Louisiana Algebra 2 Workbook

Practice Problems & Exercises with Answer Key

Dr. A. Nazari

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Algebra 2 Workbook

Focused practice with answer explanations.

This workbook is built for doing Algebra 2. Each topic gives a compact reminder, one model, and a focused practice set that moves from fluency to mixed reasoning.

Use the answer key as feedback: check the final answer, read the reason, then redo one nearby item when the setup, algebra, notation, or graphing went off track.

Matches the Study Guide

Topics follow the same Algebra 2 sequence, so students can review the lesson and then practice the matching skill.

Practice Comes First

Problems are chosen for setup, representation, graph reading, and calculation practice without long lecture pages.

Explanations Included

The key gives the answer and the main reason, so checking work becomes part of the practice routine.

How to Use This Workbook

A short routine for focused practice.

1 Read the Quick Review

Spend one minute on the rule, formula, or warning. If it feels unfamiliar, review the matching study-guide page before practicing.

2 Try the Model First

Cover the final line, work the model yourself, then compare the key step before starting the practice set.

3 Work in Order

Early items build fluency; later items mix setup, graphs, tables, and interpretation. Show enough work to find mistakes later.

4 Check Actively

Mark each miss as a setup, algebra, notation, graph, or checking mistake. Then redo one similar problem before moving on.

Suggested pace: one topic in 20–30 minutes. For test prep, do two topics and spend the last few minutes reviewing the missed steps in the answer key.

Algebra 2 Quick Reference

Key formulas and facts to bookmark while you study.

Function Features

Domain: allowed inputs.

Range: possible outputs.

Average rate of change:
$$\frac{f(b)-f(a)}{b-a}$$
Transformations:

$f(x)+k$, $f(x-h)$, $af(x)$, $f(bx)$.

Polynomials

Remainder Theorem: remainder from division by $x-a$ is $f(a)$.

Factor Theorem: $x-a$ is a factor exactly when $f(a)=0$.

End behavior comes from degree and leading coefficient.

Quadratics

Standard: ax^2+bx+c

Vertex: $a(x-h)^2+k$

Factored: $a(x-r_1)(x-r_2)$

Axis: $x=-\dfrac{b}{2a}$

Formula: $x=\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}$.

Rational Expressions

Factor first, then cancel common factors.

Excluded values come from the original denominator.

Vertical asymptotes often come from denominator zeros that do not cancel.

Holes come from factors that cancel.

Algebra 2 Quick Reference

Continued

Radicals & Exponents

$a^{m/n} = \sqrt[n]{a^m}$

For even roots, keep real-domain restrictions in mind.

To solve radical equations, isolate the radical, raise both sides to a power, and check.

Exponential & Logarithmic

$y = ab^x$ *has initial value* a *and base* b.

$\log_b(x) = y$ *means* $b^y = x$.

Product: $\log_b(MN) = \log_b M + \log_b N$

Power: $\log_b(M^p) = p \log_b M$.

Sequences & Series

Arithmetic: $a_n = a_1 + (n-1)d$

Geometric: $a_n = a_1 r^{n-1}$

Finite geometric sum:
$S_n = \frac{a_1(1-r^n)}{1-r}$, $r \neq 1$.

Trigonometry & Data

Unit circle: $(\cos\theta, \sin\theta)$.

$\sin^2\theta + \cos^2\theta = 1$

Residual: actual value − predicted value.

Strong models have residuals with no clear pattern.

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CHAPTER

1

Algebra 2 Foundations

What's Inside

1.1 Real Number System and Set Notation

Quick Review: Classifying Numbers and Writing Sets

A real number may belong to several nested sets at the same time. Use the ***smallest accurate set*** *when classifying one number, then list larger sets only if the question asks for all memberships.*

$$\text{Natural} \subset \text{Whole} \subset \text{Integer} \subset \text{Rational} \subset \text{Real}.$$

- *A* ***rational*** *number can be written as* $\frac{a}{b}$ *with integers* a, b *and* $b \neq 0$*; its decimal terminates or repeats.*
- *An* ***irrational*** *number is real but not rational; its decimal never terminates and never repeats.*
- *In interval notation, brackets include endpoints, parentheses exclude endpoints, and* ∞ *always uses a parenthesis.*

Examples: $\sqrt{64} = 8$ *is natural;* $0.\overline{27}$ *is rational;* $\sqrt{18}$ *is irrational;* $\{x \mid -2 < x \leq 5\} = (-2, 5]$.

