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

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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. A value without its unit is not a complete answer.

Supply the omitted line and finish the partial solution.

Work over the real numbers with $x^2 + 6x = 7$.

$x^2 + 6x = 7$

_____

$(x + 3)^2 = 16$

Fill the equality-preserving completion step.

Work over the real numbers with $x^2 - 8x = -7$.

$x^2 - 8x = -7$

_____

$(x - 4)^2 = 9$

Supply the normalization line that must precede square completion.

Work over the real numbers with $2x^2 + 12x = 10$.

$2x^2 + 12x = 10$

_____

$x^2 + 6x + 9 = 5 + 9$

Repair the trace by supplying the omitted signed branch.

Work over the real numbers with $x^2 + 4x - 5 = 0$.

$(x + 2)^2 = 9$

$x + 2 = 3$

$x = 1$

Determine the fractional amount missing from both sides.

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

$x^2 + 5x = 2$

$x^2 + 5x +$ _____ $= 2 +$ _____

Replace the trinomial with its equivalent squared-binomial form.

Work over the real numbers with $x^2 - 6x + 9 = 14$.

$x^2 - 6x + 9 = 14$

_____

$x - 3 = \pm\sqrt{14}$

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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: 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: _____

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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.

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 $x^2 - 10x + 7 = 0$.

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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.