BEGINNING ALGEBRA

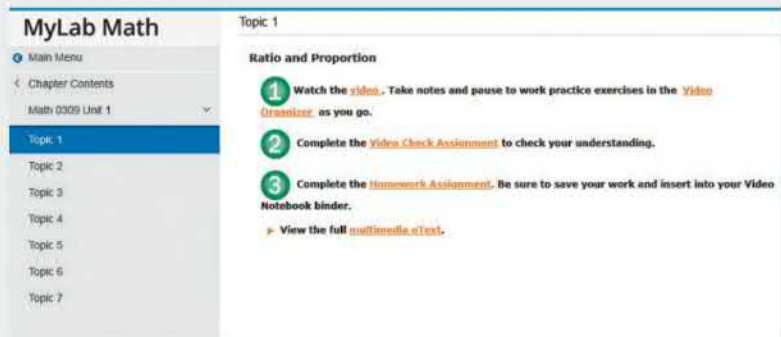## LIAL / HORNSBY / MCGINNIS

thirteenth edition

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Get the Most Out of
MyLab Math

When it comes to developmental math, we know one size does not fit all. Pearson's solutions offer market-leading content written by our author-educators, tightly integrated with the #1 choice in digital learning-MyLab Math. MyLab Math is the teaching and learning platform that empowers instructors to reach every student. By combining trusted author content with digital tools and a flexible platform, MyLab Math personalizes the learning experience and improves results for each student.
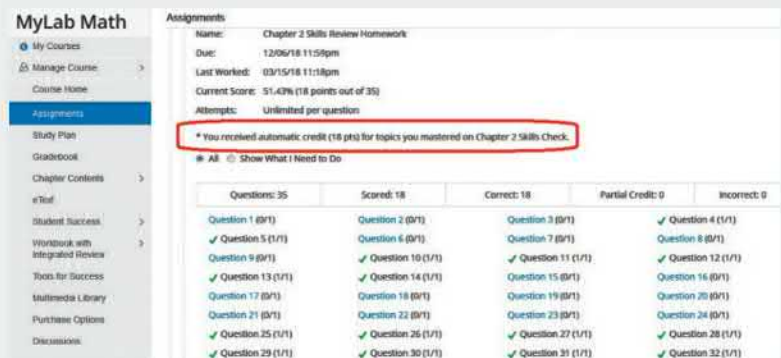
- **Flexible Platform—** Your course is unique. Whether you'd like to build your own assignments, structure students' work with a learning path, or set prerequisites, you have the flexibility to easily create *your* course to fit *your* needs.

MyLab Math

- Main Menu
- Chapter Contents
- Math 0309 Unit 1
- Topic 1
- Topic 2
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- Topic 4
- Topic 5
- Topic 6
- Topic 7

Topic 1

Ratio and Proportion

1. Watch the video. Take notes and pause to work practice exercises in the Video Organizer as you go.

2. Complete the Video Check Assignment to check your understanding.

3. Complete the Homework Assignment. Be sure to save your work and insert into your Video Notebook binder.

▶ View the full multimedia eText.

- **Personalized Learning—**Each student learns at a different pace. Personalized learning pinpoints the areas each student needs to practice, giving every student the support they need—when and where they need it—to be successful. A variety of options are available to personalize learning in MyLab Math:

  - With **Personalized Homework**, students take a quiz or test and receive a subsequent homework assignment that is personalized based on their performance. This way, students can focus on just the topics they have not yet mastered.

MyLab Math

- My Courses
- Manage Course
- Course Home
- Assignments
- Study Plan
- Gradebook
- Chapter Contents
- eText
- Student Success
- Workbook with Integrated Review
- Tools for Success
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- Discussions

Assignments

Name:	Chapter 2 Skills Review Homework
Due:	12/06/18 11:59pm
Last Worked:	03/15/18 11:18pm
Current Score:	51.43% (18 points out of 35)
Attempts:	Unlimited per question

* You received automatic credit (18 pts) for topics you mastered on Chapter 2 Skills Check.

