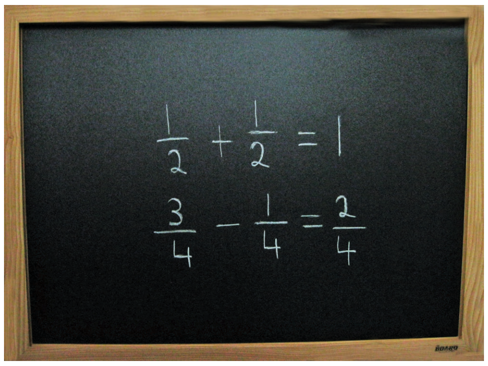
$$\begin{array}{r} 1 \\ 91\overline{)156} \\ \underline{91} \\ 65 \end{array} \quad \begin{array}{r} 1 \\ 65\overline{)91} \\ \underline{65} \\ 26 \end{array} \quad \begin{array}{r} 2 \\ 26\overline{)65} \\ \underline{52} \\ 13 \end{array} \quad \begin{array}{r} 2 \\ \boxed{13}\overline{)26} \\ \underline{26} \\ 0 \end{array}$$

$\boxed{13}$ is greatest common divisor.

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

5. a. $\begin{array}{r} 10 \\ 20\overline{)200} \end{array}$ $10 \times 14 = 140$ $\frac{14}{20} = \frac{\boxed{140}}{200}$

b. $\begin{array}{r} 6 \\ 10\overline{)60} \end{array}$ $6 \times 8 = 48$ $\frac{8}{10} = \frac{\boxed{48}}{60}$



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Learning Unit 2–2: Adding and Subtracting Fractions

More teachers are using online video-sharing sites that are modeled after Google Inc.'s YouTube. As you can see in the 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.

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.

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

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.

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

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).

$$\underbrace{\boxed{2 \times 2 \times 3}}_{\text{Divisors}} \times \underbrace{\boxed{1 \times 2 \times 3 \times 1}}_{\text{Last row}} = 72 \text{ (LCD)}$$

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

$$\boxed{\frac{1}{3} = \frac{?}{72} \quad \begin{array}{l} 72 \div 3 = 24 \\ 24 \times 1 = 24 \end{array}}$$

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

$$\boxed{\frac{1}{8} = \frac{?}{72} \quad \begin{array}{r} 72 \div 8 = 9 \\ 9 \times 1 = 9 \end{array}}$$

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

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

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

EXAMPLE

$$\begin{array}{rr} 4\frac{7}{20} & 4\frac{7}{20} \\ 6\frac{3}{5} & 6\frac{12}{20} \\ +\,7\frac{1}{4} & +\,7\frac{5}{20} \\ \hline \end{array}$$

$$\frac{3}{5} = \frac{?}{20}$$

$$20 \div 5 = \begin{array}{r} 4 \\ \times\,3 \\ \hline 12 \end{array}$$

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

Step 2 $\quad + \,\underline{17\quad}$

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

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

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

$\uparrow$ **Step 1** $\uparrow$ **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

$$\begin{array}{rr} \frac{5}{8} & \frac{40}{64} \\ -\,\frac{2}{64} & -\,\frac{2}{64} \\ \hline & \frac{38}{64} = \boxed{\frac{19}{32}} \end{array}$$

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	*When Borrowing Is Necessary*
Step 1. Subtract fractions, making sure to find the LCD.	**Step 1.** Make sure the fractions have the LCD.
Step 2. Subtract whole numbers.	**Step 2.** Borrow from the whole number of the minuend (top number).
Step 3. Reduce the fraction(s) to lowest terms.	**Step 3.** Subtract the whole numbers and fractions.
	Step 4. Reduce the fraction(s) to lowest terms.

