Chapter 7

Chapter Review

Vocabulary Review

composite function (p. 399)	**like radicals** (p. 380)	**radicand** (p. 370)
index (p. 370)	***n*th root** (p. 369)	**rational exponent** (p. 385)
inverse functions (p. 409)	**principal root** (p. 370)	**rationalize the denominator** (p. 376)
inverse relation (p. 407)	**radical equation** (p. 391)	**square root equation** (p. 391)
	radical function (p. 415)	**square root function** (p. 415)

Choose the correct vocabulary term to complete each sentence.

1. In the expression $\sqrt[3]{8}$, 8 is called the *(principal root, radicand)*. **radicand**
2. In the expression $\sqrt[3]{8}$, 3 is called the *(principal root, index)*. **index**
3. When you rewrite an expression so there are no radicals in any denominator and no denominators in any radical, you *(rationalize the denominator, compose two functions)*. **rationalize the denominator**
4. The expressions $\sqrt{x}$ and $\sqrt[5]{x}$ *(are, are not)* examples of like radicals. **are not**
5. The definition of *(rational exponents, inverse functions)* allows us to write $7^{\frac{2}{3}} = \sqrt[3]{7^2}$. **rational exponents**
6. If $g(x) = x - 4$ and $h(x) = x^2$, $(g \circ h)(x) = x^2 - 4$ is a *(radical function, composite function)*. **composite function**
7. To multiply expressions you sometimes add *(radicands, rational exponents)*. **rational exponents**
8. If f and f^{-1} are *(composite functions, inverse functions)*, then $(f \circ f^{-1})(x) = x$ and $(f^{-1} \circ f)(x) = x$. **inverse functions**
9. $(x - 7)^{\frac{1}{2}} + 2 = x$ is an example of *(a radical equation, an inverse relation)*. **a radical equation**
10. The positive even root of a number is called the *(principal root, rational exponent)*. **principal root**

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Skills and Concepts

7-1 and 7-2 Objectives

- To simplify *n*th roots (p. 369)
- To multiply radical expressions (p. 374)
- To divide radical expressions (p. 375)

For any real numbers a and b, and any positive integer n, if $a^n = b$, then a is an nth root of b. The **principal root** of a number with two real roots is the positive root. The principal nth root of b is written as $\sqrt[n]{b}$. b is the **radicand** and n is the **index** of the radical.

For any negative real number a, $\sqrt[n]{a^n} = |a|$ when n is even.

If $\sqrt[n]{a}$ and $\sqrt[n]{b}$ are real numbers, then $\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{ab}$, and, if $b \neq 0$, then $\frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\frac{a}{b}}$.

To **rationalize the denominator** of an expression, rewrite it so there are no radicals in any denominator and no denominators in any radical.

7 Chapter Review

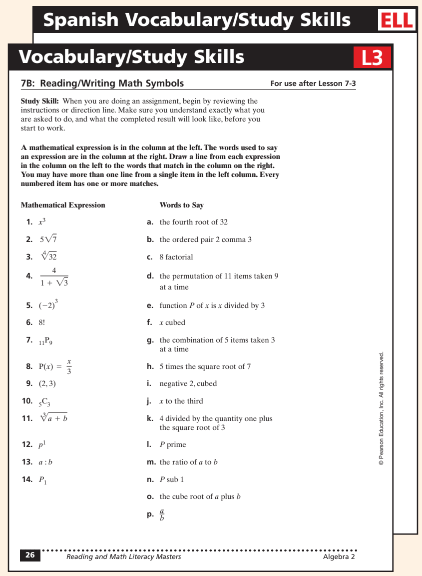
Resources

Student Edition
Extra Skills and Word Problems Practice, Ch. 7, p. 848
English/Spanish Glossary, p. 899
Properties and Formulas, p. 893
Table of Symbols, p. 889

Differentiated Instruction

Vocabulary and Study Skills worksheet 7D
Spanish Vocabulary and Study Skills worksheet 7D
Interactive Textbook Audio Glossary
Online Vocabulary Quiz

Success Tracker™
Online at PHSchool.com


Spanish Vocabulary/Study Skills ELL

Vocabulary/Study Skills L3

7B: Reading/Writing Math Symbols — For use after Lesson 7-3

Study Skill: When you are doing an assignment, begin by reviewing the instructions or direction line. Make sure you understand exactly what you are asked to do, and what the completed result will look like, before you start to work.

