

# 3 Pennsylvania Keystone Grade 9 Math Practice Tests

*Full-Length Test Prep with Detailed Answer Explanations*

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# 3 Practice Tests

★ Algebra 1 ★

## Welcome!

This book contains **3 full-length Algebra 1 practice tests** designed to prepare you for your end-of-course assessment. Each test covers all nine major topics:

📖 Foundations of Algebra    📖 Linear Equations

📖 Functions    📖 Linear Functions & Graphs

📖 Systems of Equations    📖 Polynomials & Factoring

📖 Quadratic Functions    📖 Exponential Functions

📖 Data Analysis & Statistics

Every test includes **detailed answer explanations** so you can learn from each question.

*Practice builds confidence. Confidence builds results.*

“ Take your time, review each answer explanation, and learn from every mistake. That's how you grow! ”



# How to Use This Book

Your 3-step path to Algebra 1 success

## What's Inside


- **3 Full-Length Practice Tests** — each covers all 9 chapters of Algebra 1: real numbers, linear equations & inequalities, functions, graphing, systems of equations, polynomials, quadratics, exponential functions, and data analysis.
- **Detailed Answer Explanations** — every question includes a complete step-by-step solution to help you learn from your mistakes.
- **Formula Reference Sheet** — all the key Algebra 1 formulas and concepts organized in one page for quick access.
- **Test Tracker** — record scores and track improvement across all three tests.


## Suggested Study Schedule

1. **Test 1 (Untimed — Diagnostic):** Take the first test without a time limit. This is your baseline. Don't worry about speed—focus on showing your work and trying every question.
2. **Study the gaps:** After scoring Test 1, identify your weakest topics. Spend 5–7 days reviewing those areas before moving to Test 2.
3. **Test 2 (Timed — 120 Minutes):** Take this test with a timer. Practice pacing yourself. Review your answers and compare to Test 1 to see improvement.
4. **Test 3 (Full Test Conditions):** Simulate real test conditions—quiet room, no notes, timed. This is your dress rehearsal.

 **Types of Questions**

• **Multiple Choice:** Four answer options. Work the problem yourself first, then match your answer. Eliminate clearly wrong options to narrow your choices.

 **Short Answer & Constructed Response:** Write your full solution. Show all equations, substitutions, and simplification steps. Partial credit is given for correct work even if the final answer is missing or wrong.

 **Graphing & Data:** Plot points, draw lines, and interpret graphs and scatter plots. Label axes clearly and use a ruler for straight lines.



**Tip:** After each test, go back and review every question you missed. Read the full explanation and try the problem again on your own. That single habit makes the biggest difference.



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# 💡 Test-Taking Tips 💡

Five key strategies for Algebra 1 success

## Five Strategies for Every Problem

- 1. Read carefully.** Don't skim. Read every word of the problem and identify exactly what is being asked before you start calculating.
- 2. Set up before solving.** Write the equation or expression before diving into arithmetic. Label your variables and identify what you're solving for.
- 3. Show your work.** Write each step clearly—distribute, combine like terms, isolate the variable. This earns partial credit and reduces mistakes.
- 4. Check your answer.** Plug your result back into the original equation or condition. Does it work?
- 5. Re-read the question.** Make sure you answered what was actually asked. Many mistakes come from solving correctly but answering the wrong question.

## Common Algebra 1 Mistakes to Watch For

-  **Sign errors:** When multiplying or dividing an inequality by a negative, flip the sign.
-  **Distributing negatives:**  $-(3x - 5) = -3x + 5$ , not  $-3x - 5$ .
-  **Slope:** Rise over run,  $m = \frac{y_2 - y_1}{x_2 - x_1}$ . Don't swap  $x$  and  $y$ .
-  **Factoring:** Always check by multiplying your factors back out.
-  **Quadratic formula:** Don't forget the "2a" in the denominator, not just "a".

