Sets & Steps
Math Practice & Worked Solutions

Algebra 1

Quadratic Solving Methods & Discriminants | Algebra 1 | 6-Topic Bundle

6-topic bundle | 576 problems | Four activity formats

In every topic

Answer Bank Challenge	24 tasks
Grid Rounds	24 tasks
Match & Move	24 cards
Error Analysis & Strategy	24 tasks
Quick Answer Key and Full Worked Solutions	included
Teacher / Parent Use Guide and Terms of Use	included

Product previews

The following preview pages show the cover, all four activity formats, and worked examples for each included resource, in the listed order.

48 PDFs and 6 READMEs; 379 buyer PDF pages across the 6 products.

Preview pages are not included in the buyer page count. Check the list against resources you already own.

This is a fixed collection of the listed products. Purchase includes the existing individual resource files. To open a product's online preview, follow its title link and select View Preview.

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Sets & Steps
Math Practice & Worked Solutions

Algebra 1

Solving Quadratics by Factoring

Solving Quadratics by Factoring | A1-U09-P07

96 problems · Four activity formats

Topic focus

This topic is a focused set of 96 practice tasks on Solving Quadratics by Factoring.

8 PDFs and a README; 49 buyer pages.

The following pages use the same questions, given data, and notation as the final files. Question/card serial numbers and internal IDs are omitted in this preview only. Table values and matching responses are retained. Full answer keys are not included.

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Algebra 1

Solving Quadratics by Factoring

Name: ______________ **Date:** ______________ **Class:** ______________

Answer each question and record the matching bank letter. Give exact values. Give the whole requested response, including any reasoning the question asks for.

Solve the product equation and list both roots. Match the complete solution set while showing the original required normalized equation, factorization and zero-product branches. Equation: $(x-2)(x+5)=0$ Bank label: ______	Find the complete solution set without dividing by x. Match the complete solution set while showing the original required normalized equation, factorization and zero-product branches. Equation: $x(x-7)=0$ Bank label: ______
Solve each linear factor equation. Match the complete solution set while showing the original required normalized equation, factorization and zero-product branches. Equation: $(2x-3)(x+1)=0$ Bank label: ______	Explain whether the outside -3 changes the roots. Match the complete solution set while showing the original required normalized equation, factorization and zero-product branches. Equation: $-3(x+2)(x-6)=0$ Bank label: ______
Solve by separating the two factor equations. Match the complete solution set while showing the original required normalized equation, factorization and zero-product branches. Equation: $(x-9)(x+9)=0$ Bank label: ______	Keep every root of the product. Match the complete solution set while showing the original required normalized equation, factorization and zero-product branches. Equation: $4x(3x+2)=0$ Bank label: ______
Solve the nonmonic factor equations exactly. Match the complete solution set while showing the original required normalized equation, factorization and zero-product branches. Equation: $(3x+4)(2x-5)=0$ Bank label: ______	Account for the reversed second factor. Match the complete solution set while showing the original required normalized equation, factorization and zero-product branches. Equation: $7(x-3)(5\text{-}x)=0$ Bank label: ______

Algebra 1

Solving Quadratics by Factoring

Name: ______________ **Date:** ______________ **Class:** ______________

Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. Give the whole requested response, including any reasoning the question asks for.

Give the distinct real solution and its multiplicity. Equation: $(x + 4)^2 = 0$	State the distinct root and multiplicity. Equation: $(5x + 1)^2 = 0$
How many distinct solutions are there? Equation: $-(x - 1)(x - 1) = 0$	Find the root represented twice. Equation: $(7 - 2x)^2 = 0$
Recognize duplicate roots from opposite factors. Equation: $(4x + 5)(-4x - 5) = 0$	State the repeated solution exactly. Equation: $(\frac{x}{3} - 5)^2 = 0$

Algebra 1

Solving Quadratics by Factoring

Name: ______________ **Date:** ______________ **Class:** ______________

Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

Incoming: factorization: $(-\frac{x}{7})(5-3x)$; solutions: $0, \frac{5}{3}$ Factor the nonmonic trinomial and solve exactly. Match the complete solution set while showing the original required normalized equation, factorization and zero-product branches. Equation: $2x^2+7x+3=0$ Your response: ______________	**Incoming:** factorization: $(3x+1)(x-2)$; solutions: $-\frac{1}{3}, 2$ Use nonmonic linear factors to solve. Match the complete solution set while showing the original required normalized equation, factorization and zero-product branches. Equation: $6x^2+x-2=0$ Your response: ______________
Incoming: cross terms: $-15x+8x=-7x$; factorization: $(3x+4)(2x-5)=0$; solutions: $-\frac{4}{3}, \frac{5}{2}$ Factor with product -120 and solve. Match the complete solution set while showing the original required normalized equation, factorization and zero-product branches. Equation: $20x^2+7x-6=0$ Your response: ______________	**Incoming:** factorization: $2(2x-1)(2x+1)$; solutions: $-\frac{1}{2}, \frac{1}{2}$ Factor by coordinating the cross terms. Match the complete solution set while showing the original required normalized equation, factorization and zero-product branches. Equation: $10x^2-17x+3=0$ Your response: ______________
Incoming: factorization: $(x+8)(x+3)$; solutions: $-8, -3$ Use two factors with leading term $2x$. Match the complete solution set while showing the original required normalized equation, factorization and zero-product branches. Equation: $4x^2+4x-15=0$ Your response: ______________	**Incoming:** factorization: $5(x-3)(x+3)$; solutions: $-3, 3$ Factor completely before solving. Match the complete solution set while showing the original required normalized equation, factorization and zero-product branches. Equation: $3x^2+12x+9=0$ Your response: ______________

Algebra 1

Solving Quadratics by Factoring

Name: ______________ **Date:** ______________ **Class:** ______________

Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

Factor the trinomial and solve. Choose a factoring setup: test integer binomial factor pairs directly, or split the middle term using a product-sum pair. Explain which is efficient for this equation, then finish the original factor-and-solve task with every zero-product branch.

Equation: $x^2 + 5x + 6 = 0$

Use a factor pair with product -12. Choose a factoring setup: test integer binomial factor pairs directly, or split the middle term using a product-sum pair. Explain which is efficient for this equation, then finish the original factor-and-solve task with every zero-product branch.

Equation: $x^2 - x - 12 = 0$

Recognize the difference of squares and solve. Choose a factoring setup: test integer binomial factor pairs directly, or split the middle term using a product-sum pair. Explain which is efficient for this equation, then finish the original factor-and-solve task with every zero-product branch.

