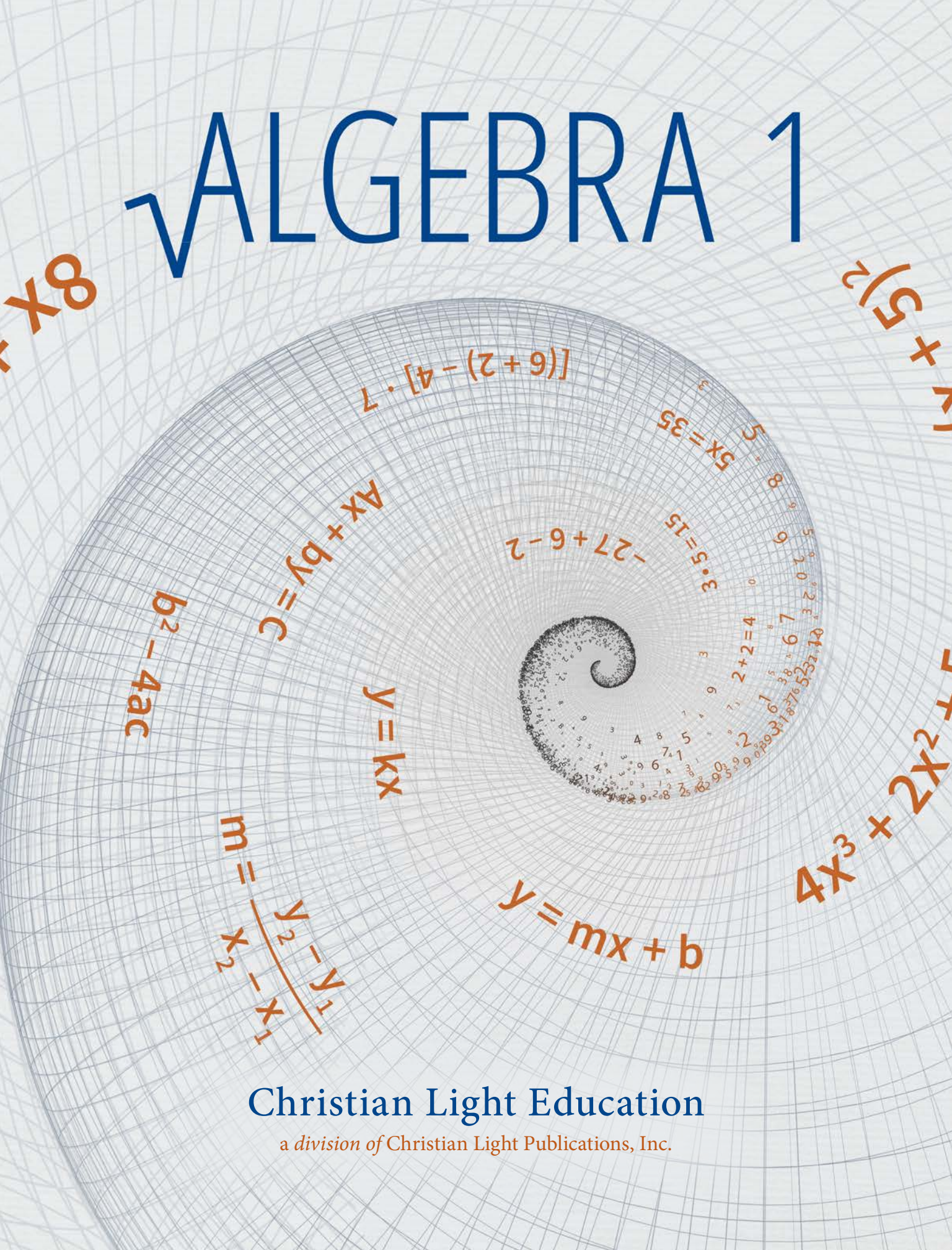
ALGEBRA 1



Christian Light Education

a *division of* Christian Light Publications, Inc.

