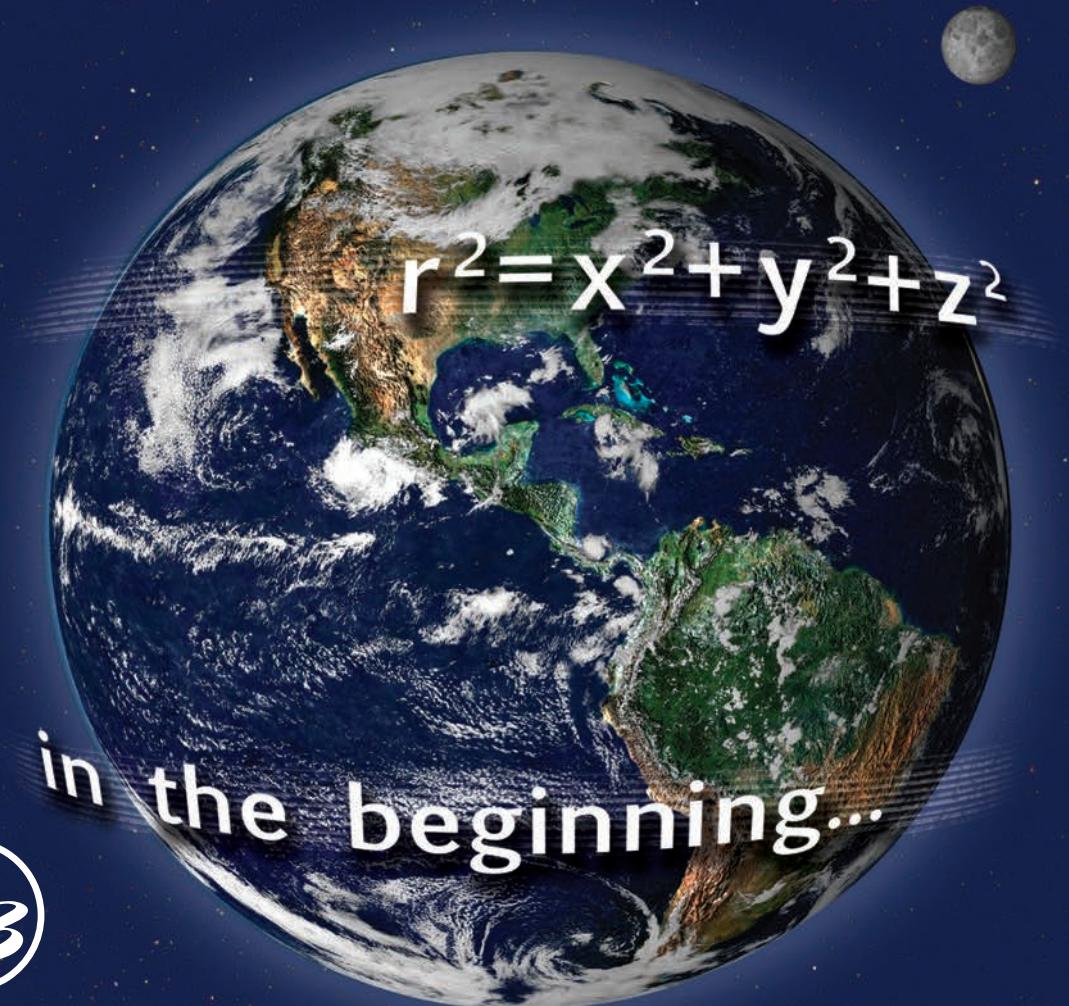
TEACHER GUIDE

High School | Algebra I

- Weekly Lesson Schedule
- Chapter Tests & Final Exam
- Answers to Exercises & Exams

ELEMENTARY ALGEBRA

HAROLD R. JACOBS



REVISED EDITION

MASTERBOOKS® CURRICULUM

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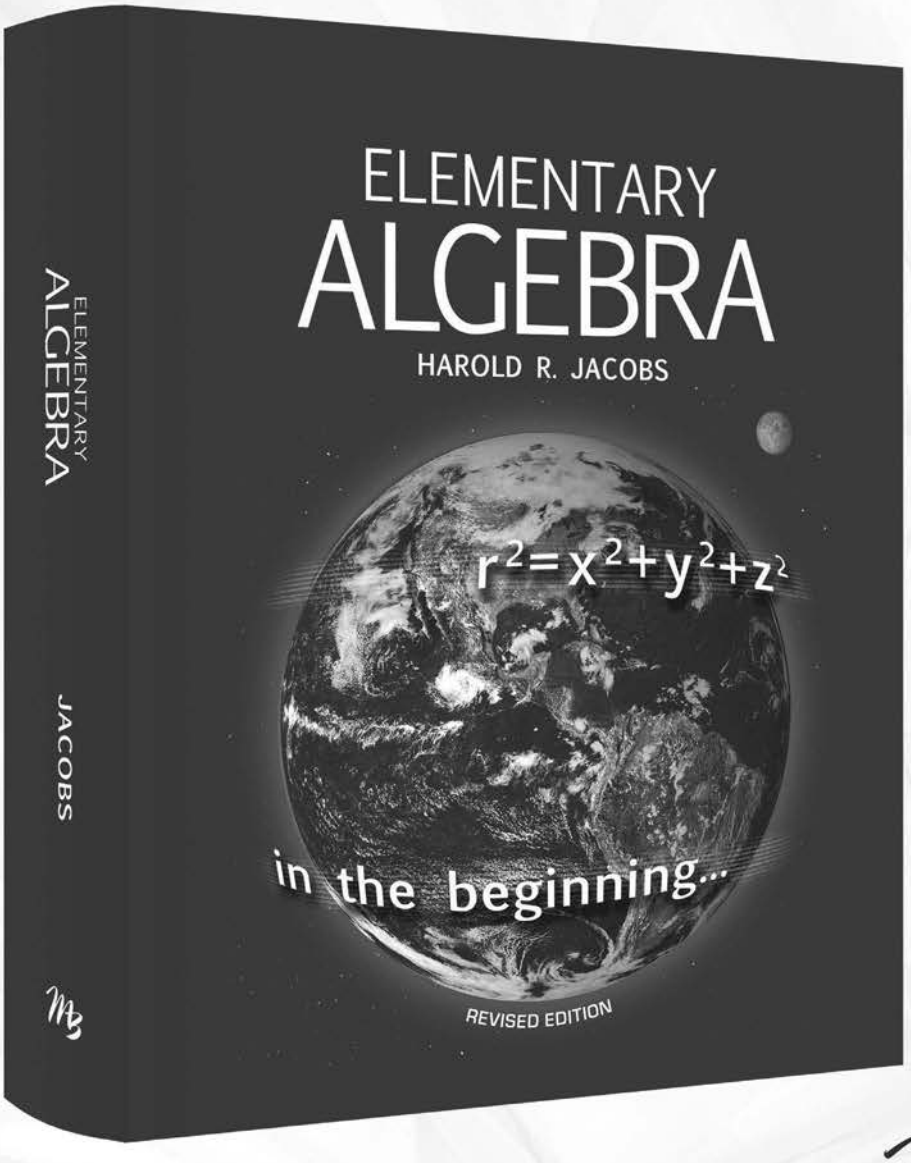

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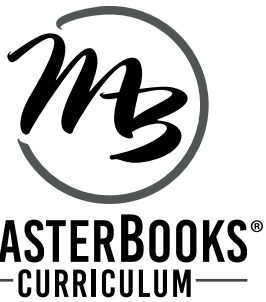

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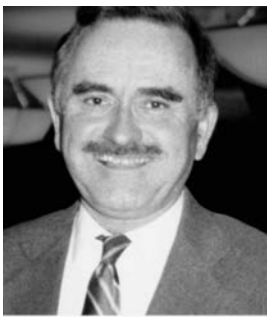

About the Author

Harold R. Jacobs is teacher of mathematics and science, writer, and well-respected speaker. He received his B.A. from UCLA and his M.A.L.S from Wesleyan University. His other publications include *Jacobs Geometry* and *Mathematics: A Human Endeavor.* Mr. Jacobs has received the Distinguished Teacher Award, the Senior Extension Teacher award, the Most Outstanding High School Mathematics Teacher in Los Angeles award, the Presidential Award for Excellence in Mathematics Teaching, and many other acknowledgments.

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Using This Course

Course Description: The course is divided into 17 sections, covering functions and graphs, integers, rational numbers, exponents, polynomials, factoring, fractions, and more. As the student works through the textbook, the answers to the Set II exercise are provided in the back of the student textbook, with full solutions to all of the exercises available in this volume.

Features

Target Level	Designed for grades 9–12 1 credit math or algebra
Flexible 180-Day Schedule	Approximately 45 to 60 minutes per day, five days a week
Open & Go	Daily Schedule, Solutions, Answer Keys
Engaging Application	Worksheets
Assessments	Tests and Exams

Objectives

- Prepares the student with a foundational understanding of basic principles in algebra
- Gives deeper insight into the nature of equations and solutions
- Provides instruction over 17 sections, including functions, integers, and rational numbers
- Helps students take their knowledge and apply it to real life situations
- Designed with flexibility for students and teachers, with optional exercises for practice

Additional Materials Needed:

- ☐ *Elementary Algebra* (student textbook).
- ☐ A notebook and graph paper are essential. It is highly recommended that students use a 3-ring binder, loose-leaf paper, and graph paper to complete the coursework. Tab dividers to separate your work by lesson are also recommended.

