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ANNOTATED INSTRUCTOR'S EDITION

Intermediate Algebra

for College Students

10e

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Pearson

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To my wife, Kathy,
and our sons, Robert and Steven
Allen R. Angel

To my wife, Kristin,
and our sons, Alex, Nick, and Max
Dennis C. Runde

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Preface

Welcome to the 10th edition of *Intermediate Algebra for College Students!* This book has been used by thousands of students and other adults who have never been exposed to algebra or those who have been exposed but need a refresher course. Our primary goal was to write a book that students can read, understand, and enjoy. To achieve this goal we have used short sentences, clear explanations, and many detailed, worked-out examples. We have tried to make the book relevant to college students by using practical applications of algebra throughout the text.

New to This Edition

One of the most important features of the text is its emphasis on readability. The book is very understandable to students at all reading skill levels. The Tenth Edition retains this emphasis and has been revised with a focus on improving accessibility and addressing the learning needs and styles of today's students. To this end, the following changes have been made:

Content Changes

- We've done an extensive review of exercise sets, including an analysis of data analytics on exercise usage, leading to modification of exercises and exercise sets as follows:
  - Exercise sets have been modified to ensure precise graduation from simple to more complex and include more direct matching of the book examples and the corresponding exercises in MyLab Math. This creates a better experience throughout for students as well as making the material in the book better connected to the homework students do.
  - Precise correlation has been made between each odd and even exercise. The odds can be used as examples and solutions are provided, and the evens can be assigned as homework or in MyLab Math.
  - Now Try Exercises are revised, with particular focus on odd–even pairing.
- Chapter openers each include a new video, created by the authors, that explains how the material presented in the chapter is used to solve problems from everyday life. These explanations are carried into the actual solution to one or more exercises that are in the chapter and to other assignable exercises.
- Renewed focus on the Understanding Algebra feature throughout the book. Many Understanding Algebra boxes are new or revised for greater clarity. The new design of the Understand Algebra boxes will make them stand out more.
- The MyLab Math course itself includes extensive enhancements to improve outcomes for students:
  - The addition of Skill Builder exercises
  - Author-developed Sample Assignments that instructors can assign to utilize all of the new exercise enhancements
  - Learning Catalytics can be accessed from the MyLab Math course
  - Fully accessible PowerPoint slides

Features of the Text

Accuracy

Accuracy in a mathematics text is essential. To ensure accuracy in this book, math teachers from around the country have read the pages carefully for typographical errors and have checked all the answers.

Making Connections

Many of our students do not thoroughly grasp new concepts the first time they are presented. In this text we encourage students to make connections. That is, we introduce a concept, then later in the text briefly reintroduce it and build upon it. Often an important concept is used in many sections of the text. Important concepts are also reinforced throughout the text in the Cumulative Review Exercises and Cumulative Review Tests.

Chapter Opening Application

Each chapter begins with a real-life application related to the material covered in the chapter and further illuminated through an author-created video explanation within MyLab Math. By the time students complete the chapter, they should have the knowledge to work the problem.

Goal of This Chapter

This feature on the chapter opener page gives students a preview of the chapter and also indicates where this material will be used again in other chapters of the book. This material helps students see the connections among various topics in the book and the connection to real-world situations.

Keyed Section Objectives

Each section opens with a list of skills that the student should learn in that section. The objectives are then keyed to the appropriate portions of the sections with blue numbers such as 1.

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Problem Solving
Pólya's five-step problem-solving procedure is discussed in Section 1.2. Throughout the book, problem solving and Pólya's problem-solving procedure are emphasized.

Practical Applications
Practical applications of algebra are stressed throughout the text. Students need to learn how to translate application problems into algebraic symbols. The problem-solving approach used throughout this text gives students ample practice in setting up and solving application problems. The use of practical applications motivates students.

Detailed, Worked-Out Examples
A wealth of examples have been worked out in a step-by-step, detailed manner. Important steps are highlighted in color, and no steps are omitted until after the student has seen a sufficient number of similar examples.

Now Try Exercises
In each section, after each example, students are asked to work an exercise that parallels the example given in the text. These Now Try Exercises make the students *active,* rather than passive, learners and they reinforce the concepts as students work the exercises. Through these exercises, students have the opportunity to immediately apply what they have learned. After each example, Now Try Exercises are indicated in orange type such as **Now Try Exercise 27**. They are also indicated in green type in the exercise sets, such as 27.