A mathematical expression is in the column at the left. The words used to say an expression are in the column at the right. Draw a line from each expression in the column on the left to the words that match in the column on the right. You may have more than one line from a single item in the left column. Every numbered item has one or more matches.

Mathematical Expression	Words to Say
1. x^3	a. the fourth root of 32
2. $5\sqrt{7}$	b. the ordered pair 2 comma 3
3. $\sqrt[4]{32}$	c. 8 factorial
4. $\frac{4}{1 + \sqrt{3}}$	d. the permutation of 11 items taken 9 at a time
5. $(-2)^3$	e. function P of x is x divided by 3
6. 8!	f. x cubed
7. ${}_{11}P_9$	g. the combination of 5 items taken 3 at a time
8. $P(x) = \frac{x}{3}$	h. 5 times the square root of 7
9. (2, 3)	i. negative 2, cubed
10. ${}_5C_3$	j. x to the third
11. $\sqrt[3]{a + b}$	k. 4 divided by the quantity one plus the square root of 3
12. p^1	l. P prime
13. $a : b$	m. the ratio of a to b
14. P_1	n. P sub 1
	o. the cube root of a plus b
	p. $\frac{a}{b}$

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24. $10x^2y\sqrt[3]{12y^2}$

25. $7x^2\sqrt{2}$

26. $15x^3y^2\sqrt{x}$

27. $6xy\sqrt[4]{2y}$

31. $6xy\sqrt{3x}$

32. $3a^2b\sqrt[3]{b}$

37. $\frac{y\sqrt[3]{150x}}{10x^2}$

53. $\frac{y^4}{x^6}$

Find each indicated root if it is a real number.

11. $\sqrt{144}$ **12** **12.** $\sqrt[3]{-0.064}$ **−0.4** **13.** $\sqrt[4]{7^4}$ **7** **14.** $\sqrt{0.25}$ **0.5** **15.** $-\sqrt[3]{27}$ **−3**

Simplify each radical expression. Use absolute value symbols as needed.

16. $\sqrt{49x^2y^{10}}$ $7|xy^5|$ **17.** $\sqrt[3]{-64y^9}$ $-4y^3$ **18.** $\sqrt{(a-1)^4}$ $(a-1)^2$

19. $\sqrt[5]{243x^{15}}$ $3x^3$ **20.** $\sqrt[3]{(y+3)^6}$ $(y+3)^2$ **21.** $\sqrt{32x^9y^5}$ $4x^4y^2\sqrt{2xy}$

Simplify each expression. Assume that all variables are positive.

22. $\sqrt{10}\cdot\sqrt{40}$ **20** **23.** $\sqrt[3]{12}\cdot\sqrt[3]{36}$ $6\sqrt[3]{2}$ **24.** $2\sqrt[3]{2x^2y}\cdot 5\sqrt[3]{6x^4y^4}$

25. $\sqrt{7x^3}\cdot\sqrt{14x}$ **26.** $\sqrt{5x^4y^3}\cdot\sqrt{45x^3y}$ **27.** $3\sqrt[4]{4x^3}\cdot\sqrt[4]{8xy^5}$

28. $\frac{\sqrt{128}}{\sqrt{8}}$ **4** **29.** $\frac{\sqrt[3]{56y^5}}{\sqrt[3]{7y}}$ $2y\sqrt[3]{y}$ **30.** $\frac{\sqrt{75x^3}}{\sqrt{3x}}$ $5x$ **31.** $\frac{\sqrt{216x^3y^2}}{\sqrt{2}}$ **32.** $\frac{\sqrt[3]{81a^8b^5}}{\sqrt[3]{3a^2b}}$

Simplify each expression. Rationalize all denominators. Assume that all variables are positive.

33. $\frac{\sqrt{8}}{\sqrt{6}}$ $\frac{2\sqrt{3}}{3}$ **34.** $\frac{\sqrt{3x^5}}{\sqrt{8x^2}}$ $\frac{x\sqrt{6x}}{4}$ **35.** $\frac{\sqrt[3]{5}}{\sqrt[3]{x^4}}$ $\frac{\sqrt[3]{5x^2}}{x^2}$ **36.** $\frac{\sqrt{2a^7b^2}}{\sqrt{32b^3}}$ $\frac{a^3\sqrt{ab}}{4b}$ **37.** $\frac{\sqrt[3]{6x^2y^4}}{2\sqrt[3]{5x^7y}}$

7-3 and 7-4 Objectives

- To add and subtract radical expressions (p. 380)
- To multiply and divide binomial radical expressions (p. 381)
- To simplify expressions with rational exponents (p. 385)

Like radicals have the same index and the same radicand. Use the distributive property to add or subtract them. Simplify radicals to find all the like radicals.