 Don't Forget

- Circle keywords in word problems: "how many more," "total," "rate"
- For word problems, define your variable first: "Let  $x = \dots$ "
- When graphing, plot at least two points and check a third
- Convert between forms when it helps: slope-intercept  $\leftrightarrow$  standard
- For systems, check your solution in both equations



“ The best way to learn algebra is to understand **why** each step works, not just memorize procedures. When you review your mistakes, ask: Where did my thinking go wrong? ”



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# What You'll Need

Gather these materials before you begin

## Materials Checklist

- ✓ **Sharpened Pencils** — #2 pencils, at least two
- ✓ **Good Eraser** — for clean corrections
- ✓ **Scratch Paper** — for working out problems
- ✓ **Graphing Calculator** — if allowed by your state's test
- ✓ **Ruler / Straightedge** — for graphing
- ✓ **Quiet Space** — no distractions
- ✓ **Focused Mind** — ready to do your best

## Typically Allowed

- ✓ Pencils and eraser
- ✓ Scratch paper (provided on official test day)
- ✓ Graphing calculator (varies by state—check your test rules)
- ✓ Ruler or straightedge

## Not Allowed

- ✗ Cell phone or any electronic device (other than allowed calculator)
- ✗ Notes, textbooks, or reference sheets (beyond what's provided)
- ✗ Help from others during the test

 **A Note for Parents & Guardians**

Three tests provide a focused, manageable study plan. Space them **one week apart** with study days in between.

**How to help:**

- Test 1 should be untimed — focus on learning, not speed.
- After each test, review the full solutions together. Ask: “Which topics were hardest? Let’s study those before the next one.”
- Use the Test Tracker page to visualize progress over time.
- For extra support on specific topics, pair this book with our **Algebra 1 Study Guide**.

PREVIEW



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# Algebra 1 Reference Sheet

Key formulas and facts you may use during each practice test

## ★ Properties & Exponents

Commutative:  $a + b = b + a$ ;  $ab = ba$

Associative:  $(a + b) + c = a + (b + c)$

Distributive:  $a(b + c) = ab + ac$

$a^m \cdot a^n = a^{m+n}$       $(a^m)^n = a^{mn}$

$\frac{a^m}{a^n} = a^{m-n}$       $a^0 = 1$

$a^{-n} = \frac{1}{a^n}$       $(ab)^n = a^n b^n$

## ★ Linear Equations & Inequalities

Slope-intercept:  $y = mx + b$

Point-slope:  $y - y_1 = m(x - x_1)$

Standard form:  $Ax + By = C$

Slope:  $m = \frac{y_2 - y_1}{x_2 - x_1}$

Parallel lines: same slope

Perpendicular:  $m_1 \cdot m_2 = -1$

## ★ Functions

A function maps each input to exactly one output.

Vertical line test: passes through at most one point.

Domain: set of all inputs ( $x$ -values)

Range: set of all outputs ( $y$ -values)

$f(x)$  notation:  $f(3)$  means substitute  $x = 3$

## ★ Systems of Equations

Solve by graphing, substitution, or elimination

One solution: lines intersect (consistent)

No solution: lines are parallel

Infinitely many: same line (dependent)

## ★ Polynomials & Factoring

$(a + b)^2 = a^2 + 2ab + b^2$

$(a - b)^2 = a^2 - 2ab + b^2$

$a^2 - b^2 = (a + b)(a - b)$

To factor  $ax^2 + bx + c$ : find two numbers that multiply to  $ac$  and add to  $b$

## ★ Quadratic Functions

Standard form:  $y = ax^2 + bx + c$

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

Vertex:  $(h, k)$ ; axis of symmetry:  $x = h$

Quadratic formula:  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Discriminant:  $b^2 - 4ac$

