

## WELCOME TO THE 13TH EDITION

The first edition of Marge Lial's *Beginning Algebra* was published in 1969, and now we are pleased to present the 13th edition—with the same successful, well-rounded framework that was established 50 years ago and updated to meet the needs of today's students and professors. The names Lial and Miller, two faculty members from American River College in Sacramento, California, have become synonymous with excellence in Developmental Mathematics, Precalculus, Finite Mathematics, and Applications-Based Calculus.

With Chuck Miller's passing in 1986, Marge Lial was joined by a team of carefully selected coauthors who partnered with her. John Hornsby (University of New Orleans) joined Marge in this capacity in 1992, and in 1999, Terry McGinnis became part of this developmental author team. Since Marge's passing in 2012, John and Terry have dedicated themselves to carrying on the Lial/Miller legacy.

In the preface to the first edition for *Intermediate Algebra*, Marge Lial wrote

*“ . . . the strongest theme . . . is a combination of readability and suitability for the book's intended audience: students who are not completely self-confident in mathematics as they come to the course, but who must be self-confident and proficient . . . by the end of the course.”*

Today's Lial author team upholds these same standards. With the publication of the 13th edition of *Beginning Algebra*, we proudly present a complete course program for students who need developmental algebra. Revisions to the core text, working in concert with such innovations in the MyLab Math course as Skill Builder and Learning Catalytics, combine to provide superior learning opportunities appropriate for all types of courses (traditional, hybrid, online).

We hope you enjoy using it as much as we have enjoyed writing it. We welcome any feedback that you have as you review and use this text.

## WHAT'S NEW IN THIS EDITION?

We are pleased to offer the following new features and resources in the text and MyLab.

**IMPROVED STUDY SKILLS** These special activities are now grouped together at the front of the text, prior to Chapter R. **Study Skills Reminders** that refer students to specific Study Skills are found liberally throughout the text. Many Study Skills

now include a *Now Try This* section to help students implement the specific skill.

**REVISED EXPOSITION** With each edition of the text, we continue to polish and improve discussions and presentations of topics to increase readability and student understanding. This edition is no exception.

**NEW FIGURES AND DIAGRAMS** For visual learners, we have included more than 50 new mathematical figures, graphs, and diagrams, including several new “hand drawn” style graphs. These are meant to suggest what a student who is graphing with paper and pencil should obtain. We use this style when introducing a particular type of graph for the first time.

**ENHANCED USE OF PEDAGOGICAL COLOR** We have thoroughly reviewed the use of pedagogical color in discussions and examples and have increased its use whenever doing so would enhance concept development, emphasize important steps, or highlight key procedures.

**INCREASED Concept Check AND WHAT WENT WRONG? EXERCISES** The number of **Concept Check**, exercises, which facilitate students' mathematical thinking and conceptual understanding, and which begin each exercise set, has been increased. We have also more than doubled the number of **WHAT WENT WRONG?** exercises that highlight common student errors.

**INCREASED RELATING CONCEPTS EXERCISES** We have doubled the number of these flexible groups of exercises, which are located at the end of many exercise sets. These sets of problems were specifically written to help students tie concepts together, compare and contrast ideas, identify and describe patterns, and extend concepts to new situations. They may be used by individual students or by pairs or small groups working collaboratively. All answers to these exercises appear in the student answer section.

**ENHANCED MYLAB MATH RESOURCES** MyLab exercise coverage in the revision has been expanded, and video coverage has also been expanded and updated to a modern format for today's students. **WHAT WENT WRONG?** problems and all **RELATING CONCEPTS** exercise sets (both even- and odd-numbered problems) are now assignable in MyLab Math.

**SKILL BUILDER** These exercises offer just-in-time additional adaptive practice in MyLab Math. The adaptive engine tracks student performance and delivers, to each individual, questions that adapt to his or her level of understanding. This new feature enables instructors to assign fewer questions for

homework, allowing students to complete as many or as few questions as they need.