There is flexibility in how the course is structured for the student, where the teacher can assign various sets of exercises based on the focus and intensity of the course. Both the student textbook and the *Teacher Guide* are crucial in completing the course.

- Each chapter is segmented into lessons, with each lesson having informative material to explain and analyze critical concepts with examples for analysis; four sets of exercises for each lesson are available for applying this knowledge, as well as a corresponding chapter exam available for assessment purposes.
- Set I exercises review ideas from the previous lessons, which allows for an ongoing application of material from earlier in the course.
- Set II and Set III are similar in that they allow the student to apply concepts from the new lesson. (Set III is found in the download.)
- Set IV exercises are meant to challenge students who are excelling in the course, although many can be done by any student taking the course. These should be considered optional and can also be used for extra credit.
- Extra testing materials can be used as pre-tests, reviews, or bonus material. (These are found in the download.)

Optional Exercises and Assessment Materials

A download is available for purchase that has optional Set III exercise worksheets that can be used by the student for additional practice or for bonus purposes. The Set III worksheets are an optional feature. The course is robust even without their inclusion.

Testing

There are three additional versions available of each chapter test in the download. The teacher can utilize these in various ways based on assessment needs. Some can be used as review sheets or as practice work in prep for the chapter exams. They can also be used as bonus materials. Mid-term and final exams are also included.

For ease in applying the testing materials, all of the Test A versions are recommended. Versions B, C, and D are grouped in a supplemental section of the download.

Grading

It is always the prerogative of an educator/parent to assess student grades however he or she might deem best. The following is only a suggested guideline based on the material presented through this course:

- Each lesson's coursework is worth 100 points. Because of variations in how this course may be taught — based on the numbered Set Exercises you choose to include — it is recommended you use the formula for grading explained below.
- All tests within the course are worth 100 points each.

To calculate the percentage of the worksheets, chapter tests, mid-term or final exam, the parent/educator may use the following guide.

Divide total number of questions correct (example: 43) by the total number of questions possible (example: 46) to calculate the percentage out of 100 possible. 43/46 = 93 percent correct. The suggested grade values are noted as follows:

90 to 100 percent = A

80 to 89 percent = B

70 to 79 percent = C

60 to 69 percent = D

0 to 59 percent = F

First Semester Suggested Daily Schedule

Date	Day	Assignment	Due Date	✓	Grade
First Semester-First Quarter					
Week 1	Day 1	Read pages xi-3 of *Elementary Algebra* textbook (EA) • Complete the exercise on pages 3-4 • See this *Teacher Guide* (TG) for exams.			
	Day 2	Read Chapter 1, Lesson 1: Addition, pages 6-8 (EA) Complete Sets I, II, and *IV on pages 8-10.			
	Day 3	Read Chapter 1, Lesson 2: Subtraction, pages 11-12 (EA) Complete Sets I, II, and *IV on pages 12-14.			
	Day 4	Read Chapter 1, Lesson 3: Multiplication, pages 15-16 (EA) Complete Sets I, II, and *IV on pages 17-19.			
	Day 5	Read Chapter 1, Lesson 4: Division, pages 20-21 (EA) Complete Sets I, II, and *IV on pages 21-23.			
Week 2	Day 6	Read Chapter 1, Lesson 5: Raising to a Power, pages 24-25 (EA) Complete Sets I, II, and IV on pages 25-27.			
	Day 7	Read Chapter 1, Lesson 6: Zero and One, pages 28-29 (EA) Complete Sets I, II, and *IV on pages 30-31.			
	Day 8	Read Chapter 1, Lesson 7: Several Operations, pages 32-34 (EA) Complete Sets I, II, and *IV on pages 35-37.			
	Day 9	Read Chapter 1, Lesson 8: Parentheses, pages 38-40 (EA) Complete Sets I, II, and *IV on pages 40-42.			
	Day 10	Read Chapter 1, Lesson 9: The Distributive Rule, pages 43-44 (EA) Complete Sets I, II, and *IV on pages 45-47.			
Week 3	Day 11	Read Chapter 1: Summary and Review, pages 48-49 (EA) Complete Sets I and II on pages 50-52.			
	Day 12	Chapter 1 Test Study Day			
	Day 13	Test 1A, pages 17-18 (TG)			
	Day 14	Read Chapter 2, Lesson 1: An Introduction to Functions, pages 54-55 (EA) • Complete Sets I, II, and *IV on pages 55-58.			
	Day 15	Read Chapter 2, Lesson 2: The Coordinate Graph, pages 59-60 (EA) • Complete Sets I, II, and *IV on pages 60-62.			
Week 4	Day 16	Read Chapter 2, Lesson 3: More on Functions, pages 63-64 (EA) Complete Sets I, II, and *IV on pages 65-67.			
	Day 17	Read Chapter 2, Lesson 4: Direct Variation, pages 68-69 (EA) Complete Sets I, II, and *IV on pages 70-72.			
	Day 18	Read Chapter 2, Lesson 5: Linear Functions, pages 73-74 (EA) Complete Sets I, II, and *IV on pages 75-77.			
	Day 19	Read Chapter 2, Lesson 6: Inverse Variation, pages 78-79 (EA) Complete Sets I, II, and *IV on pages 80-82.			
	Day 20	Read Chapter 2, Summary and Review, page 83 (EA) Complete Sets I and II on pages 84-88.			
Week 5	Day 21	Chapter 2 Test Study Day			
	Day 22	Test 2A, pages 19-20 (TG)			
	Day 23	Review text and work for Chapters 1-2. Use this time to build your skills or work on concepts you may be struggling to understand or master.			
	Day 24	Read Chapter 3, Lesson 1: The Integers, pages 90-91 (EA) Complete Sets I, II, and *IV on pages 91-93.			
	Day 25	Read Chapter 3, Lesson 2: More on the Coordinate Graph, pages 94-95 (EA) • Complete Sets I, II, and *IV on pages 96-98.			

*Set IV problems are considered optional.

Date	Day	Assignment	Due Date	✓	Grade
Week 6	Day 26	Read Chapter 3, Lesson 3: Addition, pages 99-100 (EA) Complete Sets I, II, and *IV on pages 101-102.			
	Day 27	Read Chapter 3, Lesson 4: Subtraction, pages 103-104 (EA) Complete Sets I, II, and *IV on pages 105-106.			
	Day 28	Read Chapter 3, Lesson 5: Multiplication, pages 107-109 (EA) Complete Sets I, II, and *IV on pages 109-110.			
	Day 29	Read Chapter 3, Lesson 6: Division, pages 111-112 (EA) Complete Sets I, II, and *IV on pages 112-113.			
	Day 30	Read Chapter 3, Lesson 7: Several Operations, pages 114-115 (EA) Complete Sets I, II, and *IV on pages 115-117.			
Week 7	Day 31	Read Chapter 3, Summary and Review, pages 118-119 (EA) • Complete Sets I and II on pages 119-122.			
	Day 32	Chapter 3 Test Study Day			
	Day 33	Test 3A, pages 21-22 (TG)			
	Day 34	Read Chapter 4, Lesson 1: The Rational Numbers, pages 124-126 (EA) • Complete Sets I, II, and *IV on pages 126-127.			
	Day 35	Read Chapter 4, Lesson 2: Absolute Value and Addition, pages 128-130 (EA) • Complete Sets I, II, and *IV on pages 131-132.			
Week 8	Day 36	Read Chapter 4, Lesson 3: More on Operations with Rational Numbers, pages 133-134 (EA) • Complete Sets I, II, and *IV on pages 135-136.			
	Day 37	Read Chapter 4, Lesson 4: Approximations, pages 137-139 (EA) Complete Sets I, II, and *IV on pages 139-140.			
	Day 38	Read Chapter 4, Lesson 5: More on Graphing Functions, pages 141-143 (EA) • Complete Sets I, II, and *IV on pages 143-145.			
	Day 39	Read Chapter 4, Summary and Review, pages 146-147 (EA) Complete Sets I and II on pages 147-149.			
	Day 40	Chapter 4 Test Study Day			
Week 9	Day 41	Test 4A, pages 23-24 (TG)			
	Day 42	Review text and work for Chapters 3-4. Use this time to build your skills or work on concepts you may be struggling to understand or master.			
	Day 43	Read Chapter 5, Lesson 1: Equations, pages 152-153 (EA) • Complete Sets I, II, and *IV on pages 153-155.			
	Day 44	Read Chapter 5, Lesson 2: Inverse Operations, pages 156-158 (EA) • Complete Sets I, II, and *IV on pages 158-161.			
	Day 45	Read Chapter 5, Lesson 3: Equivalent Equations, pages 162-165 (EA) • Complete Sets I, II, and *IV on pages 165-167.			
First Semester-Second Quarter					
Week 1	Day 46	Read Chapter 5, Lesson 4: Equivalent Expressions, pages 168-171 (EA) Complete Sets I, II, and *IV on pages 171-172.			
	Day 47	Read Chapter 5, Lesson 5: More on Solving Equations, pages 173-176 (EA) • Complete Sets I, II, and *IV on pages 176-178.			
	Day 48	Read Chapter 5, Lesson 6: Length and Area, pages 179-181 (EA) Complete Sets I, II, and *IV on pages 181-184.			
	Day 49	Read Chapter 5, Lesson 7: Distance, Rate, and Time, pages 185-186 (EA) • Complete Sets I, II, and *IV on pages 186-188.			
	Day 50	Read Chapter 5, Lesson 8: Rate Problems, pages 189-191 (EA) Complete Sets I, II, and *IV on pages 192-193.			