● All ○ Show What I Need to Do

Questions: 35	Scored: 18	Correct: 18	Partial Credit: 0	Incorrect: 0
Question 1 (0/1)	Question 2 (0/1)	Question 3 (0/1)	Question 4 (1/1)
Question 5 (1/1)	Question 6 (0/1)	Question 7 (0/1)	Question 8 (0/1)
Question 9 (0/1)	Question 10 (1/1)	Question 11 (1/1)	Question 12 (1/1)
Question 13 (1/1)	Question 14 (1/1)	Question 15 (0/1)	Question 16 (0/1)
Question 17 (0/1)	Question 18 (0/1)	Question 19 (0/1)	Question 20 (0/1)
Question 21 (0/1)	Question 22 (0/1)	Question 23 (0/1)	Question 24 (0/1)
Question 25 (1/1)	Question 26 (1/1)	Question 27 (1/1)	Question 28 (1/1)
Question 29 (1/1)	Question 30 (1/1)	Question 31 (1/1)	Question 32 (1/1)

  - **Skill Builder** offers adaptive practice that is designed to increase students' ability to complete their assignments. By monitoring student performance on their homework, Skill Builder adapts to each student's needs and provides just-in-time, in-assignment practice to help them improve their proficiency of key learning objectives. Available for select MyLab™ courses.

Visit pearson.com/mylab/math and click Get Trained to make sure you're getting the most out of MyLab Math.

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EDITION
13

Beginning Algebra

Margaret L. Lial
American River College

John Hornsby
University of New Orleans

Terry McGinnis

P Pearson

Pearson

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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

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.

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.
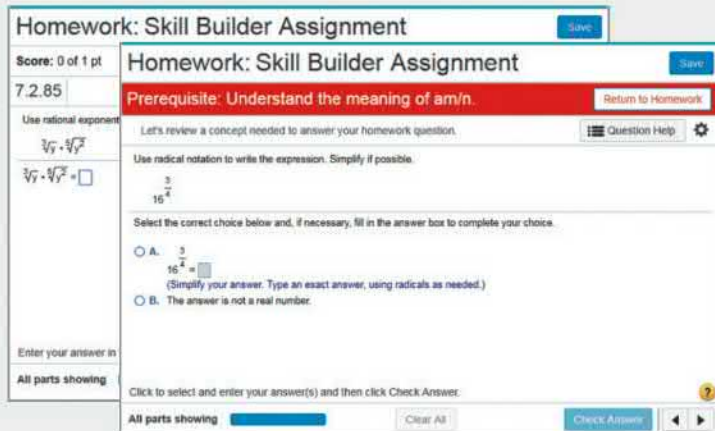
Resources for Success

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.

$$-12 - [(9-2)-(-6-3)]$$
$$= -12 - [(9+(-2))-(-6+(-3))]$$
$$= -12 - [(7)-(-9)]$$
$$= -12 - [7+9]$$
$$= -12 - 16 = -12 + (-16) = -28$$
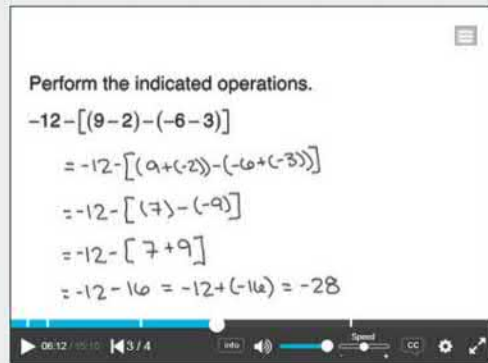
Foster a Growth Mindset

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.

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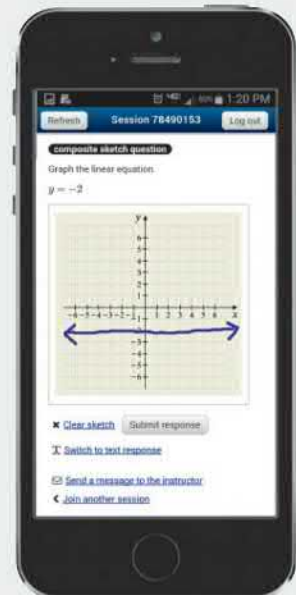
Resources for Success

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.

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Using Your Math Text

Your text is a valuable resource. You will learn more if you make full use of the features it offers.

General Features of This Text

Locate each feature, and complete any blanks.

- **Table of Contents**   This is located at the front of the text.

  Find it and mark the chapters and sections you will cover, as noted on your course syllabus.

- **Answer Section**   This is located at the back of the text.

  Tab this section so you can easily refer to it when doing homework or reviewing for tests.

- **List of Formulas**   This helpful list of geometric formulas, along with review information on triangles and angles, is found at the back of the text.

  The formula for the volume of a cube is _____.

Specific Features of This Text

Look through Chapter 1 or 2 and give the number of a page that includes an example of each of the following specific features.

