fornia
ndards

14.0 Students solve a quadratic equation by factoring or **completing the square.**

Objective:

We will solve quadratic equations by completing the square.

Pair share
non-volunteer

APK

Simplify. Teacher does 1
Students do 2,3,4

1. $\left(\frac{7}{2}\right)^2$

2. $\left(\frac{10}{2}\right)^2 - 6$

3. $\left(\frac{-9}{2}\right)^2$

4. $\left(\frac{3}{2}\right)^2 + 3$

This is how you find the end term of completing the square

Concept development

Solving by **completing the square** is adding a term to $x^2 + bx$ to form a trinomial that is a perfect square.

Choral read- pairshare – in own words

Completing the Square

WORDS	NUMBERS	ALGEBRA
To complete the square of $x^2 + bx$, add $\left(\frac{b}{2}\right)^2$ to the expression. This will form a perfect square trinomial.	$x^2 + 6x + \square$ $x^2 + 6x + \left(\frac{6}{2}\right)^2$ $x^2 + 6x + 9$ $(x + 3)^2$	$x^2 + bx + \square$ $x^2 + bx + \left(\frac{b}{2}\right)^2$ $\left(x + \frac{b}{2}\right)^2$

When completing the square the expression needs to be in standard form

Example

Non -example

Which one is an example of a completed square?

A.

B.

Justify

9-7 Completing the Square

Importance:

1. Landscapers can solve quadratic equations to find dimensions of patios.
2. It's on the chapter, benchmark, and CST tests.

What quantity should be added to both sides of this equation to complete the square?

$$x^2 - 8x = 5$$

A 4

B −4

C 16

D −16

Additional Example 1: Completing the Square

Complete the square to form a perfect square trinomial.

I do

A. $x^2 + 2x +$ ▢

$x^2 + 2x$

$\left(\frac{2}{2}\right)^2 = 1^2 = 1$

$x^2 + 2x + 1$

Identify b.

Find $\left(\frac{b}{2}\right)^2$.

Add $\left(\frac{b}{2}\right)^2$ *to the expression.*

We do

B. $x^2 - 6x +$ ▢

How did I/we complete the square to form a perfect square trinomial?

Guided Practice (You do)

Complete the square to form a perfect square trinomial.

c. $8x + x^2 +$ ▢

Identify b.

Find $\left(\frac{b}{2}\right)^2$.

Add $\left(\frac{b}{2}\right)^2$ *to the expression.*

How did you find the perfect square trinomial?

Additional guided practice (if needed)

Complete the square to form a perfect square trinomial.

a. $x^2 + 12x +$ ☐

b. $x^2 - 5x +$ ☐

Identify b.

Find $\left(\frac{b}{2}\right)^2$.

Add $\left(\frac{b}{2}\right)^2$ *to the expression.*

Concept Development

To solve a quadratic equation in the form $x^2 + bx = c$, first complete the square of $x^2 + bx$. Then you can solve using square roots.

How do you solve a quadratic equation $x^2 + bx = c$?

Skill development

Solving a Quadratic Equation by Completing the Square

Step 1 Write the equation in the form $x^2 + bx = c$.
Step 2 Find $\left(\frac{b}{2}\right)^2$.
Step 3 Complete the square by adding $\left(\frac{b}{2}\right)^2$ to both sides of the equation.
Step 4 Factor the perfect-square trinomial.
Step 5 Take the square root of both sides.
Step 6 Write two equations, using both the positive and negative square root, and solve each equation.

Completing the Square (I do)

Solve by completing the square. Check your answer.

$x^2 + 16x = -15$

The equation is in the form $x^2 + bx = c$.

Step 1 $x^2 + 16x = -15$

Step 2 $\left(\frac{16}{2}\right)^2 = 8^2 = 64$ *Find* $\left(\frac{b}{2}\right)^2$. Why?

Step 3 $x^2 + 16x + 64 = -15 + 64$ *Complete the square.*

Step 4 $(x + 8)^2 = 49$ How? *Factor and simplify.*

Step 5 $x + 8 = \pm 7$ *Take the square root of both sides.*

Step 6 $x + 8 = 7$ or $x + 8 = -7$ *Write and solve two equations.*

$x = -1$ or $x = -15$

Guided Practice (we do)

Solve by completing the square. Check your answer.

$$x^2 + 10x = -9$$

Step 1 $x^2 + 10x = -9$ — *The equation is in the form $x^2 + bx = c$.*

Step 2 $\left(\frac{10}{2}\right)^2 = 5^2 = 25$ — *Find $\left(\frac{b}{2}\right)^2$.*

Step 3 $x^2 + 10x + 25 = -9 + 25$ — *Complete the square.*

Step 4 $(x + 5)^2 = 16$ — *Factor and simplify.*

Step 5 $x + 5 = \pm 4$ — *Take the square root of both sides.*

Step 6 $x + 5 = 4$ or $x + 5 = -4$ — *Write and solve two equations.*

$x = -1$ or $x = -9$

How did we?

You Do

Step 1

Step 2

Step 3

Step 4

Step 5

Step 6

Additional Guided practice (If needed)

Solve by completing the square. Check your answer.

$x^2 - 4x - 6 = 0$

Write in the form $x^2 + bx = c$.

Find $\left(\frac{b}{2}\right)^2$.

Complete the square.

Factor and simplify.

Take the square root of both sides.

Write and solve two equations.

Additional Guided Practice (if needed)

Solve by completing the square. Check your answer.

$$t^2 - 8t - 5 = 0$$

Write in the form $x^2 + bx = c$.

Find $\left(\frac{b}{2}\right)^2$.

Complete the square.

Factor and simplify.

Take the square root of both sides.

Write and solve two equations.

I do (simplifying first)

Solve by completing the square.

$$-3x^2 + 12x - 15 = 0$$

Guided practice (we do)

Solve by completing the square.

$$2t^2 + 5t = 3$$

Guided practice (we do)

Solve by completing the square.

$$2x^2 = -7x - 29$$

Guided practice (we do)

Solve by completing the square.

$$4t^2 - 4t + 9 = 0$$

Closure Skill (Every variation)

Complete the square to form a perfect square trinomial.

1. $x^2 + 11x +$ ▢

2. $x^2 - 18x +$ ▢

Solve by completing the square.

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

4. $3x^2 + 6x = 144$

5. $4x^2 + 44x = 23$

9-7 Completing the Square

Closure

1. What is the process of adding to $x^2 + bx$ called?

2. What did you learn about solving a quadratic equation by completing the square? Why is this important to learn?

9-7 Completing the Square

- Practice book pg 62 1-6

Independent practice