Introduction

For Parents and Teachers

Algebra I teaches students basic algebra concepts. Its incremental approach of teaching concepts in small increments and use of continuous review makes Algebra I an effective math course. The consistent, systematic review helps students retain what they have learned. The goal is mastery, not just exposure.

How to use Algebra I

The text at the beginning of each lesson explains the new concept. Lessons also have examples that clearly describe each step used to complete the processes needed for the new concept.

Exercises are divided into 3 groups. The first and the last groups, titled "Today's Lesson,"use the skill taught in the lesson. The second group makes up the majority of the exercises and reviews concepts taught in earlier lessons. Students should be able to work through these exercises independently. Small reference numbers after each direction line, and sometimes at individual exercises, indicate the previous lesson(s) where the concepts were taught. Review sections maybe further divided into skills, applications, and facts. Concepts are reviewed through the whole course or until they are absorbed into other skills.

Extra practice problems for the new concept are provided at the end of each lesson. These optional problems are for students who may need extra practice.

Lessons 5, 10, and 16 of each unit are quiz and test lessons. Lesson 15 is a review for the test. Material is reviewed a minimum of four times before it is quizzed or tested. The lessons on quiz and test days have an optional enrichment activity. The activities are not reviewed or tested.

The appendix includes the glossary, index, and reference material.

Course Materials

- **Algebra I textbook**
- **Student pack**
  - Quizzes
  - Tests
- **Full solution key**

UNIT 1

Measurements

TABLE OF CONTENTS

Section 1

Section 2

Section 3

UNIT
2

Chinese Beginnings

Section 1

Section 2

Section 3

UNIT
3

Greek Discoveries

Section 1

Section 2

Section 3

UNIT
4

Michael Faraday

Section 1

Section 2

Section 3

UNIT 5

Hindu & Arabic Concepts

Section 1

Section 2

Section 3

UNIT
6

Music

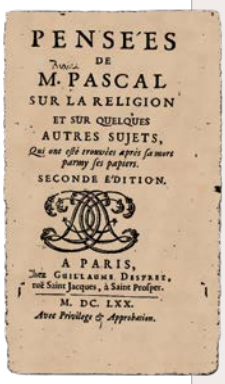
Section 1

Section 2

Section 3

UNIT
7

Blaise Pascal


PENSE'ES
DE
M. PASCAL
SUR LA RELIGION
ET SUR QUELQUES
AUTRES SUJETS,
Qui ont été trouvées après sa mort
parmy ses papiers.
SECONDE EDITION.
A PARIS,
M. DC. LXX.
Avec Privilege & Approbation.

Section 1

Section 2

Section 3

UNIT
8

Robert Boyle

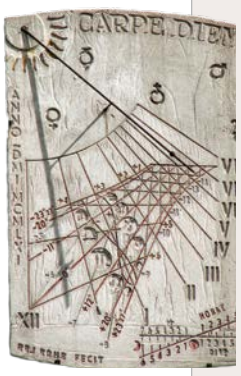
Section 1

Section 2

Section 3

UNIT
9

Isaac Newton



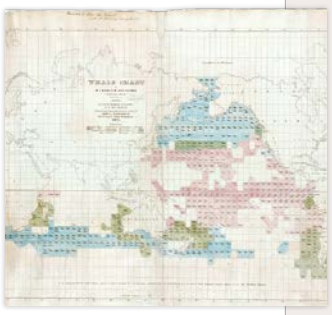
Section 1

Section 2

Section 3

UNIT
10

Matthew Maury



Section 1

Section 2

Section 3

3.3

Solving More Complex Equations

So far, you have solved equations with variables on only one side of the equation. However, equations often have variables on both sides, such as the equation $2x + 6 = x - 1$.

To solve equations with variables on both sides, simplify both sides of the equation first and then eliminate the variable from one side of the equation using the addition or subtraction property of equality. Then, with the variable on only one side, solve the equation using standard methods.

