

Intermediate

# ALGEBRA

with **POWER** Learning

Sherri Messersmith

Lawrence Perez

Robert S. Feldman



# What is **POWER** ?

**P.O.W.E.R.** is an approach to systematically completing tasks based on five practical steps

## **P** Prepare

The most critical facet of preparation is setting goals. Goal-setting improves student performance by increasing student focus, confidence, motivation, and persistence.

## **O** Organize

Students have to identify and organize the intellectual tools necessary to accomplish their goals. Organizing refers not only to considering how they must apply the most appropriate academic strategies, but also to maintaining and applying good habits outside of class in order to manage their many responsibilities.

## **W** Work

Doing the work—reading the materials, taking good notes in class, and doing in-class exercises—may seem like the most obvious step, but it is an area where students often falter. Using P.O.W.E.R. will improve your students' motivation and help them view success as a product of their hard work and effort.

## **E** Evaluate

In math, concepts build on each other, so student success depends on reaching a level of mastery in each section before progressing. P.O.W.E.R. helps students understand that their work is not complete until they have assessed their progress and identified where they are struggling.

## **R** Rethink

Too often in developmental math, students do not stop to assess their overall performance until after an exam, at which point it may be too late. P.O.W.E.R. prompts students after each section to honestly assess how they are doing and where they may need to change their strategy or ask for help.

# Why Math Needs



The P.O.W.E.R. series is a solution for students struggling to achieve their academic goals and instructors trying to balance teaching math with teaching effective student behavior.



## Sherri Messersmith

*Professor of Mathematics, College of DuPage*

**"Developmental students don't want to fail, they just don't know how to succeed.** Teaching students at the developmental level is not just about teaching mathematics; it's about helping them learn all of the 'other' things it takes to be successful in college (and in life). If students don't know how to read a textbook, how to manage their time, how to take notes, how to set realistic goals, how to study, etc.—if they don't know how to be college students, then how can they be successful in our math courses? This challenge for students becomes our challenge as instructors. How do we teach successful student behavior while also getting through the objectives in our math courses?"

**"First and foremost, this is a math textbook.** Its purpose is to present all of the mathematics that is required for a course in the clearest, most mathematically precise way possible through the use of both traditional methods and some that you will find unique. But we think it is crucial to address study strategies as well, and, in fact, Larry and I wrote the manuscripts this way even before we met Bob! We teamed up to formalize the steps by integrating the P.O.W.E.R. framework into the textbooks, customizing it for teaching and learning mathematics. It turned out to be a very natural fit."



## Lawrence Perez

*Professor of Mathematics, Saddleback College*

**"It's not just about the content.** Having an easy-to-read text coupled with thought-provoking pedagogy, in many cases, is not enough. As instructors, we strive to teach our students how to be successful learners. Integrating study strategies that are not directly connected to the text may not suffice. This is what makes the P.O.W.E.R. Math Series different. Dr. Feldman's research has provided the necessary framework that can assist developmental math students in navigating the difficult transition from arithmetic to abstract algebra and it is applicable to a variety of learning environments. It is also a framework that we as developmental math instructors can use to create our own supplemental resources and refine our personal teaching styles."



## Bob Feldman

*Dean and Professor of Psychology, University of Massachusetts Amherst,  
Director of POWER Up for Student Success, The UMass first-year experience program*

**"Good students are made, not born.** What does being a 'good' student at the college level mean? Among other things, it means coming to class prepared, taking good notes, developing good study habits, and managing time effectively. These skills can be taught, and taught in ways that lead to success. In fact, careful research shows courses that cover the skills related to college success produce a significant and demonstrable rise in student retention beyond the first semester in college. After years of teaching and doing research in student success, I developed the P.O.W.E.R. Learning framework to help students to achieve their goals in any class and even after they graduate."

"A developmental math course is often one of the first courses students take at the college level, and it is the gateway to continuing their college education. We have integrated a proven method of helping students develop basic skills into a text written by instructors with years of classroom experience."



# What Students Are Saying about

**P O W E R**

Dozens of college students participated in focus groups to help develop this series. Here is what they told us. To see video clips of students talking about P.O.W.E.R. go to [www.mhhe.com/sem/powermath](http://www.mhhe.com/sem/powermath)

**"In math class, I usually dive head first into the problems, hoping the material will come to me. I don't evaluate my work which leads to dishonesty about my strengths and weaknesses and whether I understand the concepts enough to move on. The "Evaluate" step in P.O.W.E.R. will really help improve my grades."**

– Ashley Grayson, *Northeastern Illinois University*

**"P.O.W.E.R. will help prepare me to do or learn something that is a little challenging. It helps me identify my goals and what I need to do to get there."**

– Nina Turnage, *Wilbur Wright College*

**"I always work in a trial and error kind of way. P.O.W.E.R. will help me study more efficiently because it breaks down learning into steps."**

– Zainab Khomusi, *University of Illinois at Chicago*



**"The P.O.W.E.R. framework is like the scientific method for learning. Even outside of class, I think it will help me be successful in business and life goals."**

– Nathan Hurde, *University of Illinois at Chicago*

**"You can use P.O.W.E.R. to attack learning math, or really any subject, successfully."**

– Eire Aatnite, *Roosevelt University*

**"P.O.W.E.R. would motivate and guide me to take more time with math and recognize and fix my weaknesses."**

– Jaimie O'Leary, *Northeastern Illinois University*

**"I like that this framework already fits in with a lot of my study habits. It just makes sense."**

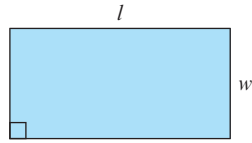
– Lauren Mosley, *Western Illinois University*



# Geometry Formulas

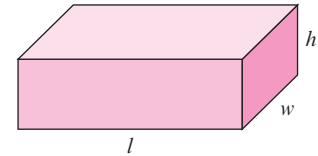
## Rectangle

Perimeter:  $P = 2 \cdot l + 2 \cdot w$   
 Area:  $A = l \cdot w$



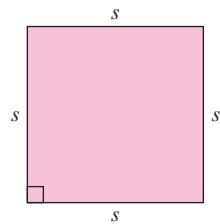
## Rectangular Solid

Volume:  $V = l \cdot w \cdot h$



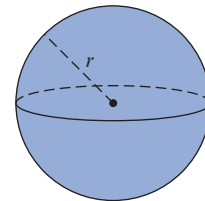
## Square

Perimeter:  $P = 4 \cdot s$   
 Area:  $A = s^2$



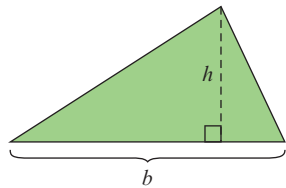
## Sphere

Volume:  $V = \frac{4}{3} \cdot \pi \cdot r^3$



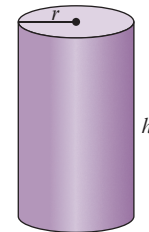
## Triangle

Area:  $A = \frac{1}{2} \cdot b \cdot h$



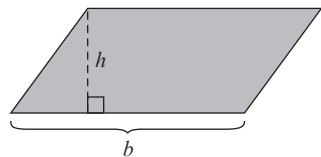
## Cylinder

Volume:  $V = \pi \cdot r^2 \cdot h$



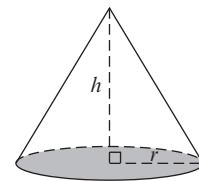
## Parallelogram

Area:  $A = b \cdot h$



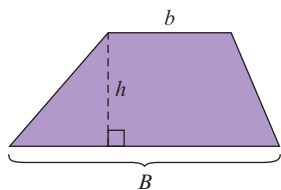
## Cone

Volume:  $V = \frac{1}{3} \cdot \pi \cdot r^2 \cdot h$



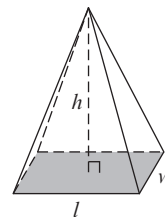
## Trapezoid

Area:  $A = \frac{1}{2} \cdot h \cdot (b + B)$



## Pyramid

Volume:  $V = \frac{1}{3} \cdot l \cdot w \cdot h$



## Circle

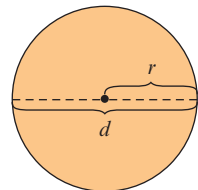
Diameter:  $d = 2 \cdot r$

Radius:  $r = \frac{d}{2}$

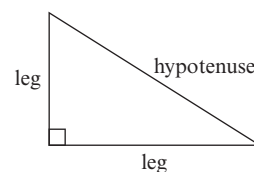
Circumference:  $C = \pi \cdot d$   
 $C = 2 \cdot \pi \cdot r$

Area:  $A = \pi \cdot r^2$

$\pi \approx 3.14$  or  $\pi \approx \frac{22}{7}$



## Right Triangle



$$(\text{leg})^2 + (\text{leg})^2 = (\text{hypotenuse})^2$$

$$\text{leg} = \sqrt{(\text{hypotenuse})^2 - (\text{known leg})^2}$$

Intermediate

# ALGEBRA



## INTERMEDIATE ALGEBRA WITH P.O.W.E.R. LEARNING

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# Intermediate **ALGEBRA**

**SHERRI MESSERSMITH**

*College of DuPage*

**LAWRENCE PEREZ**

*Saddleback College*

**ROBERT S. FELDMAN**

*University of Massachusetts Amherst*

With contributions from William C. Mulford, *The McGraw-Hill Companies*

# About the Authors

## **Sherri Messersmith**

*Professor of Mathematics, College of DuPage*

Sherri Messersmith began teaching at the College of DuPage in Glen Ellyn, Illinois in 1994 and has over 25 years of experience teaching many different courses from developmental mathematics through calculus. She earned a Bachelor of Science degree in the Teaching of Mathematics at the University of Illinois at Urbana-Champaign and taught at the high school level for two years. Sherri returned to UIUC and earned a Master of Science in Applied Mathematics and stayed on at the university to teach and coordinate large sections of undergraduate math courses as well as teach in the Summer Bridge program for at-risk students. In addition to the P.O.W.E.R. Math Series, she is the author of a hardcover series of textbooks and has also appeared in videos accompanying several McGraw-Hill texts.

Sherri and her husband are recent empty-nesters and live in suburban Chicago. In her precious free time, she likes to read, cook, and travel; the manuscripts for her books have accompanied her from Spain to Greece and many points in between.