Equation: $x^2 - 9 = 0$

Factor and report distinct roots. Choose a factoring setup: test integer binomial factor pairs directly, or split the middle term using a product-sum pair. Explain which is efficient for this equation, then finish the original factor-and-solve task with every zero-product branch.

Equation: $x^2 + 8x + 16 = 0$

Solving Quadratics by Factoring

Full Worked Solutions - excerpt

Worked example

Problem. A student factors correctly as $(2x+1)(x+3)$ but solves only $2x+1=0$. Complete the reasoning.

Answer. factorization: $(2x+1)(x+3)=0$; first error: the factor $x+3$ was never set to zero; solutions: -3, $-\frac{1}{2}$

Explanation and check.

Zero-product reasoning is a union of both factor equations, so -3 must be added to $-\frac{1}{2}$.

Worked example

Problem. A student claims $(x+4)(x+3)=0$. Find the first mismatch and repair the solution.

Equation: $x^2+x-12=0$ Student Factorization: $(x+4)(x+3)=0$

Answer. correct factorization: $(x+4)(x-3)=0$; first error: the claimed factors expand to $x^2+7x+12$; solutions: -4, 3

Explanation and check.

The constant must be -12 and the linear coefficient $+1$; constants 4 and -3 meet both conditions.

Sets & Steps
Math Practice & Worked Solutions

Algebra 1

Solving Quadratics by Square Roots

Solving Quadratics by Square Roots | A1-U09-P08

96 problems · Four activity formats

Topic focus

This topic is a focused set of 96 practice tasks on Solving Quadratics by Square Roots.

8 PDFs and a README; 51 buyer pages.

The following pages use the same questions, given data, and notation as the final files. Question/card serial numbers and internal IDs are omitted in this preview only. Table values and matching responses are retained. Full answer keys are not included.

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Algebra 1

Solving Quadratics by Square Roots

Name: ______________ **Date:** ______________ **Class:** ______________

Answer each question and record the matching bank letter. Give exact values. Give the whole requested response, including any reasoning the question asks for.

Solve over the real numbers and show both branches. Match the complete exact real solution set. Show the steps that isolate the square and include every real branch. Keep radicals exact. Solve $x^2 = 16$ over the real numbers. Bank label: ______	How many distinct real solutions are there? Match the complete exact real solution set. Show the steps that isolate the square and include every real branch. Keep radicals exact. Solve $x^2 = 0$ over the real numbers. Bank label: ______
Classify the real solution set before attempting a square root. Match the complete exact real solution set. Show the steps that isolate the square and include every real branch. Keep radicals exact. Solve $x^2 = -9$ over the real numbers. Bank label: ______	Distinguish the principal square root from the equation solutions. Match the complete exact real solution set. Show the steps that isolate the square and include every real branch. Keep radicals exact. Solve $x^2 = 1$ over the real numbers. Bank label: ______
List the complete real solution set. Match the complete exact real solution set. Show the steps that isolate the square and include every real branch. Keep radicals exact. Solve $x^2 = 49$ over the real numbers. Bank label: ______	Use square-root branches to solve. Match the complete exact real solution set. Show the steps that isolate the square and include every real branch. Keep radicals exact. Solve $x^2 = 25$ over the real numbers. Bank label: ______
Find and verify both roots. Match the complete exact real solution set. Show the steps that isolate the square and include every real branch. Keep radicals exact. Solve $x^2 = 100$ over the real numbers. Bank label: ______	State both real roots rather than only the radical value. Match the complete exact real solution set. Show the steps that isolate the square and include every real branch. Keep radicals exact. Solve $x^2 = 4$ over the real numbers. Bank label: ______

Algebra 1

Solving Quadratics by Square Roots

Name: ______________ **Date:** ______________ **Class:** ______________

Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. Give the whole requested response, including any reasoning the question asks for.

Determine the number of real roots. Solve $x^2 = -36$ over the real numbers.	Classify the equation in the real domain. Solve $x^2 = -\frac{4}{9}$ over the real numbers.
Decide whether any real branch exists. Solve $x^2 = -0.49$ over the real numbers.	Use sign evidence to classify real solvability. Solve $x^2 = -\frac{121}{9}$ over the real numbers.
Determine the real solution count. Solve $x^2 = -0.0001$ over the real numbers.	Separate perfect-square magnitude from the sign classification. Solve $x^2 = -\frac{289}{64}$ over the real numbers.

Algebra 1

Solving Quadratics by Square Roots

Name: ______________ **Date:** ______________ **Class:** ______________

Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

Incoming: x = -2 or $x = 4$ Separate the outer operations from the final translation. Match the complete exact real solution set. Show the steps that isolate the square and include every real branch. Keep radicals exact. Solve $3(x+4)^2 + 2 = 29$ over the real numbers. Your response: ______________	**Incoming:** x = -1 or $x = 7$ Interpret the plus sign inside the square correctly. Match the complete exact real solution set. Show the steps that isolate the square and include every real branch. Keep radicals exact. Solve $(x+5)^2 = 9$ over the real numbers. Your response: ______________
Incoming: x = -8 or $x = -2$ Determine whether the branch notation creates distinct roots. Match the complete exact real solution set. Show the steps that isolate the square and include every real branch. Keep radicals exact. Solve $(x-4)^2 = 0$ over the real numbers. Your response: ______________	**Incoming:** x = $-\frac{17}{10}$ or $x = \frac{17}{10}$ Control the subtraction and the negative decimal divisor. Match the complete exact real solution set. Show the steps that isolate the square and include every real branch. Keep radicals exact. Solve $-0.8x^2 + 1.25 = -2.982$ over the real numbers. Your response: ______________
Incoming: x = $-\frac{20}{9}$ or $x = \frac{20}{9}$ Find the common-denominator isolation and all real roots. Match the complete exact real solution set. Show the steps that isolate the square and include every real branch. Keep radicals exact. Solve $(\frac{7}{3})x^2 + \frac{5}{6} = \frac{599}{84}$ over the real numbers. Your response: ______________	**Incoming:** x = $-\frac{19}{10}$ or $x = \frac{19}{10}$ Invert the fractional scale, then take square roots. Match the complete exact real solution set. Show the steps that isolate the square and include every real branch. Keep radicals exact. Solve $(\frac{81}{4})x^2 + 6 = 106$ over the real numbers. Your response: ______________

Algebra 1

Solving Quadratics by Square Roots

Name: ______________ **Date:** ______________ **Class:** ______________

Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

Isolate x squared before taking both square-root branches. Choose whether to remove the additive term before dividing by the square coefficient, or divide the whole equation by that nonzero coefficient first. Justify the cleaner arithmetic, then isolate the square and finish both branches as originally requested.