Math in History

A story is told that when Thales' mule came to a stream, it learned to roll over to dissolve the salt in its load and make it lighter. Thales cured the mule of the bad habit by replacing the salt with sponges.

Each step is clearly explained in the examples.

Example 1 **Solve the equation: $4x - 16 = x - 7$.**

$4x - 16 = x - 7$	Original equation.
$4x - 16 = x - 7$ $-x \quad\quad -x$	x subtracted from both sides to eliminate the variable from the right side.
$3x - 16 = -7$	Simplified.
$3x - 16 = -7$ $+16 \quad +16$	16 added to both sides to eliminate the constant from the variable side.
$3x = 9$	Simplified.
$\frac{3x}{3} = \frac{9}{3}$	Both sides divided by 3 to change the coefficient of the variable to 1.
$x = 3$	Simplified.

Check:

$4(3) - 16 = 3 - 7$	3 substituted for x in the original equation.
$-4 = -4$	Simplified. Because this statement is true, the answer to the equation is correct.

It does not matter from which side the variable is eliminated. However, eliminating the variable with the smaller coefficient gives a positive variable, which is usually preferred.

Some people prefer to solve equations with the variable on the left, which sometimes results in a negative variable. Multiplying or dividing each side by –1 will make the variable positive and show the correct solution.

Examples 2a and 2b on the next page show an equation being solved with the variable positive and then negative. The answer is the same regardless of how it is solved.

The solution key will always show the final solution with the variable on the left, even when solved with a positive variable on the right.

Notes in the margin provide important tips.

Example 2a **Solve the equation: $3(4 - 2x) = -5x - 10$.**

$3(4 - 2x) = -5x - 10$	Original equation.
$12 - 6x = -5x - 10$	Simplified using the distributive property.
$12 - 6x = -5x - 10$ $+6x \quad +6x$	$6x$ added to both sides to eliminate the variable with the smaller coefficient.
$12 = x - 10$	Simplified.
$12 = x - 10$ $+10 \quad +10$	10 added to both sides to eliminate it from the variable side.
$22 = x$	Simplified.
$x = 22$	Solution reversed to show variable on left.

Check:

$3[4 - 2(22)] = -5(22) - 10$	22 substituted for x in the original equation.
$-120 = -120$	Check.

Example 2b shows the problem solved with variable on the left and negative variable changed to a positive variable by dividing each side by –1.

Math in History

Thales used calculations based on similar triangles to figure the heights of the pyramids at Giza, Egypt.

Example 2b **Solve the equation: $3(4 - 2x) = -5x - 10$.**

$3(4 - 2x) = -5x - 10$	Original equation.
$12 - 6x = -5x - 10$	Simplified using the distributive property.
$12 - 6x = -5x - 10$ $+5x \quad +5x$	$5x$ added to both sides to eliminate the variable from the right side.
$12 - x = -10$	Simplified.
$12 - x = -10$ $-12 \quad -12$	12 subtracted from both sides to eliminate it from the variable side.
$-x = -22$	Simplified.
$\frac{-x}{-1} = \frac{-22}{-1}$	Both sides divided by –1 to change the coefficient of the variable to 1.
$x = 22$	Simplified.

Check:

$3[4 - 2(22)] = -5(22) - 10$	22 substituted for x in the original equation.
$-120 = -120$	Check.

Today's Lesson

Solve.

1. $7x + 15 = 3x + 23$ **2.** $-6x - 9 = -11 - 8x$ **3.** $x - 10 = 11 - 2x$

4. $-8x + 23 = -5x + 11$ **5.** $2(5x - 3) + 2 = 7x - 5$ **6.** $6(2x - 1) - 4x = 2$

Exercises are arranged with new material first, then review of previous material. At the end of each lesson the student works with the new material again and has the option of extra practice if needed.