**LEARNING CATALYTICS** This new student response tool uses students' own devices to engage them in the learning process. Problems that draw on prerequisite skills are included at the beginning of each section to gauge student readiness for the section. Accessible through MyLab Math and customizable to instructors' specific needs, these problems can be used to generate class discussion, promote peer-to-peer learning, and provide real-time feedback to instructors. More information can be found via the Learning Catalytics link in MyLab Math. Specific exercises notated in the text can be found by searching LialBeginning# where the # is the chapter number.

## CONTENT CHANGES

Specific content changes include the following:

- **Exercise sets** have been scrutinized and updated with a renewed focus on conceptual understanding and skill development. Even and odd pairing of the exercises, an important feature of the text, has been carefully reviewed.
- **Real-world data** in all examples and exercises and in their accompanying graphs has been updated.
- **An increased emphasis on fractions, decimals, and percents** appears throughout the text. We have **expanded Chapter R** to include new figures and revised explanations and examples on converting among fractions, decimals, and percents. And we have included an **all-new set of Cumulative Review Exercises**, many of which focus on fractions, decimals, and percents, at the end of Chapter 1. Sets of Cumulative Review Exercises in subsequent chapters now begin with new exercises that review skills related to these topics.
- **A new Section 2.4 provides expanded coverage of linear equations in one variable with fractional and decimal coefficients.** Two new examples have been included, and the number of exercises has been doubled.
- **Solution sets of linear inequalities in Section 2.9** are now graphed first, before they are written using interval notation.
- **Expanded Mid-Chapter Summary Exercises** in Chapter 2 continue our emphasis on the difference between simplifying an expression and solving an equation. New examples in the Summary Exercises in Chapters 4, 6, and 9 illustrate and distinguish between solution methods.
- **Presentations of the following topics have been enhanced and expanded**, often including new examples and exercises.

- Order of operations involving absolute value expressions (Section 1.5)
- Solving linear equations in one variable (Sections 2.1 and 2.2)
- Solving problems involving proportions and percent (Section 2.7)
- Writing an equation of a line from a graph (Section 3.4)
- Solving systems of equations using the elimination method (Section 4.3)
- Adding, subtracting, and dividing polynomials (Sections 5.4 and 5.7)
- Finding reciprocals of rational expressions (Section 7.2)
- Solving direct variation problems (Section 7.8)
- Solving quadratic equations with no real solution (Sections 9.1–9.3)
- Graphing quadratic equations (Section 9.4)

## LIAL DEVELOPMENTAL HALLMARK FEATURES

We have enhanced the following popular features, each of which is designed to increase ease of use by students and/or instructors.

- **Emphasis on Problem-Solving** We introduce our six-step problem-solving method in Chapter 2 and integrate it throughout the text. The six steps, *Read, Assign a Variable, Write an Equation, Solve, State the Answer,* and *Check*, are emphasized in boldface type and repeated in examples and exercises to reinforce the problem-solving process for students. We also provide students with **PROBLEM-SOLVING HINT** boxes that feature helpful problem-solving tips and strategies.
- **Helpful Learning Objectives** We begin each section with clearly stated, numbered objectives, and the included material is directly keyed to these objectives so that students and instructors know exactly what is covered in each section.
- **Cautions and Notes** One of the most popular features of previous editions is our inclusion of information marked **CAUTION** and **NOTE** to warn students about common errors and to emphasize important ideas throughout the exposition. The updated text design makes them easy to spot.
- **Comprehensive Examples** The new edition features a multitude of step-by-step, worked-out examples that include pedagogical color, helpful side comments, and special pointers. We give special attention to checking example solutions—more checks, designated using a special **CHECK** tag and ✓, are included than in past editions.
- **More Pointers** There are more pointers in examples and discussions throughout this edition of the text. They provide students with important on-the-spot reminders, as well as warnings about common pitfalls.