EXAMPLE Where borrowing is not necessary: Find LCD of 2 and 8. LCD is 8.

$$\begin{array}{r} 6\frac{1}{2} \\ -\ \frac{3}{8} \\ \hline \end{array} \qquad \begin{array}{r} 6\frac{4}{8} \\ -\ \frac{3}{8} \\ \hline \boxed{6\frac{1}{8}} \end{array}$$

MONEY tips

Create an emergency fund for the unexpected. Having four to 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:

$$\begin{array}{rrr} 3\frac{1}{2} = & 3\frac{2}{4} = & 2\frac{6}{4}\left(\frac{4}{4}+\frac{2}{4}\right) \\ -1\frac{3}{4} = & -1\frac{3}{4} = & -1\frac{3}{4} \\ \hline & & \boxed{1\frac{3}{4}} \end{array}$$

LCD is 4.

©Fancy Collection/SuperStock

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.

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

2. Calculate total grocery square footage.

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

Check

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

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.

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

✓ Solutions

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

$$\text{LCD} = 2\times2\times3\times1\times3\times1\times1 = \boxed{36}$$

2. **a.** $\frac{3}{40}+\frac{2}{5}=\frac{3}{40}+\frac{16}{40}=\boxed{\frac{19}{40}}$ $\left(\frac{2}{5}=\frac{?}{40} \quad 40\div5=8\times2=16\right)$

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

$$\frac{3}{4}=\frac{?}{20} \qquad 20\div4=5\times3=15$$

3. a.

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

b.

$$\begin{array}{rcrcrl} 8\frac{1}{4} & = & 8\frac{7}{28} & = & 7\frac{35}{28} & \leftarrow \left(\frac{28}{28} + \frac{7}{28}\right) \\ -3\frac{9}{28} & = & -3\frac{9}{28} & = & -3\frac{9}{28} & \\ \hline & & & & 4\frac{26}{28} & = \boxed{4\frac{13}{14}} \end{array}$$

c.

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

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 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.

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

2. Calculate the total square footage for customer service.

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

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?

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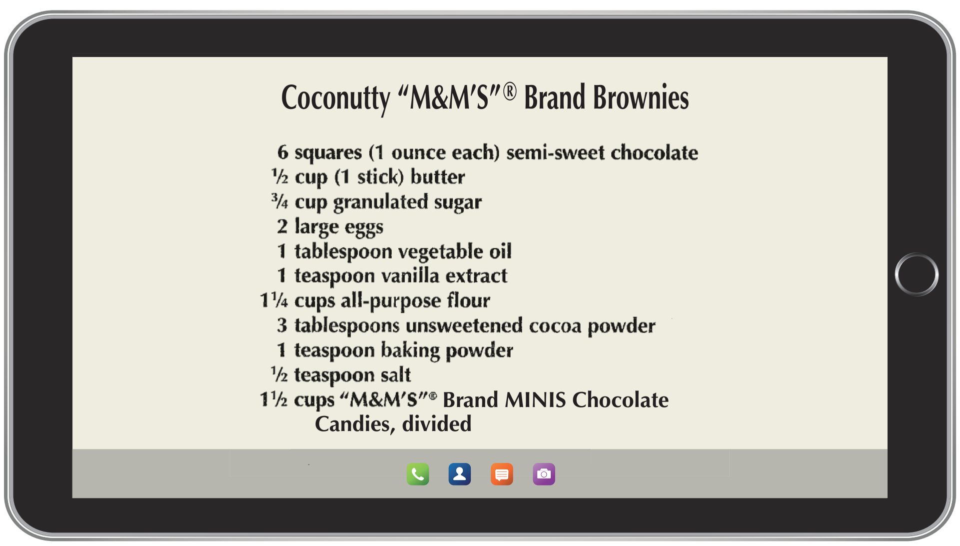


Source: Adapted from Mars, Inc.

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

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

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

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

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

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

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

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.