- **Objectives**   The objectives are listed at the beginning of each section and again within the section as the corresponding material is presented. Once you finish a section, ask yourself if you have accomplished them. *See page _____.*

- **Vocabulary List**   Important vocabulary is listed at the beginning of each section. You should be able to define these terms when you finish a section. *See page _____.*

- **Now Try Exercises**   These margin exercises allow you to immediately practice the material covered in the examples and prepare you for the exercises. Check your results using the answers at the bottom of the page. *See page _____.*

- **Pointers**   These small, shaded balloons provide on-the-spot warnings and reminders, point out key steps, and give other helpful tips. *See page _____.*

- **Cautions**   These provide warnings about common errors that students often make or trouble spots to avoid. *See page _____.*

- **Notes**   These provide additional explanations or emphasize other important ideas. *See page _____.*

- **Problem-Solving Hints**   These boxes give helpful tips or strategies to use when you work applications. Look for them beginning in Chapter 2. *See page _____.*

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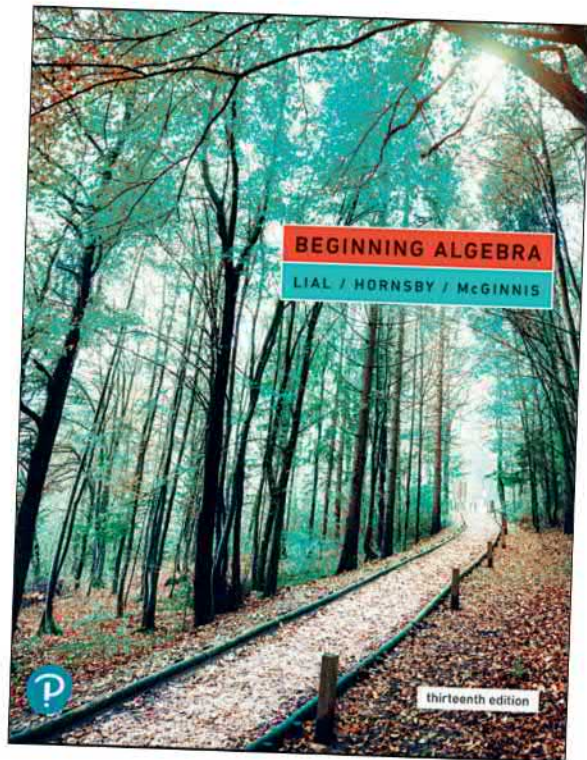
Reading Your Math Text

Take time to read each section and its examples before doing your homework. You will learn more and be better prepared to work the exercises your instructor assigns.

Approaches to Reading Your Math Text

Student A learns best by listening to her teacher explain things. She "gets it" when she sees the instructor work problems. She previews the section before the lecture, so she knows generally what to expect. **Student A carefully reads the section in her text *AFTER* she hears the classroom lecture on the topic.**

Student B learns best by reading on his own. He reads the section and works through the examples before coming to class. That way, he knows what the teacher is going to talk about and what questions he wants to ask. **Student B carefully reads the section in his text *BEFORE* he hears the classroom lecture on the topic.**

Which of these reading approaches works best for you—that of Student A or Student B?

Tips for Reading Your Math Text

- **Turn off your cell phone and the TV.** You will be able to concentrate more fully on what you are reading.

- **Survey the material.** Glance over the assigned material to get an idea of the "big picture." Look at the list of objectives to see what you will be learning.

- **Read slowly.** Read only one section—or even part of a section—at a sitting, with paper and pencil in hand.

- **Pay special attention to important information given in colored boxes or set in bold-face type.** Highlight any additional information you find helpful.

- **Study the examples carefully.** Pay particular attention to the blue side comments and any pointer balloons.

- **Do the Now Try exercises in the margin on separate paper as you go.** These problems mirror the examples and prepare you for the exercise set. Check your answers with those given at the bottom of the page.

- **Make study cards as you read.** Make cards for new vocabulary, rules, procedures, formulas, and sample problems.

- **Mark anything you don't understand.** *ASK QUESTIONS* in class—everyone will benefit. Follow up with your instructor, as needed.

Now **TRY THIS**

Think through and answer each question.

1. Which two or three reading tips given above will you try this week?

2. Did the tips you selected improve your ability to read and understand the material? Explain.

Taking Lecture Notes

Come to class prepared.

- Bring paper, pencils, notebook, text, completed homework, and any other materials you need.

- Arrive 10–15 minutes early if possible. Use the time before class to review your notes or study cards from the last class period.

- Select a seat carefully so that you can hear and see what is going on.

Study the set of sample math notes given at the right.

- **Include the date and the title** of the day's lecture topic.