- **Numerous Now Try Problems** These margin exercises, with answers immediately available at the bottom of the page, have been carefully written to correspond to every example in the text. This key feature allows students to immediately practice the material in preparation for the exercise sets.
- **Updated Figures, Photos, and Hand-Drawn Graphs** Today's students are more visually oriented than ever. As a result, we provide detailed mathematical figures, diagrams, tables, and graphs, including a "hand-drawn" style of graphs, whenever possible. We have incorporated depictions of well-known mathematicians, as well as appealing photos to accompany applications in examples and exercises.
- **Relevant Real-Life Applications** We include many new or updated applications from fields such as business, pop culture, sports, technology, and the health sciences that show the relevance of algebra to daily life.
- **Extensive and Varied Exercise Sets** The text contains a wealth of exercises to provide students with opportunities to practice, apply, connect, review, and extend the skills they are learning. Numerous illustrations, tables, graphs, and photos help students visualize the problems they are solving. Problem types include skill building and writing exercises, as well as applications, matching, true/false, multiple-choice, and fill-in-the-blank problems. Special types of exercises include **Concept Check**, **WHAT WENT WRONG?**, **Extending Skills**, and **RELATING CONCEPTS**.
- **Special Summary Exercises** We include a set of these popular in-chapter exercises in every chapter. They provide students with the all-important *mixed review problems* they need to master topics and often include summaries of solution methods and/or additional examples.
- **Extensive Review Opportunities** We conclude each chapter with the following review components:

A **Chapter Summary** that features a helpful list of **Key Terms** organized by section, **New Symbols**, a **Test Your Word Power** vocabulary quiz (with answers immediately following), and a **Quick Review** of each section's main concepts, complete with additional examples.

A comprehensive set of **Chapter Review Exercises**, keyed to individual sections for easy student reference.

A set of **Mixed Review Exercises** that helps students further synthesize concepts and skills.

A **Chapter Test** that students can take under test conditions to see how well they have mastered the chapter material.

A set of **Cumulative Review Exercises** for ongoing review that covers material going back to Chapter R.

- **Comprehensive Glossary** The online Glossary includes key terms and definitions (with section references) from throughout the text.

## ACKNOWLEDGMENTS

The comments, criticisms, and suggestions of users, non-users, instructors, and students have positively shaped this text over the years, and we are most grateful for the many responses we have received. The feedback gathered for this edition was particularly helpful.

We especially wish to thank the following individuals who provided invaluable suggestions.

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Over the years, we have come to rely on an extensive team of experienced professionals. Our sincere thanks go to these dedicated individuals at Pearson who worked long and hard to make this revision a success.

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We are especially pleased to welcome Callie Daniels, who has taught from our texts for many years, to our team. Her assistance has been invaluable. She thoroughly reviewed all chapters and helped extensively with manuscript preparation.

We are grateful to Carol Merrigan for her excellent production work. We appreciate her positive attitude, responsiveness, and expert skills. We would also like to thank SPi Global for their production work; Emily Keaton for her detailed help in updating real data applications; Connie Day for supplying her copyediting expertise; SPi Global for their photo research; and Lucie Haskins for

producing another accurate, useful index. Paul Lorczak and Hal Whipple did a thorough, timely job accuracy-checking the page proofs and answers, and Sarah Sponholz checked the index.

We particularly thank the many students and instructors who have used this text over the years. You are the reason we do what we do. It is our hope that we have positively impacted your mathematics journey. We would welcome any comments or suggestions you might have via email to [math@pearson.com](mailto:math@pearson.com).

**John Hornsby**  
**Terry McGinnis**

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## DEDICATION

To Marin, Kasey, Erin, and Kellen

Uncle Johnny

To Andrew and Tyler

Mom



# Resources for Success

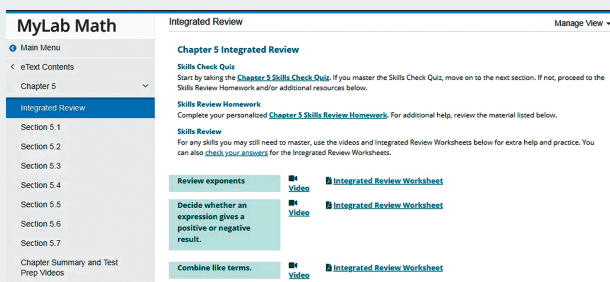
## Get the Most Out of MyLab Math for *Beginning Algebra*, Thirteenth Edition by Lial, Hornsby, McGinnis

The Lial team has helped thousands of students learn algebra with an approachable, teacherly writing style and balance of skill and concept development. With this revision, the series retains the hallmarks that have helped students succeed in math, and includes new and updated digital tools in the MyLab Math course.