## **Lawrence Perez**

*Professor of Mathematics, Saddleback College*

Larry Perez has fifteen years of classroom experience teaching math and was the recipient of the 2010 Community College Professor of the Year Award in Orange County, California. He realized early on that students bring to the classroom different levels of attitude, aptitude, and motivation sometimes accompanied by a tremendous fear of taking math. Confronted by this, he developed a passion for engaging students, demanding him to innovate traditional and online pedagogical techniques using architecture created with student feedback as the mechanism of design. He is the creator of the award-winning online learning environment Algebra2go<sup>®</sup> and has presented his work and methodology at conferences around the country.

Larry is a Veteran of the United States Navy Submarine Force and is a graduate of California State University Fullerton earning degrees in Electrical Engineering and Applied Mathematics. In his spare time he enjoys mountain biking and the great outdoors.

## **Robert S. Feldman**

*Dean and Professor of Psychology, University of Massachusetts Amherst*

Bob Feldman still remembers those moments of being overwhelmed when he started college at Wesleyan University. “I wondered whether I was up to the challenges that faced me,” he recalls, “and although I never would have admitted it then, I really had no idea what it took to be successful at college.”

That experience, along with his encounters with many students during his own teaching career, led to a life-long interest in helping students navigate the critical transition that they face at the start of their own college careers. Bob, who went on to receive a doctorate in psychology from the University of Wisconsin-Madison, teaches at the University of Massachusetts Amherst, where he is the Dean of the College of Social and Behavioral Sciences and Professor of Psychology. He also directs a first-year experience course for incoming students.

Bob is a Fellow of both the American Psychological Association and the Association for Psychological Science. He has written more than 200 scientific articles, book chapters, and books, including P.O.W.E.R. Learning: *Strategies for Success in College and Life*, 6e and *Understanding Psychology*, 11e. He is president-elect of the FABBS Foundation, an umbrella group of societies promoting the behavioral and brain sciences.

Bob loves travel, music, and cooking. He and his wife live near the Holyoke mountain range in western Massachusetts.

# Table of Contents

## CHAPTER 1 Real Numbers and Algebraic Expressions 1

**Study Strategies: The P.O.W.E.R. Framework** 2

- Section 1.1** Set of Numbers 4
- Section 1.2** Operations on Real Numbers 12
- Section 1.3** Exponents, Roots, and Order of Operations 20
- Section 1.4** Algebraic Expressions and Properties of Real Numbers 26
- Group Activity** 30
- emPOWERme: Why Am I Going to College?** 31
- Chapter 1 Summary** 32
- Chapter 1 Review Exercises** 34
- Chapter 1 Test** 35

## CHAPTER 2 Linear Equations in One Variable 36

**Study Strategies: Reading Math (and Other) Textbooks** 37

- Section 2.1** Linear Equations in One Variable 39
- Section 2.2** Applications of Linear Equations 52
- Section 2.3** Geometry Applications and Solving Formulas 66
- Section 2.4** More Applications of Linear Equations 76
- Group Activity** 85
- emPOWERme: Organize Your Memory** 86
- Chapter 2 Summary** 88
- Chapter 2 Review Exercises** 90
- Chapter 2 Test** 92
- Cumulative Review for Chapters 1 and 2** 93

## CHAPTER 3 Linear Inequalities and Absolute Value 94

**Study Strategies: Time Management** 95

- Section 3.1** Linear Inequalities in One Variable 97
- Section 3.2** Compound Inequalities in One Variable 109
- Section 3.3** Absolute Value Equations and Inequalities 117
- Group Activity** 129
- emPOWERme: Identify the Black Holes of Time Management** 129
- Chapter 3 Summary** 131
- Chapter 3 Review Exercises** 132
- Chapter 3 Test** 133
- Cumulative Review for Chapters 1–3** 134

## CHAPTER 4 Linear Equations in Two Variables and Functions 135

**Study Strategies: Taking Notes in Class** 136

- Section 4.1** Introduction to Linear Equations in Two Variables 138
- Section 4.2** Slope of a Line and Slope-Intercept Form 155
- Section 4.3** Writing an Equation of a Line 170
- Section 4.4** Linear and Compound Linear Inequalities in Two Variables 186
- Section 4.5** Introduction to Functions 196
- Group Activity** 213
- emPOWERme: Checklist for Effective Notes** 214
- Chapter 4 Summary** 215
- Chapter 4 Review Exercises** 221
- Chapter 4 Test** 225
- Cumulative Review for Chapters 1–4** 227

## CHAPTER 5 Solving Systems of Linear Equations 228

**Study Strategies: Taking Math Tests** 229

- Section 5.1** Solving Systems of Linear Equations in Two Variables 232
- Section 5.2** Solving Systems of Linear Equations in Three Variables 250
- Section 5.3** Applications of Systems of Linear Equations 259
- Section 5.4** Solving Systems of Linear Equations Using Matrices 273
- Group Activity** 281
- emPOWERme: Studying Smart** 281
- Chapter 5 Summary** 282
- Chapter 5 Review Exercises** 286
- Chapter 5 Test** 288
- Cumulative Review for Chapters 1–5** 289

## CHAPTER 6 Polynomials and Polynomial Functions 290

**Study Strategies: Doing Math Homework** 291

- Section 6.1** The Rules of Exponents 293
- Section 6.2** More on Exponents and Scientific Notation 303
- Section 6.3** Addition and Subtraction of Polynomials and Polynomial Functions 313
- Section 6.4** Multiplication of Polynomials and Polynomial Functions 324



**Section 6.5** Division of Polynomials and Polynomial Functions 335  
**Group Activity** 344  
**emPOWERme: The Right Time and Place for Homework** 335  
**Chapter 6 Summary** 346  
**Chapter 6 Review Exercises** 348  
**Chapter 6 Test** 351  
**Cumulative Review for Chapters 1–6** 352

## CHAPTER 7 Factoring Polynomials 353

**Study Strategies: Working with a Study Group** 354

**Section 7.1** The Greatest Common Factor and Factoring by Grouping 356

**Section 7.2** Factoring Trinomials 366

**Section 7.3** Special Factoring Techniques 378  
**Putting It All Together** 388

**Section 7.4** Solving Quadratic Equations by Factoring 392

**Section 7.5** Applications of Quadratic Equations 402  
**Group Activity** 412  
**emPOWERme: Switch “You” to “I”** 413  
**Chapter 7 Summary** 414  
**Chapter 7 Review Exercises** 416  
**Chapter 7 Test** 418  
**Cumulative Review for Chapters 1–7** 419

## CHAPTER 8 Rational Expressions, Equations, and Functions 420

**Study Strategies: The Writing Process** 421

**Section 8.1** Simplifying, Multiplying, and Dividing Rational Expressions and Functions 423

**Section 8.2** Adding and Subtracting Rational Expressions 436

**Section 8.3** Simplifying Complex Fractions 450

**Section 8.4** Solving Rational Equations 460  
**Putting It All Together** 471

**Section 8.5** Applications of Rational Equations 478

**Section 8.6** Variation 488  
**Group Activity** 496  
**emPOWERme: Mad, Mad, Mad Math** 496  
**Chapter 8 Summary** 497  
**Chapter 8 Review Exercises** 502  
**Chapter 8 Test** 505  
**Cumulative Review for Chapters 1–8** 506

## CHAPTER 9 Radicals and Rational Exponents 507

**Study Strategies: Working with Technology** 508

**Section 9.1** Radical Expressions and Functions 511

**Section 9.2** Rational Exponents 525

**Section 9.3** Simplifying Expressions Containing Square Roots 534

**Section 9.4** Simplifying Expressions Containing Higher Roots 545

**Section 9.5** Adding, Subtracting, and Multiplying Radicals 553

**Section 9.6** Dividing Radicals 561  
**Putting It All Together** 573

**Section 9.7** Solving Radical Equations 578

**Section 9.8** Complex Numbers 587  
**Group Activity** 596  
**emPOWERme: Information Please!** 597  
**Chapter 9 Summary** 598  
**Chapter 9 Review Exercises** 603  
**Chapter 9 Test** 605  
**Cumulative Review for Chapters 1–9** 606

## CHAPTER 10 Quadratic Equations and Functions 607

**Study Strategies: Developing Financial Literacy** 608

**Section 10.1** The Square Root Property and Completing the Square 610

**Section 10.2** The Quadratic Formula 623  
**Putting It All Together** 632

**Section 10.3** Equations in Quadratic Form 636

**Section 10.4** Formulas and Applications 645

**Section 10.5** Quadratic Functions and their Graphs 653

**Section 10.6** Application of Quadratic Functions and Graphing Other Parabolas 667

**Section 10.7** Quadratic and Rational Inequalities 680  
**Group Activity** 690  
**emPOWERme: Determine Your Saving Style** 691  
**Chapter 10 Summary** 692  
**Chapter 10 Review Exercises** 696  
**Chapter 10 Test** 699  
**Cumulative Review for Chapters 1–10** 700

## CHAPTER 11 Exponential and Logarithmic Functions 701

**Study Strategies: Coping with Stress** 702

**Section 11.1** Composite and Inverse Functions 704

**Section 11.2** Exponential Functions 719

<b>Section 11.3</b>	Logarithmic Functions	730
<b>Section 11.4</b>	Properties of Logarithms	743
<b>Section 11.5</b>	Common and Natural Logarithms and Change of Base	753
<b>Section 11.6</b>	Solving Exponential and Logarithmic Equations	765
	<b>Group Activity</b>	776
	<b>emPOWERme: Progressive Relaxation</b>	777
	<b>Chapter 11 Summary</b>	778
	<b>Chapter 11 Review Exercises</b>	783
	<b>Chapter 11 Test</b>	786
	<b>Cumulative Review for Chapters 1–11</b>	787

## **CHAPTER 12** Nonlinear Functions, Conic Sections, and Nonlinear Systems **788**

**Study Strategies: Improving Your Memory** 789

<b>Section 12.1</b>	Graphs of Other Useful Functions	791
<b>Section 12.2</b>	The Circle	802
<b>Section 12.3</b>	The Ellipse	810
<b>Section 12.4</b>	The Hyperbola	817
	<b>Putting It All Together</b>	828

<b>Section 12.5</b>	Nonlinear Systems of Equations	832
<b>Section 12.6</b>	Second-Degree Inequalities and Systems of Inequalities	839
	<b>Group Activity</b>	844
	<b>emPOWERme: Memory Devices</b>	845
	<b>Chapter 12 Summary</b>	846
	<b>Chapter 12 Review Exercises</b>	849
	<b>Chapter 12 Test</b>	850
	<b>Cumulative Review for Chapters 1–12</b>	851

## **APPENDIX**

<b>Section A.1</b>	Review of Fractions	A-1
<b>Section A.2</b>	Geometry Review	A-12
<b>Section A.3</b>	Determinants and Cramer's Rule	A-24
<b>Section A.4</b>	Synthetic Division and the Remainder Theorem	A-33
<b>This appendix is available online at <a href="http://www.connectmath.com">www.connectmath.com</a> and <a href="http://www.mcgrawhillcreate.com">www.mcgrawhillcreate.com</a>.</b>		

<b>Student Answer Appendix</b>	SA-1
<b>Instructor Answer Appendix (AIE only)</b>	IA-1
<b>Credits</b>	C-1
<b>Index</b>	I-1

# Consistent Integration of Study Skills

In *Intermediate Algebra*, strategies for learning are presented alongside the math content, making it easy for students to learn math *and* study skills at the same time. The P.O.W.E.R. framework aligns with the math learning objectives, providing instructors with a resource that has been consistently integrated throughout the text.