Warm-Up

Classify Each Number

Write ***rational*** *or* ***irrational****.*

1. $-\frac{9}{5}$ _____

2. $\sqrt{121}$ _____

3. $\sqrt{45}$ _____

4. $0.312312312\ldots$ _____

Set and Interval Practice

Smallest Set or Notation

5. *Name the smallest number set for* -18. _____

6. *Name the smallest number set for* 0. _____

7. *Write* $\{x \mid x \geq -4\}$ *in interval notation.* _____

8. *Write* $(-7, 2]$ *in set-builder notation.* _____

9. *Write* $x < 1$ *or* $x \geq 5$ *in interval notation.* _____

10. *Use the number line to write the interval and set-builder notation.*

Classification and Notation Check

11. *Which number is irrational?*

A. $0.\overline{8}$ **B.** $\sqrt{36}$

C. $\sqrt{20}$ **D.** $-\frac{4}{3}$

12. *Which interval matches* $-2 \leq x < 8$*?*

A. $(-2, 8)$ **B.** $[-2, 8)$

C. $(-2, 8]$ **D.** $[-2, 8]$

13. *Every rational number is an integer.* **True** ○ **False** ○

Applications and Explanations

14. *A calculator displays* $0.090909\ldots$ *for a quotient. Is the value rational or irrational? Explain.*

Answer: _____

15. *A student says* $\sqrt{72}$ *is rational because it simplifies to* $6\sqrt{2}$*. Is the student correct?*

Answer: _____

Challenge!

16. *Give a rational number that is not an integer and explain why it belongs to the real numbers.*

CHAPTER

2

Algebra 2 Foundations

What's Inside

2.1 Properties of Operations and Order of Operations

Quick Review: Keeping Expressions Equivalent

Algebra has two jobs here: calculate in the correct order and rewrite expressions without changing their value. ***Order matters*** *when operations compete;* ***properties*** *explain why a rewrite is legal.*

- ***Order:*** *grouping symbols, powers, multiplication/division left to right, then addition/subtraction left to right.*
- ***Commutative:*** $a + b = b + a$ *and* $ab = ba$
- ***Associative:*** $(a + b) + c = a + (b + c)$ *and* $(ab)c = a(bc)$
- ***Distributive:*** $a(b + c) = ab + ac$
- ***Identity and inverse:*** $a + 0 = a$, $a \cdot 1 = a$, $a + (-a) = 0$, $a \cdot \frac{1}{a} = 1$ *for* $a \neq 0$

Example: $20 - 2(3^2 + 1) \div 5 = 20 - 2(10) \div 5 = 20 - 20 \div 5 = 16$.

Warm-Up

Evaluate Carefully

1. $6 + 3(8 - 5)$ _____

2. $4^2 - 2 \cdot 5$ _____

3. $18 \div 3 + 2^3$ _____

4. $5[12 - (3 + 4)]$ _____

Properties in Action

Name the Property or Simplify

5. *Name the property shown:* $7 + x = x + 7$. _____

6. *Name the property shown:* $4(y + 9) = 4y + 36$. _____

7. *Use the distributive property to rewrite* $-3(2x - 5)$. _____

8. *Simplify* $8a + 3b - 2a + 5b$. _____

9. *Explain why* $2(x + 4) = 2x + 4$ *is not equivalent to the original expression.*

Property Decisions

10. *Which expression is equivalent to* $5(2x - 3) + 4x$*?*

A. $10x - 15$ **B.** $14x - 15$

C. $14x - 3$ **D.** $10x + 1$

11. *Decide whether this rule is correct: multiplication and division are completed from left to right when they occur at the same level.* _____

12. *Correct the rewrite if needed:* $3(a + b + c) = 3a + b + c$. _____

13. *Use the order table to evaluate the expression.*

expression	*grouping*	*powers*	*multiply/add*
$2(5 + 1)^2 - 7$	$2(6)^2 - 7$	$2(36) - 7$	_____

Order and Error Analysis

14. *A streaming plan costs a one-time setup fee of $18 plus $9 per month. Write an equivalent expression for* $18 + 9(m + 2)$.

Answer: _____

15. *A student evaluates* $4 + 6^2$ *as* $10^2 = 100$. *What order-of-operations mistake did the student make?*

Answer: _____

Challenge!

16. *Insert parentheses to make the statement true:* $2 + 3 \cdot 4 - 1 = 19$.