$> 0$ : two real solutions     $= 0$ : one     $< 0$ : none

## ★ Exponential Functions & Sequences

Growth:  $y = a \cdot b^x$  where  $b > 1$

Decay:  $y = a \cdot b^x$  where  $0 < b < 1$

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

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

## ★ Data & Statistics

Line of best fit: approximates scatter plot trend

Correlation: positive, negative, or none

Correlation  $\neq$  causation

Residual = actual - predicted

Good fit: residuals small, randomly scattered

## ★ Square Roots & Radicals

Perfect squares: 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144

$\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$       $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$

Simplify:  $\sqrt{50} = \sqrt{25 \cdot 2} = 5\sqrt{2}$

# My Test Tracker

Record your scores and track your progress

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

Start Date: \_\_\_\_\_

## Test 1 (Untimed – Diagnostic)

Date: \_\_\_\_\_

Score: \_\_\_\_\_ / \_\_\_\_\_

Percent: \_\_\_\_\_

Topics to review: \_\_\_\_\_

## Test 2 (Timed – 120 Minutes)

Date: \_\_\_\_\_

Score: \_\_\_\_\_ / \_\_\_\_\_

Percent: \_\_\_\_\_

Improved on: \_\_\_\_\_

Still need work: \_\_\_\_\_

## Test 3 (Timed – Full Test Conditions)

Date: \_\_\_\_\_

Score: \_\_\_\_\_ / \_\_\_\_\_

Percent: \_\_\_\_\_

Total improvement since Test 1: \_\_\_\_\_

 Score Progress


Shade each bar to your score after each test.

 Final Reflection

The most important thing I learned: \_\_\_\_\_

The topic where I improved the most: \_\_\_\_\_

What I want to keep working on: \_\_\_\_\_



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-  **Interactive Lessons** — Review the concepts behind each question with clear explanations
-  **Adaptive Quizzes** — Practice your weak topics with questions that match your level
-  **Progress Tracking** — See your mastery grow across all Grade A1 math topics
-  **Personalized Dashboard** — A learning plan tailored just for you



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PRACTICE TEST

1

## Practice Test 1

 10 Questions

### Before You Start

- ✓ *Read each question carefully before choosing your answer.*
- ✓ *Show your work on scratch paper when you need to.*
- ✓ *Skip hard questions and come back to them later.*
- ✓ *Check your answers when you're done.*
- ✓ *Take your time — there's no rush!*

★ *You've Got This!* ★

*Do your best and show what you know!*



1. The table below shows the monthly cost (in dollars) of two streaming plans. Plan A has a \$40 signup fee and costs \$25 per month. Plan B has an \$80 signup fee and costs \$15 per month. After how many months will both plans have the same total cost?

Month	Plan A	Plan B
1	\$65	\$95
2	\$90	\$110
3	\$115	\$125
4	?	?
5	?	?

Your Answer:

2. The table below shows a pattern of powers of 2. What value belongs in the box marked "?"?

$2^4$	$2^3$	$2^2$	$2^1$	$2^0$	$2^{-1}$	$2^{-2}$
16	8	4	2	?		

(A) 0

(B) 1

(C) -1

(D) 2



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3. Which inequality matches the graph below?



The solid boundary line passes through  $(0, 2)$  and  $(4, 0)$ . The region above the line is shaded.

(A)  $y < -\frac{1}{2}x + 2$

(B)  $y > -\frac{1}{2}x + 2$

(C)  $y \leq -\frac{1}{2}x + 2$

(D)  $y \geq -\frac{1}{2}x + 2$

4. Two lines are graphed on the coordinate plane below. Classify the system as consistent and independent, consistent and dependent, or inconsistent.



Your Answer:



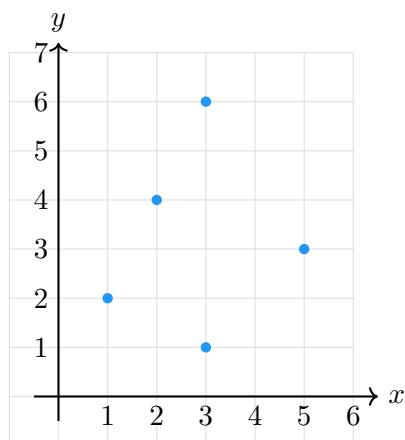
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5. The graph below shows a set of plotted points. Does the relation pass the vertical line test?