A **STUDY STRATEGIES** feature begins each chapter. Utilizing the P.O.W.E.R. framework, these boxes present steps for mastering the different skills students will use to succeed in their developmental math course. For example, these boxes will contain strategies on time management, taking good notes and, as seen in the sample below, taking a math test.

**POWER** Study Strategies *Taking Math Tests*

You've studied your class notes and your textbook. You've reviewed your homework and problem sets. You've even worked with your fellow students in a study group. Now it's time to sit down and actually take the test you've prepared for. When this moment comes, don't you owe it to yourself to perform your best? Use the following strategies to ensure that you get the grade you deserve.

- P Prepare**
  - Study smart. Focus your preparation on the material that will be covered on the test. The emPOWERme on page 281 will help you.
  - Practice, practice, practice! Repetition will help build your skills. Do problems using a timer to simulate the amount of time you will have to take the test.
  - Get a good night's sleep before the test, as it is during sleep that short-term memory turns into long-term memory.
  - Warm up for the test just like athletes do before they play a game. No matter how much you studied the night before, do several "warm-up" problems the same day as the test. This way, you will be in the groove of doing math and won't go into the test cold.
- O Organize**
  - Arrive at the test location early.
  - Have multiple pens, pencils, scratch paper, and your textbook with you when you sit down to take the test.
  - Warm-up your brain by reviewing your notes and working through problems like those that will appear on the test.
- W Work**
  - Before you start the test, read all the instructions.
  - Answer the easiest questions first, leaving time at the end to work on the harder problems.
  - Show all your work in a neat and organized way because your instructor may give you credit for this even if you don't finish the problem.
  - Remain calm throughout the test. Take a deep breath and focus on doing your best if you start to feel anxious.
- E Evaluate**
  - Leave time at the end of the test to check over your work.
  - Double-check your calculations to ensure you didn't make any careless errors.
- R Rethink**
  - Review your test carefully when you get it back. You want to understand the source of any errors you made.
  - Consider the process you used to study for the test, and think about ways it could be improved.

**...all the work you do throughout the term—the note-taking, the homework, all of it—represents test preparation. The strategies below will help you perform your best on math tests.**

**...answer the easiest questions first. This will build your confidence and leave you more time to work on the harder problems.**

**...when you get your test back... look it over and see where you made errors. Remember, math concepts build on each other—you can't master the new concepts until you are comfortable with the previous ones.**



**CHAPTER AND SECTION POWER PLANS** Before getting started on reading the chapter, a student will focus on Preparation and Organization skills in the **POWER Plans**. These tools give practical suggestions for setting and achieving goals. The steps revolve around best practices for student success and then apply P.O.W.E.R. toward learning specific concepts in math.

# Chapter 5 **POWER** Plan

## **P** Prepare

## **O** Organize

What are your goals for Chapter 5?	How can you accomplish each goal?
<p><b>1</b> Be prepared before and during class.</p>	<ul style="list-style-type: none"> <li>• Don't stay out late the night before, and be sure to set your alarm clock!</li> <li>• Bring a pencil, notebook paper, and textbook to class.</li> <li>• Avoid distractions by turning off your cell phone during class.</li> <li>• Pay attention, take good notes, and ask questions.</li> <li>• Complete your homework on time, and ask questions on problems you do not understand.</li> <li>• Plan ahead for tests by preparing many days in advance.</li> </ul>
<p><b>2</b> Understand the homework to the point where you could do it without needing any help or hints.</p>	<ul style="list-style-type: none"> <li>• Read the directions, and show all of your steps.</li> <li>• Go to the professor's office for help.</li> <li>• Rework homework and quiz problems, and find similar problems for practice.</li> <li>• Review old material that you have not mastered yet.</li> </ul>
<p><b>3</b> Use the P.O.W.E.R. framework to help you take tests: <i>Studying Smart</i>.</p>	<ul style="list-style-type: none"> <li>• Read the Study Strategy that explains how to study effectively for tests.</li> <li>• Do a "practice run" the night before the test by doing a practice test without notes.</li> <li>• Complete the emPOWERme that appears before the Chapter Summary.</li> </ul>
<p><b>4</b> Write your own goal.</p> <p>_____</p> <p>_____</p>	<ul style="list-style-type: none"> <li>• _____</li> </ul>
What are your objectives for Chapter 5?	How can you accomplish each objective?
<p><b>1</b> Be able to solve a system of linear equations in two variables by using the graphing, substitution, or elimination methods. Know when to use each method.</p>	<ul style="list-style-type: none"> <li>• Learn the procedures for each of these methods.</li> <li>• Know the terminology associated with the solutions such as independent and consistent.</li> <li>• Know how to check each answer.</li> </ul>
<p><b>2</b> Be able to determine when the solution to a system of equations is <i>no solution</i> or <i>infinite solutions</i>. Know what these solutions look like on a graph and how to write the answer.</p>	<ul style="list-style-type: none"> <li>• Learn the procedures for solving a system of equations and the possible answers when variables "drop out."</li> <li>• Learn the terminology associated with the solutions such as <i>inconsistent</i> and <i>dependent</i>.</li> <li>• Know what these results look like on a graph.</li> <li>• Know how to check your solutions.</li> </ul>
<p><b>3</b> Be able to solve a system of linear equations in three variables, including systems where there are missing terms.</p>	<ul style="list-style-type: none"> <li>• Learn the procedure for <b>Solving a System of Linear Equations in Three Variables</b>.</li> <li>• Know how to check your solutions.</li> </ul>

**Hint**  
Be sure you are writing out each step as you are reading the example.

b) To solve  $t^2 - 20 = 0$ , begin by getting  $t^2$  on a side by itself.

$$\begin{aligned}
 t^2 - 20 &= 0 \\
 t^2 &= 20 && \text{Add 20 to each side.} \\
 t &= \pm\sqrt{20} && \text{Square root property} \\
 t &= \pm\sqrt{4 \cdot 5} && \text{Product rule for radicals} \\
 t &= \pm 2\sqrt{5} && \sqrt{4} = 2
 \end{aligned}$$

Check:

$$\begin{array}{l|l}
 t = 2\sqrt{5}: & t = -2\sqrt{5}: \\
 \begin{aligned}
 t^2 - 20 &= 0 \\
 (2\sqrt{5})^2 - 20 &\stackrel{?}{=} 0 \\
 (4 \cdot 5) - 20 &\stackrel{?}{=} 0 \\
 20 - 20 &= 0 \quad \checkmark
 \end{aligned} & \begin{aligned}
 t^2 - 20 &= 0 \\
 (-2\sqrt{5})^2 - 20 &\stackrel{?}{=} 0 \\
 (4 \cdot 5) - 20 &\stackrel{?}{=} 0 \\
 20 - 20 &= 0 \quad \checkmark
 \end{aligned}
 \end{array}$$

The solution set is  $\{-2\sqrt{5}, 2\sqrt{5}\}$ .

**WORK HINTS** provide additional explanation and point out common places where students might go wrong when solving a problem. Along with the *Be Careful* boxes, these tools act as a built-in tutor, helping students navigate the material and learn concepts even outside of class.

**IN-CLASS EXAMPLES** are available only in the Annotated Instructor Edition. These examples offer instructors additional problems to work through in class. In-class example problems align with the Guided Student Notes resource available with this package.

### EXAMPLE 1

Solve using the square root property.

a)  $x^2 = 9$       b)  $t^2 - 20 = 0$       c)  $2a^2 + 21 = 3$

#### Solution

a)

$$\begin{array}{c}
 x^2 = 9 \\
 \swarrow \quad \searrow \\
 x = \sqrt{9} \quad \text{or} \quad x = -\sqrt{9} \quad \text{Square root property} \\
 x = 3 \quad \quad \text{or} \quad x = -3
 \end{array}$$

The solution set is  $\{-3, 3\}$ . The check is left to the student.

An equivalent way to solve  $x^2 = 9$  is to write it as

$$\begin{aligned}
 x^2 &= 9 \\
 x &= \pm\sqrt{9} && \text{Square root property} \\
 x &= \pm 3
 \end{aligned}$$

The solution set is  $\{-3, 3\}$ . We will use this approach when solving equations using the square root property.

**PUTTING IT ALL TOGETHER** One of the challenges students struggle with is putting all of the steps they've learned together and *applying* that knowledge to a problem. *Putting It All Together* sections will help students understand the big picture and work through the toughest challenge when solving applications—*problem recognition*, or knowing *when* to use *what* method or thought process. These sections include a summary and several problems that help students reason through a problem using conversational, yet mathematically correct, language.

## Putting It All Together

**P Prepare**

**O Organize**

What are your objectives for Putting It All Together?

How can you accomplish each objective?

1 Decide Which Method to Use to Solve a Quadratic Equation

- Be able to write out all the different methods in your notes.
- Review characteristics of each method, and be able to identify the most efficient method for each problem.
- Try solving some problems using more than one method, if time permits, and check your answers.
- Complete the given example on your own.
- Complete You Try 1.

**W Work**

Read the explanations, follow the examples, take notes, and complete the You Try.