Answer Key

Chapter 1

Section 1.1 Real Number System and Set Notation

Answers

1. rational
2. rational
3. irrational
4. rational
5. integer
6. whole
7. $[-4, \infty)$
8. $\{x \mid -7 < x \leq 2\}$
9. $(-\infty, 1) \cup [5, \infty)$
10. $(-4, 3]$; $\{x \mid -4 < x \leq 3\}$
11. C
12. B
13. False
14. rational
15. No
16. Sample: $\frac{3}{5}$

Answer explanations

1. **Answer:** rational. A rational number can be written as a ratio of integers. Here -9 and 5 are integers and the denominator is nonzero.

2. **Answer:** rational. 121 is a perfect square, so $\sqrt{121} = 11$. Since $11 = \frac{11}{1}$, it is rational.

3. **Answer:** irrational. The number 45 has no whole-number square root. Therefore $\sqrt{45}$ is a nonterminating, nonrepeating decimal.

4. **Answer:** rational. A repeating decimal always represents a fraction. Since the block 312 repeats, the number is rational.

5. **Answer:** integer. The smallest accurate set is integer because -18 is a negative whole-number value. It is also rational and real, but those are larger sets.

6. **Answer:** whole. 0 is not usually counted as natural, but it is a whole number. Larger memberships include integer, rational, and real.

7. **Answer:** $[-4, \infty)$. The inequality includes -4, so the left endpoint uses a bracket. Infinity is not a number endpoint, so it always uses a parenthesis.

8. **Answer:** $\{x \mid -7 < x \leq 2\}$. The left parenthesis means -7 is excluded, so use $-7 < x$. The right bracket includes 2, so use $x \leq 2$.

9 **Answer:** $(-\infty, 1) \cup [5, \infty)$. The word "or" means either ray is allowed. The first ray stops before 1, and the second begins at included 5.

10 **Answer:** $(-4, 3]$; $\{x \mid -4 < x \leq 3\}$. The open circle excludes -4, and the closed circle includes 3. The shaded segment keeps all values between them.

11 **Answer:** C. $\sqrt{20}$ is not a perfect square and simplifies to $2\sqrt{5}$. The irrational factor $\sqrt{5}$ makes the value irrational.

12 **Answer:** B. The endpoint -2 is included because of $\leq$, while 8 is excluded because of $<$. That matches $[-2, 8)$.

13 **Answer:** False. Integers are rational, but not every rational number is an integer. For example, $\frac{1}{2}$ is rational and not an integer.

14 **Answer:** rational. The decimal repeats the block 09 forever. Repeating decimals can be converted into fractions, so the value is rational.

15 **Answer:** No. Simplifying gives $6\sqrt{2}$, but $\sqrt{2}$ is irrational. Multiplying by 6 does not turn it into a rational number.

16 **Answer:** Sample: $\frac{3}{5}$. This is a ratio of integers, so it is rational. It is not an integer because it is not a whole-number value, and all rational numbers are real.

Chapter 2

Section 2.1 *Properties of Operations and Order of Operations*

Answers

1 15

2 6

3 14

4 25

5 *commutative property of addition*

6 *distributive property*

7 $-6x + 15$

8 $6a + 8b$

9 *The 4 was not multiplied by 2*

10 B

11 True

12 $3a + 3b + 3c$

13 65

14 $9m + 36$

15 *They added before using the exponent*

16 $(2+3)\cdot 4-1=19$

Answer explanations

1 **Answer:** 15. Parentheses come first, so $8-5=3$. Then multiply $3(3)$ before adding to 6.

2 **Answer:** 6. Evaluate powers and multiplication before subtraction. That gives $16-10$, not $(4^2-2)\cdot 5$.

3 **Answer:** 14. The division $18\div 3$ and the exponent 2^3 both happen before the final addition.

4 **Answer:** 25. Brackets mean to simplify inside first. After $3+4=7$, the expression becomes $5(12-7)=5(5)$.

5 **Answer:** commutative property of addition. Only the order of the addends changes. The commutative property says a sum is unchanged when terms switch places.

6 **Answer:** distributive property. The factor outside the parentheses multiplies every term inside. That changes $4(y+9)$ into $4y+36$.

7 **Answer:** $-6x+15$. Distribute -3 to both terms. The second product is positive because a negative times a negative is positive.

8 **Answer:** $6a+8b$. Combine only like terms: the a-terms combine with each other and the b-terms combine with each other.