- **Include definitions,** written here in parentheses—don't trust your memory.

- **Skip lines and write neatly** to make reading easier.

- **Emphasize direction words** (like *evaluate, simplify,* or *solve*) with their explanations.

- **Mark important concepts with stars, underlining, etc.**

- **Use two columns,** which allows an example and its explanation to be close together.

- **Use brackets and arrows** to clearly show steps, related material, etc.

- **Highlight any material and/or information that your instructor emphasizes.** Instructors often give "clues" about material that will definitely be on an exam.

Consider using a three-ring binder to organize your notes, class handouts, and completed homework.

January 12

Exponents

Exponents used to show repeated multiplication.

$3 \cdot 3 \cdot 3 \cdot 3$ can be written 3^4 ← exponent (how many times it's multiplied)

base (the number being multiplied)

Read 3^2 as 3 to the 2nd power or 3 squared

3^3 as 3 to the 3rd power or 3 cubed

3^4 as 3 to the 4th power

etc.

Simplifying an expression with exponents
→ actually do the repeated multiplication

2^3 means $2 \cdot 2 \cdot 2$ and $2 \cdot 2 \cdot 2 = 8$

☆ Careful! 5^2 means $5 \cdot 5$ NOT $5 \cdot 2$

so $5^2 = 5 \cdot 5 = 25$ BUT $5^2 \neq 10$

Example	Explanation
Simplify $2^4 \cdot 3^2$	Exponents mean <u>multiplication</u>.
$2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3$	Use 2 as a factor 4 times. Use 3 as a factor 2 times.
$16 \cdot 9$	$2 \cdot 2 \cdot 2 \cdot 2$ is 16 $3 \cdot 3$ is 9 → $16 \cdot 9$ is 144
144	Simplified result is 144 (no exponents left)

Now TRY THIS

With a study partner or in a small group, compare lecture notes. Then answer each question.

1. What are you doing to show main points in your notes (such as boxing, using stars, etc.)?

2. In what ways do you set off explanations from worked problems and subpoints (such as indenting, using arrows, circling, etc.)?

3. What new ideas did you learn by examining your classmates' notes?

4. What new techniques will you try when taking notes in future lectures?

Completing Your Homework

You are ready to do your homework **AFTER** you have read the corresponding text section and worked through the examples and Now Try exercises.

Homework Tips

- **Keep distractions and potential interruptions to a minimum.** Turn off your cell phone and the TV. Find a quiet, comfortable place to work, away from a lot of other people, so you can concentrate on what you are doing.

- **Review your class notes.** Pay particular attention to anything your instructor emphasized during the lecture on this material.

- **Survey the exercise set.** Glance over the problems that your instructor has assigned to get a general idea of the types of exercises you will be working. Skim directions, and note any references to section examples.

- **Work problems neatly.** NEVER do your math homework in pen. Use pencil and write legibly, so others can read your work. Skip lines between steps. Clearly separate problems from each other.

- **Show all your work.** It is tempting to take shortcuts. Include ALL steps.

- **Check your work frequently to make sure you are on the right track.** It is hard to unlearn a mistake. For all odd-numbered problems, answers are given in the back of the text.

- **If you have trouble with a problem, refer to the corresponding worked example in the section.** The exercise directions will often reference specific examples to review. Pay attention to every line of the worked example to see how to get from step to step.

- **If you have trouble with an even-numbered problem, work the corresponding odd-numbered problem.** Check your answer in the back of the text, and apply the same steps to work the even-numbered problem.

- **If you have genuinely tried to work a problem but have not been able to complete it in a *reasonable* amount of time, it's ok to STOP.** Mark these problems. Ask for help at your school's tutor center or from fellow classmates, study partners, or your instructor.

- **Do some homework problems every day.** This is a good habit, even if your math class does not meet each day.

Now TRY THIS

Think through and answer each question.

1. What is your instructor's policy regarding homework?

2. Think about your current approach to doing homework. Be honest in your assessment.

    (a) What are you doing that is working well?

    (b) What improvements could you make?

3. Which one or two homework tips will you try this week?

4. In the event that you need help with homework, what resources are available? When does your instructor hold office hours?

Using Study Cards

You may have used "flash cards" in other classes. In math, "study cards" can help you remember terms and definitions, procedures, and concepts. Use study cards to

- Help you understand and learn the material;
- Quickly review when you have a few minutes;
- Review before a quiz or test.

One of the advantages of study cards is that you learn the material while you are making them.

Vocabulary Cards

Put the word and a page reference on the front of the card. On the back, write the definition, an example, any related words, and a sample problem (if appropriate).