## em **POWER** me Studying Smart

Imagine packing your bag for a trip without knowing where you were going. Would you take sweaters or swimsuits? A raincoat or sunblock? This dilemma is parallel to the one you face if you study for a test without knowing what it will cover. The key to effective studying—and to successful test-taking—is to tailor your efforts to the test you will have to take. Before you start studying, answer these questions, and use your answers to help you prepare.

- Is the test called a “test,” “exam,” “quiz,” or something else? There is a difference! Exams tend to be longer, while quizzes are often shorter and narrower in their focus. If you are aren't sure, ask your instructor.
- What material will the test cover? Will it cover only the most recent subjects or everything you've learned in the term so far?
- How many questions will be on the test? How much time is it expected to take? A full class period? Only part of a period?
- What kinds of questions will be on the test?
- Will you be allowed to use a calculator? Consult your textbook?
- Will the test be graded on a curve?
- Will sample questions be provided?
- Are tests from previous terms available for you to study?
- How much does the test contribute to your final course grade?

em **POWER** me boxes circle back to the opening **Study Strategies** and give students a checklist to evaluate how well they followed through on all of the positive habits recommended to successfully master a skill.



# Instructor **P O W E R** Tool Kit

The Messersmith/Perez/Feldman Series offers instructors a robust digital resources package to help you with all of your teaching needs.

## Resources in your P.O.W.E.R. tool kit include:

- Connect Hosted by Aleks\*
- ALEKS 360\*
- Instructor Solutions Manual
- Student Solutions Manual
- Guided Student Notes\*
- Classroom Worksheets\*
- Instructor Resource Manual
- Test Bank Files
- Computerized Test Bank
- Faculty Development and Digital Training\*
- PowerPoint Presentations
- Extensive Video Package\*

\*Details of these resources are included in the following pages!

## Videos

Hundreds of videos are available to guide students through the content, offering support and instruction even outside your classroom.

**Exercise Videos** – These 3–5-minute clips show students how to solve various exercises from the textbook. With around thirty videos for every chapter, your students are supported even outside the classroom.

**Lecture Videos** – These 5–10-minute videos walk students through key learning objectives and problems from the textbook.

**P.O.W.E.R. Videos** – These engaging segments guide students through the P.O.W.E.R. framework and the study skills for each chapter.

Perform the operations and simplify:  $4 - \sqrt{13} + 8 - 6\sqrt{13}$

Like radicals have the same index and the same radicand.

$$4 - \sqrt{13} + 8 - 6\sqrt{13}$$

$$12 - \sqrt{13} - 6\sqrt{13}$$

$$12 + (-1 - 6)\sqrt{13}$$

$$12 + (-7)\sqrt{13}$$

$$\underline{12 - 7\sqrt{13}}$$

12 - 7 times square root (13).

# Faculty Development and Digital Training

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Workshops are available on these topics for anyone using or considering the Messersmith/Perez/Feldman P.O.W.E.R. Math Series. Led by the authors, contributors, and McGraw-Hill P.O.W.E.R. Learning consultants, each workshop is tailored to the needs of individual campuses or programs.

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your course, using reports, and building assignments?**

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Are you interested in getting ideas from other instructors who  
have used ALEKS™ or Connect Hosted by ALEKS in their  
courses?**

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Contact your local representative for more information about any of the faculty development, training, and support opportunities through McGraw-Hill. <http://catalogs.mhhe.com/mhhe/findRep.do>

# Need a tool to help your students take better notes?

## GUIDED STUDENT NOTES

By taking advantage of Guided Student Notes, your students will have more time to learn the material and participate in solving in-class problems while, at the same time, becoming better note takers. Ample examples are included for appropriate coverage of a topic that will not overwhelm students. Use them as they are or download and edit the Guided Student Notes according to your teaching style.

Guided Student Notes  
MPF – Intermediate Algebra

**Rules for Dividing Rational Expressions**

Divide. Write each rational expression in lowest terms.

16)  $\frac{42b^6}{c^3} \div \frac{2b}{c^5}$

17)  $\frac{r^2 - 13r + 36}{2r + 10} \div \frac{12r - 3r^2}{16}$

18)  $\frac{3n^2 - 22n - 16}{n^2} \div (3n + 2)^2$

5

Guided Student Notes  
MPF – Intermediate Algebra

Name: \_\_\_\_\_

**8.1 Simplifying, Multiplying, and Dividing Rational Expressions and Functions**

**Prepare** | What are my goals for this section?  
\_\_\_\_\_  
\_\_\_\_\_

**Organize** | What am I going to do to accomplish these goals?  
\_\_\_\_\_  
\_\_\_\_\_

**Work**

**Definition of a Rational Expression**      **Definition of a Rational Function**

**Determining the Domain of a Rational Function**

1) If  $f(x) = \frac{x^2 - 16}{x + 3}$ ,

- a) find  $f(5)$
- b) find  $x$  so that  $f(x) = 0$
- c) determine the domain of the function.

1

# Develop your students' basic skills with a ready-made resource.

## WORKSHEETS FOR STUDENT AND INSTRUCTOR USE

Worksheets for every section are available as an instructor supplement. These author-created worksheets provide a quick, engaging way for students to work on key concepts. They save instructors from having to create their own supplemental material and address potential stumbling blocks in student understanding. Classroom tested and easy to implement, they are also a great resource for standardizing instruction across a mathematics department.

The worksheets fall into three categories: Worksheets to Improve Basic Skills; Worksheets to Help Teach New Concepts; and Worksheets to Tie Concepts Together.

The worksheets are available in an instructor edition, with answers, and in a student edition, without answers.

Worksheet 5A  
Messersmith – Intermediate Algebra

Name: \_\_\_\_\_

Evaluate.

1) $\sqrt{36}$ <u>6</u>	16) $\sqrt[3]{64}$ _____
2) $\sqrt{144}$ <u>12</u>	17) $\sqrt[3]{32}$ _____
3) $\sqrt{25}$ <u>5</u>	18) $\sqrt{49}$ _____
4) $\sqrt[3]{8}$ <u>2</u>	19) $\sqrt{100}$ _____
5) $\sqrt[3]{125}$ <u>5</u>	20) $\sqrt[3]{8}$ _____
6) $\sqrt{81}$ <u>9</u>	21) $\sqrt[3]{1}$ _____
7) $\sqrt[3]{27}$ <u>3</u>	22) $\sqrt[3]{27}$ _____
8) $\sqrt[3]{16}$ <u>2</u>	23) $\sqrt{16}$ _____
9) $\sqrt[3]{1000}$ <u>10</u>	24) $\sqrt[3]{32}$ _____
10) $\sqrt{121}$ <u>11</u>	25) $\sqrt{121}$ _____
11) $\sqrt{169}$ <u>13</u>	26) $\sqrt[3]{81}$ _____
12) $\sqrt[3]{64}$ <u>2</u>	27) $\sqrt[3]{125}$ _____
13) $\sqrt[3]{81}$ <u>3</u>	28) $\sqrt[3]{16}$ _____
14) $\sqrt{4}$ <u>2</u>	29) $\sqrt{9}$ _____
15) $\sqrt[3]{1}$ <u>1</u>	30) $\sqrt{1}$ _____

# Connect Math Hosted by ALEKS® Corp.

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**Math 060 - Basic College Math - MWF**  
Basic College Mathematics, 2nd Ed., Miller, O'Neill, Hyde

HOME GRADEBOOK MESSAGES RESOURCES

Course List >> Assignments List

Manage Assignments

Assignments (7)

Showing Category

Start Date: Mar APRIL 2012 Max

End Date: Jan FEBRUARY 2013 Mar

Start Time: 12:00 am End Time: 11:59 pm

Type: Online Problems Avg: 82% (1/5 students)

Type: Quiz # 1 Avg: 90% (2/5 students)

Type: Test # 1 Avg: N/A

Change assignment dates right from the home page.

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Question	Online Problem	Success Rate	Average Time
1	1.6 Section Exercise 76	100.0%	13m 44s
2	1.8 Section Exercise 84	100.0%	4m 16s
3	2.4 Section Exercise 46	100.0%	1m 08s
4	2.4 Section Exercise 50	100.0%	1m 58s
5	2.4 Section Exercise 60	100.0%	1m 29s
6	2.6 Section Exercise 26	100.0%	5m 19s
7	2.6 Section Exercise 36	100.0%	20m 59s
8	2.6 Section Exercise 41	100.0%	10m 00s
9	3.3 Section Exercise 20	100.0%	40s
10	3.5 Section Exercise 92	0.0%	3m 14s
11	3.5 Section Exercise 100	0.0%	5s

Assignment: Chapter Review  
Due Date: 02/13/13 11:59 PM  
Current Gradebook Score: 82% (best score)

Attempt 1 of 3 (82%) \* Date: 05/09/12 (time spent: 1 hour 3 minutes)  
Score: 9 of 11 points (82%) (delete this result)

Questions: Student Score Adjusted Score

Question 7 of 11 (time spent: 20m 59s) 1 of 1 points [Edit]

For the mixture problem: (1) use a chart to organize the information, (2) write an appropriate equation, (3) solve the equation, and (4) write the answer in complete sentences. (See Objective 3.)

A lab technician needs a 32% alcohol solution. He has 10 gal of a 29% alcohol solution. How many gallons of a 42% alcohol solution need to be mixed with the 10 gal of the 29% alcohol solution to obtain a 32% alcohol solution?

Part 1  
Let  $x$  = the amount of the 42% alcohol solution needed.  
The appropriate equation for this situation is

Reference: 2.6 Section Exercise 36  
Learning Objective: Unclassified  
Learn more about this question:  
- View the explanation  
- Practice  
Link to Text

Students can view explanations and extra practice exercises immediately upon reviewing an assignment.



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# Quality Content For Today's Online Learners

Online Exercises were carefully selected and developed to provide a seamless transition from textbook to technology.

Question 20 of 29 (1 point) 2.7 Section Exercise 42

Two canoes travel down a river, starting at 9:00 A.M. One canoe travels twice as fast as the other. After 4.5 hr, the canoes are 15.75 mi apart. Find the speed of each canoe.

Step 1:  
Read the problem and draw a sketch.

For simplicity, we will call the two canoes, Canoe A and Canoe B. Let Canoe B be the canoe that travels at the faster rate.

Step 2:  
Label the variables.

Let  $x$  represent the rate of Canoe A.  
Then,  $2x$  is the rate of Canoe B.

To complete the second column, we can use the relationship,  $d = rt$ .

