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Introduction

Mathematics 8 is built on the thesis that most children can learn, understand, and master mathematical concepts. It seeks to relate math to everyday life and to make it practical. We believe that mathematics should help students achieve the ultimate goal of loving, serving, and glorifying God.

Mathematics 8 introduces concepts in incremental steps, allowing the student to master each increment of a skill before advancing to the next step. Each increment easily becomes a part of the student's "big picture," not only because it is small, but also because it fits with what he has already learned.

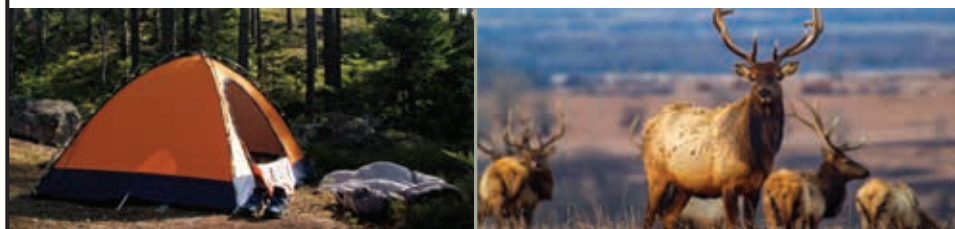
Mathematics 8 uses a system of continuous review of each concept. Students retain what they have learned by consistent, systematic review. Instead of a grand review at the end of the year, a large part of every day's work is review. The goal is mastery, not just exposure.



Unit 1

Mathematics in Everyday Life

Lesson 1	2	Lesson 9	24
Working With Fractions; Fraction, Decimal, and Percent Equivalents		Calculating Mixed Units of Measure	
Lesson 2	5	Lesson 10	27
Order of Operations; Finding Mean, Median, Mode, and Range		Quiz 2	
Lesson 3	8	Lesson 11	28
Reviewing Basic Geometric Formulas; Multiplying Terms by a Constant		Finding the Missing Dimension of Geometric Figures	
Lesson 4	11	Lesson 12	31
Solving and Checking Equations		Using the Distributive Property; Using Prime Factorization to Find the GCF	
Lesson 5	14	Lesson 13	34
Quiz 1		Using the Factor-Label Method to Convert Between Measures	
Lesson 6	15	Lesson 14	37
Changing Mixed and Fraction Percents to Decimals; Solving Algebraic Word Problems		Solving Equations and Inequalities and Graphing Solutions	
Lesson 7	18	Lesson 15	40
Finding the Area of Irregular Figures; Finding the Volume of Prisms and Cylinders		Simplifying Complex Fractions	
Lesson 8	21	Lesson 16	43
Combining Integers; Multiplying and Dividing Numbers		Test 1	



Materials

Student

- **Mathematics 8 Textbook**
- **Student Packet**
 - Worksheets
 - Speed/Mastery Drills
 - Quizzes
 - Tests

Teacher

- **Mathematics 8 Teacher's Guide**
 - Resource CD
- **Full Solution Answer Key**

Student Materials

Textbook

Mathematics 8 is a nonconsumable text, designed to be reused year after year. Students write their answers on separate paper. For easier grading, set up a form for students to follow. Show them in the first math class of the year how you expect them to arrange and number their papers. Tell them whether you want their work to be done in spiral notebooks or on notebook paper. Appendix C page 486 contains suggestions and samples for ways to have students set up their pages.

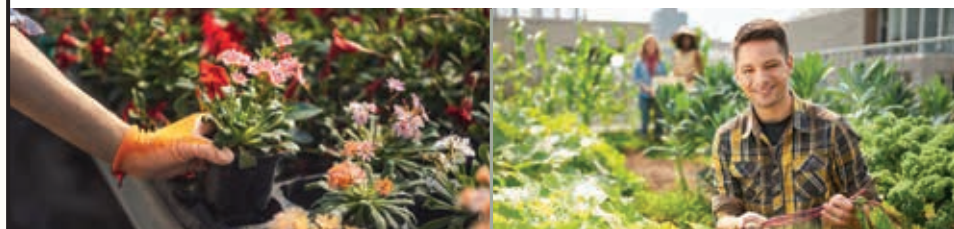
Mathematics 8 is divided into 10 units with 16 lessons in each. Lessons 1-4, 6-9, and 11-15 are regular lessons. Lessons 5 and 10 are quizzes, and Lesson 16 is the test. Unit 10 does not have quizzes. Lesson 16 is the test lesson.



Mathematics in Horticulture

Unit 2

Lesson 1 46	Lesson 9 68
Calculating the Amount of Increase or Decrease	Reading and Constructing Bar Graphs
Lesson 2 49	Lesson 10 71
Finding the Surface Area of Pyramids	Quiz 2
Lesson 3 52	Lesson 11 72
Using Prime Factorization to Find the LCM; Combining More Than Two Integers	Fraction Equivalents of Percents in Word Problems; Fluid Ounce Equivalents
Lesson 4 55	Lesson 12 75
Calculating Profit or Loss	The Pythagorean Theorem
Lesson 5 58	Lesson 13 78
Quiz 1	Calculating Profit or Loss as a Percent of Sales
Lesson 6 59	Lesson 14 81
Calculating Percent of Increase or Decrease	Simplifying Expressions Before Solving Equations
Lesson 7 62	Lesson 15 84
Using Proportions to Solve Percent Word Problems	Using the Interest Formula
Lesson 8 65	Lesson 16 87
Simplifying Expressions With Variables	Test 2



Unit Themes

The introduction to each unit features a different theme relating to math in occupations.