*Set IV problems are considered optional.

Date	Day	Assignment	Due Date	✓	Grade
Week 2	Day 51	Read Chapter 5, Summary and Review, pages 194-195 (EA) Complete Sets I and II on pages 196-200.			
	Day 52	Chapter 5 Test Study Day			
	Day 53	Test 5A, pages 25-26 (TG)			
	Day 54	Read Chapter 6, Lesson 1: Equations in Two Variables, pages 202-203 (EA) • Complete Sets I, II, and *IV on pages 203-205.			
	Day 55	Read Chapter 6, Lesson 2: Formulas, pages 206-208 (EA) Complete Sets I, II and *IV on pages 208-210.			
Week 3	Day 56	Read Chapter 6, Lesson 3: Graphing Linear Equations, pages 211-213 (EA) • Complete Sets I, II, and IV on pages 214-215.			
	Day 57	Read Chapter 6, Lesson 4: Intercepts, pages 216-219 (EA) Complete Sets I, II, and *IV on pages 219-221.			
	Day 58	Read Chapter 6, Lesson 5: Slope, pages 222-224 (EA) Complete Sets I, II, and *IV on pages 225-226.			
	Day 59	Read Chapter 6, Lesson 6: The Slope-Intercept Form, pages 227-229 (EA) • Complete Sets I, II, and *IV on pages 229-231.			
	Day 60	Read Chapter 6, Summary and Review, page 232 (EA) Complete Sets I and II on pages 233-236.			
Week 4	Day 61	Chapter 6 Test Study Day			
	Day 62	Test 6A, pages 27-28 (TG)			
	Day 63	Review text and work for Chapters 5-6. Use this time to build your skills or work on concepts you may be struggling to understand or master.			
	Day 64	Read Chapter 7, Lesson 1: Simultaneous Equations, pages 238-241 (EA) • Complete Sets I, II, and *IV on pages 241-243.			
	Day 65	Read Chapter 7, Lesson 2: Solving by Subtraction, pages 244-245 (EA) • Complete Sets I, II, and *IV on pages 246-248.			
Week 5	Day 66	Read Chapter 7, Lesson 3: More on Solving by Addition and Subtraction, pages 249-252 (EA) • Complete Sets I, II, and *IV on pages 253-254.			
	Day 67	Read Chapter 7, Lesson 4: Graphing Simultaneous Equations, pages 255-258 (EA) • Complete Sets I, II, and *IV on pages 258-260.			
	Day 68	Read Chapter 7, Lesson 5: Inconsistent and Equivalent Equations, pages 261-263 (EA) • Complete Sets I, II, and *IV on pages 263-266.			
	Day 69	Read Chapter 7, Lesson 6: Solving by Substitution, pages 267-271 (EA) • Complete Sets I, II, and IV on pages 271-273.			
	Day 70	Read Chapter 7, Lesson 7: Mixture Problems, pages 274-275 (EA) Complete Sets I, II, and *IV on pages 276-277.			
Week 6	Day 71	Read Chapter 7, Summary and Review, pages 278-279 (EA) Complete Sets I and II on pages 280-282.			
	Day 72	Chapter 7 Test Study Day			
	Day 73	Test 7A, pages 29-30 (TG)			
	Day 74	Read Chapter 8, Lesson 1: Large Numbers, pages 284-286 (EA) Complete Sets I, II, and *IV on pages 286-288.			
	Day 75	Read Chapter 8, Lesson 2: A Fundamental Property of Exponents, pages 289-292 (EA) • Complete Sets I, II, and *IV on pages 292-293.			

*Set IV problems are considered optional.

Date	Day	Assignment	Due Date	✓	Grade
Week 7	Day 76	Read Chapter 8, Lesson 3: Two More Properties of Exponents, pages 294-296 (EA) • Complete Sets I, II, and *IV on pages 297-298.			
	Day 77	Read Chapter 8, Lesson 4: Zero and Negative Exponents, pages 299-302 (EA) • Complete Sets I, II, and *IV on pages 302-303.			
	Day 78	Read Chapter 8, Lesson 5: Small Numbers, pages 304-305 (EA) Complete Sets I, II, and *IV on pages 306-307.			
	Day 79	Read Chapter 8, Lesson 6: Powers of Products and Quotients, pages 308-310 (EA) • Complete Sets I, II, and *IV on pages 310-312.			
	Day 80	Read Chapter 8, Lesson 7: Exponential Functions, pages 313-315 (EA) • Complete Sets I, II, and *IV on pages 315-317.			
Week 8	Day 81	Read Chapter 8, Summary and Review pages 318-319 (EA) Complete Sets I and II on pages 319-322.			
	Day 82	Chapter 8 Test Study Day			
	Day 83	Test 8A, pages 31-32 (TG)			
	Day 84	Chapter 1-8, Mid-Term Review - Read over Chapter 1-8 Summary and Review pages; Complete Sets I, II, and III on pages 324-328.			
	Day 85	Mid Term Test A - Chapters 1-8, Pages 51-54 (TG)			
Week 9	Day 86	Read Chapter 9, Lesson 1: Monomials, pages 330-332 (EA) Complete Sets I, II, and *IV on pages 332-334.			
	Day 87	Read Chapter 9, Lesson 2: Polynomials, pages 335-337 (EA) • Complete Sets I, II, and *IV on pages 337-339.			
	Day 88	Read Chapter 9, Lesson 3: Adding and Subtracting Polynomials, pages 340-342 (EA) • Complete Sets I, II, and *IV on pages 343-344.			
	Day 89	Read Chapter 9, Lesson 4: Multiplying Polynomials, pages 345-347 (EA) • Complete Sets I, II, and *IV on pages 347-349.			
	Day 90	Read Chapter 9, Lesson 5: More on Multiplying Polynomials, pages 350-351 (EA) • Complete Sets I, II, and *IV on pages 352-353.			
		Mid-Term Grade			

Second Semester Suggested Daily Schedule

Date	Day	Assignment	Due Date	✓	Grade
		Second Semester-Third Quarter			
Week 1	Day 91	Read Chapter 9, Lesson 6: Squaring Binomials, pages 354-358 (EA) • Complete Sets I, II, and *IV on pages 358-360.			
	Day 92	Read Chapter 9, Lesson 7: Dividing Polynomials, pages 361-364 (EA) • Complete Sets I, II, and *IV on pages 365-367.			
	Day 93	Read Chapter 9, Summary and Review pages 368-369 (EA) Complete Sets I and II on pages 369-372.			
	Day 94	Chapter 9 Test Study Day			
	Day 95	Test 9A, pages 33-34 (TG)			

*Set IV problems are considered optional.

Date	Day	Assignment	Due Date	✓	Grade
	Day 96	Review text and work for Chapters 7-9. Use this time to build your skills or work on concepts you may be struggling to understand or master.			
	Day 97	Read Chapter 10, Lesson 1: Prime and Composite Numbers, pages 374-377 (EA) • Complete Sets I, II, and *IV on pages 377-379.			
Week 2	Day 98	Read Chapter 10, Lesson 2: Monomials and Their Factors, pages 380-382 (EA) • Complete Sets I, II, and *IV on pages 383-384.			
	Day 99	Read Chapter 10, Lesson 3: Polynomials and Their Factors, pages 385-388 (EA) • Complete Sets I, II, and *IV on pages 388-390.			
	Day 100	Read Chapter 10, Lesson 4: Factoring Second-Degree Polynomials, pages 391-396 (EA) • Complete Sets I, II, and *IV on pages 396-398.			
	Day 101	Read Chapter 10, Lesson 5: Factoring the Difference of Two Squares, pages 399-401 (EA) • Complete Sets I, II, and *IV on pages 401-403.			
	Day 102	Read Chapter 10, Lesson 6: Factoring Trinomial Squares, pages 404-405 (EA) • Complete Sets I, II, and *IV on pages 406-407.			
Week 3	Day 103	Read Chapter 10, Lesson 7: More on Factoring Second-Degree Polnomials, pages 408-411 (EA) • Complete Sets I, II, and *IV on pages 411-412.			
	Day 104	Read Chapter 10, Lesson 8: Factoring Higher-Degree Polynomials, pages 413-415 (EA) • Complete Sets I, II, and *IV on pages 415-416.			
	Day 105	Read Chapter 10, Summary and Review pages 417-418 (EA) Complete Sets I and II on pages 419-420.			
	Day 106	Chapter 10 Test Study Day			
	Day 107	Test 10A, page 35 (TG)			
	Day 108	Read Chapter 11, Lesson 1: Fractions, pages 422-425 (EA) • Complete Sets I, II, and *IV on pages 426-428.			
Week 4	Day 109	Read Chapter 11, Lesson 2: Algebraic Fractions, pages 429-432 (EA) • Complete Sets I, II, and *IV on pages 432-434.			
	Day 110	Read Chapter 11, Lesson 3: Adding and Subtracting Fractions, pages 435-438 (EA) • Complete Sets I, II, and *IV on pages 439-440.			
	Day 111	Read Chapter 11, Lesson 4: More on Addition and Subtraction, pages 441-443 (EA) • Complete Sets I, II, and *IV on pages 444-445.			
	Day 112	Read Chapter 11, Lesson 5: Multiplying Fractions, pages 446-449 (EA) • Complete Sets I, II, and *IV on pages 449-450.			
Week 5	Day 113	Read Chapter 11, Lesson 6: More on Multiplication, pages 451-454 (EA) • Complete Sets I, II, and *IV on pages 454-455.			
	Day 114	Read Chapter 11, Lesson 7: Dividing Fractions, pages 456-459 (EA) • Complete Sets I, II, and *IV on pages 459-461.			
	Day 115	Read Chapter 11, Lesson 8: Complex Fractions, pages 462-464 (EA) • Complete Sets I, II, and *IV on pages 465-466.			