	Distance	Rate	Time
Canoe A	$4.5x$	$x$	4.5
Canoe B	$4.5(\quad)$	$2x$	4.5

Question 16 of 26 (1 point) 6.4 Section Exercise 48

Write the percent equation in terms of  $x$ . Then solve for the unknown percent. Round to the nearest tenth of a percent if necessary.

What percent of 80 is 4.24?

Step 1:  
Let  $x$  represent the unknown percent.

What percent of 80 is 4.24?

$x$  (select)  $\cdot$  (80) (select)  $=$  4.24

Buttons: Question, Try Another, Solve It, Guided Solution, Show Example, Ask My Instructor, Link to Textbook, CHECK, NEXT

For consistency, the guided solutions match the style and voice of the original text as though the author is guiding the students through the problems.

Gradebook - ALEKS Initial Assessment #1 - Goulet, Robert

Assignment: ALEKS Initial Assessment #1  
Completion Date: 04/18/11 (time spent: 6 minutes)  
Gradebook Score: 100%

ALEKS Assessment Report for Goulet, Robert

ALEKS Corporation's experience with algorithm development ensures a commitment to accuracy and a meaningful experience for students to demonstrate their understanding with a focus towards online learning.

Student Readiness by Topic

This ALEKS Assessment report shows the percentage of students that have mastered the following topics:

Ch.4-Linear Equations in Two Variables

Section 4.1

- Reading a point in the coordinate plane
- Plotting a point in the coordinate plane
- Finding a solution to a linear equation in two variables
- Identifying solutions to linear equations in two variables

Section 4.2

- Graphing a line given the  $x$ - and  $y$ -intercepts
- Graphing a line given its equation in slope-intercept form
- Graphing a line given its equation in standard form
- Graphing a vertical or horizontal line
- Finding  $x$ - and  $y$ -intercepts of a line given the equation in standard form

Section 4.3

- Graphing a line through a given point with a given slope
- Finding slope given the graph of a line on a grid
- Finding slope given two points on the line

Section 4.4

- $Y$ -intercept of a line
- Finding the slope of a line given its equation

Section 4.5

- Writing the equations of vertical and horizontal lines through a given point
- Writing equations and drawing graphs to fit a narrative

Section 4.6

- Function tables
- Vertical line test

The ALEKS® Initial Assessment is an artificially intelligent (AI), diagnostic assessment that identifies precisely what a student knows. Instructors can then use this information to make more informed decisions on what topics to cover in more detail with the class.

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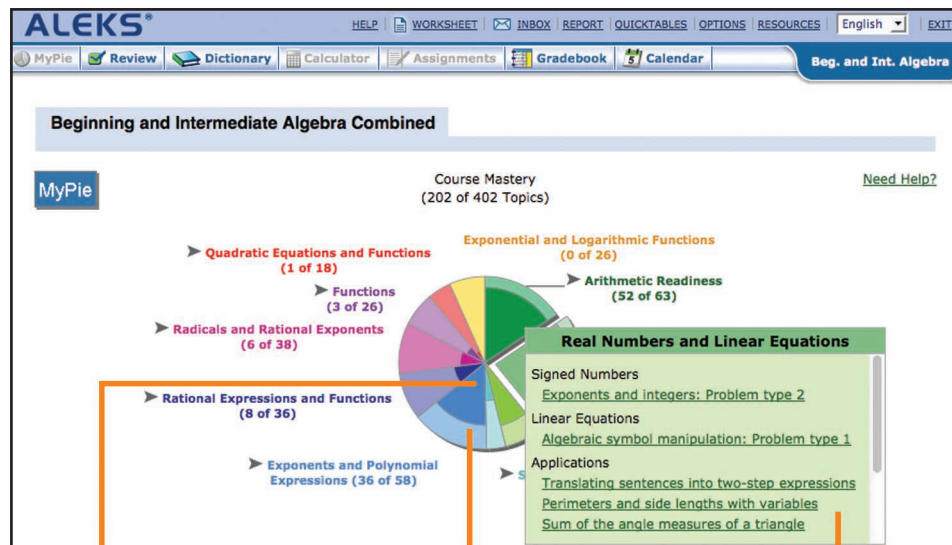
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- **Adaptive, Open-Response Environment** includes comprehensive tutorials and resources
- **Detailed, Automated Reports** track student and class progress toward course mastery
- **Course Management Tools** include textbook integration, custom features, and more



The ALEKS Pie summarizes a student's current knowledge, then delivers an individualized learning path with the exact topics the student is most ready to learn.

**Dark portion** represents what the student knows.

**Light portion** represents what the student still has to learn.

**Ready to Learn** topics appear in pop-up boxes when the student scrolls over a pie slice.

“My experience with ALEKS has been effective, efficient, and eloquent. **Our students' pass rates improved from 49 percent to 82 percent with ALEKS.** We also saw student retention rates increase by 12% in the next course. Students feel empowered as they guide their own learning through ALEKS.”

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# ALEKS® Prep Products

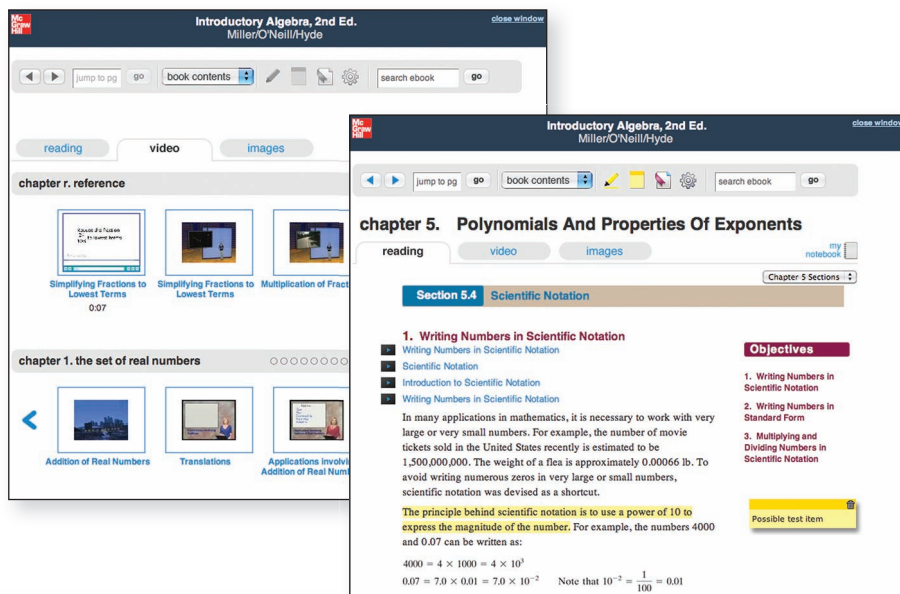
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# Acknowledgments

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Corrine Kirkbride, Solano Community College  
Brianna Kurtz, Daytona State College  
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Amy Naughten  
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# Application Index

## BIOLOGY AND HEALTH

ages of mother and daughter, 227  
ages of sisters, 268  
antibiotic remaining in system, 729  
bacteria population in culture, 763–764,  
771–772, 775, 785  
blood alcohol percentage, 153  
cats and dogs treated per day, 287  
distance person can see to horizon, 586  
dog licenses issued per year, 742  
drivers in fatal vehicle  
    accidents, 152  
foot length and shoe size, 184  
generic vs. name brand drugs, 93  
ibuprofen in bloodstream over time, 213  
intravenous drip rate, 484  
iodine in system, 776  
length of hair, 147–149  
medication dosage by weight, 484  
peanut allergies treated per year, 739–740  
spending on veterinary care, 91  
steroid solution, 85

## BUSINESS AND MANUFACTURING

billboard rentals, 184  
dimensions of bulletin board, 409, 838  
dimensions of desktop, 403  
gold production by country, 267–268  
hybrid vehicles sold, 132  
manufacturing cost of notebooks, 495  
market share of paper towel brands, 271  
market share of tire brands, 287  
production cost of clay pigeons, 690  
production cost of purses, 690  
profit function, 690, 699  
profit on book sales, 319–320  
profit on purse sales, 470  
revenue during construction, 91  
salary and commission over time, 168–169  
Starbucks worldwide, 64  
time to assemble conference notebooks, 486  
time to put away clothes, 697  
value of U.S. exports, 150

## CONSTRUCTION AND WORK

area of Big Ben clock face, 72  
area of ice rink, 678  
area watered by sprinklers, 73  
boards used for playhouse, 289  
bridge arch, 816  
cost to carpet room, 490  
dimensions of cardboard for box,  
647–648, 651, 698  
dimensions of countertop, 417  
dimensions of dog pen, 679  
dimensions of door, 269  
dimensions of garden, 403, 623, 678  
dimensions of glass, 409

dimensions of lot, 261–262  
dimensions of Parthenon foyer, 485  
dimensions of playground, 269  
dimensions of sheet metal, 651  
dimensions of storage cube, 524  
distance from ceiling of light fixture, 652  
distance from ground of shirt on  
    clothesline, 652  
distance from ladder to wall, 410  
farmland in county, 64  
fencing for trapezoidal plot, 73  
height of wall with ladder, 622  
length of fence for animal pen, 406  
length of gravel road, 91  
length of pool, 72  
length of room, 66–67  
length of trapezoidal plot, 73  
length of wire attached to pole, 407, 410  
lengths of boards, 54–55, 65  
lengths of cables, 65  
lengths of chain, 55  
lengths of pipes, 63  
lengths of trim pieces, 63  
lengths of wires, 62  
maximum dimensions of outdoor café, 698  
maximum fenced area, 670–671, 679  
Oval Office equation, 816  
radius of garden, 524  
reinforcing the Leaning Tower of Pisa, 153  
slope of a driveway, 167  
slope of a highway, 157  
slope of a parking garage ramp, 167  
slope of a roof, 167  
slope of a wheelchair ramp, 167  
storage capacity of container, 809  
time for ice to reach ground, 524  
time to assemble swing set, 506  
time to build tree house, 644  
time to clean carpets, 504  
time to clean pool, 486  
time to fertilize lawn, 486  
time to mow lawn, 484  
time to paint bedroom, 482–484  
time to paint billboard, 486  
time to paint fence, 486  
time to shovel snow, 486  
time to trim bushes, 486  
weight supported by beam, 496  
width of pond border, 648–649  
width of window shade, 129