Unit 1—Mathematics in Everyday Life

Unit 2—Mathematics in Horticulture

Unit 3—Mathematics in the Bakeshop

Unit 4—Mathematics in Excavation

Unit 5—Mathematics in Landscaping

Unit 6—Mathematics in a Fabric Store

Unit 7—Mathematics at the Clockworks

Unit 8—Mathematics at the Spic and Span Business

Unit 9—Mathematics in the Used Parts Business

Unit 10—Mathematics in Daily Living

Sharpening Your Skills

Math skills must be continually sharpened. The *Sharpening Your Skills* section in each lesson hones those skills day by day. These exercises include *Computation* and *Fact Focus* sections. These exercises do not have reference numbers.

Computation

Addition, subtraction, multiplication, and division problems appear in this section. Students copy and work the problems. Using calculators is not recommended but is left to the teacher's discretion. Instructions in color give specific direction for dividing, rounding quotients, and writing remainders. These directions refer only to computation exercises.

Teaching Boxes

Daily lessons begin with at least one framed and colored teaching box that introduces and explains one or more mathematical concepts. A few lesson exercises follow each teaching box to reinforce the new material.

Applying Your Skills

The *Applying Your Skills* section systematically reviews concepts taught in earlier lessons. The first exercises review the material taught the previous day. The final exercises review the concepts taught in this lesson. The other exercises review concepts taught earlier in the textbook.

20. Below the bold black p. 228 exercise numbers is a small gray *reference number*. The number indicates the textbook page where the concept reviewed in this exercise was taught. A few word problems involve general math concepts and do not have a reference number.

Fact Focus

Some lessons include reviews of simple facts that students should be able to recall instantly. Students write only the answers without copying the problem. *Fact Focus* includes geometric formulas, measurement equivalents, squares, square roots, and fraction, decimal, and percent equivalents.

Quiz or Unit Test

After a concept has been reviewed for five lessons, it may appear on any quiz or test. One exception is concepts in Unit 1 that were taught and reviewed in previous grades.

Fascinating Discoveries

Quiz and test lessons include optional enrichment activities to expose students to new concepts. *Fascinating Discoveries* are neither reviewed nor tested.

Unit
3

Mathematics in the Bakeshop

Lesson 1 90

Understanding Probability and Expressing Levels of Certainty

Lesson 2 93

Plotting and Locating Points on a Coordinate Plane

Lesson 3 96

Automobile Purchase Costs

Lesson 4 99

Constructing Congruent Triangles

Lesson 5 102

Quiz 1

Lesson 6 103

Finding the Surface Area of Cylinders

Lesson 7 106

Calculating Commission

Lesson 8 109

Expressing Probability as a Ratio

Lesson 9 112

Reading and Constructing Bar-in-a-Bar Graphs

Lesson 10 115

Quiz 2

Lesson 11 116

Identifying Rational and Irrational Numbers

Lesson 12 119

Graphing Linear Relations

Lesson 13 122

Using the Interest Formula for Partial Years

Lesson 14 125

Solving Fraction Questions; Simplifying Expressions With Variables and Exponents

Lesson 15 128

Perfect Squares and Irrational Numbers

Lesson 16 131

Test 3





Textbook Graphics

 Applying Your Skills

Applying Your Skills—The daily review section continuously reviews skills and concepts. Character-building quotes scattered throughout the textbook stimulate students’ minds. These quotes with their accompanying photographs may generate additional discussion and/or research.

 A calculator icon indicates that students may use a calculator for those exercises.

 Sharpening Your Skills

Sharpening Your Skills—Computation, Fact Focus, Mental Math

Glossary, Reference Charts, Index

The *Glossary*, *Reference Charts*, and *Index* are tools that help students work more independently. The *Glossary* defines terms used throughout the course. The page number indicates where the term is defined or where the concept is shown in an example. When new terms are used in textbook lessons, they are in **bold print**. The *Reference Charts* provides definitions, diagrams, equivalent measures, geometry formulas, and other helpful information. The *Index* contains topics under various headings and the page numbers where they can be found.



Unit 4

Mathematics in Excavation

Lesson 1 134	Lesson 9 156
Multiplying Identical Bases With Exponents	Constructing and Reading Circle Graphs
Lesson 2 137	Lesson 10 159
Constructing Congruent Angles	Quiz 2
Lesson 3 140	Lesson 11 160
Convenience Store Pricing	Finding Lengths Using the Pythagorean Theorem
Lesson 4 143	Lesson 12 163
Solving Equations With a Squared Variable	The Relationship of Volume to Capacity in U.S. Measures
Lesson 5 146	Lesson 13 166
Quiz 1	Probability With More Than Two Options
Lesson 6 147	Lesson 14 169
Finding the Surface Area of Cones	Order of Operations With Grouping Symbols
Lesson 7 150	Lesson 15 172
Finding Square Roots on a Calculator	Solving and Graphing Linear Equations
Lesson 8 153	Lesson 16 175
Multistep Unit Conversions	Test 4



Student Packet

The *Student Packet* contains worksheets, speed/mastery drills, quizzes, and tests. These pages are designed for the student to write on. Separate the pages from the packet and file them for easy retrieval when needed, or store them as packets and separate when needed.

Worksheets

Worksheets contain charts and graphs, grids for plotting and naming points, and lines and figures for construction exercises.

Quizzes and Tests

Quizzes and tests are designed for the student to write on. Each quiz is on a two-sided sheet. Each test is on a larger folded sheet with a cover and three working pages. Distribute quizzes in Lessons 5 and 10 and tests in Lesson 16 of Units 1-9. Unit 10 has a test at the end of the unit, but it does not have quizzes. Quizzes and tests may not have enough space to do all the calculations so allow students to have extra paper to do the calculations. Separate, collate, and file the quizzes and tests by test number or store them in the booklet and separate as needed.