*Set IV problems are considered optional.

Date	Day	Assignment	Due Date	✓	Grade
Week 6	Day 116	Read Chapter 11, Summary and Review, pages 467-468 (EA) Complete Sets I and II on pages 469-472.			
	Day 117	Chapter 11 Test Study Day			
	Day 118	Test 11A, pages 37-38 (TG)			
	Day 119	Review text and work for Chapters 10-11. Use this time to build your skills or work on concepts you may be struggling to understand or master.			
	Day 120	Read Chapter 12, Lesson 1: Squares and Square Roots, pages 474-475 (EA) • Complete Sets I, II, and *IV on pages 475-478.			
Week 7	Day 121	Read Chapter 12, Lesson 2: Square Roots of Products, pages 479-481 (EA) • Complete Sets I, II, and *IV on pages 482-483.			
	Day 122	Read Chapter 12, Lesson 3: Square Roots of Quotients, pages 484-487 (EA) • Complete Sets I, II, and *IV on pages 487-489.			
	Day 123	Read Chapter 12, Lesson 4: Adding and Subtracting Square Roots, pages 490-491 (EA) • Complete Sets I, II, and *IV on pages 492-493.			
	Day 124	Read Chapter 12, Lesson 5: Multiplying Square Roots, pages 494-496 (EA) • Complete Sets I, II, and *IV on pages 496-497.			
	Day 125	Read Chapter 12, Lesson 6: Dividing Square Roots, pages 498-500 (EA) • Complete Sets I, II, and *IV on pages 501-502.			
Week 8	Day 126	Read Chapter 12, Lesson 7: Radical Equations, pages 503-505 (EA) • Complete Sets I, II, and *IV on pages 506-507.			
	Day 127	Read Chapter 12, Summary and Review pages 508-510 (EA) Complete Sets I and II on pages 510-512.			
	Day 128	Chapter 12 Test Study Day			
	Day 129	Test 12A, pages 39-40 (TG)			
	Day 130	Read Chapter 13, Lesson 1: Polynomial Equations, pages 514-515 (EA) • Complete Sets I, II, and *IV on pages 516-517.			
Week 9	Day 131	Read Chapter 13, Lesson 2: Polynomial Functions, pages 518-520 (EA) • Complete Sets I, II, and *IV on pages 520-521.			
	Day 132	Read Chapter 13, Lesson 3: Solving Polynomial Equations by Graphing, pages 522-523 (EA) • Complete Sets I, II, and *IV on pages 524-525.			
	Day 133	Read Chapter 13, Lesson 4: Solving Quadratic Equations by Factoring, pages 526-528 (EA) • Complete Sets I, II, and *IV on pages 528-529.			
	Day 134	Read Chapter 13, Lesson 5: Solving Quadratic Equations by Taking Square Roots, pages 530-532 (EA) • Complete Sets I, II, and *IV on pages 532-534.			
	Day 135	Read Chapter 13, Lesson 6: Completing the Square, pages 535-537 (EA) • Complete Sets I, II, and *IV on pages 537-539.			

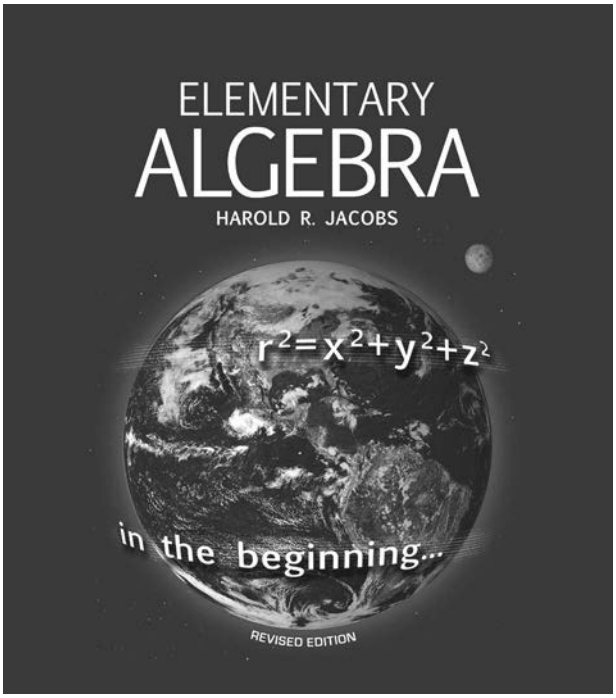
*Set IV problems are considered optional.

Date	Day	Assignment	Due Date	✓	Grade
		Second Semester-Fourth Quarter			
Week 1	Day 136	Read Chapter 13, Lesson 7: The Quadratic Formula, pages 540-542 (EA) • Complete Sets I, II, and *IV on pages 542-544.			
	Day 137	Read Chapter 13, Lesson 8: The Discriminant, pages 545-548 (EA) • Complete Sets I, II, and *IV on pages 549-551.			
	Day 138	Read Chapter 13, Lesson 9: Solving Higher-Degree Equations, pages 552-555 (EA) • Complete Sets I, II, and *IV on pages 555-556.			
	Day 139	Read Chapter 13, Summary and Review, pages 557-559 (EA) Complete Sets I and II on pages 560-562.			
	Day 140	Chapter 13 Test Study Day			
Week 2	Day 141	Test 13A, pages 41-42 (TG)			
	Day 142	Review text and work for Chapters 12-13. Use this time to build your skills or work on concepts you may be struggling to understand or master.			
	Day 143	Read Chapter 14, Lesson 1: Rational Numbers, pages 564-567 (EA) • Complete Sets I, II, and *IV on pages 567-569.			
	Day 144	Read Chapter 14, Lesson 2: Irrational Numbers, pages 570-571 (EA) • Complete Sets I, II, and *IV on pages 572-574.			
	Day 145	Read Chapter 14, Lesson 3: More Irrational Numbers, pages 575-577 (EA) • Complete Sets I, II, and *IV on pages 577-579.			
Week 3	Day 146	Read Chapter 14, Lesson 4: Pi, pages 580-582 (EA) Complete Sets I, II, and *IV on pages 582-584.			
	Day 147	Read Chapter 14, Lesson 5: The Real Numbers, pages 585-587 (EA) • Complete Sets I, II, and *IV on pages 587-588.			
	Day 148	Read Chapter 14, Summary and Review, page 589 (EA) Complete Sets I and II on pages 590-594.			
	Day 149	Chapter 14 Test Study Day			
	Day 150	Test 14A, pages 43-44 (TG)			
Week 4	Day 151	Read Chapter 15, Lesson 1: Ratio and Proportion, pages 596-598 (EA) • Complete Sets I, II, and *IV on pages 599-600.			
	Day 152	Read Chapter 15, Lesson 2: Equations Containing Fractions, pages 601-603 (EA) • Complete Sets I, II, and *IV on pages 603-604.			
	Day 153	Read Chapter 15, Lesson 3: More on Fractional Equations, pages 605-607 (EA) • Complete Sets I, II, and *IV on pages 607-608.			
	Day 154	Read Chapter 15, Lesson 4: Solving Formulas, pages 609-611 (EA) • Complete Sets I, II, and *IV on pages 612-613.			
	Day 155	Read Chapter 15, Lesson 5: More on Solving Formulas, pages 614-617 (EA) • Complete Sets I, II, and *IV on pages 617-619.			

*Set IV problems are considered optional.

Date	Day	Assignment	Due Date	✓	Grade
Week 5	Day 156	Read Chapter 15, Summary and Review, page 620 (EA) Complete Sets I and II on pages 621-624.			
	Day 157	Chapter 15 Test Study Day			
	Day 158	Chapter 15 Test A, page 45 (TG)			
	Day 159	Review text and work for Chapters 14-15. Use this time to build your skills or work on concepts you may be struggling to understand or master.			
	Day 160	Read Chapter 16, Lesson 1: Inequalities, pages 626-628 (EA) Complete Sets I, II, and *IV on pages 629-630.			
Week 6	Day 161	Read Chapter 16, Lesson 2: Solving Linear Inequalities, pages 631-633 (EA) • Complete Sets I, II, and *IV on pages 634-635.			
	Day 162	Read Chapter 16, Lesson 3: More on Solving Inequalities, pages 636-638 (EA) • Complete Sets I, II, and *IV on pages 638-640.			
	Day 163	Read Chapter 16, Lesson 4: Absolute Values and Inequalities, pages 641-644 (EA) • Complete Sets I, II, and *IV on pages 644-646.			
	Day 164	Read Chapter 16, Summary and Review, page 647 (EA) Complete Sets I and II on pages 648-650.			
	Day 165	Chapter 16 Test Study Day			
Week 7	Day 166	Chapter 16 Test A, pages 47-48 (TG)			
	Day 167	Read Chapter 17, Lesson 1: Number Sequences, pages 652-655 (EA) • Complete Sets I, II, and *IV on pages 655-657.			
	Day 168	Read Chapter 17, Lesson 2: Arithmetic Sequences, pages 658-662 (EA) • Complete Sets I, II, and *IV on pages 662-664.			
	Day 169	Read Chapter 17, Lesson 3: Geometric Sequences, pages 665-669 (EA) • Complete Sets I, II, and *IV on pages 669-672.			
	Day 170	Read Chapter 17, Lesson 4: Infinite Geometric Sequences, pages 673-677 (EA) • Complete Sets I, II, and *IV on pages 678-679.			
Week 8	Day 171	Read Chapter 17, Summary and Review, pages 680-681 (EA) Complete Sets I and II on pages 682-686.			
	Day 172	Chapter 17 Test Study Day			
	Day 173	Chapter 17 Test A, pages 49-50 (TG)			
	Day 174	Review text and work for Chapters 16-17. Use this time to build your skills or work on concepts you may be struggling to understand or master.			
	Day 175	Study Day for Final Review - review exercises for chapters 1-8			
Week 9	Day 176	Study Day for Final Review - review tests for chapters 1-8			
	Day 177	Study Day for Final Review - review exercises for chapters 9-17			
	Day 178	Study Day for Final Review - review chapter tests for chapters 9-17			
	Day 179	Pre-Test (Optional)			
	Day 180	Final Exam, pages 55-58; Other tests are available in the download.			
		Final Grade			

*Set IV problems are considered optional.