Solve $8x^2 + 3 = 53$ over the real numbers.

Preserve equality through both inverse operations and solve. Choose whether to remove the additive term before dividing by the square coefficient, or divide the whole equation by that nonzero coefficient first. Justify the cleaner arithmetic, then isolate the square and finish both branches as originally requested.

Solve $18x^2 - 7 = 91$ over the real numbers.

Determine whether the two sign branches remain distinct. Choose whether to remove the additive term before dividing by the square coefficient, or divide the whole equation by that nonzero coefficient first. Justify the cleaner arithmetic, then isolate the square and finish both branches as originally requested.

Solve $4x^2 + 13 = 13$ over the real numbers.

Track the negative coefficient while isolating the square. Choose whether to remove the additive term before dividing by the square coefficient, or divide the whole equation by that nonzero coefficient first. Justify the cleaner arithmetic, then isolate the square and finish both branches as originally requested.

Solve $-25x^2 + 8 = -56$ over the real numbers.

Solving Quadratics by Square Roots

Full Worked Solutions - excerpt

Worked example

Problem. Isolate the middle squared term, then branch.

Solve $7 - 2(x-4)^2 = 5$ over the real numbers.

Answer. branches: $x - 4 = \pm 1$; center: 4 ; radius squared: 1 ; real solution count: 2 ; solutions: 3 , 5

Explanation and check.

Subtract 7 and divide by -2 to find $(x-4)^2 = 1$. Therefore x is 3 or 5 .

Worked example

Problem. Determine the number of real roots.

Solve $x^2 = -36$ over the real numbers.

Answer. isolated square value: -36 ; real solution count: 0 ; No real solutions

Explanation and check.

Because x squared is at least zero for every real x , there are no real roots.

Sets & Steps
Math Practice & Worked Solutions

Algebra 1

Solving Quadratics by Completing the Square

Solving Quadratics by Completing the Square | A1-U09-P09

96 problems · Four activity formats

Topic focus

This topic is a focused set of 96 practice tasks on Solving Quadratics by Completing the Square.

8 PDFs and a README; 62 buyer pages.

The following pages use the same questions, given data, and notation as the final files. Question/card serial numbers and internal IDs are omitted in this preview only. Table values and matching responses are retained. Full answer keys are not included.

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Algebra 1

Solving Quadratics by Completing the Square

Name: ______________ **Date:** ______________ **Class:** ______________

Answer each question and record the matching bank letter. Give exact values. A value without its unit is not a complete answer.

Complete the square and solve the symmetric integer branches. Match the complete exact real solution set and show every originally requested square isolation, equality-preserving step, and branch. Do not replace exact radicals with decimals. Work over the real numbers with $x^2 + 16x + 60 = 0$. Bank label: _______	Find the center and both roots using equality-preserving additions. Match the complete exact real solution set and show every originally requested square isolation, equality-preserving step, and branch. Do not replace exact radicals with decimals. Work over the real numbers with $x^2 - 14x + 40 = 0$. Bank label: _______
Preserve the exact nonsquare distance from the completed center. Match the complete exact real solution set and show every originally requested square isolation, equality-preserving step, and branch. Do not replace exact radicals with decimals. Work over the real numbers with $x^2 + 18x + 70 = 0$. Bank label: _______	Complete the square with a negative linear term. Match the complete exact real solution set and show every originally requested square isolation, equality-preserving step, and branch. Do not replace exact radicals with decimals. Work over the real numbers with $x^2 - 2x - 10 = 0$. Bank label: _______
Build the square and simplify the exact solution statement. Match the complete exact real solution set and show every originally requested square isolation, equality-preserving step, and branch. Do not replace exact radicals with decimals. Work over the real numbers with $x^2 + 12x + 29 = 0$. Bank label: _______	Use the fractional half-coefficient and give exact roots. Match the complete exact real solution set and show every originally requested square isolation, equality-preserving step, and branch. Do not replace exact radicals with decimals. Work over the real numbers with $x^2 + 3x - 1 = 0$. Bank label: _______
Complete the square without rounding the half-integer center. Match the complete exact real solution set and show every originally requested square isolation, equality-preserving step, and branch. Do not replace exact radicals with decimals. Work over the real numbers with $x^2 - 5x + 2 = 0$. Bank label: _______	Track the quarter fractions created by the odd coefficient. Match the complete exact real solution set and show every originally requested square isolation, equality-preserving step, and branch. Do not replace exact radicals with decimals. Work over the real numbers with $x^2 + 7x + 3 = 0$. Bank label: _______

Algebra 1

Solving Quadratics by Completing the Square

Name: ______________ **Date:** ______________ **Class:** ______________

Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. A value without its unit is not a complete answer.

<table>
<tr>
<td>Supply the omitted line and finish the partial solution.
Work over the real numbers with $x^2 + 6x = 7$.
$x^2 + 6x = 7$
____
$(x + 3)^2 = 16$</td>
<td>Fill the equality-preserving completion step.
Work over the real numbers with $x^2 - 8x = -7$.
$x^2 - 8x = -7$
____
$(x - 4)^2 = 9$</td>
</tr>
<tr>
<td>Supply the normalization line that must precede square completion.
Work over the real numbers with $2x^2 + 12x = 10$.
$2x^2 + 12x = 10$
____
$x^2 + 6x + 9 = 5 + 9$</td>
<td>Repair the trace by supplying the omitted signed branch.
Work over the real numbers with $x^2 + 4x - 5 = 0$.
$(x + 2)^2 = 9$
$x + 2 = 3$
$x = 1$</td>
</tr>
<tr>
<td>Determine the fractional amount missing from both sides.
Work over the real numbers with $x^2 + 5x = 2$.
$x^2 + 5x = 2$
$x^2 + 5x +$ _______ $= 2 +$ _______</td>
<td>Replace the trinomial with its equivalent squared-binomial form.
Work over the real numbers with $x^2 - 6x + 9 = 14$.
$x^2 - 6x + 9 = 14$
____
$x - 3 = \pm\sqrt{14}$</td>
</tr>
</table>

Algebra 1

Solving Quadratics by Completing the Square

Name: ________________ **Date:** ________________ **Class:** ________________

Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

Incoming: amount added to each side: $\frac{25}{16}$; completed square equation: $(x-\frac{5}{4})^2=\frac{31}{16}$; real solution count: 2; solutions: $\frac{5-\sqrt{31}}{4}$, $\frac{5+\sqrt{31}}{4}$; square root radicand: $\frac{31}{16}$

Recognize the repeated root created by a rational completion amount. Match the complete exact real solution set and show every originally requested square isolation, equality-preserving step, and branch. Do not replace exact radicals with decimals.

