Completing the Square & the Quadratic Formula

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Name: _____ Date: _____ Score: / 10

Learning Objectives

- Identify and construct perfect square trinomials
- Solve quadratic equations by completing the square
- Solve quadratic equations using the quadratic formula
- Solve quadratic inequalities using a sign chart

Solve each problem completely, showing all steps and writing answers in exact form.

1. Warm-up: Solve the quadratic equation by factoring.

$x^2 - 5x + 6 = 0$

Answer: _____

2. Determine the value of c that makes the expression a perfect square trinomial.

$x^2 + 12x + c$

Answer: _____

3. Determine the value of c that makes the expression a perfect square trinomial.

$x^2 - 7x + c$

Answer: _____

4. Factor the perfect square trinomial.

$x^2 - 10x + 25$

Answer: _____

5. Solve the quadratic equation by completing the square.

$x^2 + 6x - 7 = 0$

Answer: _____

6. Solve the quadratic equation by completing the square.

$2x^2 - 8x + 2 = 0$

Answer: _____

7. Solve using the quadratic formula.

$x^2 + 5x + 3 = 0$

Answer: _____

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8. Solve using the quadratic formula.

$3x^2 - 2x - 1 = 0$

Answer: _____

9. Solve the quadratic inequality using a sign chart.

$x^2 - x - 6 > 0$

Answer: _____

10. Solve the quadratic inequality using a sign chart.

x 2 +2x-8 le 0

Answer: _____

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ANSWER KEY & SOLUTIONS

This worksheet covers the topics in the video: warm-up factoring/quadratic review, perfect square trinomials (PST), creating a PST by completing the square, solving quadratics by completing the square, deriving and applying the quadratic formula, and solving quadratic inequalities using a sign chart.

Solutions

1. Warm-up: Solve the quadratic equation by factoring.

$x^2 - 5x + 6 = 0$

→ *Factor the trinomial as the product of two binomials whose constants multiply to six and add to negative five.*
→ *The factored form is the quantity x minus two times the quantity x minus three equals zero.*
→ *Set each factor equal to zero.*
→ *The solutions are x equals two and x equals three.*

Answer: $x = 2,\ x = 3$

2. Determine the value of c that makes the expression a perfect square trinomial.

$x^2 + 12x + c$

→ *Take half of the coefficient of x, which is six.*
→ *Square six to obtain thirty-six.*
→ *So c equals thirty-six, giving the perfect square the quantity x plus six squared.*

Answer: $c = 36$

3. Determine the value of c that makes the expression a perfect square trinomial.

$x^2 - 7x + c$

→ *Take half of negative seven to get negative seven-halves.*
→ *Square negative seven-halves to obtain forty-nine fourths.*
→ *So c equals forty-nine over four.*

Answer: $c = \frac{49}{4}$

4. Factor the perfect square trinomial.

$x^2 - 10x + 25$

→ *Identify that twenty-five is the square of five and that ten is twice five.*
→ *Write the trinomial as the quantity x minus five squared.*

Answer: $(x - 5)^2$

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5. Solve the quadratic equation by completing the square.

$x^2 + 6x - 7 = 0$

→ *Move the constant to the right side to get x squared plus six x equals seven.*
→ *Take half of six to get three, then square it to get nine.*
→ *Add nine to both sides, giving x squared plus six x plus nine equals sixteen.*
→ *Factor the left side as the quantity x plus three squared equals sixteen.*
→ *Take the square root of both sides to get x plus three equals plus or minus four.*
→ *Subtract three from both sides to get x equals one or x equals negative seven.*

Answer: $x = 1,\ x = -7$

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6. Solve the quadratic equation by completing the square.

$2x^2 - 8x + 2 = 0$

→ *Divide every term by two to get x squared minus four x plus one equals zero.*
→ *Move the constant to the right side to get x squared minus four x equals negative one.*
→ *Take half of negative four to get negative two, then square it to get four.*
→ *Add four to both sides, giving x squared minus four x plus four equals three.*
→ *Factor the left side as the quantity x minus two squared equals three.*
→ *Take the square root of both sides to get x minus two equals plus or minus the square root of three.*
→ *Add two to both sides to get x equals two plus or minus the square root of three.*

Answer: $x = 2 \pm \sqrt{3}$

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7. Solve using the quadratic formula.

$x^2 + 5x + 3 = 0$

→ *Identify a equals one, b equals five, and c equals three.*
→ *Substitute into the quadratic formula.*
→ *The discriminant is twenty-five minus twelve, which equals thirteen.*
→ *The solutions are x equals negative five plus or minus the square root of thirteen, all over two.*

Answer: $x = \frac{-5 \pm \sqrt{13}}{2}$

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8. Solve using the quadratic formula.

$3x^2 - 2x - 1 = 0$

→ *Identify a equals three, b equals negative two, and c equals negative one.*
→ *Substitute into the quadratic formula.*
→ *The discriminant is four plus twelve, which equals sixteen, and its square root is four.*
→ *The solutions are x equals two plus four over six, which simplifies to one, and x equals two minus four over six, which simplifies to negative one third.*

Answer: $x = 1,\ x = -\frac{1}{3}$

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9. Solve the quadratic inequality using a sign chart.

$x^2 - x - 6 > 0$

→ *Factor the quadratic as the quantity x minus three times the quantity x plus two.*
→ *Find the critical numbers where the expression equals zero, which are x equals three and x equals negative two.*
→ *Use a sign chart to test the intervals to the left of negative two, between negative two and three, and to the right of three.*
→ *The expression is positive on the outer intervals, so the solution is x less than negative two or x greater than three.*

Answer: $x < -2$ or $x > 3$

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10. Solve the quadratic inequality using a sign chart.

x 2 +2x-8 le 0

→ *Factor the quadratic as the quantity x plus four times the quantity x minus two.*
→ *Find the critical numbers where the expression equals zero, which are x equals negative four and x equals two.*
→ *Use a sign chart to test the intervals; the expression is negative between the critical numbers.*
→ *Include the endpoints since the inequality is less than or equal to, giving negative four less than or equal to x less than or equal to two.*

Answer: -4 le x le 2