Algebra Tests and Exams

for Use with

Elementary Algebra

NOTE: This section also contains the mid-term and final tests.

Introductory Comments

This book contains chapter tests, a midterm examination, and a final examination that can be used with *Elementary Algebra*. The midyear and final examinations consist of eighty problems each; both are four pages long, with twenty problems on each page.

The chapter tests are designed for an examination period of approximately 45 minutes; the midterm and final are designed for an examination period of approximately 110 minutes. Complete answers for all of the tests are in a separate section at the end of this book.

Write another expression equivalent to each of the following.

1. $x + x + x$
2. $7 \cdot 7 \cdot 7 \cdot 7$
3. y^2

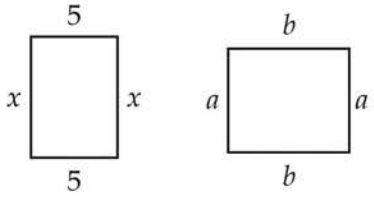
If possible, express each of the following as a power of the number given.

4. 10,000,000 as a power of 10.
5. 4 as a power of 1.
6. 32,768 as a power of 8.

The following problems are about division and zero.

7. Does it make sense to divide 0 by 15?
8. Explain why or why not.

The perimeter of a rectangle is the sum of the lengths of its sides. The area of a rectangle is the product of its length and width. What is the perimeter and area of each of these rectangles?



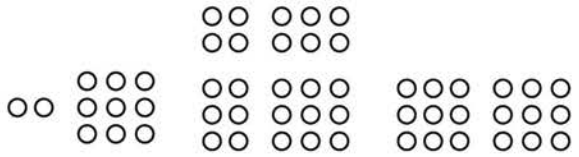
9. Perimeter of the left rectangle.
10. Area of the left rectangle.
11. Perimeter of the right rectangle.
12. Area of the right rectangle.

Write an expression for each of the following.

13. The number x multiplied by 6.
14. The difference between 2 and y.
15. The fourth power of z.

Which figure below illustrates each of these expressions?

16. $2 \cdot 3^2$
17. $2 + 3^2$
18. $(2 + 3)^2$



Max and Minnie are taking a test.

19. If Max's score is 2 more than the average score, x, how many questions did he answer correctly?
20. If there are y questions and Minnie answers 20 of them correctly, how many did she get wrong?

Write an expression for each of the following sets of operations.

21. Multiply 5 by 7 and then cube the result.
22. Subtract 4 from 12 and then multiply by 6.

Here are directions for a number trick. Show how the trick works by drawing boxes and circles to illustrate the steps.

23. Think of a number.
24. Add three.
25. Multiply by four.
26. Subtract eight.
27. Divide by four.
28. Subtract the number you first thought of.
29. What is the result at the end of the trick?

Write each of these products as a sum or difference.

30. $4(a + 8)$
31. $(c - d)c$

Stock of the eEverything Company sells for $1000 per share.

32. How many shares could be bought for y dollars?
33. How much would x shares of the stock cost?

Find the value of each of these expressions.

34. $18 + 2 \cdot 8$
35. $7 \cdot 3^2$
36. $8^2 - 2^2$
37. $30 - (12 - 7)$

Each of the following expressions contains two unknown numbers, x and y. Simplify each expression as much as you can. Assume that neither x nor y is zero.

38. $0x + 1y$
39. $\frac{x}{1} - \frac{y}{1}$

A molecule of ammonia gas consists of one nitrogen atom and three hydrogen atoms.

40. How many of each atom do x molecules of ammonia contain?
41. Write the total number of atoms in x molecules of the gas as a sum.
42. How many atoms does one molecule of ammonia gas contain?
43. Write the total number of atoms in x molecules of the gas as a product.

Find the values of each of the following powers.

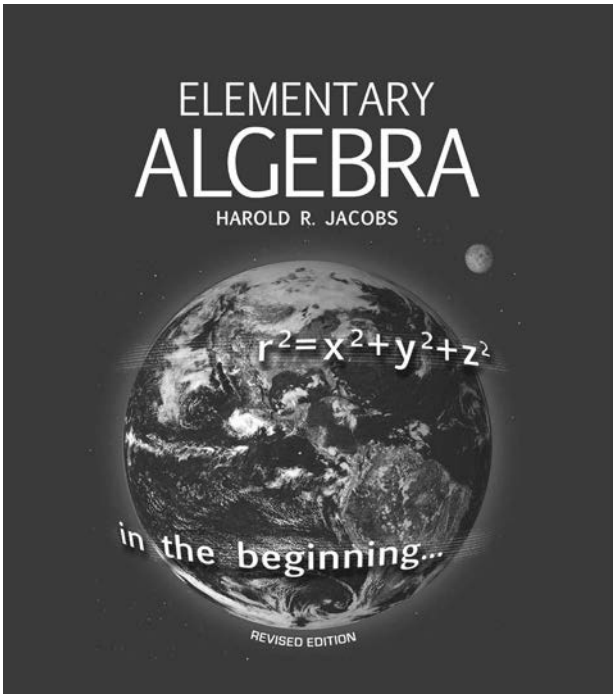
44. 5^3
45. 5^4
46. 5^5
47. Do you think the 20th power of 5 is odd or even?

Find the value of $x^2 + 20 - 9x$ if

48. x is 1.
49. x is 2.
50. x is 3.

Extra Credit. What symbols of operation can be used to replace ||||| in this expression to make it equal to 100?

1 ||||| 2 ||||| 3 ||||| 4 ||||| 5 ||||| 6 ||||| 7 ||||| 8 ||||| 9



Answers to Tests and Exams

for Use with

Elementary Algebra

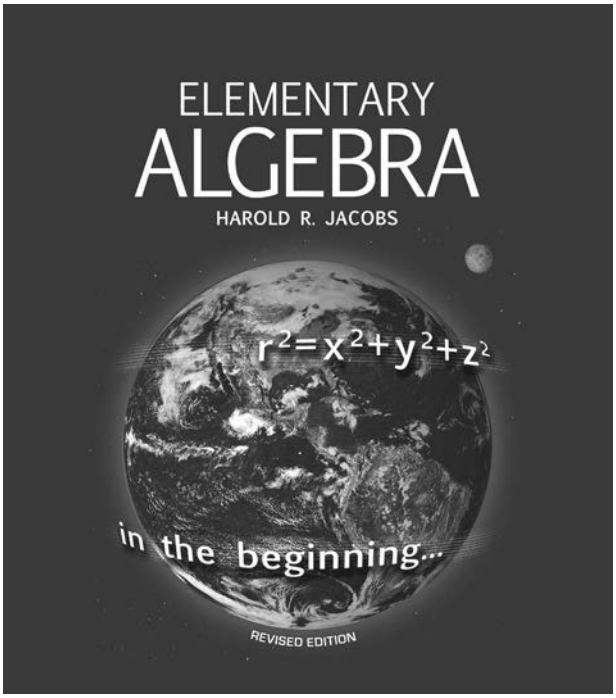
Chapter 1 Test Answers

Problem	Test 1A
1	$3x$
2	7^4
3	$y \cdot y$
4	10^7
5	Not possible.
6	8^5
7	Yes.
8	$\frac{0}{15} = 0$, because $15 \cdot 0 = 0$.
9	$2x + 10$
10	$5x$
11	$2a + 2b$
12	ab
13	$6x$
14	$2 - y$
15	z^4
16	Figure 3.
17	Figure 1.
18	Figure 2.
19	$x + 2$

Problem	Test 1A
20	$y - 20$
21	$(5 \cdot 7)^3$
22	$6(12 - 4)$
23	□
24	□○○○
25	□□□□ ○○○○○○ ○○○○○○
26	□□□□ ○○○○
27	□○
28	○
29	One.
30	$4a + 32$
31	$c^2 - cd$
32	$\frac{y}{1000}$
33	$1000x$ dollars.
34	34
35	63
36	60
37	25
38	y
39	$x - y$

Chapter 1 Test Answers

Problem	Test 1A
40	x nitrogen atoms and $3x$ hydrogen atoms.
41	$x + 3x$
42	4
43	$4x$
44	125
45	625
46	3,125
47	Odd.
48	12
49	6
50	2
Extra Credit	$1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 \bullet 9$



Answers to Exercises

(Sets I, II, and IV)

for Use with

Elementary Algebra

ANSWERS TO EXERCISES

Introduction (pp. 3–4)

1. a)

Think of a number:	1	2	3	4	5
Double it:	2	4	6	8	10
Add six:	8	10	12	14	16
Divide by two:	4	5	6	7	8
Subtract the number you first thought of:	3	3	3	3	3

b) No.

c)

Think of a number: □
Double it: □□
Add six: □□ ooo
Divide by two: □ ooo
Subtract the number you first thought of: ooo

d) Yes.