REVIEW

Label and represent the value(s) algebraically. 3.2

7. The larger of two numbers is five times the smaller num

8. A 60-inch board is cut into two unequal pieces.

9. Rachel made twice as many chocolate chip cookies as peanut butter cookies.

10. Brooke worked 5 less hours at the coffee shop than LeAnn.

Skills

Evaluate. 1.2

11. $2 \bullet |-7 - 4| \bullet |2|$ **12.** $17 - |12| \div 4 + |-2|$ **13.** $|-4 \bullet 6| \div (-3) + 2$

Evaluate. 2.1, 2.3

14. 6^1 **15.** 7^0 **16.** $(-2)^4$ **17.** -3^2

Multiply or divide. 1.12, 1.13

18. $22 \div (-11)$ **19.** $5 \bullet (-4) \bullet (-3)$ **20.** $-6 \bullet (-3) \bullet (-2)$

21. $\frac{-8}{-2}$ **22.** $\frac{-12}{3}$ **23.** $\frac{24}{-8}$

Distribute the division and simplify. 3.1

24. $(3x + 3) \div 3$ **25.** $(18x^4y + 20x^3y^2) \div 2x^2y$ **26.** $(6y - 3) \div 3y$

Evaluate the expressions if $x = 2$, $y = 3$, and $z = 4$. 1.9

27. $\frac{yz}{x}$ **28.** $(xyz) \div (xy) \bullet y^2$ **29.** $x^2 + |-xy| \bullet yz$

Simplify. 2.11

30. $3x(2x^2 - 7)$ **31.** $6x^2(2x^2 + 3x - 4)$

Multiply or divide. 1.7

32. $\frac{5}{21} \bullet 7$ **33.** $7\frac{1}{2} \div \frac{2}{3}$ **34.** $\frac{11}{16} \bullet \frac{9}{22} \bullet \frac{8}{15}$

Application

Write the answer.

35. On the school field trip there were 75 students and 5 teachers. In lowest terms, what was the student to teacher ratio? 1.14

36. Twenty-four students went on a field trip. Four adults went along as chaperones. Form a ratio and simplify it to show the amount of students per chaperone. 1.14

37. What is 40% of 1,280? 1.14

38. The freezing point of grain alcohol (ethanol) is –114°C (–173°F.) 79°C (174°F). How much warmer is the boiling point than the fre

39. In A.D. 44, Herod (Agrippa I), grandson of Herod the Great, mentioned in Acts 12, was eaten by worms and died. He was born in 10 B.C. How old was he when he died? 1.11

Small gray reference numbers give the lesson number where the concept was taught.

Assign variables(s) to the unknown(s), then translate the expression. 2.13

40. mother's age 10 years ago

41. the length is twice the width

Facts

Write the word(s) for each definition.

42. the number above the radical sign that indicates the root called for 2.12

43. the number under the radical sign for which the root is found 2.12

Today's Lesson

Solve.

44. $12x - 7 + x = -3 + x$

45. $-4x + 8 + 2x = 32 - 5x$

46. $-3(x + 1) - 2 = 23 + x$

Extra Practice

Solve.

47. $7x + 22 = -11 - 4x$

48. $-18x + 13 = -x - 4$

49. $11x - 1 = 5x + 5$

50. $2x - 7 = 20 - 9 - x$

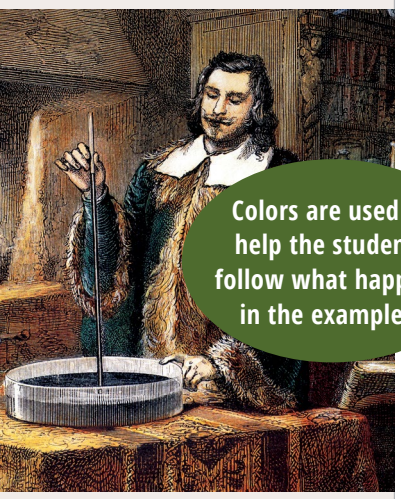
51. $7(2x - 3) + 18x + 16 = 27$

52. $3(5x - 2) - 8x = 22$

7.9

Writing a Linear Equation From Two Points

In Lesson 7.3, linear equations were found using the slope and an ordered pair. The equation of a line can also be determined if two ordered pairs are known. These two ordered pairs can be used to find the slope. Then, as taught in Lesson 7.3, substitute the slope and the points from one of the ordered pairs into the slope-intercept equation to find the value of b. Using the value of b and the slope, a linear equation in slope-intercept form can be written.