Work over the real numbers with $x^2+(\frac{7}{5})x+\frac{49}{100}=0$.

Your response: ________________

Incoming: amount added to each side: $\frac{9}{16}$; completed square equation: $(x+\frac{3}{4})^2=\frac{33}{16}$; real solution count: 2; solutions: $\frac{-3-\sqrt{33}}{4}$, $\frac{-3+\sqrt{33}}{4}$; square root radicand: $\frac{33}{16}$

Normalize the leading coefficient before completing the square. Match the complete exact real solution set and show every originally requested square isolation, equality-preserving step, and branch. Do not replace exact radicals with decimals.

Work over the real numbers with $2x^2+8x+1=0$.

Your response: ________________

Incoming: amount added after normalizing: 1; completed square equation: $(x-1)^2=\frac{8}{5}$; leading coefficient divisor: 5; normalized equation: $x^2-2x-\frac{3}{5}=0$; real solution count: 2; solutions: $1-2\cdot\frac{\sqrt{10}}{5}$, $1+2\cdot\frac{\sqrt{10}}{5}$; square root radicand: $\frac{8}{5}$

Use normalization to expose the repeated root. Match the complete exact real solution set and show every originally requested square isolation, equality-preserving step, and branch. Do not replace exact radicals with decimals.

Work over the real numbers with $2x^2-4x+2=0$.

Your response: ________________

Incoming: amount added after normalizing: $\frac{25}{4}$; completed square equation: $(x-\frac{5}{2})^2=\frac{13}{12}$; leading coefficient divisor: 6; normalized equation: $x^2-5x+\frac{31}{6}=0$; real solution count: 2; solutions: $\frac{5}{2}-\frac{\sqrt{39}}{6}$, $\frac{5}{2}+\frac{\sqrt{39}}{6}$; square root radicand: $\frac{13}{12}$

Normalize the odd linear coefficient and solve exactly. Match the complete exact real solution set and show every originally requested square isolation, equality-preserving step, and branch. Do not replace exact radicals with decimals.

Work over the real numbers with $4x^2+20x+11=0$.

Your response: ________________

Incoming: amount added after normalizing: $\frac{9}{4}$; completed square equation: $(x+\frac{3}{2})^2=\frac{1}{4}$; leading coefficient divisor: 10; normalized equation: $x^2+3x+2=0$; real solution count: 2; solutions: -2, -1; square root radicand: $\frac{1}{4}$

Normalize and simplify the small exact radius. Match the complete exact real solution set and show every originally requested square isolation, equality-preserving step, and branch. Do not replace exact radicals with decimals.

Work over the real numbers with $12x^2-24x+11=0$.

Your response: ________________

START

Rearrange the constants and use the completed-square sign to classify roots. Match the complete exact real solution set and show every originally requested square isolation, equality-preserving step, and branch. Do not replace exact radicals with decimals.

Work over the real numbers with $x^2-5x+9=2$.

Your response: ________________

Algebra 1

Solving Quadratics by Completing the Square

Name: ____________ **Date:** ____________ **Class:** ____________

Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

Complete the square and keep both exact radical branches. Choose between adding the completing quantity to both sides and inserting a compensating pair on the left before isolating the square. Justify the clearer equality-preserving route, then solve by the requested square completion.

Work over the real numbers with $x^2 + 6x + 1 = 0$.

Use half the linear coefficient to build the square. Choose between adding the completing quantity to both sides and inserting a compensating pair on the left before isolating the square. Justify the clearer equality-preserving route, then solve by the requested square completion.

Work over the real numbers with $x^2 - 4x - 3 = 0$.

Show the equal addition that creates a perfect-square trinomial. Choose between adding the completing quantity to both sides and inserting a compensating pair on the left before isolating the square. Justify the clearer equality-preserving route, then solve by the requested square completion.

Work over the real numbers with $x^2 + 8x + 5 = 0$.

Complete the square and simplify the resulting radical. Choose between adding the completing quantity to both sides and inserting a compensating pair on the left before isolating the square. Justify the clearer equality-preserving route, then solve by the requested square completion.

Work over the real numbers with $x^2 - 10x + 7 = 0$.

Solving Quadratics by Completing the Square

Full Worked Solutions - excerpt

Worked example

Problem. Use normalization to expose the repeated root. Match the complete exact real solution set and show every originally requested square isolation, equality-preserving step, and branch. Do not replace exact radicals with decimals.

Work over the real numbers with $2x^2 - 4x + 2 = 0$.

Answer. amount added after normalizing: 1; completed square equation: $(x-1)^2 = 0$; leading coefficient divisor: 2; normalized equation: $x^2 - 2x + 1 = 0$; real solution count: 1; solutions: 1; square root radicand: 0

Explanation and check.

Dividing by 2 already displays the perfect square $x^2 - 2x + 1$. Its only root is $x = 1$.

Worked example

Problem. Show how negative normalization reveals a zero radius. Match the complete exact real solution set and show every originally requested square isolation, equality-preserving step, and branch. Do not replace exact radicals with decimals.

Work over the real numbers with $-5x^2 + 20x - 20 = 0$.

Answer. amount added after normalizing: 4; completed square equation: $(x-2)^2 = 0$; leading coefficient divisor: -5; normalized equation: $x^2 - 4x + 4 = 0$; real solution count: 1; solutions: 2; square root radicand: 0

Explanation and check.

Every term divided by -5 gives the perfect square $x^2 - 4x + 4$. Hence $x = 2$ is repeated.

Sets & Steps
Math Practice & Worked Solutions

Algebra 1

Quadratic Formula

Quadratic Formula | A1-U09-P10

96 problems · Four activity formats

Topic focus

This topic is a focused set of 96 practice tasks on Quadratic Formula.

8 PDFs and a README; 58 buyer pages.

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Algebra 1

Quadratic Formula

Name: ______________ **Date:** ______________ **Class:** ______________

Answer each question and record the matching bank letter. Give exact values. Give the whole requested response, including any reasoning the question asks for.