## CONSUMER APPLICATIONS

American vs. foreign cars, 91  
appreciation of home value, 728–729  
bouquet supply and demand, 698  
break-even point for backpacks, 838  
capacity of conical vase, 586  
children at birthday party, 105–106

cost of attorney consultation, 801  
cost of batteries, 484  
cost of car rental, 248  
cost of car washes, 270  
cost of earrings and necklace, 263  
cost of gasoline, 212, 479  
cost of library rate postage, 797  
cost of mailing large envelope, 797  
cost of mailing small packages, 801  
cost of metered parking, 801  
cost of souvenirs, 270  
cost of truck rental, 108, 248  
depreciation of car value, 726, 728, 783  
depreciation of truck value, 726  
dimensions of rug, 409, 586  
dimensions of storage box, 409  
gallons of ethanol purchased, 79–80  
hybrid vehicle registrations over time, 185  
loudness of dishwasher, 763  
maximum guests at inn, 678  
moon jump rental, 152  
motel rooms with queen size beds, 261  
number of restaurants in U.S., 268  
original price of backpack, 64  
original price of book, 63  
original price of calendar, 63  
original price of coffee maker, 64  
original price of refrigerator, 64  
pages in book, 65  
parking garage time limits, 108  
personal consumption expenditures over  
    time, 223  
price of birthday gifts, 128–129  
profit on dog house sales, 323  
profit on toaster sales, 323  
sale price of bathing suit, 63  
sale price of clothing, 717  
sale price of dress shirt, 58  
sale price of jeans, 58  
sale price of stroller, 63  
sales of wine, 698  
sales tax on clothing, 717  
shovel supply and demand, 652  
time to address invitations, 486  
types of batteries purchased, 270  
types of books sold, 480  
types of stamps purchased, 83, 270  
value of car over time, 167

## DISTANCE AND TRAVEL

airport on-time departures, 286  
cruise ships operating in North America, 349  
distance between car and motorcycle, 418  
distance between cyclists, 410  
distance driven, 81  
distance from home, 411  
distance from LA to Chicago, 153  
distance on bike, 64

distance space shuttles travel, 312  
 distance to California, 62  
 distance traveled by jet, 225  
 distance traveled by sloth, 312  
 distance traveled by truck, 211  
 fuselage of Boeing 767, 816  
 height of dropped rock, 411  
 height of launched object, 411, 412, 418  
 height of rocket, 690  
 height of thrown object, 408  
 kinetic energy of car, 495  
 loudness of jet takeoff, 785  
 maximum height of ball, 669–670  
 maximum height of object, 670, 678, 698  
 passengers on New York flight, 62  
 speed during snowstorm, 644  
 speed of boat in current, 485  
 speed of boat in still water, 481–482, 485, 644  
 speed of car, 85  
 speed of current, 485, 486, 504  
 speed of driver at time of accident, 524  
 speed of plane in wind, 485, 486, 504, 644  
 speed of planes, 85  
 speed of walker, 486  
 speeds of car and bus, 287  
 speeds of car and train, 134, 271  
 speeds of car and truck, 270  
 speeds of cyclists, 265–266, 271  
 speeds of drivers, 83, 84  
 speeds of planes, 84, 271  
 speeds of trains, 84, 270  
 speeds of walker and cyclist, 271  
 students biking to class, 62  
 taxi charges per mile, 108  
 time for ball to reach ground, 629–630, 632  
 time for ball to reach height, 629–630, 632, 669–670  
 time for object to reach ground, 630, 632, 651, 698  
 time for object to reach height, 630, 632, 651, 670, 678, 698  
 time to catch up, 81–83, 84, 85, 92  
 time to meet, 93  
 time to travel distance, 495  
 time until distance apart, 84, 85  
 velocity of an object, 211  
 velocity of car, 544

## EDUCATION

average salary for high school principals, 185  
 boys and girls in class, 53–54  
 children not in preschool, 91  
 freshman in class, 65  
 number of students over years, 160  
 per-pupil spending, 154  
 revenue from t-shirt fundraiser, 412  
 students giving speeches *vs.* writing papers, 269  
 students studying French and Spanish, 287  
 students taking notes in pen *vs.* pencil, 485  
 test average in class, 62, 108  
 time to grade tests, 644

## ENTERTAINMENT

album downloads per year, 287  
 albums sold per artist, 65  
*American Idol* viewers, 150  
 Broadway play attendees, 652  
 CD sales per artist, 91

cost of concert tickets, 262–263, 269  
 cost of movie tickets, 271  
 cost of theater seats, 287  
 Country Music Awards won, 269  
 dimensions of television screen, 651  
 earnings of two movies, 65  
 Emmy nominations by network, 260–261  
 movies nominated for Academy Awards, 268  
 original price of CD, 58–59  
 original price of video game, 59  
 profit on television sales, 323  
 revenue from comedy performance, 412  
 revenue from theater tickets, 490  
 revenue from ticket sales, 412  
 sale price of television, 63  
 types of movie tickets sold, 83, 85

## ENVIRONMENT AND NATURE

altitude and barometric pressure, 153–154  
 area of oil spill, 717  
 average temperature in Tulsa, 717  
 carbon emissions per person, 312  
 cockroach population increase, 729  
 deer in wildlife refuge, 485  
 difference between elevations, 18  
 difference between temperatures, 15  
 elevation of city, 18  
 equivalent temperatures, 75  
 farms with milk cows, 185  
 gallons of water in water treatment plant, 213  
 garbage collected per year, 740  
 highest temperature in U.S., 18  
 lengths of rivers, 63  
 lowest temperature in Colorado, 18  
 pollution produced by population, 495  
 quills on porcupine, 349  
 radius of oil spill, 717  
 spread of magnetic stripes, 471  
 sulfur dioxide emissions over time, 180–181  
 temperatures in Anchorage, 54  
 weights of dogs, 63  
 wind chill, 533, 586

## FINANCE AND INVESTMENT

average earnings for embalmers, 212  
 average salary for pharmacists over time, 169  
 compound interest on account, 759, 763, 785  
 compound interest on loan, 763  
 continuous compounding, 760, 763, 770–771, 775, 785  
 difference in median income, 18  
 earnings at part-time job, 212  
 earnings per week, 495  
 exchange rate between dollars and pesos, 169  
 income and hours worked, 169  
 interest earned on annuity, 729  
 interest earned on investment, 60, 64, 493  
 interest on two accounts, 64  
 interest rate needed, 775, 785  
 investments in three accounts, 65  
 investments in two accounts, 60–62, 64, 65, 91, 270, 485  
 net weekly pay, 783  
 salary over time, 64  
 salary per year, 65  
 value of stock over time, 222  
 wealthiest women in the world, 116

## FOOD

caffeine in soda, 484  
 calories in ice cream, 227  
 calories in mayonnaise brands, 271  
 candy mixture, 287  
 chicken consumption per capita, 269  
 coffee blend, 84  
 cookie sales per month, 742  
 cost of cantaloupe and watermelon, 270  
 cost of chips and soda, 700  
 cost of granola, 484  
 cost of hamburger and fries, 270  
 cost of hot dog, fries, and soda, 271  
 cost of hot dog and soda, 287  
 cost of ice cream cone, shake, and sundae, 287  
 cost of meals, 269  
 cost of nut mixture, 270  
 cost of potatoes, 478–479  
 fat in Starbucks drink, 504  
 fruit juice mixture, 270  
 grams of protein in protein bars, 271  
 guacamole eaten during Super Bowl, 312  
 height of coffee can, 73  
 height of tomato sauce can, 73  
 length of candy bar, 419  
 milk consumption per capita, 169  
 nut mixture, 84  
 original price of dog food, 93  
 ounces in cereal box, 128  
 ounces in milk container, 128  
 ounces in soup can, 125  
 potato chips consumed per person, 152  
 profit on candy sales, 320  
 profit on salmon sales, 470  
 sales of dog food, 784  
 sales of hamburgers, 62  
 sandwich supply and demand, 652  
 sodium in drinks, 287  
 sugar in drinks, 62, 270  
 types of coffee ordered, 479–480  
 types of flour in mixture, 485  
 volume of soup can, 586

## INTERNET AND TECHNOLOGY

dimensions of computer screen, 838  
 dimensions of iPod, 269  
 dimensions of laptop screen, 623  
 dimensions of monitor, 287  
 dimensions of mouse pad, 262  
 DVD data transfer rate, 212  
 Google quarterly revenue, 289  
 households with Internet access, 247  
 ink droplets per photo print, 312  
 length of copy machine paper, 72  
 original price of camera, 63  
 original price of cell phone, 65  
 profit on calculator sales, 323  
 profit on laptop sales, 323  
 sale price of cell phone, 63  
 sales of digital cameras, 700  
 samples of sound read from CD, 207–208, 212  
 surface area of CD, 809  
 text messages per month, 106  
 texts per person per day, 287  
 time for programming job, 486  
 time to print pictures, 486

time to set up alarm system, 486  
USB data transfer rate, 225  
width of printed area, 72  
wireless communication subscribers over  
time, 223  
YouTube video views, 289

### SCIENCE AND CHEMISTRY

acid solution, 80–81, 84, 92, 265, 270  
alcohol solution, 81, 84, 270, 287, 352,  
506, 851  
antifreeze solution, 84  
cleaning solution, 485  
current in circuit, 492  
dimensions of aquarium, 409  
focal length of lens, 470  
force exerted on object, 495  
force to stretch spring, 496  
frequency of piano string, 495  
height of firework shell, 411–412  
height of tank, 72  
hydrogen peroxide solution, 84, 264–265  
illuminance, 652  
impedance of circuits, 586  
intensity of light, 492  
loudness of space shuttle, 763  
mass of water molecules, 349  
period of pendulum, 524  
pH of substances, 764, 785  
power in electrical system, 495  
power generated by Hoover Dam, 312  
radioactive decay, 772–773, 775–776, 785  
radius of water tank, 552  
resistance of wire, 495  
silver alloy, 85  
speed of sound, 586  
surface area of cube, 495  
time to empty tank, 644  
time to fill pool, 644

time to fill sink, 486  
time to fill tub, 486  
volume of box, 493  
volume of candle wax, 552  
volume of cylinder, 495, 586  
volume of gas, 504  
wave velocity, 586, 604  
weight of ball, 504  
weight of object above Earth, 496