2. a) Think of a number.
   b) Multiply it by four.
   c) Add eight.
   d) Divide by four.
   e) Add three.
   f) Subtract the number that you first thought of.

3. a) 2.
   b) The result at the end is 4 instead of 2.
   c) The result at the end is 1.
   d) The result at the end now depends on the number first thought of.

4. (One of many possible answers.)
   Think of a number.
   Triple it.
   Add twelve.
   Divide by three.
   Subtract the number that you first thought of.
   The result is four.

Chapter 1, Lesson 1

Set I (page 8)

1. 1,776.
2. 1,107.
3. 1.984.
4. 20.202.
5. 1,370.
6. 1,370.
7. 4.664.
8. 10.631.
9. 2.8.
10. 1.605.

Set II (pages 8–9)

11. a) $10 + 7$ or 17.
    b) $x + 7$.
    c) $10 + y$.
    d) $x + y$.
    e) $4 + 8$ or 12.
    f) $4 + z$.
    g) $2 + 5 + 1$ or 8.
    h) $x + 5 + 1$ or $x + 6$.
    i) $2 + y + 1$ or $y + 3$.
    j) $x + y + 1$.

12. a) $9 + 4$.
    b) 13.
    c) $x + 5$.
    d) 7.
    e) 9.

13. a) $11 + 4 + 5$ or 20.
    b) $x + 6$.
    c) $x + y$.
    d) $5 + 3 + x$ or $8 + x$.
    e) $x + 1 + y + 1$ or $x + y + 2$.
    f) $x + y + z$.

14. a) □ oooooo and oooooo□
    b) oo□ ooooo and □ ooooooo
    c) □ oooo□ and oooo□□

15. a) $8 + y + 2$ or $y + 10$.
    b) $9 + y + 2$ or $y + 11$.
    c) $x + 3 + 2$ or $x + 5$.
    d) $x + 0 + 2$ or $x + 2$.
    e) $6 + 2 + 2$ or 10.

16. a) 44.
    b) $39 + x$.
    c) $39 + x + 6$ or $x + 45$.
    d) $x + 5$.
    e) $x + y$.
    f) $x + y + z$.

Set IV (page 10)

It would happen with any four numbers because:

a	b	$a+b$
x	y	$x+y$
$a+x$	$b+y$	$a+b+x+y$ $=a+x+b+y$

Chapter 1, Lesson 2

Set I (page 12)

1. 20,222.
2. 589.
3. 877.
4. 3.321.
5. 4.221.
6. 0.
7. 0.1.
8. 0.01.
9. 1,793.88.
10. 179.388.

Set II (pages 13–14)

11. a) $10-7$ or 3.
    b) $6-x$.
    c) $x-6$.
    d) $11-3$ or 8.
    e) $x-1$.
    f) $x-y$.
    g) $4-x$.
    h) $x-4$.
12. a) $12-7$ or 5.
    b) $14-x$.
    c) $x-3$.
    d) $y-x$.
    e) $9-2-3$ or 4.
    f) $x-y-1$.
13. a) 2.
    b) 3.
    c) 10.
    d) The value of $x-4$ gets larger.
    e) 12.
    f) 11.
    g) 5.
    h) The value of $15-x$ gets smaller.
14. a) 8.
    b) 10.
    c) 8.
    d) 10.
    e) Each expression is $x+y-3$.
15. a) 4.
    b) $7-x$.
    c) 6.
    d) $14-y$.
16. a) $7{,}000-x$ pounds.
    b) $7{,}000+y$ pounds.
17. a) 24 cents.
    b) $y-x$ cents.
    c) $x+30$ cents.
    d) $95-y$ cents.

Set IV (page 14)

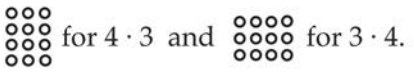
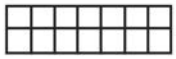
The clerk is giving a customer the change for an \$8.47 purchase: \$20 – \$8.47 = \$11.53. The problem is being solved by addition.

Chapter 1, Lesson 3

Set I (page 17)

1. 36,000.
2. 714,285.
3. 77,777.
4. 1.
5. 12.345.
6. 12.345.
7. 1.001.
8. 10.01.
9. 100.1.
10. 10,000.

Set II (pages 17–18)

11. a)  for $4 \cdot 3$ and for $3 \cdot 4$.
    b) 
    c) 
12. a) $5 \cdot 6$ or 30.
    b) $5+6$ or 11.
    c) $5x$.
    d) $5+x$.
    e) xy.
    f) $x+y$.
    g) xx.
    h) $8x$.

i) $x - 8$.
j) $2 + 7 + x$ or $9 + x$.
k) $2 \cdot 7 \cdot x$ or $14x$.
l) $10 + y + 3$ or $y + 13$.
m) $10 \cdot y \cdot 3$ or $30y$.
n) $4 + x + y$.
o) $4xy$.

13. a) $6 \cdot 2$.
b) $2 \cdot 6$.
c) $5x$.
d) $11 \cdot 7$.
e) $x \cdot 7$ or $7x$.
f) xy.
g) $17 + 17 + 17$.
h) $x + x + x + x$.
i) $2 + 2 + \cdots + 2$ (y of them).
j) $z + z + \cdots + z$ (y of them).

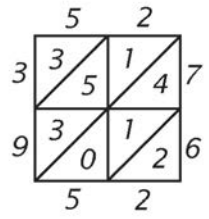
14. a) $7 \cdot 8$ or 56.
b) $10x$.
c) xy.
d) xx.

15. a) 140.
b) $354x$.

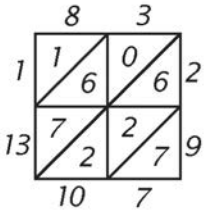
16. a) $7x$.
b) $24x$.
c) 1,440.
d) $1{,}440x$.
e) $10{,}080x$.
f) $100x$.
g) $1{,}200x$.

17. a) 165.
b) $11x$.

Set IV (page 19)

1. 

Yes: 3952 is correct.

2. 

Yes. If we "carry" from each slanting column to the next going clockwise, we get 2407.

Chapter 1, Lesson 4

Set I (page 21)

1. 50.
2. 0.02.
3. 1234.
4. 3003.
5. 1.6.
6. 16.
7. 0.625.
8. 0.0625.

Set II (pages 21–22)

9. a) $\frac{12}{3}$ or 4.
b) $12 - 3$ or 9.
c) $\frac{7}{x}$.
d) $\frac{x}{7}$.
e) $\frac{x}{2}$.
f) $x \cdot 2$ or $2x$.
g) $\frac{10}{x}$.
h) $10 - x$.
i) $\frac{x}{y}$.
j) xy.

10. a) $\frac{12}{3} = 4$ and $\frac{12}{4} = 3$.
b) $\frac{16}{4} = 4$.
c) $\frac{18}{3} = 6$ and $\frac{18}{6} = 3$.

11. a) $5 \cdot 3 = 15$.
b) $23 \cdot 4 = 92$.
c) $12 \cdot 0 = 0$.
d) $(7.5)(1) = 7.5$.
e) $10 \cdot 7 = x$.
f) $x \cdot 12 = 36$.
g) $4x = 20$.
h) $y \cdot 2 = x$.

12. a) 45. [$9 \cdot 5$.]
b) 63. [$9 \cdot 7$.]

c) 108. [$9 \cdot 12$.]
d) The value of $9x$ gets larger.
e) 1. [$\frac{4}{4}$.]
f) 5. [$\frac{20}{4}$.]
g) 25. [$\frac{100}{4}$.]
h) The value of $\frac{x}{4}$ gets larger.
i) 15. [$\frac{30}{2}$.]
j) 6. [$\frac{30}{5}$.]
k) 0.5. [$\frac{30}{60}$.]
l) The value of $\frac{30}{x}$ gets sma

13. a) 20. [$\frac{300}{15}$.]
    b) $\frac{300}{x}$.
14. a) $170x$ dollars.
    b) 600. [$\frac{102,000}{170}$.]
    c) $\frac{x}{170}$.
15. a) $12x$ inches or x feet.
    b) 50. [$\frac{600}{12}$.]
    c) $\frac{x}{12}$.
16. a) 10.6. [$\frac{159}{15}$.]
    b) $\frac{159}{x}$.

Set IV (page 23)

There were twelve loaves of bread altogether. In sharing them equally, the three travelers each got four loaves. This means that the third traveler got three loaves from the pilgrim who had seven loaves and one loaf from the pilgrim who had five loaves. Because $\frac{3}{3+1} = \frac{3}{4}$ of the traveler's bread came from the first pilgrim, he should receive $\frac{3}{4}$ of the twelve coins: $\frac{3}{4}$ of 12 coins = 9 coins.

Chapter 1, Lesson 5

Set I (page 25)

1. 25.
2. 32.
3. 1,000.
4. 10,000,000.
5. 1.
6. 1.
7. 1.69.
8. 9.61.
9. 0.064.
10. 0.004096.