Study Skills Section
Students taking this course may benefit from a review of essential study skills. Such study skills are essential for success in mathematics. Section 1.1, the first section of the text, discusses such study skills. This section should be very beneficial for your students and should help them to achieve success in mathematics.

Understanding Algebra
Understanding Algebra boxes appear in the margin throughout the text. Placed at key points, Understanding Algebra boxes help students focus on the important concepts and facts that they need to master.

Helpful Hints
The Helpful Hint boxes offer useful suggestions for problem solving and other varied topics. They are set off in a special manner so that students will be sure to read them.

Avoiding Common Errors
Common student errors are illustrated. Explanations of why the shown procedures are incorrect are given. Explanations of how students may avoid such errors are also presented.

Exercise Sets

The exercise sets are broken into three main categories: Warm-Up Exercises, Practice the Skills, and Problem Solving. Many exercise sets also contain Concept/Writing Exercises, Challenge Problems, and/or Group Activities. Each exercise set is graded in difficulty, and the exercises are paired. The early problems help develop the students' confidence, and then students are eased gradually into the more difficult problems. A sufficient number and variety of examples are given in each section for students to successfully complete even the more difficult exercises. The number of exercises in each section is more than ample for student assignments and practice.

Warm-Up Exercises
The exercise sets begin with Warm-Up Exercises. These fill-in-the-blank exercises include an emphasis on vocabulary. They serve as a great warm-up to the homework exercises or as 5-minute quizzes.

Practice the Skills Exercises
The Practice the Skills exercises reinforce the concepts and procedures discussed in the section. These exercises provide students with practice in working problems similar to the examples given in the text. In many sections the Practice the Skills exercises are the main and most important part of the exercise sets.

Problem-Solving Exercises
These exercises help students become better thinkers and problem solvers. Many of these exercises involve real-life applications of algebra. It is important for students to be able to apply what they learn to real-life situations. Many problem-solving exercises help with this.

Concept/Writing Exercises
Most exercise sets include exercises that require students to write out the answers in words. These exercises improve students' understanding and comprehension of the material. Many of these exercises involve problem solving and conceptualization and help develop better reasoning and critical thinking skills.

Challenge Problems
These exercises, which are part of many exercise sets, provide a variety of problems. Many were written to stimulate student thinking. Others provide additional applications of algebra or present material from future sections of the book so that students can see and learn the material on their own before it is covered in class. Others are more challenging than those in the regular exercise set.

Group Activities
Many exercise sets have Group Activity exercises that lead to interesting group discussions. Many students

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learn well in a cooperative learning atmosphere, and these exercises will get students talking mathematics to one another.

Cumulative Review Exercises

All exercise sets (beginning with Section 1.3) contain questions from previous sections in the chapter and from previous chapters. These Cumulative Review Exercises will reinforce topics that were previously covered and help students retain the earlier material while they are learning the new material. For the students' benefit, Cumulative Review Exercises are keyed to the section where the material is covered, using brackets, such as [3.4].

Mid-Chapter Tests

In the middle of each chapter is a Mid-Chapter Test. Students should take each Mid-Chapter Test to make sure they understand the material presented in the chapter up to that point. In the student answers, brackets such as [2.3] are used to indicate the section where the material was first presented.

Chapter Summary

At the end of each chapter is a comprehensive chapter summary that includes important chapter facts and examples illustrating these important facts.

Chapter Review Exercises

At the end of each chapter are review exercises that cover all types of exercises presented in the chapter. The review exercises are keyed using colored numbers and brackets, such as [1.5], to the sections where the material was first introduced.

Chapter Practice Tests

The comprehensive end-of-chapter practice tests enable students to see how well they are prepared for the actual class test. The section where the material was first introduced is indicated in brackets in the student answers.

Cumulative Review Tests

These tests, which appear at the end of each chapter after the first, test the students' knowledge of material from the beginning of the book to the end of that chapter. Students can use these tests for review, as well as for preparation for the final exam. These exams, like the Cumulative Review Exercises, serve to reinforce topics taught earlier. In the answer section, after each answer, the section where that material was covered is given using brackets.