Take advantage of the following resources to get the most out of your MyLab Math course.

### Get Students Prepared with Integrated Review

Every student enters class with different levels of preparedness and prerequisite knowledge. To ensure students are caught up on prior skills, every Lial MyLab course now includes Integrated Review.



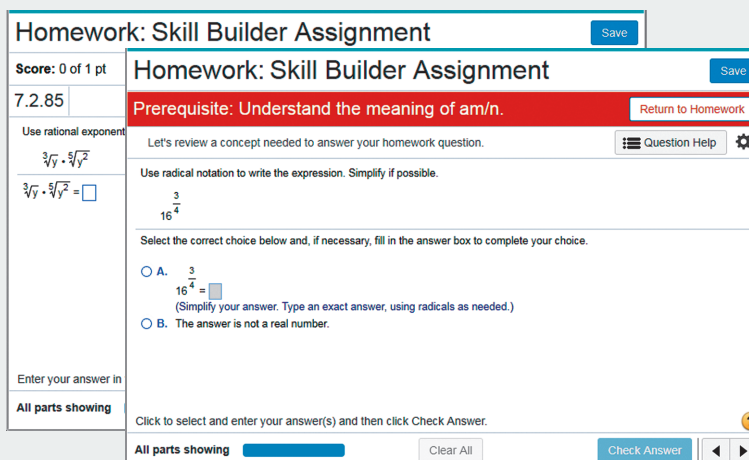
The screenshot shows the MyLab Math interface for Chapter 5 Integrated Review. The left sidebar lists sections 5.1 through 5.7. The main content area includes a 'Skills Check Quiz' section with instructions to proceed to the next section if the quiz is mastered. Below this is a 'Skills Review Homework' section with instructions to complete personalized homework. There are three rows of resources, each with a video icon and a worksheet icon: 'Review exponents', 'Decide whether an expression gives a positive or negative result.', and 'Combine like terms.'.

Integrated Review provides embedded and personalized review of prerequisite topics within relevant chapters. Students can check their prerequisite skills, and receive personalized practice on the topics they need to focus on, with study aids like worksheets and videos also available to help.

Integrated Review assignments are premade and available to assign in the Assignment Manager.

### Personalize Learning

**New! Skill Builder** exercises offer just-in-time additional adaptive practice. The adaptive engine tracks student performance and delivers questions to each individual that adapt to his or her level of understanding. This new feature allows instructors to assign fewer questions for homework, allowing students to complete as many or as few questions as they need.



The screenshot shows a 'Homework: Skill Builder Assignment' interface. At the top, it says 'Score: 0 of 1 pt' and '7.2.85'. The main content area has a red header 'Prerequisite: Understand the meaning of am/n.' with a 'Return to Homework' button. Below this, there is a question: 'Use radical notation to write the expression. Simplify if possible.' with the expression  $\sqrt[3]{17} \cdot \sqrt[3]{17^2}$ . The answer box contains  $16^{\frac{3}{2}}$ . Below the answer box, there are two multiple-choice options: 'A.  $\frac{3}{16^{\frac{3}{2}}}$ ' and 'B. The answer is not a real number.' At the bottom, there are buttons for 'All parts showing', 'Clear All', and 'Check Answer'.