Use FOIL to multiply binomial radical expressions.

Binomials such as $a + b$ and $a - b$ are called conjugate expressions.

If the denominator of a fraction is a binomial radical expression, multiply both the numerator and denominator of the fraction by the conjugate of the denominator to rationalize the denominator.

The definition of **rational exponents** states that if the nth root of a is a real number and m is an integer, then $a^{\frac{1}{n}} = \sqrt[n]{a}$ and $a^{\frac{m}{n}} = \sqrt[n]{a^m} = (\sqrt[n]{a})^m$. If m is negative, $a \neq 0$. The usual properties of exponents hold for rational exponents.

Simplify each expression.

38. $\sqrt{27}+\sqrt{75}-\sqrt{12}$ $6\sqrt{3}$ **39.** $(5+\sqrt{3})(2-\sqrt{3})$ $7-3\sqrt{3}$ **40.** $(7-\sqrt{6})(7+\sqrt{6})$ **43**

Simplify each expression. Rationalize all denominators. Assume that all variables are positive.

41. $\sqrt{2x}-\sqrt{8x}+\sqrt{18x}$ $2\sqrt{2x}$ **42.** $\frac{6}{7+2\sqrt{3}}$ $\frac{42-12\sqrt{3}}{37}$ **43.** $\frac{\sqrt{2}}{1-\sqrt{5}}$ $-\frac{\sqrt{2}+\sqrt{10}}{4}$

Write each expression in radical form.

44. $3^{\frac{1}{5}}$ $\sqrt[5]{3}$ **45.** $x^{\frac{2}{3}}$ $\sqrt[3]{x^2}$ **46.** $2^{-\frac{3}{4}}$ $\sqrt[4]{\frac{1}{8}}$ **47.** $3^{0.2}$ $\sqrt[5]{3}$ **48.** $p^{-2.25}$ $\sqrt[4]{\frac{1}{p^9}}$

Simplify each expression. Assume that all variables are positive.

49. $(243)^{\frac{4}{5}}$ **81** **50.** $36^{\frac{3}{2}}$ **216** **51.** $\left(x^{\frac{3}{4}}\right)^{\frac{4}{3}}$ x **52.** $x^{\frac{1}{6}}\cdot x^{\frac{2}{3}}$ $x^{\frac{5}{6}}$ **53.** $\left(x^{-\frac{3}{8}}y^{\frac{1}{4}}\right)^{16}$

7-5 Objective

- To solve square root and other radical equations (p. 391)

To solve a **square root equation** or any **radical equation,** isolate a radical on one side of the equation. Then raise both sides of the equation to the same power. Check all possible solutions in the original equation to eliminate extraneous solutions.

Solve each equation. Check for extraneous solutions.

54. $\sqrt[3]{3x + 1} = -5$ **−42** **55.** $\sqrt{x + 7} = x + 1$ **2** **56.** $x^{\frac{1}{2}} - 3 = 8$ **121**

7-6 and 7-7 Objectives

- To add, subtract, multiply, and divide functions (p. 398)
- To find the composite of two functions (p. 399)
- To find the inverse of a relation or function (p. 406)

The following are definitions of function operations.

Addition $(f + g)(x) = f(x) + g(x)$ Subtraction $(f - g)(x) = f(x) - g(x)$

Multiplication $(f \cdot g)(x) = f(x) \cdot g(x)$ Division $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}, g(x) \neq 0$

The composition of function g with function f is written as $g \circ f$ and is defined as $(g \circ f)(x) = g(f(x))$. The domain of the **composite function** $g \circ f$ consists of the values a in the domain of f such that $f(a)$ is in the domain of g.

If (a, b) is an ordered pair of a relation, then (b, a) is an ordered pair of its **inverse relation.** If a relation or function is described by an equation in x and y, you can interchange x and y to get the inverse. The inverse of a function is denoted by f^{-1}.

If f and f^{-1} are both functions, they are called **inverse functions,** and $(f^{-1} \circ f)(x) = x$ and $(f \circ f^{-1})(x) = x$.

Let $f(x) = 2x + 5$ and $g(x) = x^2 - 3x + 2$. Perform each function operation.