Answers

The *odd-numbered answers* are provided for the exercise sets. *All answers* are provided for the Cumulative Review Exercises, Mid-Chapter Test, Chapter Review Exercises, Chapter Practice Tests, and Cumulative Review Tests. Answers are not provided to students for the Group Activity exercises because we want students to reach agreement by themselves on the answers to these exercises.

Prerequisite

The prerequisite for this course is a working knowledge of elementary algebra. Although some elementary algebra topics are briefly reviewed, students should have a basic understanding of elementary algebra before taking this course.

Modes of Instruction

The format and readability of this book, and its many resources and supplements, lend it to many different modes of instruction. The constant reinforcement of concepts will result in greater understanding and retention of the material by your students.

The features of the text and its supplements make it suitable for many types of instructional modes, including:

- face-to-face courses
- hybrid or blended courses
- emporium-based courses
- online instruction
- accelerated courses
- self-paced instruction
- inverted classrooms
- cooperative or group study

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Resources for Success

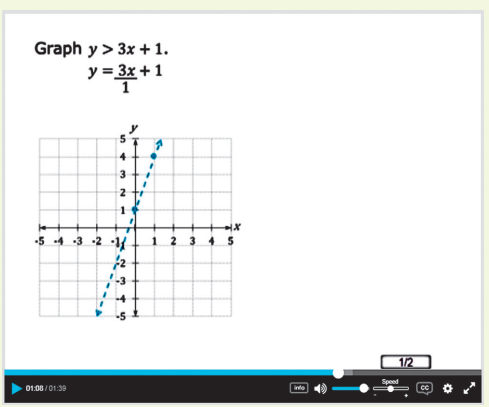
Get the Most out of MyLab Math for *Intermediate Algebra,* Tenth Edition by Allen Angel and Dennis Runde

The Angel/Runde team has helped thousands of students learn algebra through clear examples and concise language. With this revision, the authors have continued their hallmark clear writing style. This, along with new media resources and revamped exercise sets, provides students with a comprehensive learning and practice environment in MyLab Math. Bringing the authors' voice and approach into the MyLab course gives students the motivation, understanding, and skill set they need to master algebra.

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

Support and Motivate with Video Resources

NEW! Chapter Opener Videos highlight how the math students are about to learn can be applied and used in the real world. Providing an interesting and useful overview of the chapter, these videos can be assigned or even used in the classroom to kick off a lecture.



Instructional Videos walk students through concepts and examples in a modern presentation format. Videos are accessible in many ways, including from the eText pages and from within homework exercises and can also be assigned in a media assignment to encourage students to watch them. All videos can be played from any laptop or mobile device to provide support even on the go.

Chapter Test Prep Videos help students during their most teachable moment—when they are preparing for a test. The videos provide step-by-step solutions for every exercise found in the text's Chapter Tests.