Consider $4x^2 + 9 = 12x$ over the real numbers. Rewrite with zero on one side and identify the coefficient used for *-b*. Use the quadratic formula, show your substitution and simplification, and match the complete exact real solution set. Bank label: ______	Consider $x(x - 3) = 10$ over the real numbers. Expand the product and normalize before filling the formula slots. Use the quadratic formula, show your substitution and simplification, and match the complete exact real solution set. Bank label: ______
Consider $2x(x + 4) = 3$ over the real numbers. Distribute the outside factors and determine the signed constant after normalization. Use the quadratic formula, show your substitution and simplification, and match the complete exact real solution set. Bank label: ______	Consider $(x - 2)(x + 5) = 7$ over the real numbers. Expand, combine the product constant with the right-side value, and then identify coefficients. Use the quadratic formula, show your substitution and simplification, and match the complete exact real solution set. Bank label: ______
Consider $3(x^2 - 2) = x + 1$ over the real numbers. Remove grouping and collect both right-side terms before entering a, b, and c. Use the quadratic formula, show your substitution and simplification, and match the complete exact real solution set. Bank label: ______	Consider $(x + 1)^2 = 8$ over the real numbers. Convert the square to standard zero form for a formula substitution. Use the quadratic formula, show your substitution and simplification, and match the complete exact real solution set. Bank label: ______
Consider $5x^2 = 2(x + 3)$ over the real numbers. Distribute the right side and move its two terms with the correct signs. Use the quadratic formula, show your substitution and simplification, and match the complete exact real solution set. Bank label: ______	Consider $0.5x^2 - 1.5x = 2$ over the real numbers. Keep the fractional coefficients rather than clearing them, and normalize c correctly. Use the quadratic formula, show your substitution and simplification, and match the complete exact real solution set. Bank label: ______

Algebra 1

Quadratic Formula

Name: ______________ **Date:** ______________ **Class:** ______________

Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. Give the whole requested response, including any reasoning the question asks for.

Consider $6x - 5 = 2x^2$ over the real numbers. Place the quadratic term first without losing the signs of the other terms.

Consider $4\text{-}x(x + 2) = 0$ over the real numbers. Use an equivalent positive-leading normalization and state the coefficient triple it creates.

Consider $\text{-}(x - 4)^2 = 3x - 20$ over the real numbers. Expand the leading negative square, collect, and choose a positive-leading zero form.

Consider $x^2 + x - 1 = 0$ over the real numbers. Round the final approximations to 2 decimal places. Report the exact pair first and then fill a hundredths-and-residual table.

branch	**exact root**	**rounded to 2 places**	**absolute residual**
Smaller root	______	______	______
Larger root	______	______	______

Consider $2x^2\text{-}x - 2 = 0$ over the real numbers. Round the final approximations to 2 decimal places. Approximate each branch to the nearest hundredth and substitute the rounded results.

branch	**exact root**	**rounded to 2 places**	**absolute residual**
Smaller root	______	______	______
Larger root	______	______	______

Consider $3x^2 - 2x - 2 = 0$ over the real numbers. Round the final approximations to 2 decimal places. Simplify the exact radical before giving hundredth approximations.

Algebra 1

Quadratic Formula

Name: ______________ **Date:** ______________ **Class:** ______________

Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

START

Consider $8x^2 + 2x - 3 = 0$ over the real numbers. Evaluate the radical 10 and reduce the two sixteenth-denominator branches. Use the quadratic formula, show your substitution and simplification, and match the complete exact real solution set.

Your response: ______________

Incoming: $\{1, \frac{7}{2}\}$

Consider $3x^2 - 5x = 2x^2 + 6$ over the real numbers. Collect the quadratic terms first and apply the formula to the net leading coefficient. Use the quadratic formula, show your substitution and simplification, and match the complete exact real solution set.

Your response: ______________

Incoming: $\{1\}$

Consider $16x^2 + 24x + 9 = 0$ over the real numbers. Evaluate the formula at a zero discriminant with an even denominator reduction. Use the quadratic formula, show your substitution and simplification, and match the complete exact real solution set.

Your response: ______________

Incoming: $\{-1, \frac{7}{2}\}$

Consider $(3x - 2)^2 = 25$ over the real numbers. Expand the affine square and solve the resulting quadratic by the complete formula. Use the quadratic formula, show your substitution and simplification, and match the complete exact real solution set.

Your response: ______________

Incoming: $\{-2 - \sqrt{3}, -2 + \sqrt{3}\}$

Consider $2x^2 - 3x - 1 = 0$ over the real numbers. State the exact formula roots when the positive discriminant has no square factor. Use the quadratic formula, show your substitution and simplification, and match the complete exact real solution set.

Your response: ______________

Incoming: $\{-2, 3\}$

Consider $3x^2 - 12 = 0$ over the real numbers. Use $a = 3$ and $b = 0$ directly rather than simplifying the equation first. Use the quadratic formula, show your substitution and simplification, and match the complete exact real solution set.

Your response: ______________

Algebra 1

Quadratic Formula

Name: ____________________ **Date:** ____________________ **Class:** ____________________

Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

Consider $2x^2 + 3x - 5 = 0$ over the real numbers. Read a, b, and c with their signs, then write the full quadratic-formula substitution. Choose how to organize the arithmetic: calculate the discriminant first and then insert it, or write the complete signed formula substitution before simplifying any component. Justify your choice for these coefficients, then show the coefficients and the full formula substitution.

Consider $4x^2 - 9 = 0$ over the real numbers. Insert the absent term explicitly before setting up the formula. Choose how to organize the arithmetic: calculate the discriminant first and then insert it, or write the complete signed formula substitution before simplifying any component. Justify your choice for these coefficients, then show the coefficients and the full formula substitution.

Consider $-x^2 + 6x + 7 = 0$ over the real numbers. Keep the displayed leading sign and form the denominator $2a$. Choose how to organize the arithmetic: calculate the discriminant first and then insert it, or write the complete signed formula substitution before simplifying any component. Justify your choice for these coefficients, then show the coefficients and the full formula substitution.

Consider $3x^2 - 8x + 2 = 0$ over the real numbers. Record the coefficient triple and the unsimplified radical expression. Choose how to organize the arithmetic: calculate the discriminant first and then insert it, or write the complete signed formula substitution before simplifying any component. Justify your choice for these coefficients, then show the coefficients and the full formula substitution.