### SOCIOLOGY AND DEMOGRAPHICS

addresses of houses, 63  
areas of countries, 62  
babies born to teen mothers, 168, 678  
change in housing starts, 18–19  
females in Belgian workforce, 186  
fingerprint comparisons per second, 212  
households with pets, 485  
increase in housing, 742  
maximum traffic tickets written, 678  
men in civilian labor force over time, 169–170  
population change in Oakland, 19  
population decrease, 775  
population increase, 775, 785  
population of Maine over time, 184–185  
population of North Dakota over time, 185  
tourism-related output in U.S., 649–650  
tourists visiting per year, 742  
violent crimes in U.S., 678  
voters for each candidate, 63, 485

### SPORTS AND HOBBIES

break-even point for basketballs, 838  
colors in paint mixture, 485  
cost of baseball tickets, 271  
cost of football tickets and parking, 270  
cost of soccer uniforms, 349  
difference between golf scores, 15  
difference in baseball attendance, 18

dimensions of bandana, 417  
dimensions of fabric pieces, 651  
dimensions of Ferris wheel, 809  
dimensions of London Eye, 809  
dimensions of painting, 409  
dimensions of picture, 269  
dimensions of sail, 651  
female motocross spectators, 484  
height of baseball, 407–408  
height of bike ramp, 417, 651  
length of kite string, 623  
length of side of die, 524  
lengths of jump ropes, 63  
loudness of basketball game, 785  
markup on fishing poles, 65  
NBA championships won, 114  
NCAA championships won, 269  
NCAA championship viewers, 269  
number of male runners, 62  
Olympic medals per country, 63  
Olympics participants, 64  
pitchers on baseball team, 62  
profit on bicycle sales, 323  
racing winnings over time, 18  
revenue of basketball teams, 271  
schools in NCAA conferences, 717  
snowboarding and ice skating  
participants, 246–247  
soccer games played in season, 65  
speed of baseball pitch, 133  
speed of runner, 644  
Super Bowl net yardage, 18  
teams playing in Rose Bowl, 268  
time to cut out shapes, 486  
width of basketball lane, 73  
width of picture frame border, 651  
width of pillow sham border, 698  
width of ping-pong table, 67  
width of swimming pool border, 651





# Real Numbers and Algebraic Expressions

## OUTLINE

Study Strategies: The P.O.W.E.R. Framework

- 1.1** Sets of Numbers
- 1.2** Operations on Real Numbers
- 1.3** Exponents, Roots, and Order of Operations
- 1.4** Algebraic Expressions and Properties of Real Numbers

Group Activity

emPOWERme: Why Am I Going to College?

## Math at Work: Computer Game Designer

Ever since he was a child, Dave Cantelmo has known what he wanted to do: create video games. “I still remember playing games on the classic systems I had growing up,” Dave says. “I would spend hours and hours playing those games and always imagined the games I wanted to create myself one day.”

In order to realize his ambitions, Dave put in the time and effort necessary to learn the design and computer programming skills involved in video game development. Early on in college, he was particularly focused on building up his math abilities, as math is critical to the technical side of video game creation. “I was always a little intimidated by math,” Dave describes. “But with hard work and the help of my instructors, I was able to turn math into one of my strengths. Now, it’s something I use in my job every day.”

Creating a successful video game is a complex challenge. “Completing a video game takes the coordinated efforts of dozens of designers, writers, programmers, animators, and many other people, all working for years to turn an idea into a game people all over the world can play,” Dave explains. He says the key to completing such a difficult task is taking a smart, organized approach, dividing the work into steps that will culminate in the finished product.

In this chapter, we will discuss the topic of real numbers. We will also introduce P.O.W.E.R., a framework that can help you succeed in the complex challenges you face, either in the classroom, on the job, or in your daily life.

The **P.O.W.E.R. Framework** is based on an acronym—a word formed from the first letters of a series of steps. P.O.W.E.R. stands for **Prepare**, **Organize**, **Work**, **Evaluate**, and **Rethink**. That's it. It's a simple framework, but an effective one. P.O.W.E.R. gives you a proven, ready-to-use approach to virtually any challenge you face, from studying for a math test to developing a presentation for your coworkers to writing the family grocery list. Think of its steps as a roadmap to success no matter what your task is.

Whether you are familiar with the P.O.W.E.R. framework already or are encountering it for the first time, take a moment now to review each of its steps in depth:

## P Prepare

- Think about what you are trying to accomplish: Define both your short-term and long-term goals.
- **Long-term goals** are major accomplishments that take a significant amount of time and effort to achieve, such as graduating from college. **Short-term goals** are steps that are easier to accomplish and bring you closer to your long-term goals—for example, doing well on a math exam.

## O Organize

- Identify the tools you will need to complete your task.
- Effective organization involves gathering both the *physical* tools you will need to complete your task (for example, a textbook, pen, paper, and so forth) and doing the *mental* work (reviewing lecture notes or major concepts in your textbook, say) to ensure you are ready to succeed.

## W Work

- With the previous steps as your foundation, do the work of completing your task.
- When doing math tasks in particular, it is important to work efficiently but patiently, neither trying to rush through the work nor becoming frustrated and giving up after the first difficulty you encounter.
- Stay motivated by keeping your goals in mind.

## E Evaluate

- Think back to your goal for the task. Did you meet your own expectations?
- Revise your work based on your assessment of it.
- In math courses, it's important to identify the specific obstacles that may be causing you to perform below your capabilities. Are there particular concepts you are struggling with? Would you benefit from working with a math tutor or your fellow students?

## R Rethink

- Think critically about both the work you have done and the process you used to complete it. What did you do that worked well? Where do you see room for improvement?
- Take a step back and consider how the task you completed brought you closer to your long-term goals.



# Chapter 1 **POWER** Plan

## **P** Prepare

## **O** Organize

What are your goals for Chapter 1?	How can you accomplish each goal?
<b>1</b> Be prepared before and during class.	<ul style="list-style-type: none"> <li>• Don't stay out late the night before and be sure to set your alarm clock!</li> <li>• Bring a pencil, notebook paper, and textbook to class.</li> <li>• Avoid distractions by turning off your cell phone during class.</li> <li>• Pay attention, take good notes, and ask questions.</li> <li>• Complete your homework on time and ask questions on problems you do not understand.</li> </ul>
<b>2</b> Understand the homework to the point where you could do it without needing any help or hints.	<ul style="list-style-type: none"> <li>• Read the directions and show all of your steps.</li> <li>• Go to the professor's office for help.</li> <li>• Rework homework and quiz problems and find similar problems for practice.</li> </ul>
<b>3</b> Use the P.O.W.E.R. framework to help you organize your study: <i>Why Am I Going to College?</i>	<ul style="list-style-type: none"> <li>• Read the Study Strategy that explains how to use P.O.W.E.R.</li> <li>• What does P.O.W.E.R. stand for?</li> <li>• Complete the emPOWERme that appears before the Chapter Summary.</li> </ul>
<b>4</b> Write your own goal. _____ _____	<ul style="list-style-type: none"> <li>• _____              _____</li> </ul>
What are your objectives for Chapter 1?	How can you accomplish each objective?
<b>1</b> Learn the different sets of numbers.	<ul style="list-style-type: none"> <li>• Learn the definitions in Section 1.1.</li> <li>• Take good notes in class.</li> </ul>
<b>2</b> Be able to add, subtract, multiply, and divide real numbers.	<ul style="list-style-type: none"> <li>• Master the steps for these operations! Future sections build on this knowledge, so continually review these operations.</li> </ul>
<b>3</b> Understand how to evaluate expressions, roots, and exponents. Be able to simplify an expression using the order of operations.	<ul style="list-style-type: none"> <li>• Understand the meaning of exponents and how to identify the base and exponent.</li> <li>• Memorize the powers of integers in Section 1.3.</li> <li>• Learn the <b>Order of Operations</b>: Use <b>Please Excuse My Dear Aunt Sally</b> to help you remember the order of operations.</li> </ul>
<b>4</b> Understand the properties of real numbers and how they can be used to simplify problems.	<ul style="list-style-type: none"> <li>• Understand the meaning of each property based on the meaning of the word. (Commutative property = "commute.")</li> <li>• Be aware of when the properties can be used to help simplify a problem.</li> </ul>
<b>5</b> Write your own goal. _____ _____	<ul style="list-style-type: none"> <li>• _____              _____</li> </ul>

**W Work**

Read Sections 1.1 to 1.4, and complete the exercises.

**E Evaluate**

Complete the Chapter Review and Chapter Test. How did you do?

**R Rethink**

- How did you perform on the goals for the chapter? Which steps could be improved for next time? If you had the chance to do this chapter over what would you do differently?
- Think of a job you might like to have and describe how you would need to use what you have just learned to effectively do that job.
- How has the P.O.W.E.R. framework helped you master the objectives of this chapter? Where else could you use this framework? Make it a point to use P.O.W.E.R. to complete another task this week.

# 1.1 Sets of Numbers

**P Prepare**

**O Organize**

What are your objectives for Section 1.1?	How can you accomplish each objective?
<p><b>1</b> Identify Numbers and Graph Them on a Number Line</p>	<ul style="list-style-type: none"> <li>• Know the definition of <i>natural numbers</i>, <i>whole numbers</i>, <i>integers</i>, <i>rational numbers</i>, and <i>irrational numbers</i>.</li> <li>• Determine when a number may belong to more than one number set.</li> <li>• Know how to draw/label a number line and determine where that number should be graphed.</li> <li>• Complete the given examples on your own.</li> <li>• Complete You Trys 1, 2, and 3.</li> </ul>
<p><b>2</b> Compare Numbers Using Inequality Symbols</p>	<ul style="list-style-type: none"> <li>• Write the inequality symbols in math notation and in words.</li> <li>• Know how to determine the larger of two given numbers.</li> <li>• Complete the given examples on your own.</li> <li>• Complete You Trys 4 and 5.</li> </ul>
<p><b>3</b> Find the Absolute Value of a Number</p>	<ul style="list-style-type: none"> <li>• Know the definitions of <i>additive inverse</i> and <i>absolute value</i>.</li> <li>• Be able to show, on a number line, the <i>additive inverse</i> and the <i>absolute value</i> of a given number.</li> <li>• Complete the given examples on your own.</li> <li>• Complete You Trys 6 and 7.</li> </ul>

**W Work**

Read the explanations, follow the examples, take notes, and complete the You Trys.