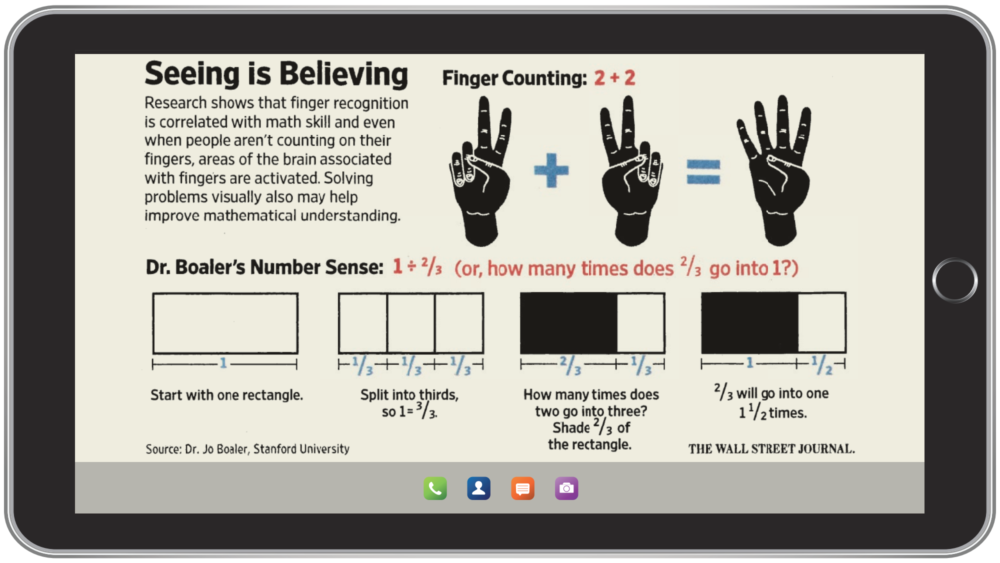
Step 3. Reduce the answer to lowest terms or use the cancellation method.

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

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

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.



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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.

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

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. $\frac{35}{\underset{2}{\cancel{4}}} \times \frac{\overset{3}{\cancel{6}}}{17} = \frac{105}{34} = \boxed{3\frac{3}{34}}$ 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. $5\frac{1}{2} \times \$150 = \frac{11}{\underset{1}{\cancel{2}}} \times \overset{\$75}{\cancel{\$150}} = \$825$

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

   \$1,095 (total cost of wood)

3. What Al pays. $\frac{1}{\underset{1}{\cancel{5}}} \times \overset{\$219}{\cancel{\$1{,}095}} = \boxed{\$219}$

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

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

$$\begin{array}{r} 1 \\ 98\overline{)150} \\ \underline{98} \\ 52 \end{array} \quad \begin{array}{r} 1 \\ 52\overline{)98} \\ \underline{52} \\ 46 \end{array} \quad \begin{array}{r} 1 \\ 46\overline{)52} \\ \underline{46} \\ 6 \end{array} \quad \begin{array}{r} 7 \\ 6\overline{)46} \\ \underline{42} \\ 4 \end{array} \quad \begin{array}{r} 1 \\ 4\overline{)6} \\ \underline{4} \\ 2 \end{array} \quad \begin{array}{r} 2 \\ 2\overline{)4} \\ \underline{4} \\ 0 \end{array}$$

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

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. $\frac{65}{\underset{1}{\cancel{8}}} \times \overset{\$2{,}000}{\cancel{\$16{,}000}} = \boxed{\$130{,}000}$

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.	$\frac{15}{65} \rightarrow \begin{array}{r} 4 \\ 15\overline{)65} \\ \underline{60} \\ 5 \end{array} \qquad \begin{array}{r} 3 \\ 5\overline{)15} \\ \underline{15} \\ 0 \end{array}$ 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 $2\times 2\times 3\times 1\times 1\times 2\times 1\times 3=\boxed{72}$	**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: $2\frac{7}{7}=\boxed{3}$	**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.	$12\frac{2}{5}-7\frac{3}{5}$ $11\frac{7}{5}-7\frac{3}{5}$ $=\boxed{4\frac{4}{5}}$ 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.	$\frac{4}{\cancel{7}_{1}}\times\frac{\cancel{7}^{1}}{9}=\boxed{\frac{4}{9}}$	**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.	$1\frac{1}{8}\times 2\frac{5}{8}$ $\frac{9}{8}\times\frac{21}{8}=\frac{189}{64}=\boxed{2\frac{61}{64}}$	**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.