Set II (pages 26–27)

11. a) "x squared" and "x to the second power."
    b) An exponent.
12. a) 3^2.
    b) 5^2.
    c) x^2.
    d) 4^3.
    e) x^3.
13. a) 7^2.
    b) 2^6.
    c) x^3.
    d) x^8.
    e) 3^x.
    f) x^y.
14. a) 7^4.
    b) 4^7.
    c) x^6.
    d) 2^{12}.
    e) 2^x.
    f) x^y.

g) $8 \cdot 8 \cdot 8 \cdot 8 \cdot 8$.
h) $x \cdot x \cdot x$.
i) $3 \cdot 3 \cdot \cdots \cdot 3$ (x of them).
j) $y \cdot y \cdot \cdots \cdot y$ (x of them).

15. a) 2,401.
b) 49^2.

16. a) 3^6.
b) 2^6.
c) 4^3.
d) 8^2.
e) 10^4.
f) 10^9.
g) Because all powers of 1 are equal to 1.

17. a) 512. [$2 \cdot 256$.]
b) 14,641. [$11 \cdot 1{,}331$.]
c) 2,187. [$3 \cdot 3 \cdot 243$.]
d) 390,625. [$5 \cdot 5 \cdot 5 \cdot 3{,}125$.]
e) x.
f) x^2.

Set IV (page 27)

This table shows Ollie's study times:

Week	Minutes
1	1
2	2
3	$2 \cdot 2 = 2^2$
4	$2 \cdot 2 \cdot 2 = 2^3$
5	$2 \cdot 2 \cdot 2 \cdot 2 = 2^4$
6	$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 2^5$
⋮	⋮
20	2^{19}

According to Ollie's plan, he would study 2^{19} minutes in the last week, but $2^{19} = 524{,}288$ minutes. Altogether there are $7 \cdot 24 \cdot 60 = 10{,}080$ minutes in a week, so Ollie wouldn't be able to do it!

Chapter 1, Lesson 6

Set I (page 30)

1. a) □
b) □ ○○
c) □ □ □ ○○○○○○
d) □ □ □ ○○
e) □ ○
f) ○

2. a) $3x$.
b) $3 + x$.
c) $3 - x$.
d) $\frac{3}{x}$.
e) x^3.
f) 3^x.

3. a) $2a$.
b) $b + b + b + b + b$.
c) c^3.
d) $d \cdot d \cdot d \cdot d$.
e) xe.
f) f^y.

Set II (pages 30–31)

4. a) The sum of a number and zero is the number.
b) The difference between a number and zero is the number.
c) The product of a number and zero is zero.
d) The product of a number and one is the number.
e) The quotient of zero and a nonzero number is zero.
f) The quotient of a number and zero is not defined.
g) The quotient of a number and one is the number.

5. a) 45.
b) 0.
c) 11.
d) 1.

6. a) $1^2 = 1$ because 1 times 1 is 1.
b) 1.
c) 1.

7. a) 0.
b) 10 has a "higher value" than 1.

8. a) x.
b) 0.
c) x.
d) $x + 1$ cannot be simplified.
e) x.
f) 0.
g) $\frac{x}{0}$ is not defined.
h) x.

9. a) $x + y$.
b) x.
c) y.
d) 0.
e) $x + y$.

f) 0.
g) x.
h) y.

10. a) 1.
b) 0.
c) Even.

Set IV (page 31)

If x is not equal to 0, then $x^0 = 1$. If x is equal to 0, it would seem that $0^0 = 0$.

Chapter 1, Lesson 7

Set I (page 35)

1. a) 5^3.
b) Not possible.
c) 2^6.

2. a) $x + 1$.
b) $17 - x$.
c) $x + 26$.

3. a) $7x$.
b) $\frac{1000}{x}$ days.
c) $15{,}000 + 10x$.

Set II (pages 35–36)

4. a) Figure 4.
b) Figure 5.
c) Figure 2.
d) Figure 6.
e) Figure 3.
f) Figure 4.
g) Figure 1.

5. a) 50. [10 + 40 = 50.]
b) 32. [2 + 20 + 10 = 32.]
c) 48. [3 · 16 = 48.]
d) 19. [3 + 16 = 19.]
e) 9. [25 – 16 = 9.]
f) 400. [25 · 16 = 400.]
g) 57. [42 – 12 + 27 = 57.]
h) 57. [42 + 27 – 12 = 57.]
i) 27. [42 – 27 + 12 = 27.]
j) 27. [42 + 12 – 27 = 27.]
k) 18. $[\frac{16}{8} + \frac{64}{4} = 2 + 16 = 18.]$
l) 12. $[\frac{16}{4} + \frac{64}{8} = 4 + 8 = 12.]$
m) 18. $[\frac{64}{4} + \frac{16}{8} = 16 + 2 = 18.]$
n) 19. [11 – 6 + 14 = 19.]
o) 52. [11 – 8 + 49 = 52.]
p) 39. [11 · 8 – 49 = 88 – 49 = 39.]
q) 531. [11 · 49 – 8 = 539 – 8 = 531.]

6. a) $x^2 + y^2$.
b) $10 - 5x$.
c) $\frac{x}{5} - 10$.
d) $8x^3$.
e) $y^4 - y$.
f) $\frac{12}{x} + 2$.
g) $x + xy$.

7. a) 2. [$1^2 + 3 \cdot 1 - 2 = 1 + 3 - 2 = 2$.]
b) 26. [$4^2 + 3 \cdot 4 - 2 = 16 + 12 - 2 = 26$.]
c) 128. [$10^2 + 3 \cdot 10 - 2 = 100 + 30 - 2 = 128$.]
d) 458. [$20^2 + 3 \cdot 20 - 2 = 400 + 60 - 2 = 458$.]

8. a) 19. [2 · 6 + 7 = 12 + 7 = 19.]
b) 9. [15 – 3 · 2 = 15 – 6 = 9.]
c) 101. [$1 + 4 \cdot 5^2 = 1 + 4 \cdot 25 = 1 + 100 = 101$.]
d) 900. [$10^3 - 10^2 = 1000 - 100 = 900$.]
e) 84. [$3^4 + 3 = 81 + 3 = 84$.]
f) 82. [$5 \cdot 4^2 - 4 + 6 = 5 \cdot 16 - 4 + 6 = 80 - 4 + 6 = 82$.]

9. a) 845 cents or \$8.45. [7 · 80 + 3 · 95 = 560 + 285 = 845.]
b) $80x + 95y$ cents.

Set IV (page 37)

1. 72. [60 – 2 + 14 = 72.]
2. 40. [12 · 5 = 60; 60 – 8 = 52; 52 ÷ 4 = 13; 13 + 7 = 20; 20 · 2 = 40.]
3. The calculator would do the operations in order from left to right.
4. Write down some of the intermediate steps.

Chapter 1, Lesson 8

Set I (page 40)

1. a) 0.
b) 100.
c) 0.
d) Not possible.
e) 0.01.
f) 100.

2. a) 7. $[\frac{35}{5}.]$
b) 6. $[\frac{6x}{x}.]$
c) x. $[\frac{x^2}{x}.]$
d) $\frac{20}{x}$.

e) x. [$\frac{x}{1}$.]

f) $\frac{y}{x}$

3. a) 5. [$\frac{50}{10}$.]

b) $\frac{x}{10}$.

Set II (pages 41–42)

4. a) Yes. [16 + 2 = 18; 11 + 7 = 18.]
b) No. [6 – 2 = 4; 11 – 3 = 8.]
c) Yes. [16 – 2 = 14; 11 + 3 = 14.]
d) No. [6 + 2 = 8; 11 – 7 = 4.]
e) Yes. [72 · 3 = 216; 12 · 18 = 216.]
f) Yes. [12 + 18 = 30; 12 + 18 = 30.]
g) No. [12 + 18 = 30; 18 · 3 = 54.]
h) Yes. [$\frac{18}{3} = 6$; $\frac{18}{3} = 6$.]

5. a) 63. [7 · 9 = 63.]
b) 441. [$21^2 = 441$.]
c) 15. [4 + 6 + 5 = 15.]
d) 23. [6 · 3 + 5 = 18 + 5 = 23.]
e) 20. [4 + 2 · 8 = 4 + 16 = 20.]
f) 48. [6 · 8 = 48.]
g) 1. [15 – 12 – 2 = 1.]
h) 24. [12 · 2 = 24.]
i) 5. [15 – (12 – 2) = 15 – 10 = 5.]
j) 9. [15 – 3 · 2 = 15 – 6 = 9.]
k) 6. [3 + 3 = 6.]
l) 3. [$\frac{36}{12} = 3$.]
m) 9. [3 · 3 = 9.]
n) 9. [$\frac{180}{20} = 9$.]
o) 5. [25 – 5 · 4 = 25 – 20 = 5.]
p) 80. [(25 – 5) · 4 = 20 · 4 = 80.]
q) 225. [$(25 - 10)^2 = 15^2 = 225$.]

6. a) Figure 2.
b) Figure 3.
c) Figure 1.
d) Figure 5.
e) Figure 4.
f) Figure 6.
g) Figure 1.
h) Figure 6.

7. a) $(x - 5)^3$.
b) $x \cdot 6 + y$ or $6x + y$.
c) $(y + 6)x$.
d) $\frac{10}{x} - y$.
e) $\frac{10 - y}{x}$.
f) $(x + 2)(x + 7)$.
g) $\frac{x - y}{2x}$.
h) $11 - (3x)^2$.
i) $(11 - 3x)^2$.
j) $(x^3 + y^3)8$ or $8(x^3 + y^3)$.