# 1 Identify Numbers and Graph Them on a Number Line

Why should we review sets of numbers and arithmetic skills? Because the manipulations done in arithmetic are precisely the same set of skills needed to learn algebra. Let's begin by defining some numbers used in arithmetic:

The set of **natural numbers** is  $\{1, 2, 3, 4, 5, \dots\}$ .

The set of **whole numbers** is  $\{0, 1, 2, 3, 4, 5, \dots\}$ .

Natural numbers are often thought of as the counting numbers. Whole numbers consist of the natural numbers and zero. Let's look at other sets of numbers. We begin with integers. Remember that, on a number line, positive numbers are to the right of zero, and negative numbers are to the left of zero.

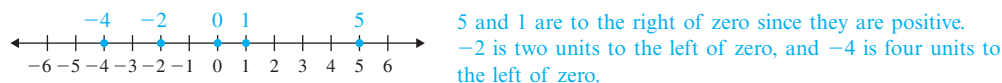
## Definition

The set of **integers** includes the set of natural numbers, their negatives, and zero. The set of *integers* is  $\{\dots, -3, -2, -1, 0, 1, 2, 3, \dots\}$ .

### EXAMPLE 1

Graph each number on a number line: 5, 1, -2, 0, -4.

#### Solution



### YOU TRY 1

Graph each number on a number line: 3, -1, 6, -5, -3.

#### Hint

Notice that we use the set of *integers* to label the number line in Example 1.

Positive and negative numbers are also called *signed numbers*.

### EXAMPLE 2

Given the set of numbers  $\left\{-11, 0, 9, -5, -1, \frac{2}{3}, 6\right\}$ , list the

- a) whole numbers      b) natural numbers      c) integers

#### Solution

- a) whole numbers: 0, 6, 9      b) natural numbers: 6, 9  
c) integers: -11, -5, -1, 0, 6, 9

### YOU TRY 2

Given the set of numbers  $\left\{3, -2, -9, 4, 0, \frac{5}{8}, -\frac{1}{3}\right\}$ , list the

- a) whole numbers      b) natural numbers      c) integers



Notice in Example 2 that  $\frac{2}{3}$  did not belong to any of these sets. That is because the whole numbers, natural numbers, and integers do not contain any fractional parts.  $\frac{2}{3}$  is a *rational number*.

### **W** Hint

Remember that whole numbers, natural numbers, and integers can all be written in the form  $\frac{p}{q}$  where  $q = 1$ .

## Definition

A **rational number** is any number of the form  $\frac{p}{q}$ , where  $p$  and  $q$  are integers and  $q \neq 0$ .

In other words, a rational number is any number that can be written as a fraction where the numerator and denominator are integers and the denominator does not equal zero.

Rational numbers include much more than numbers like  $\frac{2}{3}$ , which are already in fractional form. They also include numbers such as 3, 0.5,  $-7$ ,  $0.\bar{4}$ , and the square root of 9 because each of these numbers can be written as a fraction.

To summarize, the set of rational numbers includes

- 1) integers, whole numbers, and natural numbers.
- 2) repeating decimals.
- 3) terminating decimals.
- 4) fractions and mixed numbers.

The set of rational numbers does *not* include nonrepeating, nonterminating decimals or radicals like  $\sqrt{5}$  where the radicand is *not* a perfect square. These numbers cannot be written as the quotient of two integers. Numbers such as these are called *irrational numbers*.

### **W** Hint

Note that it is not possible to write an irrational number as a fraction. Some irrational numbers are  $\pi$ ,  $\sqrt{5}$ , 0.412738...

## Definition

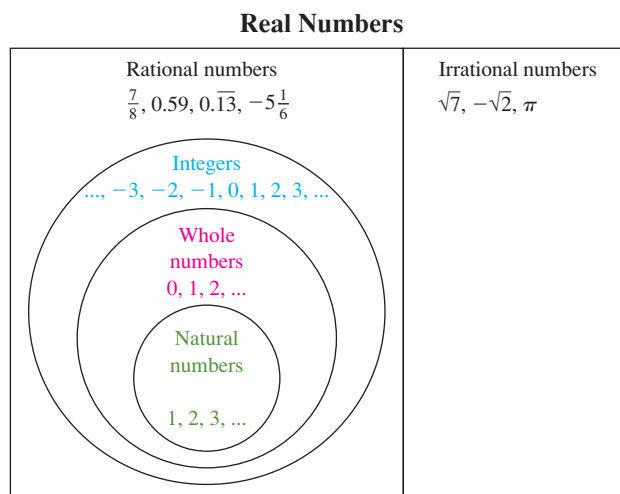
The set of numbers that cannot be written as the quotient of two integers is called the set of **irrational numbers**. Written in decimal form, an *irrational number* is a nonrepeating, nonterminating decimal.

If we put together the sets of numbers we have discussed up to this point, we get the *real numbers*.

## Definition

The set of **real numbers** consists of the rational and irrational numbers.

We summarize the information next with examples of the different sets of numbers:



From the figure we can see, for example, that all whole numbers  $\{0, 1, 2, 3, \dots\}$  are integers, but not all integers are whole numbers ( $-3$ , for example).

### EXAMPLE 3

Given the set of numbers  $\left\{0.\overline{2}, 37, -\frac{4}{15}, \sqrt{11}, -19, 8.51, 0, 6.149235\dots\right\}$ , list the

- |                     |                       |                  |
|---------------------|-----------------------|------------------|
| a) integers         | b) natural numbers    | c) whole numbers |
| d) rational numbers | e) irrational numbers | f) real numbers  |

### Solution

- a) integers:  $-19, 0, 37$
- b) natural numbers:  $37$
- c) whole numbers:  $0, 37$
- d) rational numbers:  $0.\overline{2}, 37, -\frac{4}{15}, -19, 8.51, 0$  Each of these numbers can be written as the quotient of two integers.
- e) irrational numbers:  $\sqrt{11}, 6.149235\dots$  These numbers *cannot* be written as the quotient of two integers.
- f) real numbers: All of the numbers in this set are real.  
 $\left\{0.\overline{2}, 37, -\frac{4}{15}, \sqrt{11}, -19, 8.51, 0, 6.149235\dots\right\}$

### YOU TRY 3

Given the set of numbers  $\left\{-38, 0, \sqrt{15}, 6, \frac{3}{2}, 5.4, 0.\overline{8}, 4.981162\dots\right\}$ , list the

- |                       |             |                     |
|-----------------------|-------------|---------------------|
| a) whole numbers      | b) integers | c) rational numbers |
| d) irrational numbers |             |                     |

## 2 Compare Numbers Using Inequality Symbols

Let's review the inequality symbols.

$<$ less than	$\leq$ less than or equal to
$>$ greater than	$\geq$ greater than or equal to
$\neq$ not equal to	$\approx$ approximately equal to

We use these symbols to compare numbers as in  $5 > 2$ ,  $6 \leq 17$ ,  $4 \neq 9$ , and so on. How do we compare negative numbers?

### Hint

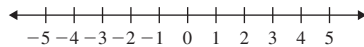
Think about why  $-8$  is less than  $-7$  on a number line. Draw a number line and notice that  $-8$  is to the left of  $-7$ .

### Note

As we move to the *left* on the number line, the numbers get smaller. As we move to the *right* on the number line, the numbers get larger.

### EXAMPLE 4

Insert  $>$  or  $<$  to make the statement true. Look at the number line, if necessary.



- a)  $5 \underline{\quad} 1$       b)  $-4 \underline{\quad} 3$       c)  $-1 \underline{\quad} -5$       d)  $-5 \underline{\quad} -2$

### Solution

- a)  $5 \geq 1$       *5 is to the right of 1.*      b)  $-4 \leq 3$       *-4 is to the left of 3.*  
c)  $-1 \geq -5$       *-1 is to the right of -5.*      d)  $-5 \leq -2$       *-5 is to the left of -2.*

### YOU TRY 4

Insert  $>$  or  $<$  to make the statement true.

- a)  $4 \underline{\quad} 9$       b)  $6 \underline{\quad} -8$       c)  $-3 \underline{\quad} -10$

We use signed numbers in everyday situations.

### EXAMPLE 5

Use a signed number to represent the change in each situation.

- a) After a storm passed through Kansas City, the temperature dropped  $18^\circ$ .  
b) Between 2006 and 2010, retail sales of gluten-free products rose by \$1.3 billion. (www.celiac.com)

### Solution

- a)  $-18^\circ$       *The negative number represents a decrease in temperature.*  
b) \$1.3 billion      *The positive number represents an increase in sales.*

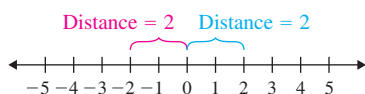
### YOU TRY 5

Use a signed number to represent the change.

After taking his last test, Julio raised his average by 3.5%.

### 3 Find the Absolute Value of a Number

Before we discuss absolute value, we will define *additive inverses*.



Notice that both  $-2$  and  $2$  are a distance of 2 units from 0 but are on opposite sides of 0. We say that  $2$  and  $-2$  are *additive inverses*.

#### **W** Hint

Notice that the additive inverse of a negative number is always positive. For a positive number, the additive inverse is always negative.

#### Definition

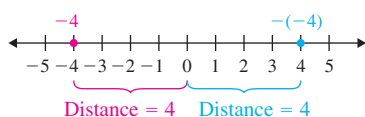
Two numbers are **additive inverses** if they are the same distance from 0 on the number line but on the opposite sides of 0. Therefore, if  $a$  is any real number, then  $-a$  is its additive inverse.

Furthermore,  $-(-a) = a$ . We can see this on the number line.

#### EXAMPLE 6

Find  $-(-4)$ .

#### Solution



Beginning with  $-4$ , the number on the opposite side of zero and 4 units away from zero is 4. So,  $-(-4) = 4$ .

#### [ YOU TRY 6 ]

Find  $-(-11)$ .

This idea of “distance from zero” can be explained in another way: *absolute value*.

#### Definition

If  $a$  is any real number, then the **absolute value of  $a$** , denoted by  $|a|$ , is

- i)  $a$  if  $a \geq 0$
- ii)  $-a$  if  $a < 0$

Remember,  $|a|$  is never negative.

#### Note

The absolute value of a number is the distance between that number and 0 on the number line. It just describes the distance, *not* what side of zero the number is on. Therefore, the absolute value of a number is always positive or zero.