2

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

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

2–4. $\frac{91}{10}$ **2–5.** $\frac{921}{15}$

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

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

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. $\frac{16}{38}$ **2–9.** $\frac{44}{52}$

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

2–10. $\frac{9}{10} = \frac{\quad}{70}$

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

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

Inspection

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

Inspection

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

Inspection

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

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

2–16. $6\frac{1}{8} + 4\frac{3}{8}$ **2–17.** $6\frac{3}{8} + 9\frac{1}{24}$

2–18. $9\frac{9}{10} + 6\frac{7}{10}$

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

2–19. $\frac{11}{12} - \frac{1}{12}$

2–20. $14\frac{3}{8} - 10\frac{5}{8}$

2–21. $12\frac{1}{9} - 4\frac{2}{3}$

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. $17 \times \frac{4}{2}$

2–23. $\frac{5}{6} \times \frac{3}{8}$

2–24. $8\frac{7}{8} \times 64$

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

2–25. $\frac{4}{10} \times \frac{30}{60} \times \frac{6}{10}$

2–26. $3\frac{3}{4} \times \frac{8}{9} \times 4\frac{9}{12}$

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

2–27. $\frac{12}{9} \div 4$

2–28. $18 \div \frac{1}{5}$

2–29. $4\frac{2}{3} \div 12$

2–30. $3\frac{5}{6} \div 3\frac{1}{2}$

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)*

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)*

2–33. Statista.com estimated the cumulative 2017 wind power capacity would reach 540,000 megawatts globally. If 2016 was $\frac{9}{10}$ of this, how much was the cumulative 2016 wind power capacity? *LU 2-3(1)*

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)*

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)*

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)*

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)*

2–38. 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)*

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)*

My Money

2–40. CNBC.com reported in 2017 $\frac{35}{100}$ people have saved only a few hundred dollars for retirement and $\frac{34}{100}$ people have zero savings. If there are an estimated 42,729,344 persons more than 64 years old, how many people have not properly prepared for their retirement? Round to the nearest whole person. *LU 2-3(1)*

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)*

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)*

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)*

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)*

My Money

2–45. Financial analysts recommend people have an emergency fund covering up to six months of expenses. Money.cnn.com reported in 2017 $\frac{31}{100}$ people have such a fund. If you have monthly expenses of $2,100 and have saved only $\frac{2}{5}$ of your recommended six months of expenses, how much more do you have to save? *LU 2-3(1)*

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)*

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)*

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)*

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)*

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)*

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)*

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)*

eXcel **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)*

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	$4\frac{1}{4}$
Tuesday	$9\frac{1}{8}$
Wednesday	$4\frac{1}{4}$
Thursday	$3\frac{1}{2}$
Friday	$10\frac{5}{8}$

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)*

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)*

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)*

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

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)*

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)*

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)*

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)*

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)*

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)*

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.

b. Selling price of each home.

c. Number of people responding to survey.

d. Number of people desiring oil.

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

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

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

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

$\frac{163}{9}$

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

$8\frac{1}{8}$

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

$\frac{63}{90}$

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

$\frac{16}{94} = \frac{?}{376}$

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

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

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

$$\begin{array}{r} 15\frac{4}{5} \\ -8\frac{19}{20} \\ \hline \end{array}$$

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

10. $\frac{3}{4} \times \frac{2}{4} \times \frac{6}{9}$ **11.** $7\frac{1}{9} \times \frac{6}{7}$ **12.** $\frac{3}{7} \div 6$

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)*

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)*

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)*

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)*

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)*

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.