Speed/Mastery Drills

Speed drills review addition, subtraction, multiplication, division facts, and squares and square roots. Unit 1 has 13 speed drills. Quiz and test lessons have no drills.

Mastery drills review measurement equivalents, geometry facts and formulas, fraction, decimal, and percent equivalents, and squares and square roots.

Units 2-5 each have 13 mastery drills. Quiz and Test lessons have no drills. Units 6-10 do not have speed/mastery drills. Appendix B pages 467-475 provide *Extra Practice Sheets* for students who struggle with Mastery Drill items. These may be copied for use with this course. Answers are on pages 476, 477.

Distribute drills at the beginning of each math class. Speed drills—students complete as many facts as possible in one minute. Mastery drills—students complete without being timed. Until they master the information, they may look up answers on the *Reference Charts* in *Appendix A* pages 453-456.

Teacher Materials

Teacher's Guide

The goal of *Mathematics 8 Teacher's Guide* is to enable teachers with all levels of experience to successfully teach this course. This *Teacher's Guide* includes replicas of each student page with answers, complete lesson plans for each lesson, additional resources in the Appendix, and a *Resource CD* with posters and practice sheets for teaching the lessons.

Discussion Points

Each unit begins with a list of questions and/or suggestions teachers may use to generate discussion about the unit theme on the next page. Use and/or adapt as time and interest allow.

Reflect—Units 2-10

Before beginning each unit, you may take some time to reflect on the material in the previous unit. Use this list of questions or come up with your own.

Assess

At the beginning of a unit is a good time to assess students' math skills. Use this list of items to check their progress. Add your own as needed.

Research Challenge

Research Challenge contains a list of quotes in the unit and the page number where each is located. Students who finish early and need an extra challenge may choose a quote from that unit to generate discussion and ideas for further research. Encourage students to write a question to discuss with parents, grandparents, or other adult.

Unit 5

Mathematics in Landscaping

Lesson 1	178	Lesson 8	197
Adding and Subtracting Fractions Horizontally; Finding Volume With Varied Units of Measure		Probability Expressed as a Percent	
Lesson 2	181	Lesson 9	200
Constructing a Triangle With Three Given Sides		Constructing a Histogram	
Lesson 3	184	Lesson 10	203
Reducing Algebraic Fractions		Quiz 2	
Lesson 4	187	Lesson 11	204
Generic and Store-Brand Items		Multiplying Terms With Exponents	
Lesson 5	190	Lesson 12	207
Quiz 1		Finding the Surface Area of Spheres	
Lesson 6	191	Lesson 13	210
Graphing Linear Relations With Negative Solutions		Overhead Costs	
Lesson 7	194	Lesson 14	213
Expressing Numbers in Scientific Notation		Using the Factor-Label Method to Convert Rates	
		Lesson 15	216
		Multiplying Numbers in Scientific Notation	
		Lesson 16	219
		Test 5	



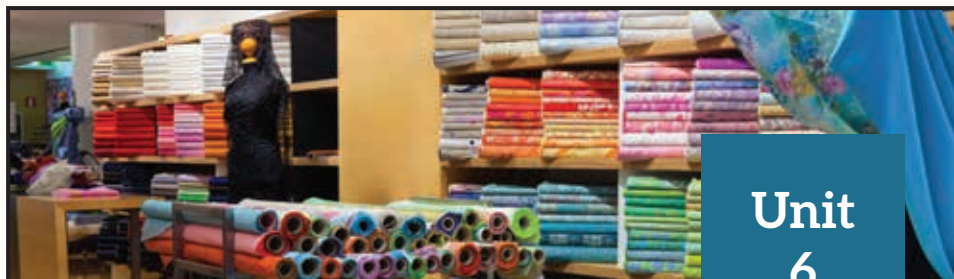
Unit Material, Terms, and Symbols

The concepts taught in the unit are categorized by addition, subtraction, geometry, measures, word problems, etc.

In the sidebar are terms, symbols, or formulas used in the unit. Use these lists as reference, to preview the unit, or review at the end of the unit.

Student Page

A replica of the textbook page appears on each corresponding *Teacher's Guide* page. Answers are in red. Where answers do not fit on the page, a note tells the appendix page where the answer is given. Solutions are shown in detail in the *Full Solution Answer Key*.



Unit 6

Mathematics in a Fabric Store

Lesson 1 222	Lesson 9 244
Calculating Markup and Selling Price	Reading and Constructing Line Graphs
Lesson 2 225	Lesson 10 247
Constructing a Triangle From Two Given Sides and a Given Angle (SAS)	Quiz 2
Lesson 3 228	Lesson 11 248
Finding the Volume of Cones and Pyramids	Distance Between Points on a Coordinate Plane
Lesson 4 231	Lesson 12 251
Introducing Insurances	Using the Distributive Property to Simplify Multiplication
Lesson 5 234	Lesson 13 254
Quiz 1	Dividing Expressions With Identical Bases
Lesson 6 235	Lesson 14 257
Simplifying Expressions With Division Bars	Measuring Electricity: Kilowatt-Hours
Lesson 7 238	Lesson 15 260
Using the Percent Proportion to Solve Percent Word Problems	Counting Back Change Without a Cash Register
Lesson 8 241	Lesson 16 263
Combination Probability	Test 6



Decide if students will trade drills for grading, grade their own, or hand them in for teacher grading. Drill exercises and answers are in the *Teacher's Guide* in the sidebar of the final page of each lesson. If a student is not doing well on drills, use alternate methods to achieve mastery. Students who need extra practice may be assigned to work the drill at another time—possibly as homework.