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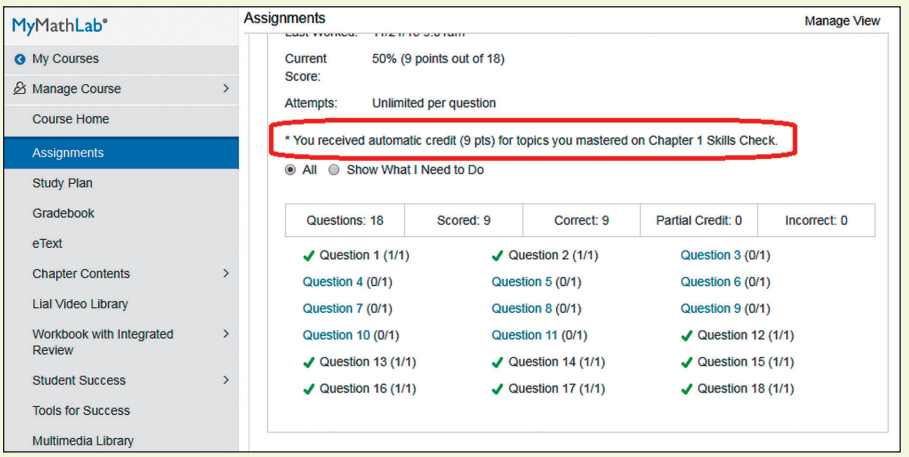
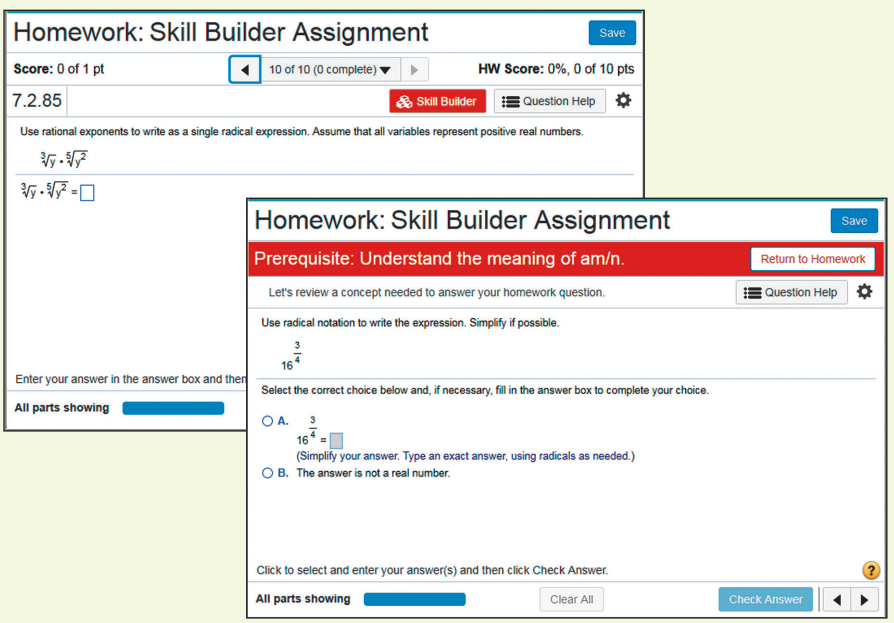
Personalize Students' Learning

One size does not fit all, especially when it comes to developmental math students. Instructors have the option to personalize students' experiences in the MyLab course with new tools, including personalized homework and Skill Builder.

Personalized Homework delivers assignments to students tailored to their understanding of topics based on their performance on a test or quiz. This way, students can focus on just the topics they have not yet mastered and receive credit for the topics they mastered on the quiz or test.





New! Skill Builder assignments offer just-in-time 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 needed.

Build Your Course More Easily

Enhanced Sample Assignments make course setup easier by giving instructors a starting point for each chapter. Each assignment has been carefully curated for this specific text by author Dennis Runde based on his and his students' experiences with MyLab Math and has been crafted to include a thoughtful mix of question types.

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Student and Instructor Resources

STUDENT RESOURCES

Student Solutions Manual
Provides complete worked-out solutions to
- the odd-numbered section exercises
- all exercises in the Mid-Chapter Tests, Chapter Reviews, Chapter Practice Tests, and Cumulative Review Tests

ISBN: 978-0-13-479484-6

Student Workbook
- Extra practice exercises for every section of the text with ample space for students to show their work

ISBN: 978-0-13-479490-7

Video Program
The Angel/Runde video program, available through MyLab Math, includes:
- Objective-based videos
- Example-based videos covering most examples and related end of section exericses
- Chapter Test Prep videos that offer step-by-step solutions to exercises in Chapter Tests
- Videos are captioned, and can be viewed on any mobile device

INSTRUCTOR RESOURCES

Annotated Instructor's Edition
Contains all the content found in the student edition, plus the following:
- Answers to exercises on the same text page with graphing answers in the Graphing Answer section at the back of the text
- Instructor Example provided in the margin paired with each student example

Instructor's Resource Manual with Tests and Mini-Lectures
- Mini-lectures for each text section
- Several forms of test per chapter (free response and multiple choice)
- Answers to all items
- Available for download from pearson.com and in MyLab Math

Instructor's Solutions Manual
- Provides complete worked-out solutions to all section exercises
- Available for download from pearson.com and in MyLab Math

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.
- 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.

MyLab Math Online Course (access code required)
MyLab Math is the world's leading homework, tutorial, and assessment program. It creates personalized learning experiences for students and provides powerful tools for instructors. Learn more about MyLab Math at pearson.com/mylab/math.

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We thank our spouses, Kathy Angel and Kris Runde, for their support and encouragement throughout the project. We are grateful for their wonderful support and understanding while we worked on the book.