Quadratic Formula

Full Worked Solutions - excerpt

Worked example

Problem. Consider $6x - 5 = 2x^2$ over the real numbers. Place the quadratic term first without losing the signs of the other terms.

Answer. coefficients: a: 2; b: -6; c: 5; discriminant: -4; formula substitution: x = $\frac{-(-6)\pm\sqrt{(-6)^2-4(2)(5)}}{2(2)}$; normalized equation: $2x^2 - 6x + 5 = 0$; solutions:

Explanation and check.

Subtracting the left side from both sides gives $2x^2 - 6x + 5 = 0$, so $a = 2, b = -6, c = 5$.

Worked example

Problem. Consider $(x + 1)^2 = 8$ over the real numbers. Convert the square to standard zero form for a formula substitution. Use the quadratic formula, show your substitution and simplification, and match the complete exact real solution set.

Answer. $\{-1 + 2 \cdot \sqrt{2}, -2 \cdot \sqrt{2} - 1\}$

Explanation and check.

The signed coefficients are $a = 1, b = 2, c = -7$. In standard form, $x^2 + 2x - 7 = 0$. The discriminant is 32. Substitution in the quadratic formula gives $x = \frac{-(2)\pm\sqrt{(2)^2-4(1)(-7)}}{2(1)}$. Expanding gives $x^2 + 2x + 1 = 8$; moving 8 left gives $c = -7$ while $b = 2$.

Sets & Steps
Math Practice & Worked Solutions

Algebra 1

Discriminant and Real Roots

Discriminant and Real Roots | A1-U09-P11

96 problems · Four activity formats

Topic focus

This topic is a focused set of 96 practice tasks on Discriminant and Real Roots.

8 PDFs and a README; 89 buyer pages.

The following pages use the same questions, given data, and notation as the final files. Question/card serial numbers and internal IDs are omitted in this preview only. Table values and matching responses are retained. Full answer keys are not included.

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Algebra 1

Discriminant and Real Roots

Name: ______________ **Date:** ______________ **Class:** ______________

Answer each question and record the matching bank letter. Give exact values. Give the whole requested response, including any reasoning the question asks for.

Consider $x^2 - 5x + 6 = 0$. The coefficients are real. Compute only the discriminant and state the number of distinct real roots. Match the discriminant and the requested root classification or graph contact. Classify without solving for the roots. Bank label: _______	Consider $x^2 + 4x + 4 = 0$. The coefficients are real. Classify the real roots from b squared minus $4ac$, without finding the root. Match the discriminant and the requested root classification or graph contact. Classify without solving for the roots. Bank label: _______
Consider $x^2 + 2x + 5 = 0$. The coefficients are real. Use the sign of the formula radicand to classify this equation. Match the discriminant and the requested root classification or graph contact. Classify without solving for the roots. Bank label: _______	Consider $2x^2 - 3x - 2 = 0$. The coefficients are real. Determine the distinct real-root count from the discriminant alone. Match the discriminant and the requested root classification or graph contact. Classify without solving for the roots. Bank label: _______
Consider $2x^2 + x + 2 = 0$. The coefficients are real. Calculate the discriminant sign and interpret it over the reals. Match the discriminant and the requested root classification or graph contact. Classify without solving for the roots. Bank label: _______	Consider $x^2 - 9 = 0$. The coefficients are real. Insert the absent linear coefficient and classify by discriminant sign. Match the discriminant and the requested root classification or graph contact. Classify without solving for the roots. Bank label: _______
Consider $x^2 + 9 = 0$. The coefficients are real. Make $b = 0$ explicit before determining the real-root count. Match the discriminant and the requested root classification or graph contact. Classify without solving for the roots. Bank label: _______	Consider $-2x^2 - 3x - 5 = 0$. The coefficients are real. Track all three signs and classify the roots without multiplying by -1. Match the discriminant and the requested root classification or graph contact. Classify without solving for the roots. Bank label: _______

Algebra 1

Discriminant and Real Roots

Name: ____________ **Date:** ____________ **Class:** ____________

Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. Give the whole requested response, including any reasoning the question asks for.

Consider $0x^2 + 5x - 1 = 0$. The coefficients are real. Explain why the quadratic discriminant classification is unavailable here.	Consider $-x^2 + 4x - 4 = 0$. The coefficients are real. Retain the negative leading coefficient and evaluate the discriminant.
Consider $4x^2 - 12x + 9 = 0$. The coefficients are real. Check whether the two discriminant terms cancel for this scaled equation.	Consider $(\frac{1}{3})x^2 + (\frac{2}{3})x + \frac{1}{3} = 0$. The coefficients are real. Compute the rational discriminant exactly and classify distinct roots.
Consider $7x^2 = 0$. The coefficients are real. Account for both missing terms and count distinct real roots.	Consider $3(x - 2)^2 = 6x - 15$. The coefficients are real. Expand the square, collect the external linear expression, and classify the resulting contact.

Algebra 1

Discriminant and Real Roots

Name: ______ **Date:** ______ **Class:** ______

Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

Incoming: D = 41; two distinct irrational roots.

Consider $4x^2 + 3x - 1 = x^2 - 2x + 1$. The coefficients are rational. Collect both polynomials and classify the two exact roots arithmetically. Match the discriminant and the requested root classification or graph contact. Classify without solving for the roots.

Your response: ______

Algebra 1

Discriminant and Real Roots

Name: ____________ **Date:** ____________ **Class:** ____________

Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

Consider $x^2 + 4x + k = 0$. Let k be real. Partition all real k by the number of distinct real roots. Choose a classification route: analyze the discriminant inequality, or normalize to a square and analyze its right-hand side. Explain which gives simpler parameter conditions here; first separate any value that makes the equation nonquadratic.

Consider $2x^2 + 3x + k = 0$. Let k be real. Find the exact constant threshold for zero, one, and two real roots. Choose a classification route: analyze the discriminant inequality, or normalize to a square and analyze its right-hand side. Explain which gives simpler parameter conditions here; first separate any value that makes the equation nonquadratic.

Consider $3x^2 - 6x + k = 0$. Let k be real. Use the discriminant to classify every real k without solving any quadratic. Choose a classification route: analyze the discriminant inequality, or normalize to a square and analyze its right-hand side. Explain which gives simpler parameter conditions here; first separate any value that makes the equation nonquadratic.