► Review

Each lesson contains a short review of concepts taught in the previous lesson. Answers are **paprika**. Review briefly before teaching the lesson.

► Teach

This is a list of the new concept(s) taught in the lesson.

► Assign

This is a list of the sections of student exercises in daily lessons or the quiz or test to be administered in the quiz and test lessons.

Materials Needed

Check here for a list of any materials needed for the day's lesson. The speed/mastery drill listed is the same as the lesson number. Worksheets are at the top of the Student Packet. Posters and practice sheets are on the *Resource CD* and are indicated in the list by a CD icon  and a poster or practice sheet number.

Lesson Overview

► Speed/Mastery Drill

Distribute the drills. For speed drills, give students one minute to complete as many facts as possible. Mastery drills do not need to be timed. If students do not know the answer, they may look it up on the *Reference Charts*.

Teaching the Lesson

► Daily Lessons

Refer to the colored teaching box and to this section for teaching each part of the lesson. Text in this section is intended to enhance and further explain the lesson without merely repeating material from the textbook. Familiarize yourself with both the teaching box and *Teaching the Lesson*. In the *Teacher's Guide*, new terms are **bold**. Board exercises are provided, and the answers are **paprika**. Write board exercises on the board before class or as the lesson is taught. Work the examples as directed and call on students to work the remaining examples.

► Quiz and Test Lessons

Use the exercises in the *Review* section to prepare students for problems they have not yet encountered on a quiz or test. Review any concepts students struggled with in the lesson just prior to the quiz or test.

Administer the quiz or test. Have students clear their desks except for pencils, erasers, paper to do calculations, and any other needed tools (protractor, calculator, etc.). Distribute the quiz or test and give students time to complete it. Solutions and answers are in **red** on the student page in the *Teacher's Guide*.

Fascinating Discoveries on the student page is an optional activity and may be worked individually or as a class. This is intended to be enjoyed by students after they finish the quiz or test and before class time is over.

Assign Class Work

► Lesson Alert

Exercises that may need special attention are noted here. Lines provide space for additional alerts.

► Assign the Lesson Exercises

Assign the exercises following the teaching box(es) after the teaching lesson and before *Applying Your Skills*. These exercises may be worked together in class.

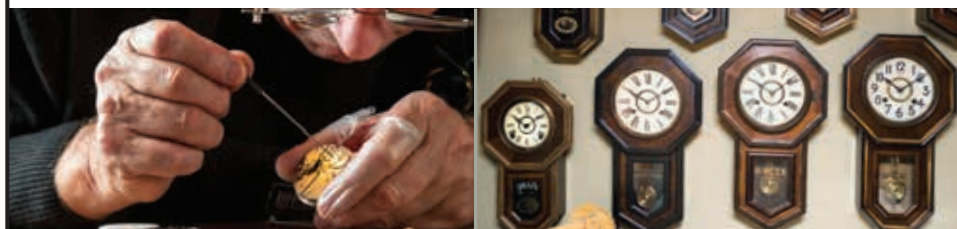
► Assign *Applying Your Skills* and *Sharpening Your Skills*

After teaching the lesson and completing the accompanying lesson exercises, assign *Applying Your Skills* and *Sharpening Your Skills*. Students should be able to complete these exercises independently. Any exercises not completed in class time should be completed before the next day's class.

Unit 7

Mathematics at the Clockworks

Lesson 1	266	Lesson 9	288
Solving Equations With Fraction Coefficients		Constructing and Reading a Double Line Graph	
Lesson 2	269	Lesson 10	291
Constructing a Triangle From Two Given Angles and a Given Side (ASA)		Quiz 2	
Lesson 3	272	Lesson 11	292
Calculating Chain Discounts		Opposite and Adjacent Sides in Trigonometry	
Lesson 4	275	Lesson 12	295
Calculating Insurance Premiums		Simplifying After Multiplying or Dividing in Scientific Notation	
Lesson 5	278	Lesson 13	298
Quiz 1		Calculating Unit Price to the Nearest Tenth of a Cent	
Lesson 6	279	Lesson 14	301
Solving Equations With Negative Numerical Coefficients		Levels of Precision	
Lesson 7	282	Lesson 15	304
Dividing Numbers in Scientific Notation		Counting Change When Customer Gives Both Bills and Coins	
Lesson 8	285	Lesson 16	307
Multiple Probability		Test 7	



Decide whether students must do every exercise. If multiple problems review the same operation, you may allow students to skip some problems.

Extra Practice

The *Extra Practice* list provides additional examples to review the concept(s) taught in the lesson. Answers are in **paprika**.

Fascinating Discoveries

A *Fascinating Discoveries* activity appears in each quiz and test lesson. Additional explanation or discussion relating to the *Fascinating Discoveries* activity in this lesson is included here.



Mathematics at the Spic and Span Business

Unit 8

Lesson 1 310	Lesson 9 332
Multiplying Negative Numbers in a Series	Reading and Constructing Pictographs
Lesson 2 313	Lesson 10 335
Finding the Volume of Spheres	Quiz 2
Lesson 3 316	Lesson 11 336
Measuring Electricity: Volts, Amperes, and Watts	The Multiplication Principle of Counting
Lesson 4 319	Lesson 12 339
Calculating Property Tax	Introducing Sine, Cosine, and Tangent
Lesson 5 322	Lesson 13 342
Quiz 1	Unit Price With Different Units of Measure
Lesson 6 323	Lesson 14 345
Multiple Probability Without Replacement	Using Proportions to Solve Fraction Word Problems
Lesson 7 326	Lesson 15 348
Solving Equations With a Variable on Both Sides of the Equal Sign	Introducing the Trigonometry Chart
Lesson 8 329	Lesson 16 351
Multiplying Square Roots	Test 8



Student Helps

Student Helps in the sidebars include tips, explanations, shortcuts, practice, games, etc. that may help students better understand the material taught in the lesson.

