



Completing the Square with Non-Integer Values

Video Notes

[Video Link](#)

Completing the Square with Integer Values

What background knowledge will I need?

- Factoring Perfect Square Trinomials

Factor the following expressions:

Reminder!

$$\sqrt{36} = \pm 6$$

$$\frac{12}{2} = 6$$

Expression	Factored Form
$x^2 + 12x + 36$ $\frac{12}{2} = 6$	$(x+6)^2$
$x^2 - 8x + 16$ $\frac{-8}{2} = -4$	$(x-4)^2$
$x^2 - 16x + 64$ $\frac{-16}{2} = -8$	$(x-8)^2$
$x^2 + 10x + 25$ $\frac{10}{2} = 5$	$(x+5)^2$

$$a^2 + 2ab + b^2 = (a+b)^2$$

$$x^2 + 12x + 36$$

$$(x + 6)(x + 6)$$

$$+6x$$

$$+6x$$

If we have a perfect square trinomial, $x^2 + bx + c$, we can say that $\left(\frac{b}{2}\right)^2 = c$.

Rewrite the expression below with an equivalent expression that has a perfect square trinomial. Then, factor.

$$x^2 + bx + c$$

$$x^2 + 6x + 10$$

$$\left(\frac{b}{2}\right)^2 = \left(\frac{6}{2}\right)^2 = \underline{\underline{(3)^2}} = \underline{9}$$

$$x^2 + 6x + \underline{9} - \underline{9} + 10$$

$$\boxed{(x+3)^2 + 1}$$

Rewrite the expression below with an equivalent expression that has a perfect square trinomial. Then, factor

$$ax^2 + bx + c$$

$$3x^2 - 30x - 14$$

$$3(x^2 - 10x) - 14$$

$$\left(\frac{-10}{2}\right)^2 = (-5)^2 = 25$$

$$3(x^2 - 10x + \underline{25} - \underline{25}) - 14$$

perfect square trinomial

$$3(x^2 - 10x + 25) - 75 - 14$$

$$\boxed{3(x-5)^2 - 89}$$

* We need the leading coefficient to be 1, so we'll factor the "a" value out of $ax^2 + bx$, but leave "c" alone.

* Complete the square for the factored expression.

* Don't forget to distribute the GCF through to the subtracted value.

* Factor + simplify.

Rewrite the expression below with an equivalent expression that has a perfect square trinomial. Then, factor.

$$ax^2 + bx + c$$

$$-5x^2 + 100x - 145$$

$$-5(x^2 - 20x) - 145$$

$$\left(\frac{-20}{2}\right)^2 = (-10)^2 = 100$$

$$-5(x^2 - 20x + 100 - 100) - 145$$

perfect square trinomial

Summary:

- Factor out the leading coefficient from $ax^2 + bx$ to make the a value 1.
- Divide the new b value by 2 and square it. ← completes the square
- Add that value to the expression, but don't forget to subtract it to preserve the expression (we don't want to change the expression).
 - Don't forget to distribute the leading coefficient if necessary.
- You now have a perfect square trinomial. Factor it!