Front of Card

Integers   *p. 43*

Back of Card

Def: The natural numbers   {1, 2, 3, 4, ...}
    their opposites   {-1, -2, -3, -4, ...}
    and 0.   {0}
Integers   { ... , -3, -2, -1, 0, 1, 2, 3, ...}

→ No fractions, decimals, roots
→ Related word: rational numbers

Procedure ("Steps") Cards

Write the name of the procedure on the front of the card. Then write each step in words. On the back of the card, put an example showing each step.

Front of Card

Evaluating Absolute Value (Simplifying)   *p. 48*

1. Work inside absolute value bars first (like working inside parentheses).
2. Find the absolute value (*never* negative).
3. A negative sign *in front* of the absolute value bar is NOT affected, so keep it!

Back of Card

Examples:

Simplify $|10 - 6|$ Work inside: $10 - 6 = 4$
     $|4| = 4$ Absolute value of 4 is 4.

Simplify $-|-12|$ Absolute value of -12 is 12.
     -12 Keep negative sign that was in front.

Practice Problem Cards

Write a problem with direction words (like *solve, simplify*) on the front of the card, and work the problem on the back. Make one for each type of problem you learn.

Front of Card

Solve $4(3x - 4) = 2(6x - 9) + 2$.   *p. 121*

Back of Card

$4(3x - 4) = 2(6x - 9) + 2$
$12x - 16 = 12x - 18 + 2$ Distributive property
$12x - 16 = 12x - 16$ Combine like terms.
$12x - 16 + 16 = 12x - 16 + 16$ Add 16.
$12x = 12x$ Combine like terms.
$12x - 12x = 12x - 12x$ Subtract 12x.
When both sides of an equation are the same, it is called an identity. $0 = 0$ True
Any real number will work, so the solution set is {all real numbers} (not just {0}).

Now TRY THIS

Make a vocabulary card, a procedure card, and a practice problem card for material that you are learning or reviewing.

Managing Your Time

Many college students juggle a busy schedule and multiple responsibilities, including school, work, and family demands.

Time Management Tips

- **Read the syllabus for each class.** Understand class policies, such as attendance, late homework, and make-up tests. Find out how you are graded.

- **Make a semester or quarter calendar.** Put test dates and major due dates for *all* your classes on the *same* calendar. Try using a different color for each class.

- **Make a weekly schedule.** After you fill in your classes and other regular responsibilities, block off some study periods. Aim for 2 hours of study for each 1 hour in class.

- **Choose a regular study time and place** (such as the campus library). Routine helps.

- **Keep distractions to a minimum.** Get the most out of the time you have set aside for studying by limiting interruptions. Turn off your cell phone. Take a break from social media. Avoid studying in front of the TV.

- **Make "to-do" lists.** Number tasks in order of importance. To see your progress, cross off tasks as you complete them.

- **Break big assignments into smaller chunks.** Don't wait until the last minute to begin big assignments or to study for tests. Make deadlines for each smaller chunk so that you stay on schedule.

- **Take breaks when studying.** Do not try to study for hours at a time. Take a 10-minute break each hour or so.

- **Ask for help when you need it.** Talk with your instructor during office hours. Make use of the learning/tutoring center, counseling office, or other resources available at your school.

Now TRY THIS

Work through the following, answering any questions.

1. Evaluate when and where you are currently studying. Are these places quiet and comfortable? Are you studying when you are most alert?

2. Which of the above tips will you try this week to improve your time management?

3. Create a weekly calendar that includes your class times, study times, and other family and/or work obligations.

4. Once the week is over, evaluate how these tips worked. Did you use your calendar and stick to it? What will you do differently next week?

5. Ask classmates, friends, and/or family members for tips on how they manage their time. Try any that you think might work for you.

Reviewing a Chapter

Your text provides extensive material to help you prepare for quizzes or tests in this course. Refer to the **Chapter 1 Summary** as you read through the following techniques.

Techniques for Reviewing a Chapter

- **Review the Key Terms and any New Symbols.** Make a study card for each. Include a definition, an example, a sketch (if appropriate), and a section or page reference.

- **Take the Test Your Word Power quiz** to check your understanding of new vocabulary. The answers immediately follow.

- **Read the Quick Review.** Pay special attention to the headings. Study the explanations and examples given for each concept. Try to think about the whole chapter.

- **Reread your lecture notes.** Focus on what your instructor has emphasized in class, and review that material in your text.

- **Look over your homework.** Pay special attention to any trouble spots.