- (A) Yes, because every point is in a different row.
- (B) No, because there are two points at  $x = 3$ .
- (C) Yes, because all  $y$ -values are positive.
- (D) No, because the points do not form a straight line.



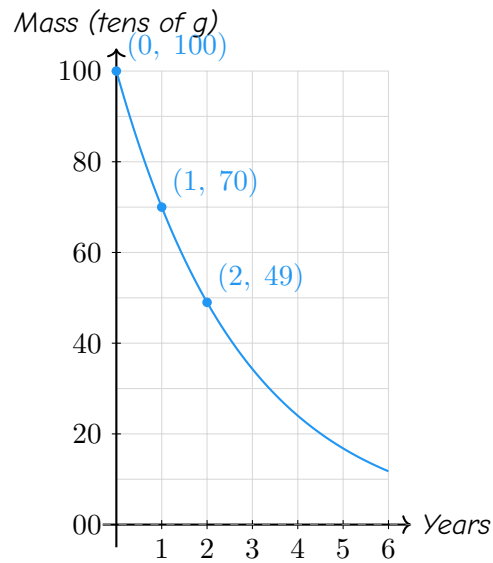
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6. The graph below shows the mass of a decaying substance over time.



What is the percent rate of decay per year?

- (A) 70%                      (B) 49%
- (C) 30%                      (D) 0.7%

7. What is the quotient of  $(2x^2 + x - 6) \div (2x - 3)$ ?

- (A)  $x + 2$                       (B)  $x - 2$
- (C)  $x + 3$                       (D)  $2x + 2$

8. A model predicts  $y = 68$  at a certain point. The actual value is 72. What is the residual?

Your Answer:



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9. Simplify  $\sqrt{12} \cdot \sqrt{3}$ .

Your Answer:

10. The graph below shows  $y = |x - 3|$  (V-shape) and the horizontal line  $y = 2$  (dashed). What is the solution to  $|x - 3| \leq 2$ ?



(A)  $x \leq 1$  or  $x \geq 5$

(B)  $1 \leq x \leq 5$

(C)  $-2 \leq x \leq 2$

(D)  $3 \leq x \leq 5$



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# *Answer Key & Explanations*



## Answer Key

First try each test on your own, then check your work here.

### Practice Test 1 – Answer Key

- |            |            |             |                                     |            |            |            |
|------------|------------|-------------|-------------------------------------|------------|------------|------------|
| <b>1</b> 4 | <b>2</b> B | <b>3</b> D  | <b>4</b> Consistent and independent | <b>5</b> B | <b>6</b> C | <b>7</b> A |
| <b>8</b> 4 | <b>9</b> 6 | <b>10</b> B |                                     |            |            |            |

### Time to Learn!

Review the explanations below, *especially for the questions you missed*.

Understanding why each answer is correct builds stronger problem-solving skills.

*Tip:* Circle any questions you got wrong, then read their explanation carefully.

### Practice Test 1 – Detailed Explanations

**1** Plan A costs  $40 + 25m$  and Plan B costs  $80 + 15m$ . Set them equal:  $40 + 25m = 80 + 15m$ . Subtract  $15m$  and  $40$ :  $10m = 40$ , so  $m = 4$  months.

**2** The pattern shows each value being divided by 2 moving from left to right:  $16, 8, 4, 2, \dots$  Dividing 2 by 2 gives 1. This confirms the zero exponent rule:  $2^0 = 1$ .



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3 The slope is  $m = \frac{0-2}{4-0} = -\frac{1}{2}$  and the  $y$ -intercept is 2. A solid line means  $\leq$  or  $\geq$ , and shading above means  $y \geq$ . The inequality is  $y \geq -\frac{1}{2}x + 2$ .

