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

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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: ______

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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.

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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: ______________________

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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 $\frac{5\pm1}{2}$, 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 $x - 4 = \pm3$, 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 $\frac{-4\pm6}{2}$, 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.