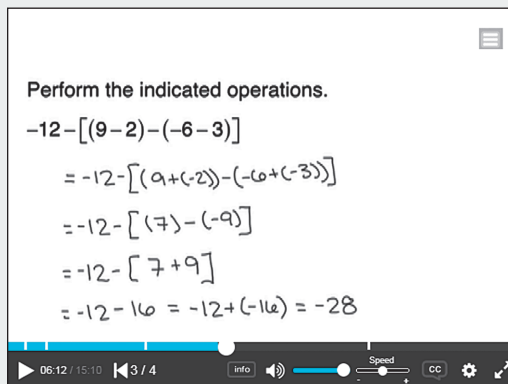
# Resources for Success

## Support Students Whenever, Wherever

Updated! The complete video program for the Lial series includes:

- Full Section Lecture Videos
- Solution clips for select exercises
- Chapter Test Prep videos
- Short Quick Review videos that recap each section

Full Section Lecture Videos are also available as shorter, objective-level videos. No matter your students' needs—if they missed class, need help solving a problem, or want a short summary of a section's concepts—they can get support whenever they need it, wherever they need it. Much of the video series has been updated in a modern presentation format.



Perform the indicated operations.

$$-12 - [(9 - 2) - (-6 - 3)]$$

$$= -12 - [(9 + (-2)) - (-6 + (-3))]$$

$$= -12 - [(7) - (-9)]$$

$$= -12 - [7 + 9]$$

$$= -12 - 16 = -12 + (-16) = -28$$

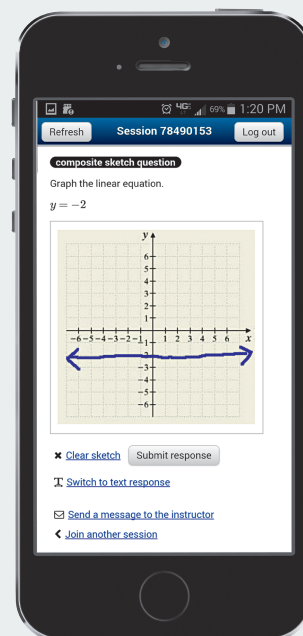

## Foster a Growth Mindset

New! A Mindset module is available in the course, with mindset-focused videos and exercises that encourage students to maintain a positive attitude about learning, value their own ability to grow, and view mistakes as a learning opportunity.

## Get Students Engaged

New! **Learning Catalytics** Learning Catalytics is an interactive student response tool that uses students' smartphones, tablets, or laptops to engage them in more sophisticated tasks and thinking.

In addition to a library of developmental math questions, Learning Catalytics questions created specifically for this text are pre-built to make it easy for instructors to begin using this tool! These questions, which cover prerequisite skills before each section, are noted in the margin of the Annotated Instructor's Edition, and can be found in Learning Catalytics by searching for "LialBeginning#" where # is the chapter number.



# Resources for Success

## Instructor Resources

### Annotated Instructor's Edition

Contains all the content found in the student edition, plus answers to even and odd exercises on the same text page, and Teaching Tips and Classroom Examples throughout the text placed at key points.

*The resources below are available through Pearson's Instructor Resource Center, or from MyLab Math.*

### Instructor's Resource Manual with Tests

Includes mini-lectures for each text section, several forms of tests per chapter—two diagnostic pretests, four free-response and two multiple-choice test forms per chapter, and two final exams.

### Instructor's Solutions Manual

Contains detailed, worked-out solutions to all exercises in the text.

### TestGen®

Enables instructors to build, edit, print, and administer tests using a computerized bank of questions developed to cover all the objectives of the text. TestGen is algorithmically based, allowing instructors to create multiple but equivalent versions of the same question or test with the click of a button. Instructors can also modify test bank questions or add new questions.

### PowerPoint Lecture Slides

Available for download only, these slides present key concepts and definitions from the text. Accessible versions of the PowerPoint slides are also available for students who are vision-impaired.

## Student Resources

### Guided Notebook

This Guided Notebook helps students keep their work organized as they work through their course. The notebook includes:

- Guided Examples that are worked out for students, plus corresponding Now Try This exercises for each text objective.
- Extra practice exercises for every section of the text, with ample space for students to show their work.
- Learning objectives and key vocabulary terms for every text section, along with vocabulary practice problems.

### Student Solutions Manual

Provides completely worked-out solutions to the odd-numbered section exercises and to all exercises in the Now Trys, Relating Concepts, Chapter Reviews, Mixed Review, Chapter Tests, and Cumulative Reviews.