4 The two lines have different slopes (1 and  $-\frac{1}{2}$ ) and intersect at exactly one point, (2, 4). A system with one solution is consistent and independent.

5 A vertical line at  $x = 3$  passes through the points (3, 6) and (3, 1). Because that vertical line hits two points, the relation fails the vertical line test and is not a function.

6 From the graph, the decay factor is  $b = \frac{70}{100} = 0.70$ . The percent rate of decay is  $r = 1 - 0.70 = 0.30 = 30\%$  per year.

7 Use polynomial long division:  $2x^2 \div 2x = x$ , and  $x(2x - 3) = 2x^2 - 3x$ . Subtract to get  $4x - 6$ . Then  $4x \div 2x = 2$ , and  $2(2x - 3) = 4x - 6$ . The remainder is 0, so the quotient is  $x + 2$ .

8 Residual = actual - predicted =  $72 - 68 = 4$ . A positive residual means the actual value is 4 above the prediction.

9 Use the product property of radicals:  $\sqrt{12} \cdot \sqrt{3} = \sqrt{12 \times 3} = \sqrt{36} = 6$ .

10 The V-shape  $y = |x - 3|$  is at or below  $y = 2$  between the intersection points  $x = 1$  and  $x = 5$ . Algebraically:  $-2 \leq x - 3 \leq 2$  gives  $1 \leq x \leq 5$ .



**Well done checking your answers!**

Keep practicing to strengthen your skills.



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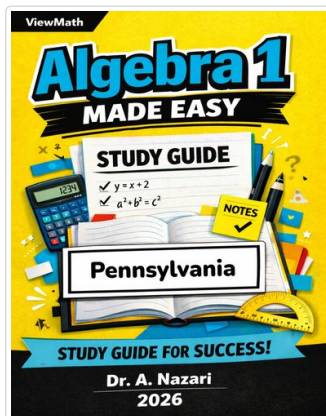


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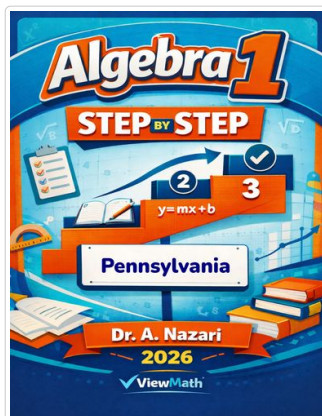
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Study Guide



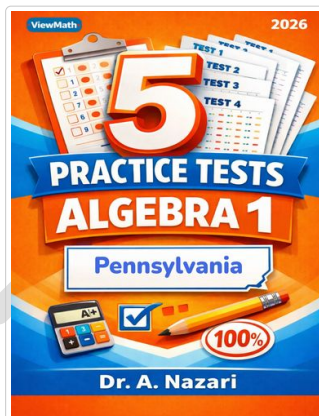
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Step-by-Step



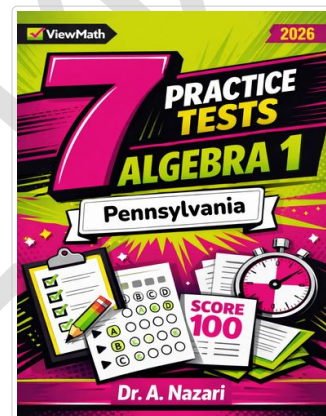
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5 Practice Tests



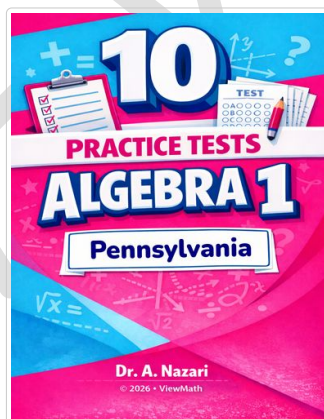
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7 Practice Tests



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10 Practice Tests



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