► Thinking It Through or Digging Deeper

This section provides additional information related to the lesson. It may be another way to think about the concept or solve the exercises.

► Practical Application

This section gives examples of ways a concept may be put into practice outside the classroom.

Resource CD

The *Resource CD* is inside the back cover of the *Teacher's Guide*. It contains posters and practice sheets for use in teaching and reviewing daily lessons. Print and file the posters and practice sheets ahead of time or print them as needed for each student. Laminate the posters to make them sturdier and reusable for write-on/wipe-off activities.

The first page on the CD lists the contents with interactive links. Click on the poster name or number to be taken directly to that poster. The *Teacher's Guide Appendix D* pages 520, 521 contains a list of the materials on the CD.

Speed/Mastery Drill

The sidebar on the final page of each lesson contains a list of all the exercises and answers from that lesson's speed/mastery drill.

Teaching Tips



Additional teaching tips are scattered

throughout the *Teacher's Guide* on yellow sticky notes. Use these tips as you see fit.

Appendixes

Appendix A consists of the textbook glossary, reference charts, and index.

Appendix B has activities to supplement the *Teacher's Guide*.

Appendix C contains math games, word problem and mental math strategies, and samples of the student work page setups.

Appendix D contains and student answers that do not fit on the student pages in the *Teacher's Guide*.

Appendix E supplies a list of the posters and practice sheets on the *Resource CD*, and a list of teaching resources.

Full Solution Answer Key —

The *Full Solution Answer Key* provides answers to all Mathematics 8 exercises and, where applicable, detailed solutions. Final answers are black. Where answers have solutions, the exercise copied from the textbook is dark green, and the solution is gray.

Grading

Daily Lessons

Answers are red on the *Teacher's Guide* student page. Answers that do not fit can be found in *Appendix D* pages 487-519. For best results, grade student papers as soon as possible. To check students' worked solutions, see the *Full Solution Answer Key*. Record the scores and return papers to students so they can learn from any wrong answers. If students consistently miss specific types of problems, they may need individualized instruction.

Miscellaneous Grading Tips

Sometimes the answer to one problem out of two or three may require rounding. If the answer comes out evenly, there is no need to round.

Answer keys in this course use the $\approx$ to indicate that an answer has been rounded. Students should be aware of what it means but are not required to show it in their answers.

Speed/Mastery Drills

Speed/mastery drill problems with answers are in the *Teacher's Guide* in the sidebar of the final page of each lesson. Drill answers are also in the *Full Solution Answer Key*.

Quizzes and Tests

Quiz and test answers and solutions are in red on the replicated quiz and test pages in the *Teacher's Guide*. Quiz and test answers are also in the *Full Solution Answer Key*.

Unit 9

Mathematics in the Used Parts Business

Lesson 1	354	Lesson 9	376
Variables on Both Sides of a Complex Equation		Constructing and Reading Rectangle Graphs	
Lesson 2	357	Lesson 10	379
Counting Significant Figures		Quiz 2	
Lesson 3	360	Lesson 11	380
Compound Interest		Solving Inequalities: Multiplying or Dividing by a Negative Number	
Lesson 4	363	Lesson 12	383
Paying Vehicle Insurance		Using Sine, Cosine, and Tangent	
Lesson 5	366	Lesson 13	386
Quiz 1		Finding the Volume of Irregular Solids	
Lesson 6	367	Lesson 14	389
Permutations		Computing Percentiles	
Lesson 7	370	Lesson 15	392
Comparing Size and Price to Find the Best Value		Combining Square Roots	
Lesson 8	373	Lesson 16	395
Rounding According to Significant Figures		Test 9	



Each quiz and test has a total of 100 points. Points per problem is stated after each set of directions. Count the number of points missed and subtract from 100 to find the score.

Analyze student quizzes and tests. Several students missing the same problems may indicate a teaching weakness in that area. Revisit the areas and make sure students understand the concept. A student who repeatedly misses the same type of problem may need remedial help.

Recording Scores

Follow the formula to arrive at a final score for daily work, quizzes, and tests.

Daily work + Quiz 1 + Quiz 2 + Test

$$87\% + 90\% + 88\% + 94\% = 359\%$$

$$359 \div 4 = 89.75\% \approx 90\%$$



Unit 10

Mathematics in Daily Living

Lesson 1	398	Lesson 9	422
Introduction to Banks		Recording Automatic Transactions	
Lesson 2	401	Lesson 10	425
Making a Deposit		Using Debit Cards and ATMs	
Lesson 3	404	Lesson 11	428
Writing a Check		Recognizing Needs and Wants	
Lesson 4	407	Lesson 12	431
Using a Check Register		Recording Income and Expenses	
Lesson 5	410	Lesson 13	434
Introducing a Bank Statement		Making a Budget	
Lesson 6	413	Lesson 14	437
Reconciling a Bank Statement		Recording Expenses Using a Multicolumn Journal	
Lesson 7	416	Lesson 15	440
If the Bank Statement and the Check Register Do Not Agree		Preparing Year-End Reports	
Lesson 8	419	Lesson 16	443
Using Credit Cards		Test 10	
Glossary	444	Index	457
Reference Charts	453	Credits	467



Teacher Notes

Unit 1

Welcome students to *Mathematics 8*, Unit 1. Read and discuss “Mathematics in Everyday Life” on page 1.