- **Work the Review Exercises.** They are grouped by section. Answers are included at the back of the text.

  - Pay attention to direction words, such as *simplify, solve,* and *evaluate.*

  - Are your answers exact and complete? Did you include the correct labels, such as $, cm^2, ft, etc.?

  - Make study cards for difficult problems.

- **Work the Mixed Review Exercises.** They are in random order. Check your answers in the answer section at the back of the text.

- **Take the Chapter Test under test conditions.**

  - Time yourself.

  - Use a calculator or notes only if your instructor permits them on tests.

  - Take the test in one sitting.

  - Show all your work.

  - Check your answers in the answer section. Section references are provided.

Reviewing a chapter takes time. Avoid rushing through your review in one night. Use the suggestions over a few days or evenings to better understand and remember the material.

Now TRY THIS

Follow these reviewing techniques to prepare for your next test. Then answer each question.

1. How much time did you spend reviewing for your test? Was it enough?

2. Which reviewing techniques worked best for you?

3. Are you investing enough time and effort to really *know* the material and set yourself up for success? Explain.

4. What will you do differently when reviewing for your next test?
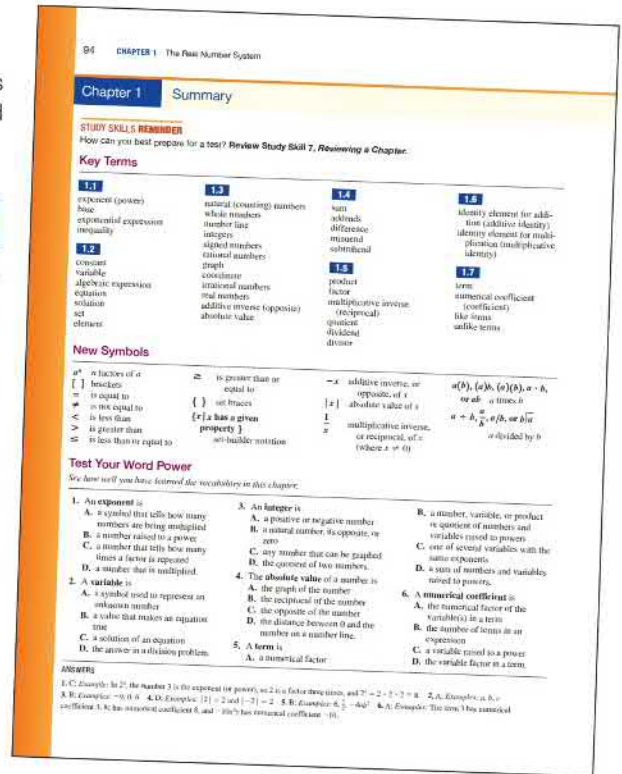
Taking Math Tests

Techniques to Improve Your Test Score	Comments
Come prepared with a pencil, eraser, paper, and calculator, if allowed.	Working in pencil lets you erase, keeping your work neat.
Scan the entire test, note the point values of different problems, and plan your time accordingly.	To do 20 problems in 50 minutes, allow $50 \div 20 = 2.5$ minutes per problem. Spend less time on easier problems.
Do a "knowledge dump" when you get the test. Write important notes, such as formulas, in a corner of the test for reference.	Writing down tips and other special information that you've learned at the beginning allows you to relax as you take the test.
Read directions carefully, and circle any significant words. When you finish a problem, reread the directions. Did you do what was asked?	Pay attention to any announcements written on the board or made by your instructor. Ask if you don't understand something.
Show all your work. Many teachers give partial credit if some steps are correct, even if the final answer is wrong. **Write neatly.**	If your teacher can't read your writing, you won't get credit for it. If you need more space to work, ask to use extra paper.
Write down anything that might help solve a problem: a formula, a diagram, etc. If necessary, circle the problem and come back to it later. Do *not* erase anything you wrote down.	If you know even a little bit about a problem, write it down. The answer may come to you as you work on it, or you may get partial credit. Don't spend too long on any one problem.
If you can't solve a problem, make a guess. Do not change it unless you find an obvious mistake.	Have a good reason for changing an answer. Your first guess is usually your best bet.
Check that the answer to an application problem is reasonable and makes sense. Reread the problem to make sure you've answered the question.	Use common sense. Can the father really be seven years old? Would a month's rent be $32,140? Remember to label your answer if needed: $, years, inches, etc.
Check for careless errors. Rework each problem without looking at your previous work. Then compare the two answers.	Reworking a problem from the beginning forces you to rethink it. If possible, use a different method to solve the problem.