57. $(f + g)(x)$ **58.** $f(x) - g(x)$ **59.** $g(x) \cdot f(x)$ **60.** $(g - f)(x)$ **61.** $\frac{g(x)}{f(x)}$

57. $x^2 - x + 7$
58. $-x^2 + 5x + 3$
59. $2x^3 - x^2 - 11x + 10$
60. $x^2 - 5x - 3$
61. $\frac{x^2 - 3x + 2}{2x + 5}, x \neq -\frac{5}{2}$

Let $f(x) = x^2$ and $g(x) = x - 3$. Evaluate each expression.

62. $(g \circ f)(-2)$ **1** **63.** $(f \circ g)(-2)$ **25** **64.** $(f \circ g)(0)$ **9** **65.** $(g \circ g)(7)$ **1** **66.** $(f \circ g)(c)$ **$c^2 - 6c + 9$**

Find the inverse of each function. Is the inverse a function?

67. $y = 6x + 2$ **68.** $y = 2x^3 + 1$ **69.** $y = (x - 2)^4$ **70.** $y = \sqrt{x + 2}$
67–70. See margin.

Let $f(x) = 3x + 1$. Find each value.

71. $(f^{-1} \circ f)(5)$ **5** **72.** $(f^{-1} \circ f)(-5)$ **−5** **73.** $(f^{-1} \circ f)(6)$ **6** **74.** $(f^{-1} \circ f)(t)$ **t**

7-8 Objective

- To graph square root and other radical functions (p. 414)

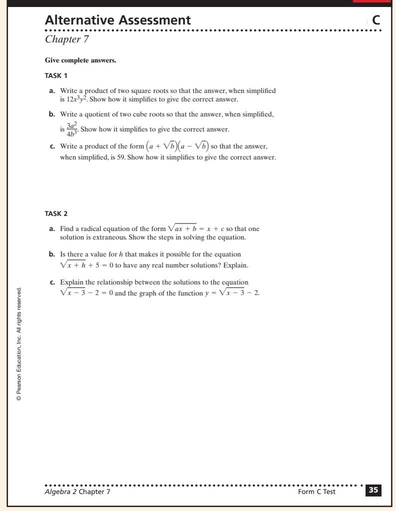
The parent function $f(x) = \sqrt{x}$ defines a family of **square root functions** $f(x) = a\sqrt{x - h} + k$. The graph of $f(x) = a\sqrt{x}$ is a stretch $(a > 0)$ or a shrink $(0 < a < 1)$ of the parent function. The graph of $y = a\sqrt{x - h} + k$ is a translation h units horizontally and k units vertically of $y = a\sqrt{x}$.

Graph each function. **75–78. See margin.**

75. $y = \sqrt{x} + 3$ **76.** $y = \sqrt{x - 1}$

77. $y = -3\sqrt{x} + 6$ **78.** $y = \sqrt{x + 7} - 2$

Alternative Assessment L4



Alternative Assessment C

Chapter 7

Give complete answers.

TASK 1

a. Write a product of two square roots so that the answer, when simplified is $12x^3y^2$. Show how it simplifies to give the correct answer.

b. Write a quotient of two cube roots so that the answer, when simplified, is $\frac{3a^2}{4b^3}$. Show how it simplifies to give the correct answer.

c. Write a product of the form $\left(a + \sqrt{b}\right)\left(a - \sqrt{b}\right)$ so that the answer, when simplified, is 59. Show how it simplifies to give the correct answer.

TASK 2

a. Find a radical equation of the form $\sqrt{ax + b} = x + c$ so that one solution is extraneous. Show the steps in solving the equation.

b. Is there a value for h that makes it possible for the equation $\sqrt{x + h} + 5 = 0$ to have any real number solutions? Explain.

c. Explain the relationship between the solutions to the equation $\sqrt{x - 3} - 2 = 0$ and the graph of the function $y = \sqrt{x - 3} - 2$.

Algebra 2 Chapter 7 Form C Test 35

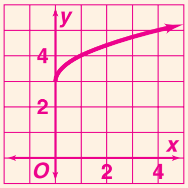
67. $y = \frac{1}{6}x - \frac{1}{3}$; yes

68. $y = \left(\frac{x - 1}{2}\right)^{\frac{1}{3}}$; yes

69. $y = \pm\sqrt[4]{x} + 2$; no

70. $y = x^2 - 2$; yes

75.



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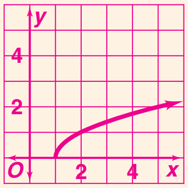

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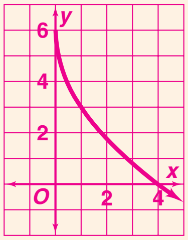

78.