Discussion Points

- Name some local businesses.
- Discuss ways in which local businesses use math.
- Discuss businesses students would like to pursue.
- Discuss good business ethics and how students can begin to develop them now.

Unit 1



Lesson 1	2
Working With Fractions; Fraction, Decimal, and Percent Equivalents	
Lesson 2	5
Order of Operations; Finding Mean, Median, Mode, and Range	
Lesson 3	8
Reviewing Basic Geometric Formulas; Multiplying Terms by a Constant	
Lesson 4	11
Solving and Checking Equations	
Lesson 5	14
Quiz 1	
Lesson 6	15
Changing Mixed and Fraction Percents to Decimals; Solving Algebraic Word Problems	
Lesson 7	18
Finding the Area of Irregular Figures; Finding the Volume of Prisms and Cylinders	
Lesson 8	21
Combining Integers; Multiplying and Dividing Numbers	
Lesson 9	24
Calculating Mixed Units of Measure	
Lesson 10	27
Quiz 2	
Lesson 11	28
Finding the Missing Dimension of Geometric Figures	
Lesson 12	31
Using the Distributive Property; Using Prime Factorization to Find the GCF	
Lesson 13	34
Using the Factor-Label Method to Convert Between Measures	
Lesson 14	37
Solving Equations and Inequalities and Graphing Solutions	
Lesson 15	40
Simplifying Complex Fractions	
Lesson 16	43
Test 1	

Getting Started

This year’s students are on the threshold of eighth grade and facing the end of middle-school education. *Mathematics 8* provides a window into the lives of people who follow Biblical principles in daily business decisions.

Life provides more opportunities than we ever have time to pursue. Therefore, it is important to establish goals for life and to consider each opportunity in the light of those goals. Goals based on truth have far-reaching effects in the lives of your students.

Research Challenge

Encourage students to read the quotes in Unit 1. For an extra challenge, have students write one question about each quote. At a convenient time, allow the student to discuss the question with a parent, grandparent, or other adult.

Unit 1 Quotes

Author	Page Number
Benjamin Franklin	Page 9
Anne Ross Cousin	Page 12
William Penn	Page 16
Francis Atterbury	Page 29
Abigail Adams	Page 32
Robert Louis Stevenson	Page 35

Mathematics in Everyday Life

A light breeze rustled the branches of the willow tree outside the Scout family home. Morning sunshine streamed through the open window, laying golden shadows on the dining room table as Mr. and Mrs. Scout and their three children finished their breakfast.

"Thanks for the breakfast, Mom." Toby scooted his chair away from the table. "Pancakes and bacon are a delicious way to start summer vacation!"

Mom smiled. "You're welcome." She turned to Dad. "Did you tell them our plans for the summer?"

"Umm, no, I didn't." Dad faced the children, his blue eyes twinkling. "It looks like a busy summer for us. We need to fix the chicken house, seed the back pasture, paint the kitchen, and—" he paused, and twelve-year-old Ian groaned.

"Take a camping trip," Dad finished, grinning at Ian.

Ian whooped.

"A real camping trip in the mountains, Dad?" Toby asked incredulously. At Dad's nod, he joined Ian in a second whoop.

"Where are we going?" seven-year-old Faye wondered.

"We're taking Tuckerman's Trail through Stone Mountain National Park. I hiked it when I was Toby's age, and it's a beautiful trail—cliffs, waterfalls, lakes, you name it. As we hike, we're going to apply the math you've learned in school. We'll also visit local businesses along the way and see how math is used in the business world. But most of all, we're going to have a wonderful time making memories together."

The children cheered.

Dad laughed and stood up. "Let's get busy. We'll need to seed the pasture before we leave, but wait to build the chicken house and paint the kitchen until we get back. For now, let's focus on getting ready. Toby, I want you to be in charge of packing. Our backpacks need to weigh 15-25 pounds, but you, Ian, and I can carry a little more so Mom and Faye aren't overloaded."

Two weeks later Toby stood eagerly with his family at the base of the mountain. Fog shrouded the surrounding conifers and the trail before them. A breeze brushed lightly across his face. He shoved his hands in his pockets and shivered, more from excitement than cold.

Dad looked at his map. "This trail is a little over a hundred miles long, so we need to average eight miles each day to keep our schedule. In a few days, we'll reach the town of Springville. We'll book rooms at the hotel and visit a few local businesses. Ready? Let's go!"

Toby shifted his backpack into position and followed Dad up the trail. He could hardly wait to see what lay around the next bend.



Unit 1 Terms

LCD—least common denominator
reciprocal
complex fraction
distributive property
GCF—greatest common factor
prime factorization
constant
term
variable
isolate
integer, positive/negative
combining integers
graphing a solution
inequality
prism
cylinder
irregular figure
tick mark
conversion factor

Unit 1 Symbols

$\sqrt{\quad}$ square root
 π pi
 $\parallel$ tick marks
 $\approx$ approximately equal to
 $\geq$ greater than or equal to
 $\leq$ less than or equal to
 $\triangle$ triangle
 $\angle$ angle

Unit 1 Material

Addition

Integers
Mixed measures

Algebra

Order of operations
Expressions
Equations and inequalities
Algebraic word problems
Integers with the same/different signs
Graph solutions

Decimals

Fraction and percent equivalents
Mixed and fraction percents and decimals

Division

Complex fractions
Integers
Mixed measures

Fractions

Add, subtract, multiply, divide
Decimal and percent equivalents
Complex fractions