Now **TRY THIS**

Think through and answer each question.

1. What two or three tips will you try when you take your next math test?

2. How did the tips you selected work for you when you took your math test?

3. What will you do differently when taking your next math test?

4. Ask several classmates how they prepare for math tests. Did you learn any new preparation ideas?

Analyzing Your Test Results

An exam is a learning opportunity—learn from your mistakes. After a test is returned, do the following:

- **Note what you got wrong and why you had points deducted.**

- **Figure out how to solve the problems you missed.** Check your text or notes, or ask your instructor. Rework the problems correctly.

- **Keep all quizzes and tests that are returned to you.** Use them to study for future tests and the final exam.

Typical Reasons for Errors on Math Tests

1. You read the directions wrong.

2. You read the question wrong or skipped over something.

3. You made a computation error.

4. You made a careless error. (For example, you incorrectly copied a correct answer onto a separate answer sheet.)

5. Your answer was not complete.

6. You labeled your answer wrong. (For example, you labeled an answer "ft" instead of "ft^2.")

7. You didn't show your work.

These are test-taking errors. They are easy to correct if you read carefully, show all your work, proofread, and double-check units and labels.

8. You didn't understand a concept.

9. You were unable to set up the problem (in an application).

10. You were unable to apply a procedure.

These are test preparation errors. Be sure to practice all the kinds of problems that you will see on tests.

Now TRY THIS

Work through the following, answering any questions.

1. Use the sample charts at the right to track your test-taking progress. Refer to the tests you have taken so far in your course. For each test, check the appropriate box in the charts to indicate that you made an error in a particular category.

2. What test-taking errors did you make? Do you notice any patterns?

3. What test preparation errors did you make? Do you notice any patterns?

4. What will you do to avoid these kinds of errors on your next test?

▼ **Test-Taking Errors**

Test	Read directions wrong	Read question wrong	Made computation error	Made careless error	Answer not complete	Answer labeled wrong	Didn't show work
1							
2							
3							

▼ **Test Preparation Errors**

Test	Didn't understand concept	Didn't set up problem correctly	Couldn't apply a procedure
1			
2			
3			

Preparing for Your Math Final Exam

Your math final exam is likely to be a comprehensive exam, which means it will cover material from the entire term. **One way to prepare for it now is by working a set of Cumulative Review Exercises** each time your class finishes a chapter. This continual review will help you remember concepts and procedures as you progress through the course.

Final Exam Preparation Suggestions

1. **Figure out the grade you need to earn on the final exam to get the course grade you want.** Check your course syllabus for grading policies, or ask your instructor if you are not sure.

2. **Create a final exam week plan.** Set priorities that allow you to spend extra time studying. This may mean making adjustments, in advance, in your work schedule or enlisting extra help with family responsibilities.

3. **Use the following suggestions to guide your studying.**

   - **Begin reviewing several days before the final exam.** DON'T wait until the last minute.

   - **Know exactly which chapters and sections will be covered on the exam.**

   - **Divide up the chapters.** Decide how much you will review each day.

   - **Keep returned quizzes and tests. Use them to review.**

   - **Practice all types of problems. Use the Cumulative Review Exercises** at the end of each chapter in your text beginning in Chapter 1. All answers, with section references, are given in the answer section at the back of the text.

   - **Review or rewrite your notes** to create summaries of important information.

   - **Make study cards for all types of problems.** Carry the cards with you, and review them whenever you have a few minutes.

   - **Take plenty of short breaks as you study to reduce physical and mental stress.** Exercising, listening to music, and enjoying a favorite activity are effective stress busters.

   Finally, *DON'T* stay up all night the night before an exam—*get a good night's sleep*.

Now TRY THIS

Think through and answer each question.

1. How many points do you need to earn on your math final exam to get the grade you want in your course?

2. What adjustments to your usual routine or schedule do you need to make for final exam week? List two or three.

3. Which of the suggestions for studying will you use as you prepare for your math final exam? List two or three.

4. Analyze your final exam results. How will you prepare differently next time?

PREALGEBRA REVIEW

R.1 Fractions
R.2 Decimals and Percents

<div style="text-align:right">**R**</div>

R.1   Fractions

OBJECTIVES

1 Write numbers in factored form.
2 Write fractions in lowest terms.
3 Convert between improper fractions and mixed numbers.
4 Multiply and divide fractions.
5 Add and subtract fractions.
6 Solve applied problems that involve fractions.
7 Interpret data in a circle graph.