Consider $-x^2 + 2x + k = 0$. Let k be real. Track the inequality direction for a parameter with negative leading coefficient. Choose a classification route: analyze the discriminant inequality, or normalize to a square and analyze its right-hand side. Explain which gives simpler parameter conditions here; first separate any value that makes the equation nonquadratic.

Discriminant and Real Roots

Full Worked Solutions - excerpt

Worked example

Problem. Consider $-3x^2 + x + 1 = 0$. The coefficients are rational. Use the positive nonsquare discriminant to classify exact root type. Match the discriminant and the requested root classification or graph contact. Classify without solving for the roots.

Answer. D = 13; two distinct irrational roots.

Explanation and check.

The discriminant calculation is $(1)^2 - 4(-3)(1) = 13$. Its square root is $\sqrt{13}$. The coefficients are rational, but $\sqrt{13}$ is not, so both real roots are irrational. The discriminant is 13; its square root is $\sqrt{13}$, so the equation has two distinct irrational roots.

Worked example

Problem. Consider $2x^2 - 8 = 0$. The coefficients are rational. Insert $b = 0$ and determine whether the symmetric roots are rational. Match the discriminant and the requested root classification or graph contact. Classify without solving for the roots.

Answer. D = 64; two distinct rational roots.

Explanation and check.

The discriminant calculation is $(0)^2 - 4(2)(-8) = 64$. Its square root is 8. The discriminant 64 has rational radical 8. The discriminant is 64; its square root is 8, so the equation has two distinct rational roots.

Sets & Steps
Math Practice & Worked Solutions

Algebra 1

Choosing a Quadratic Solving Method

Choosing a Quadratic Solving Method | A1-U09-P16

96 problems · Four activity formats

Topic focus

Across 96 tasks this topic asks for equivalence verdict, solution effect, witness, and corrected step, validity verdict, completeness verdict, corrected set, and certificate, recommended method, structural reason, and first step, chosen independent tool, independence reason, outcome, and limitation, validity, shared solution set, efficiency reason, and preferred route and constructed equation, method-sensitive justification, root set, and independent verification.

8 PDFs and a README; 70 buyer pages.

The following pages use the same questions, given data, and notation as the final files. Question/card serial numbers and internal IDs are omitted in this preview only. Table values and matching responses are retained. Full answer keys are not included.

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Algebra 1

Choosing a Quadratic Solving Method

Name: ____________ **Date:** ____________ **Class:** ____________

Answer each question and record the matching bank letter. Give exact values. Give the whole requested response, including any reasoning the question asks for.

For $(x-4)(x+3)=0$, choose the most efficient solution method for the requirement "find all exact real roots." State the structural reason and a valid first step. Both factors must be checked. Match the complete requested strategy with its actual first-step equality or branches, constructed equation, or full set-verification response. A method label alone is insufficient. Do not carry out routine solving where the original asks only for strategy and first step. Bank label: ______	For $(x+2)^2=25$, choose the most efficient solution method for the requirement "give exact real roots." State the structural reason and a valid first step. The plus-minus symbol preserves both branches. Match the complete requested strategy with its actual first-step equality or branches, constructed equation, or full set-verification response. A method label alone is insufficient. Do not carry out routine solving where the original asks only for strategy and first step. Bank label: ______
Decide whether factoring, the square-root method, completing the square, the quadratic formula, or graphing is best for $x^2+7x+12=0$ under this answer requirement: solve exactly with minimal arithmetic. The factorization is visible without formula arithmetic. Match the complete requested strategy with its actual first-step equality or branches, constructed equation, or full set-verification response. A method label alone is insufficient. Do not carry out routine solving where the original asks only for strategy and first step. Bank label: ______	Select a solution route for $x^2-2x-7=0$ that respects this precision demand: estimate roots to the nearest tenth from a displayed curve. Explain why a different representation would be less suitable. An exact radical is not the requested answer form. Match the complete requested strategy with its actual first-step equality or branches, constructed equation, or full set-verification response. A method label alone is insufficient. Do not carry out routine solving where the original asks only for strategy and first step. Bank label: ______

Algebra 1

Choosing a Quadratic Solving Method

Name: ______________________ **Date:** ______________________ **Class:** ______________________

Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. Give the whole requested response, including any reasoning the question asks for.

Audit these two correct approaches to $9x^2 - 12x + 4 = 0$ under the requirement "identify the distinct root and verify multiplicity two." A: factor $(3x - 2)^2 = 0$. B: compute discriminant 0 and use $x = \frac{12}{18} = \frac{2}{3}$. Which better preserves the requested answer form, and why? The zero discriminant independently confirms the double root.	Audit these two correct approaches to $x^2 - 6x + 12 = 0$ under the requirement "prove there are no real roots." A: complete $(x - 3)^2 = -3$. B: compute discriminant $36 - 48 = -12$. Which better preserves the requested answer form, and why? The negative discriminant is an equally valid certificate.
Two valid routes solve $(\frac{1}{3})x^2 - (\frac{4}{3})x + 1 = 0$. Route A: multiply by 3 and factor $x^2 - 4x + 3$. Route B: apply the formula to fractional coefficients. Compare their efficiency without treating the longer route as incorrect. Route B is valid but less convenient.	For $2x^2 + x - 4 = 0$, compare the algebraic route "use $x = \frac{-1 \pm \sqrt{33}}{4}$, then approximate." with the representation-based route "graph and read approximate intercepts near -1.69 and 1.19.." State what each can certify and which fits exact roots and a decimal reasonableness check. Approximate graph values do not replace exact answers.
Audit these two correct approaches to $x^2 - 8x + 10 = 0$ under the requirement "exact roots and their midpoint." A: complete $(x - 4)^2 = 6$, giving $4 \pm \sqrt{6}$. B: use $\frac{8 \pm \sqrt{24}}{2}$ and simplify. Which better preserves the requested answer form, and why? Formula results are equivalent after simplification.	Two valid routes solve $4x^2 - 4x - 15 = 0$. Route A: split $-4x$ as $6x - 10x$ and factor by grouping. Route B: recognize directly $(2x - 5)(2x + 3) = 0$. Compare their efficiency without treating the longer route as incorrect. Both factorizations encode the same zero-product branches.

Algebra 1

Choosing a Quadratic Solving Method

Name: ______________________ **Date:** ______________________ **Class:** ______________________

Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

Incoming: constraint audit: the midpoint is 3 and each root is distance 4 from it.; equation: $(x-3)^2 = 16$; favored method: the square-root method; roots: $\{-1, 7\}$; verification: expansion gives $x^2 - 6x - 7 = 0 = (x+1)(x-7)$.