9 **Answer:** The 4 was not multiplied by 2. The factor 2 must multiply both terms inside the parentheses. The correct expression is $2x+8$, not $2x+4$.

10 **Answer:** B. First distribute 5 through the parentheses. Then combine the resulting $10x$ with the extra $4x$.

11 **Answer:** True. Multiplication and division are on the same order-of-operations level. When tied, evaluate them from left to right.

12 **Answer:** $3a+3b+3c$. The outside factor applies to every term in the group. Each of a, b, and c must be multiplied by 3.

13 **Answer:** 65. The table shows the order: simplify the group, square it, multiply by 2, then subtract 7.

14 **Answer:** $9m + 36$. Distribute 9 over $m + 2$ to account for the two extra months. Then combine the two 18 constants.

15 **Answer:** They added before using the exponent. The exponent belongs to 6 before the addition happens. The correct calculation is $4 + 36$, not 10^2.

16 **Answer:** $(2 + 3) \cdot 4 - 1 = 19$. The original order gives 13, so parentheses must change the order. Grouping $2 + 3$ first makes the value 19.

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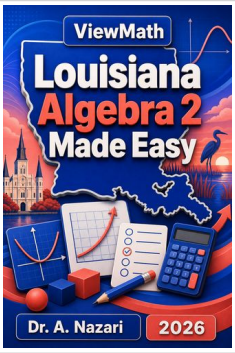

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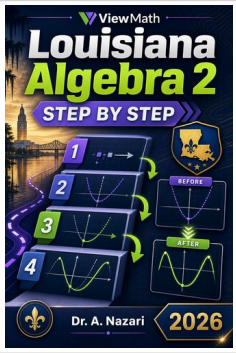

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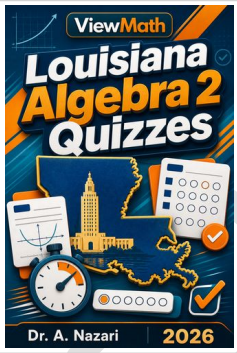

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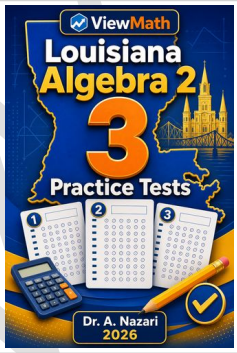

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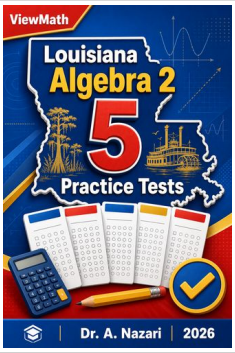

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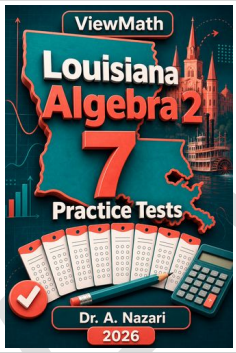

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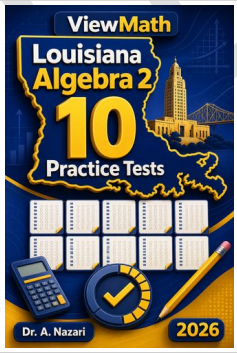

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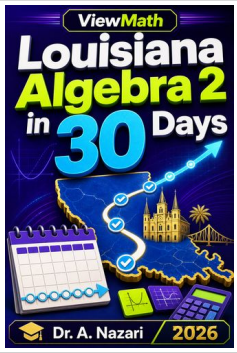

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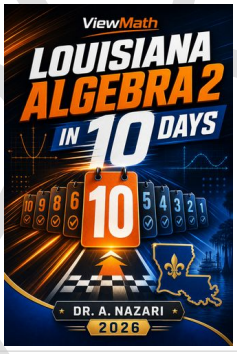

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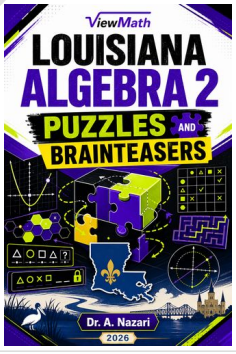

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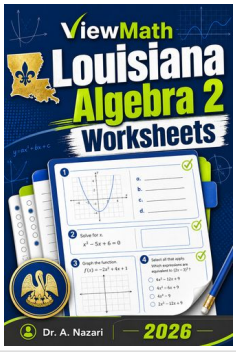

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