Geometry

Basic geometric formulas
Area of irregular shapes
Volume of prisms and cylinders
Missing dimension of figures

Measures

Mixed measures
U.S. and metric conversion equivalents
Factor-label method to convert measures

Multiplication

Integers
Mixed measures

Numbers

Mean, median, mode, and range
Prime factorization to find GCF
Distributive property

Percents

Fraction and decimal equivalents

Subtraction

Integers
Mixed measures

Lesson 1

Pages 2-4

Materials Needed

Speed Drill 1

1 Fraction, Decimal, and Percent Equivalents

Lesson Overview

Speed Drill

Teach

- Working With Fractions
Note: In this course, accept any correct canceling for fraction problems.
- Fraction, Decimal, and Percent Equivalents

Assign

- Lesson Exercises
- Applying Your Skills
- Sharpening Your Skills

Unit 1

1

Working With Fractions; Fraction, Decimal, and Percent Equivalents

Speed Drill 1

Working With Fractions

Before adding or subtracting **fractions**, make sure the fractions have **common denominators**. If they do not have common denominators, the fractions must be changed to have common denominators. Find the LCD (**least common denominator**) and change the fractions to equivalent fractions with the LCD as the new denominator. Then add or subtract the **numerators**, but keep the **denominators** the same. **Reduce** the answer to simplest form if necessary.

$$\begin{array}{r} \frac{1}{8} \\ + \frac{7}{8} \\ \hline \frac{8}{8} = 1 \end{array} \quad \begin{array}{r} \frac{4}{5} \\ + 4\frac{2}{5} \\ \hline 4\frac{6}{5} = 5\frac{1}{5} \end{array} \quad \begin{array}{r} \frac{5}{6} = \frac{10}{12} \\ + \frac{3}{4} = \frac{9}{12} \\ \hline \frac{19}{12} = 1\frac{7}{12} \end{array} \quad \begin{array}{r} 0\frac{7}{7} \\ - \frac{5}{7} \\ \hline \frac{2}{7} \end{array} \quad \begin{array}{r} 3\frac{9}{9} \\ - \frac{2}{9} \\ \hline 3\frac{7}{9} \end{array} \quad \begin{array}{r} 5\frac{13}{10} \\ - \frac{7}{10} \\ \hline 5\frac{6}{10} = 5\frac{3}{5} \end{array}$$

To multiply fractions, first change any **mixed numbers** to **improper fractions**. Then **cancel** to remove common factors from the numerator and the denominator. This results in smaller numbers to multiply, and a product that is reduced to simplest form. After canceling, multiply the numerators and then the denominators. Change any improper fraction answers to whole or mixed numbers.

Reciprocals

Reciprocals are two numbers whose product is 1.

$$\frac{2}{3} \times \frac{3}{2} = 1 \quad \frac{1}{2} \times \frac{2}{1} = 1 \quad \frac{1}{3} \times \frac{3}{1} = 1$$

To divide fractions, first change any mixed numbers to improper fractions. Then rewrite the problem, changing the division sign to a multiplication sign and replacing the second fraction with its **reciprocal**. Cancel and multiply as usual. Change any improper fractions in the answer to whole or mixed numbers.

$$\begin{array}{r} \frac{5}{6} + \frac{4}{9} \\ \hline \frac{5}{6} \times \frac{3}{3} = \frac{15}{18} \\ \frac{4}{9} \times \frac{2}{2} = \frac{8}{18} \\ \hline \frac{23}{18} = 1\frac{5}{18} \end{array} \quad \begin{array}{r} 4\frac{1}{2} + \frac{2}{3} \\ \hline \frac{9}{2} + \frac{2}{3} \\ \hline \frac{9}{2} \times \frac{3}{3} = \frac{27}{6} \\ \frac{2}{3} \times \frac{2}{2} = \frac{4}{6} \\ \hline \frac{31}{6} = 5\frac{1}{6} \end{array}$$

Copy and solve. Reduce fraction answers to simplest form.

$$\begin{array}{l} 1. \frac{4\frac{2}{5}}{-\frac{1}{2}} = 2\frac{9}{10} \\ 2. \frac{4\frac{5}{8}}{-\frac{5}{6}} = 3\frac{19}{24} \\ 3. \frac{\frac{1}{2}}{+\frac{3}{4}} = 1\frac{11}{12} \\ 4. \frac{7}{8} + 6\frac{1}{2} = 11\frac{5}{8} \\ 5. 3\frac{3}{7} \times 2\frac{1}{2} = 8\frac{4}{7} \\ 6. 2\frac{3}{4} \times 2\frac{2}{3} = 7\frac{1}{3} \\ 7. 3\frac{6}{7} \div 1\frac{4}{5} = 2\frac{1}{7} \\ 8. 2\frac{1}{6} \div \frac{5}{9} = 3\frac{9}{10} \end{array}$$

2 Unit 1

Teaching the Lesson—Working With Fractions

Explain the terms **common denominator**, **least common denominator**, **cancel**, and **reciprocal**. Fractions can be added or subtracted only when all the fractions have common denominators.

Explain how to change fractions with unlike denominators to fractions with common denominators.

Review borrowing in subtraction, simplifying improper fractions, and reducing to simplest form if necessary (see page 3 sidebar).

Explain how to multiply and divide fractions. Canceling may vary when multiplying or dividing fractions.