Construct a quadratic equation satisfying these independent requirements: use midpoint -2 and irrational offsets $\sqrt{5}$. The visible form must genuinely favor completing the square, and the roots must be $-2 \pm \sqrt{5}$. Give the equation and verify it by a different route. The equation starts in standard form so completion is a meaningful choice. Match the complete requested strategy with its actual first-step equality or branches, constructed equation, or full set-verification response. A method label alone is insufficient. Do not carry out routine solving where the original asks only for strategy and first step.

Your response: ______________________

Incoming: constraint audit: dividing by x would violate the completeness requirement.; equation: $x(2x+3) = 0$; favored method: factoring; roots: $\{-\frac{3}{2}, 0\}$; verification: expansion gives $2x^2 + 3x = 0$, and direct substitution confirms both values.

Construct a quadratic equation satisfying these independent requirements: use symmetric rational roots $\pm\frac{5}{2}$ and a leading coefficient 4. The visible form must genuinely favor factoring as a difference of squares, and the roots must be $-\frac{5}{2}$ and $\frac{5}{2}$. Give the equation and verify it by a different route. The leading coefficient requirement is satisfied independently. Match the complete requested strategy with its actual first-step equality or branches, constructed equation, or full set-verification response. A method label alone is insufficient. Do not carry out routine solving where the original asks only for strategy and first step.

Your response: ______________________

Incoming: constraint audit: the root sum is zero, consistent with the missing linear term.; equation: $4x^2 - 25 = 0$; favored method: factoring as a difference of squares; roots: $\{-\frac{5}{2}, \frac{5}{2}\}$; verification: isolating $x^2 = \frac{25}{4}$ and taking both square roots confirms the pair.

Construct a quadratic equation satisfying these independent requirements: use axis $x = \frac{3}{2}$ and offsets $\frac{\sqrt{7}}{2}$ while keeping integer standard coefficients. The visible form must genuinely favor completing the square, and the roots must be $\frac{3\pm\sqrt{7}}{2}$. Give the equation and verify it by a different route. The method requirement determines the chosen linear coefficient. Match the complete requested strategy with its actual first-step equality or branches, constructed equation, or full set-verification response. A method label alone is insufficient. Do not carry out routine solving where the original asks only for strategy and first step.

Your response: ______________________

Incoming: certificate: $(x+2)(x-3) = 0$ gives exactly -2 and 3.; complete: no; correct solution set: $\{-2, 3\}$; listed values valid: no

For $6x^2 + x - 2 = 0$, a proposed real solution set is $\{-\frac{2}{3}, \frac{1}{2}\}$. Decide separately whether every listed value is valid and whether the set is complete. Exact fractions are retained. Match the complete requested strategy with its actual first-step equality or branches, constructed equation, or full set-verification response. A method label alone is insufficient. Do not carry out routine solving where the original asks only for strategy and first step.

Your response: ______________________

Algebra 1

Choosing a Quadratic Solving Method

Name: ______________ **Date:** ______________ **Class:** ______________

Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

Two valid routes solve $x^2 - 5x + 6 = 0$. Route A: factor to $(x-2)(x-3) = 0$, giving $x = 2$ or 3. Route B: use the quadratic formula to obtain $\frac{5 \pm 1}{2}$, giving $x = 2$ or 3. Compare their efficiency without treating the longer route as incorrect. Formula use is not an error. Compare the two original routes for validity and efficiency under the stated answer requirement. Do not label a longer correct route as an error; justify any preference from the visible equation structure.

Both traces for $(x-4)^2 = 9$ claim the same solution set. Route A: take $x - 4 = \pm 3$, so $x = 1$ or 7. Route B: expand to $x^2 - 8x + 7 = 0$ and apply the formula, obtaining $x = 1$ or 7. Compare how each route preserves all branches and identify the more direct one. Both routes retain plus and minus. Compare the two original routes for validity and efficiency under the stated answer requirement. Do not label a longer correct route as an error; justify any preference from the visible equation structure.

Two valid routes solve $x^2 + 4x - 5 = 0$. Route A: complete $(x+2)^2 = 9$, then get $x = 1$ or -5. Route B: use $\frac{-4 \pm 6}{2}$, then get $x = 1$ or -5. Compare their efficiency without treating the longer route as incorrect. The formula is still exact. Compare the two original routes for validity and efficiency under the stated answer requirement. Do not label a longer correct route as an error; justify any preference from the visible equation structure.

For $x^2 - 2 = 0$, compare the algebraic route “solve exactly as $x = \pm\sqrt{2}$ and round to ± 1.41.” with the representation-based route “read graph intercepts near -1.41 and 1.41 from a sufficiently scaled graph..” State what each can certify and which fits roots to the nearest hundredth. The graph is valid at the requested precision if its scale supports hundredths. Compare the two original routes for validity and efficiency under the stated answer requirement. Do not label a longer correct route as an error; justify any preference from the visible equation structure.

Choosing a Quadratic Solving Method

Full Worked Solutions - excerpt

Worked example

Problem. What should be the strategic first step for $9x^2 - 16 = 0$ if the goal is find exact roots? Name the method that this step prepares. This avoids unnecessary formula substitution. Match the complete requested strategy with its actual first-step equality or branches, constructed equation, or full set-verification response. A method label alone is insufficient. Do not carry out routine solving where the original asks only for strategy and first step.

Answer. decisive structure: the left side is a difference of squares; first step: factor as $(3x - 4)(3x + 4) = 0$; method: factoring

Explanation and check.

The decisive feature is the left side is a difference of squares. Therefore use factoring. A valid strategic first step is factor as $(3x - 4)(3x + 4) = 0$. This avoids unnecessary formula substitution.

Worked example

Problem. Two valid routes solve $(\frac{1}{3})x^2 - (\frac{4}{3})x + 1 = 0$. Route A: multiply by 3 and factor $x^2 - 4x + 3$. Route B: apply the formula to fractional coefficients. Compare their efficiency without treating the longer route as incorrect. Route B is valid but less convenient.

Answer. both valid: True; common solution set: $\{1, 3\}$; preferred route: Route A; reason: nonzero scaling preserves roots and removes fraction arithmetic.

Explanation and check.

Both routes are reversible and give $\{1, 3\}$. Route A is more efficient here because nonzero scaling preserves roots and removes fraction arithmetic. The other route remains mathematically valid. Route B is valid but less convenient.