8. a) 0. ($3^2 + 2 \cdot 3 - 15 = 9 + 6 - 15 = 0$.)
b) 9. ($4^2 + 2 \cdot 4 - 15 = 16 + 8 - 15 = 9$.)
c) 105.
[$10^2 + 2 \cdot 10 - 15 = 100 + 20 - 15 = 105$.]
d) 2,585. [$50^2 + 2 \cdot 50 - 15 =$
$2{,}500 + 100 - 15 = 2{,}585$.]
e) 0. [0 · 8 = 0.]
f) 9. [1 · 9 = 9.]
g) 105. [7 · 15 = 105.]
h) 2,585. [47 · 55 = 2,585.]

Set IV (page 42)

1. All multiplication signs except for the first one which should be an addition sign:
$1 + 2 \cdot 3 \cdot 4 \cdot 5 \cdot 6 \cdot 7 \cdot 8 \cdot 9 \cdot 10$.
2. 3,628,801.
3. Use the same symbols of operation as before, but put parentheses around the 1 + 2: $(1 + 2) \cdot 3 \cdot 4 \cdot 5 \cdot 6 \cdot 7 \cdot 8 \cdot 9 \cdot 10$.
4. 5,443,200.

Chapter 1, Lesson 9

Set I (page 45)

1. a) $5a$.
b) b^3.
c) $a + b$.
d) 0.

2. a) $20 + x$.
b) $5x$.
c) $\frac{y}{20}$ minutes.

3. a) $1000 - x$ pounds.
b) $\frac{1000}{y}$ pounds.
c) $1000 - 10z$ pounds.

Set II (pages 45–46)

4. a) $3(6 + 2) = 3(6) + 3(2)$.
b) $4(7 - 3) = 4(7) - 4(3)$.
c) $5(1 + 8) = 5(1) + 5(8)$.

d) $6(5-1) = 6(5) - 6(1)$.

5. a) $4x^3$.
   b) $7(2x)$.
   c) $3(x+1)$.
   d) $9(x+y)$.
   e) $x^4 + x^4$.
   f) $3x + 3x + 3x + 3x + 3x$.
   g) $(x+7) + (x+7) + (x+7) + (x+7)$.

6. a) $3(x+5) = (x+5) + (x+5) + (x+5) =$
   $x + x + x + 5 + 5 + 5 = 3x + 15$.
   b) $2(x+y) = (x+y) + (x+y) =$
   $x + x + y + y = 2x + 2y$.
   c) $4(x^2+1) =$
   $(x^2+1) + (x^2+1) + (x^2+1) + (x^2+1) =$
   $x^2 + x^2 + x^2 + x^2 + 1 + 1 + 1 + 1 =$
   $4x^2 + 4$.

7. a) $8x + 24$.
   b) $5y - 10$.
   c) $x^2 + x$.
   d) $xy - y^2$.
   e) $2x + 18$.
   f) $4y + xy$.
   g) $7y - 7x$.
   h) $x^2 - 6x$.
   i) $10x^2 + 40$.
   j) $x^4 - x$.

8. a)
$$\begin{array}{r} 72 \\ \times\ 43 \\ \hline 216 \\ 2880 \\ \hline 3096 \end{array}$$
   b) $43 \cdot 72 = (40+3)72$
   $= 40 \cdot 72 + 3 \cdot 72$
   $= 2880 + 216$
   $= 3096$
   c)
$$\begin{array}{r} 43 \\ \times\ 72 \\ \hline 86 \\ 3010 \\ \hline 3096 \end{array}$$
   d) $72 \cdot 43 = (70+2)43$
   $= 70 \cdot 43 + 2 \cdot 43$
   $= 3010 + 86$
   $= 3096$

9. a) $4(x+5)$ and $4x + 20$.
   b) $x(10+x)$ and $10x + x^2$.
   c) $3(x+y+3)$ and $3x + 3y + 9$.
   d) $x(x^2+x+1)$ and $x^3 + x^2 + x$.

10. a) $x + y$.
    b) $2(x+y)$.
    c) $2x$.
    d) $2y$.
    e) $2x + 2y$.

Set IV (page 47)

1. a) 4. $[(2+0)^2 = 2^2 = 4.]$
   b) 36. $[(0+6)^2 = 6^2 = 36.]$
   c) 49. $[(3+4)^2 = 7^2 = 49.]$
   d) 100. $[(9+1)^2 = 10^2 = 100.]$
   e) 4. $[2^2 + 0^2 = 4 + 0 = 4.]$
   f) 36. $[0^2 + 6^2 = 0 + 36 = 36.]$
   g) 25. $[3^2 + 4^2 = 9 + 16 = 25.]$
   h) 82. $[9^2 + 1^2 = 81 + 1 = 82.]$

2. $(x+y)^2$ and $x^2 + y^2$ are sometimes equal and sometimes not equal.

Chapter 1, Review

Set I (pages 50–51)

1. a) $4 \cdot 7$.
   b) 7^4.
   c) $x + x$.
   d) $y \cdot y \cdot y \cdot y \cdot y \cdot y$.

2. a) w^2.
   b) $3x$.
   c) $17 - y$.
   d) z^5.

3. a) Think of a number: □
   Multiply by five: □□□□□
   Add eight: □□□□□ooooo
   Subtract three: □□□□□ooo
   Divide by five: □o
   Subtract the number you first thought of: o
   b) The number 1.
   c) Steps 3 and 4.
   d) Add 5.

4. a) Figure 3.
   b) Figure 1.
   c) Figure 2.

5. a) $4^2 = 16$
   $4^3 = 64$
   $4^4 = 256$
   $4^5 = 1{,}024$
   $4^6 = 4{,}096$
   b) The last digit of 4^{100} is 6.

6. a) 64.
   b) 8^2.

7. a) Perimeter, 22; area, 28.
   b) Perimeter, $2x + 6$; area, $3x$.
   c) Perimeter, $4y$; area, y^2.

8. a) 14. [21 – 7 = 14.]
   b) 28. [30 – 2 = 28.]
   c) 65. [1 + 64 = 65.]
   d) 125. [$5^3 = 125$.]

9. a) $x + 151$. [$9 + x + 142$.]
   b) $160 - x - y$ or $160 - (x + y)$.

10. a) If $\frac{2}{0} = a$, then $0 \cdot a = 2$. But $0 \cdot a = 0$.
    b) No.

11. a) $600x$.
    b) $\frac{10,000}{x}$.

12. a) $5x + 1$.
    b) $(x + 3)^2$.
    c) $x^6 - 7$.

13. a) $7a + 14$.
    b) $b - b^2$.
    c) $5c + 45$.

14. a) $3x$ carbon catoms and $8x$ hydrogen atoms.
    b) $3x + 5x$.
    c) 11.
    d) $11x$.

Set II (pages 51–52)

1. a) $3 \cdot 11$.
   b) 2^7.
   c) $x + x + x + x + x$.
   d) $y \cdot y \cdot y \cdot y$.

2. Step 1. Think of a number.
   Step 2. Add 1.
   Step 3. Multiply by 4.
   Step 4. Add 8.
   Step 5. Divide by 4.
   Step 6. Subtract the number that you first thought of.

3. a) $a - 5$.
   b) b^3.
   c) $2 + c$.
   d) $\frac{1}{d}$.

4. a) 2^5.
   [$2^1 = 2$, $2^2 = 4$, $2^3 = 8$, $2^4 = 16$, $2^5 = 32$.]
   b) It is impossible to express 3 as a power of 1. [$1^1 = 1$, $1^2 = 1$, $1^3 = 1$, ...]
   c) 10^6. [$10^1 = 10$, $10^2 = 100$, $10^3 = 1,000$, $10^4 = 10,000$, $10^5 = 100,000$, $10^6 = 1,000,000$.]

5. a) $x - 3$.
   b) $x + 5$.

6. a) 9. [$\frac{72}{8}$.]
   b) $\frac{20}{x}$.
   c) $\frac{x}{y}$.

7. a) $72 + x$.
   b) $72 - y$.
   c) $3 + x$. [$75 + x - 72$.]

8. a) 600. [$6 \cdot 100 = 600$.]
   b) 3,600. [$60^2 = 3,600$.]
   c) 45. [$9 \cdot 5 = 45$.]
   d) 55. [$2 + 56 - 3 = 55$.]

9. a) $3^2 - 1^2 = 8 = 2^3$
   $6^2 - 3^2 = 27 = 3^3$
   $10^2 - 6^2 = 64 = 4^3$
   $15^2 - 10^2 = 125 = 5^3$
   b) $21^2 - 15^2 = 216 = 6^3$.

10. a) $(x - 6)2$ or $2(x - 6)$.
    b) $\frac{x}{8} + 4$.
    c) $150 - x^3$.

11. a) $8v + 88$.
    b) $3w - 18$.
    c) $xy + xz$.

12. a) $3(x + 4) = 3x + 12$.
    b) $(6 + x)x = 6x + x^2$.
    c) $y(x + 1) = yx + y$.

13. a) $3x$.
    b) $200 - 3x$ kilograms.
    c) $\frac{x}{3}$.

14. a) 0. [$2^2 + 5 \cdot 2 - 14 = 4 + 10 - 14 = 0$.]
    b) 10. [$3^2 + 5 \cdot 3 - 14 = 9 + 15 - 14 = 10$.]
    c) 136.
    [$10^2 + 5 \cdot 10 - 14 = 100 + 50 - 14 = 136$.]
    d) 0. [$9 \cdot 0 = 0$.]
    e) 10. [$10 \cdot 1 = 10$.]
    f) 136. [$17 \cdot 8 = 136$.]

Chapter 2, Lesson 1

Set I (pages 55–56)

1. a) 3. [12 – 9 = 3.]
   b) 81. [$9^2 = 81$.]