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Sample Preface. Not for Distribution.

To the Student

Algebra is a course that requires active participation. You must read the text and pay attention in class, and, most importantly, you must work the exercises. The more exercises you work, the better.

The text was written with you in mind. Short, clear sentences are used, and many examples are given to illustrate specific points. The text stresses useful applications of algebra. Hopefully, as you progress through the course, you will come to realize that algebra is not just another math course that you are required to take, but a course that offers a wealth of useful information and applications.

The boxes marked **Understanding Algebra** should be studied carefully. They emphasize concepts and facts that you need to master to succeed. **Helpful Hints** should be studied carefully, for they stress important information. Be sure to study **Avoiding Common Errors** boxes. These boxes point out common errors and provide the correct procedures for doing these problems.

After each example you will see a Now Try Exercise reference, such as **Now Try Exercise 27**. The exercise indicated is very similar to the example given in the book. You may wish to try the indicated exercise after you read the example to make sure you truly understand the example. In the exercise set, the Now Try exercises are written in green, such as 27.

Each objective is accompanied by a video lecture that covers the concepts discussed in that section, as well as additional example problems. These videos may be accessed through MyLab Math.

Some questions you should ask your professor early in the course include: What supplements are available for use? Where can help be obtained when the professor is not available? Supplements that may be available include the Student Solutions Manual; the objective videos; and the Chapter Test Prep Videos, all of which are available from within this book's MyLab Math course. All these items are discussed under the heading of Supplements in Section 1.1 and listed in the Preface.

You may wish to form a study group with other students in your class. Many students find that working in small groups provides an excellent way to learn the material. By discussing and explaining the concepts and exercises to one another, you reinforce your own understanding. Once guidelines and procedures are determined by your group, make sure to follow them.

One of the first things you should do is to read Section 1.1, Study Skills for Success in Mathematics. Read this section slowly and carefully, and pay particular attention to the advice and information given. Occasionally, refer back to this section. This could be the most important section of the book. Pay special attention to the material on doing your homework and on attending class.

At the end of all exercise sets (beginning with Section 1.3) are **Cumulative Review Exercises.** You should work these problems on a regular basis, even if they are not assigned. These problems are from earlier sections and chapters of the text, and they will refresh your memory and reinforce those topics. If you have a problem when working these exercises, read the appropriate section of the text or study your notes that correspond to that material. The section of the text where the Cumulative Review Exercise was introduced is indicated in brackets, [ ], to the left of the exercise. After reviewing the material, if you still have a problem, make an appointment to see your professor. Working the Cumulative Review Exercises throughout the semester will also help prepare you to take your final exam.

Near the middle of each chapter is a **Mid-Chapter Test.** You should take each Mid-Chapter Test to make sure you understand the material up to that point. The section where the material was first introduced is given in brackets after the answer in the answer section of the book.

At the end of each chapter are a **Chapter Summary, Chapter Review Exercises,** a **Chapter Practice Test,** and a **Cumulative Review Test.** Before each examination you should review this material carefully and take the Chapter Practice Test (you may want to review the *Chapter Test Prep Videos* also). If you do well on the Chapter Practice Test, you should do well on the class test. The questions in the Review Exercises are marked to indicate the section in which that material was first introduced. If you have a problem with a Review Exercise question, reread the section indicated. You may also wish to take the Cumulative Review Test that appears at the end of every chapter (starting with Chapter 2).

In the back of the text there is an **answer section** that contains the answers to the *odd-numbered* exercises, including the Challenge Problems. Answers to *all* Cumulative Review Exercises, Mid-Chapter Tests, Chapter Review Exercises, Chapter Practice Tests, and Cumulative Review Tests are provided. Answers to the Group Activity exercises are not provided, for we wish students to reach agreement by themselves on answers to these exercises. The answers should be used only to check your work. For the Mid-Chapter Tests, Chapter Practice Tests, and Cumulative Review Tests, after each answer the section number where that type of exercise was covered is provided.

We have tried to make this text as clear and error free as possible. No text is perfect, however. If you find an error in the text, or an example or section that you believe can be improved, we would greatly appreciate hearing from you. If you enjoy the text, we would also appreciate hearing from you. You can submit comments to math@pearson.com, subject for Allen Angel and Dennis Runde.

Allen R. Angel
Dennis C. Runde