The numbers used most often in everyday life are the **natural (counting) numbers,**

$$1, 2, 3, 4, \ldots ,$$

the **whole numbers,**

$$0, 1, 2, 3, 4, \ldots ,$$
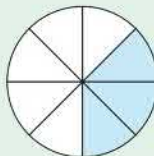
The three dots, or *ellipsis points,* indicate that each list of numbers continues in the same way indefinitely.

and **fractions,** such as

$$\frac{1}{2}, \quad \frac{2}{3}, \quad \text{and} \quad \frac{11}{12}.$$

The parts of a fraction are named as shown.

$$\text{Fraction bar} \rightarrow \frac{3}{8} \quad \begin{array}{l} \leftarrow \text{Numerator} \\ \leftarrow \text{Denominator} \end{array}$$

The fraction bar represents division $\left(\frac{a}{b} = a \div b\right).$

> **NOTE**   Fractions are a way to represent parts of a whole. In a fraction, the **numerator** gives the number of parts being represented. The **denominator** gives the total number of equal parts in the whole. See **FIGURE 1.**
>
>
>
> The shaded region represents $\frac{3}{8}$ of the circle.
>
> **FIGURE 1**

VOCABULARY

☐ natural (counting) numbers
☐ whole numbers
☐ fractions
☐ numerator
☐ denominator
☐ proper fraction
☐ improper fraction
☐ factors
☐ product
☐ prime number
(continued)

A fraction is classified as being either a **proper fraction** or an **improper fraction.**

Proper fractions	$\dfrac{1}{5}, \quad \dfrac{2}{7}, \quad \dfrac{9}{10}, \quad \dfrac{23}{25}$	Numerator **is less than** denominator. Value is less than 1.
Improper fractions	$\dfrac{3}{2}, \quad \dfrac{5}{5}, \quad \dfrac{11}{7}, \quad \dfrac{28}{4}$	Numerator **is greater than or equal to** denominator. Value is greater than or equal to 1.

1

OBJECTIVE 1 Write numbers in factored form.

In the statement $3 \times 6 = 18$, the numbers 3 and 6 are **factors** of 18. Other factors of 18 include 1, 2, 9, and 18. The result of the multiplication, 18, is the **product.** We can represent the product of two numbers, such as 3 and 6, in several ways.

$$3 \times 6, \quad 3 \cdot 6, \quad (3)(6), \quad (3)6, \quad 3(6) \qquad \text{Products}$$

We *factor* a number by writing it as the product of two or more numbers.

Multiplication
$$3 \cdot 6 = 18$$
↑ ↑   ↑
Factors Product

Factoring
$$18 = 3 \cdot 6$$
↑   ↑ ↑
Product Factors

Factoring is the reverse of multiplying two numbers to get the product.

> **NOTE** In algebra, a raised dot · is often used instead of the × symbol to indicate multiplication because × may be confused with the letter *x*.

A natural number greater than 1 is **prime** if it has only itself and 1 as factors. "Factors" are understood here to mean natural number factors.

$$2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37 \qquad \text{First dozen prime numbers}$$

A natural number greater than 1 that is not prime is a **composite number.**

$$4, 6, 8, 9, 10, 12, 14, 15, 16, 18, 20, 21 \qquad \text{First dozen composite numbers}$$

The number 1 is considered to be neither prime nor composite.

**NOW TRY
EXERCISE 1**
Identify the number 60 as *prime, composite,* or *neither.* If the number is composite, write it as a product of prime factors.

EXAMPLE 1 Writing Numbers in Prime Factored Form

Identify each number as *prime, composite,* or *neither.* If the number is composite, write it as a product of prime factors.

(a) 43

There are no natural numbers other than 1 and 43 itself that divide *evenly* into 43, so the number 43 is prime.

(b) 35

The number 35 is composite and can be written as the product of the prime factors 5 and 7.

$$35 = 5 \cdot 7$$

(c) 24

The number 24 is composite. We show a factor tree on the right, with prime factors circled.
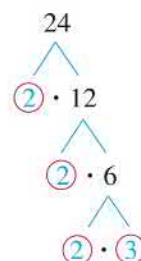
Divide by the least prime factor of 24, which is 2.

$$24 = 2 \cdot 12$$

Divide 12 by 2 to find two factors of 12.

$$24 = 2 \cdot 2 \cdot 6$$

Now factor 6 as $2 \cdot 3$.

$$24 = \underline{2 \cdot 2 \cdot 2 \cdot 3}$$
All factors are prime.

24
② · 12
② · 6
② · ③

NOW TRY ANSWER
1. composite; $2 \cdot 2 \cdot 3 \cdot 5$

NOW TRY