Write these exercises on the board. Demonstrate solving one of each of the four operations. Have students solve the remaining problems.

$$\begin{array}{l} 3\frac{1}{4} = 3\frac{2}{8} \\ \frac{1}{2} = \frac{4}{8} \\ + 1\frac{1}{8} = 1\frac{1}{8} \\ \hline 4\frac{7}{8} \end{array} \quad \begin{array}{l} 5\frac{3}{4} \\ + 6\frac{1}{4} \\ \hline 11\frac{4}{4} = 12 \end{array} \quad \begin{array}{l} 17\frac{5}{5} \\ - 10\frac{2}{5} \\ \hline 7\frac{3}{5} \end{array} \quad \begin{array}{l} 3\frac{2}{3} = 3\frac{16}{24} \\ - 1\frac{1}{8} = 1\frac{3}{24} \\ \hline 2\frac{13}{24} \end{array}$$

$$\begin{array}{l} 8\frac{1}{3} \times 2\frac{5}{8} \times \frac{4}{15} \\ \frac{5}{3} \times \frac{7}{4} \times \frac{1}{15} = \frac{35}{6} = 5\frac{5}{6} \end{array} \quad \begin{array}{l} 2\frac{1}{4} \div 3 \\ \frac{9}{4} \div \frac{3}{1} \\ \hline \frac{3}{4} \times \frac{1}{3} = \frac{3}{12} = \frac{1}{4} \end{array} \quad \begin{array}{l} 2 \div \frac{1}{9} \\ \frac{2}{1} \times \frac{9}{1} = \frac{18}{1} = 18 \end{array}$$

Student Helps

Subtracting Fractions Using Borrowing

To subtract fractions, the denominators in the problem must be the same. If the fraction in the minuend is smaller than the fraction in the subtrahend, borrow 1 from the whole number. Change the borrowed 1 to a fraction that equals 1 and add it to the existing too-small fraction. Now subtract the fractions and whole numbers and reduce to simplest form if necessary.

Steps to Calculate Fractions

Adding/Subtracting

1. Find common denominators.
2. Add/subtract.
3. Reduce to simplest form if necessary.

Multiplying/Dividing

1. Change mixed numbers to improper fractions.
2. Cancel where possible. In division, replace divisor with reciprocal.
3. Multiply numerators/denominators.
4. Change any improper fractions to mixed numbers and reduce to simplest form.

Fraction, Decimal, and Percent Equivalents

Fractions, decimals, and percents are all different ways of showing the same value. Fractions describe parts of a whole, **decimals** have a decimal point and show values less than one, and **percents** show how many out of 100. Fractions, decimals, and percents can be converted to any of the other forms and still have the same value.

Memorize these commonly used fraction, decimal, and percent **equivalents**.

Equivalents											
Fraction	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{3}{4}$	$\frac{1}{3}$	$\frac{2}{3}$	$\frac{1}{6}$	$\frac{5}{6}$	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	$\frac{7}{8}$
Decimal	0.5	0.25	0.75	0.3	0.6	0.16	0.83	0.125	0.375	0.625	0.875
Percent	50%	25%	75%	$33\frac{1}{3}\%$	$66\frac{2}{3}\%$	$16\frac{2}{3}\%$	$83\frac{1}{3}\%$	$12\frac{1}{2}\%$ 12.5%	$37\frac{1}{2}\%$ 37.5%	$62\frac{1}{2}\%$ 62.5%	$87\frac{1}{2}\%$ 87.5%

Write *equivalent* or *not equivalent* for each set of numbers.

9. $\frac{1}{2}$ 75% 0.75
not equivalent
10. $\frac{5}{6}$ 0.83 $83\frac{1}{3}\%$
equivalent
11. $\frac{2}{3}$ 0.6 $66\frac{2}{3}\%$
equivalent
12. $\frac{5}{8}$ 0.875 $87\frac{1}{2}\%$
not equivalent



Applying Your Skills

Copy and solve. Reduce fraction answers to simplest form.

13. $\frac{3}{5} + \frac{2}{3}$
 $1\frac{4}{15}$
14. $9\frac{5}{6} + 7\frac{11}{12}$
 $17\frac{3}{4}$
15. $\frac{5}{3} - \frac{2}{3}$
 $1\frac{1}{3}$
16. $9\frac{7}{9} - 7\frac{7}{9}$
 $1\frac{2}{9}$
17. $\frac{2}{5} \times \frac{1}{7}$
 $\frac{2}{35}$
18. $3 \times 1\frac{2}{3}$
5
19. $\frac{7}{8} \div 2\frac{1}{2}$
 $\frac{7}{20}$
20. $\frac{5}{9} \div \frac{1}{2}$
 $1\frac{1}{9}$

Teaching the Lesson—Fraction, Decimal, and Percent Equivalents

Explain how fractions, decimals, and percents relate to each other.

To convert a fraction to a decimal, divide the numerator by the denominator.

To convert a decimal to a percent, move the decimal point two places to the right and add a percent symbol.

To convert a percent to a decimal, move the decimal point two places to the left and drop the percent symbol. Write a 0 in the ones place if there is no other whole number.

To convert a decimal to a fraction, write the digits to the right of the decimal point as the numerator. Use the decimal's place value to write the denominator—tenths, hundredths, thousandths, etc. Reduce to simplest form if possible.

Equivalents will be on the Speed Drills beginning in Lesson 1. Students should have them memorized before Quiz 1.

Display the *Fraction, Decimal, and Percent Equivalents* poster. Discuss the commonly used equivalents for half, fourths, eighths, thirds, and sixths. The decimal equivalents of eighths have three decimal places. When these decimals are converted to percents, the decimal point is moved two places to the right. These may be written as decimals or as fractions. The decimal equivalents of thirds and sixths are repeating decimals. The percent equivalents may be written as repeating decimals or fractions.

Cover parts of the poster and have students give the missing equivalent.