Final PDF to printer

Notes on Watching Videos

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MY MONEY

Give Yourself a Run for Your Money!

What I need to know

As you work through your college courses you no doubt have your sights set on attaining a degree or credential that will 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. You should ask yourself three questions to determine if the salary expectations of your chosen career are a good fit with your financial goals:

1. What is the starting pay for the position for someone with my degree?
2. What other forms of earning could be a part of this position? (commission, bonus, etc.)
3. How does this salary compare to my financial goals?

What I need to do

Research, research, research! Be sure you know the salary expectations before committing to a desired course of study. Many times this information is available through your collegiate institution and is provided based upon the program of study you pursue. Although only a range may be given from the college, it will give you a rough estimate from which to determine your educational path. Compare the cost it will take to attain your degree to the expected salary to determine the cost effectiveness of each degree option you are considering.

Additionally, you could seek out professionals in the field you are considering to get some first-hand feedback on the position and the financial expectations of the position. 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, for example, benefits, personal growth, and contribution to a greater cause? If these professionals had it to do all over again, what might they do differently as it relates to career preparedness? Obtaining such valuable first-hand knowledge will go a long way in helping you make a decision about which discipline to pursue while in college—a decision that will help lead you to your desired career.

Ultimately you will want to determine whether or not 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, and entertainment.

Resources I can use

- Indeed Job Search (mobile app)
- https://www.payscale.com/ — get a report about your expected pay
- https://money.usnews.com/money/careers/articles/2015/01/13/do-you-know-how-much-youre-worth — helpful hints for determining your worth as you enter the job market

MY MONEY ACTIVITY

- Search for job openings in your local area related to your degree.
- Compare the expected salaries to obtain a range for this position in your area.

PERSONAL FINANCE

A KIPLINGER APPROACH

By the Numbers

How Much to Save for a Four-Year Degree

The table below shows the estimated total cost for four years of college for children at four different ages—for in-state and out-of-state public colleges as well as private colleges. The estimates are based on the current average annual sticker prices for tuition, fees, and room and board and assume that costs will continue to rise at rates similar to those seen over the past decade. The good news: You don't have to save the whole tab. Each sticker price is accompanied by a savings goal. Most experts recommend that you aim to save between one-fourth and one-third of the projected sticker price (we've based the savings goals on the larger of the two). The rest can come from financial aid, scholarships and student loans.


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Newborn	6-year-old	12-year-old	17-year-old
In-State Public College **TOTAL COST** **$137,757**	In-State Public College **TOTAL COST** **$116,722**	In-State Public College **TOTAL COST** **$98,900**	In-State Public College **TOTAL COST** **$86,145**
Savings Goal $45,919	Savings Goal $38,907	Savings Goal $32,967	Savings Goal $28,715
Out-of-State Public College **TOTAL COST** **$220,501**	Out-of-State Public College **TOTAL COST** **$192,378**	Out-of-State Public College **TOTAL COST** **$167,843**	Out-of-State Public College **TOTAL COST** **$149,804**
Savings Goal $73,500	Savings Goal $64,126	Savings Goal $55,948	Savings Goal $49,935
Private College **TOTAL COST** **$282,842**	Private College **TOTAL COST** **$246,769**	Private College **TOTAL COST** **$215,296**	Private College **TOTAL COST** **$192,158**
Savings Goal $94,281	Savings Goal $82,256	Savings Goal $71,765	Savings Goal $64,053

SOURCES: College Board Trends in College Pricing 2016, Saving for College's World's Simplest College Cost Calculator

BUSINESS MATH ISSUE

Saving $\frac{1}{4}$ to $\frac{1}{3}$ of sticker price shown means your college goals will be met.

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