Colors are used to help the students follow what happens in the examples.

Math in History

Evangelista Torricelli discovered the barometer while attempting to solve a problem that pump makers had trying to raise water to a height of 12 meters. Pascal used the barometer in his study of atmospheric pressure.

Example 1 **Write the equation for the line containing the points (1, 6) and (3, 2).**

Step 1. Find the slope.

$x_1\ y_1 \quad x_2\ y_2$
$(1, 6) \quad (3, 2)$ (x_1, y_1) and (x_2, y_2) paired with the two ordered pairs.

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2 - 6}{3 - 1}$ Corresponding values substituted into the slope formula.

$m = \frac{-4}{2} = -2$ Subtraction completed and ratio reduced; the slope is –2.

Step 2. Find the *b*-value.

$y = mx + b$ Slope-intercept formula.

$6 = -2(1) + b$ Slope and one of the ordered-pair values (1, 6) substituted into the slope-intercept formula and the formula solved for b.

$6 = -2 + b$

$8 = b$

Step 3. Write a linear equation.

$y = -2x + 8$ Slope and b-value used to write an equation in slope-intercept form.

A summary box lists the steps involved in using a concept.

Steps **Writing an Equation for a Line From Two Points**

1. Determine the slope of the line by substituting the two ordered-pair values into the slope formula:
   $m = \frac{y_2 - y_1}{x_2 - x_1}$.
2. Substitute this slope value and one of the ordered pairs into the slope-intercept equation and solve for b.
3. Using the slope and b-value from steps 1 and 2, write a linear equation in slope-intercept form.

Math in History

Pascal used his brother-in-law Périer to assist him in his experiments with air pressure. Périer, who lived near the Puy de Dôme Mountain, measured the air pressure at the top of the mountain and at the bottom. He found that the air pressure was lower at the top of the mountain.

Example 2 **Write the equation for the line containing the points (–7, 2) and (–3, 8).**

Step 1. Find the slope.

$x_1 \quad y_1 \qquad x_2 \quad y_2$
$(-7, 2) \qquad (-3, 8)$

(x_1, y_1) and (x_2, y_2) paired with the ordered-pairs points.

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{8 - 2}{-3 - (-7)}$ Corresponding values substituted into the slope formula.

$m = \frac{6}{4} = \frac{3}{2}$ Arithmetic simplified. The slope is $\frac{3}{2}$.

Step 2. Find the *b*-value.

$y = mx + b$ Slope-intercept formula.

$8 = \frac{3}{2}(-3) + b$

$8 = -\frac{9}{2} + b$

$\frac{16}{2} = -\frac{9}{2} + b$

$+\frac{9}{2} \quad +\frac{9}{2}$

$\frac{25}{2} = b$

Slope and one of the ordered-pair values (–3, 8) substituted into the slope-intercept formula and the formula solved for *b*. 8 is converted to the equivalent fraction of $\frac{16}{2}$.

Step 3. Write a linear equation.

$y = \frac{3}{2}x + \frac{25}{2}$ Slope and *b*-value used to write an equation in slope-intercept form.

Today's Lesson

Write equations for the lines passing through these points.

1. (1, 5), (3, 11)

2. (–2, –3), (–1, 2)

3. (3, –3), (9, –5)

4. (–4, 2), (–2, –1)

REVIEW

Combine like radicals. If they cannot be combined, write *cannot be combined.* 7.8

5. $3\sqrt{(x-1)} + 2\sqrt{(x-1)}$

6. $5\sqrt{2} + 3\sqrt[3]{2}$

7. $(x-1)\sqrt{2} + 3\sqrt{2}$

8. $6\sqrt{7} - 8\sqrt{7}$