Objective: Factor trinomials

Prior Knowledge

Multiply: $(3x+2)(2x-5)$

$6x^2-11x-10$

Explain where the $6x^2$ came from.

From the product of $3x$ and $2x$ (the first terms in the binomials).

Explain where the $-11x$ came from.

The product of $3x$ and -5 (the outside terms) added to the product of 2 and $2x$ (the inside terms). $(-15x + 4x = -11x)$

Explain where the -10 came from.

From the product of 2 and -5 (the last terms in the binomials).

Objective: Factor trinomials

Concept

If $a \cdot b = c$, then a and b are factors of c.

Factor (noun): a number or algebraic expression that divides evenly into a number or algebraic expression; factors are often written in pairs; the product of factors equals the original value

15

$\downarrow$

$3 \cdot 5$

$-3 \cdot -5$

$15 \cdot 1$

$-15 \cdot -1$

Factors

$10x^2$

$\downarrow$

$2x \cdot 5x$

$10x \cdot x$

$10 \cdot x^2$

Factors

-16

$\downarrow$

$8 \cdot -2$

$-8 \cdot 2$

$4 \cdot -4$

$-4 \cdot 4$

$16 \cdot -1$

$-16 \cdot 1$

Factors

Objective: Factor trinomials

Factor (verb): to write a number or polynomial as a product of factors

$$6x^2 + x - 2 \leftarrow \text{polynomial}$$

$$(3x+2)(2x-1) \leftarrow \text{factored}$$

Polynomials are factored so that each factor is prime. What does it mean to say that a factor is prime?

Saying a factor is prime means that it can only be written as a product of 1 and itself.

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Concept

Trinomials can have factors that are monomials (called a Greatest Common Factor (GCF)), and factors that are binomials.

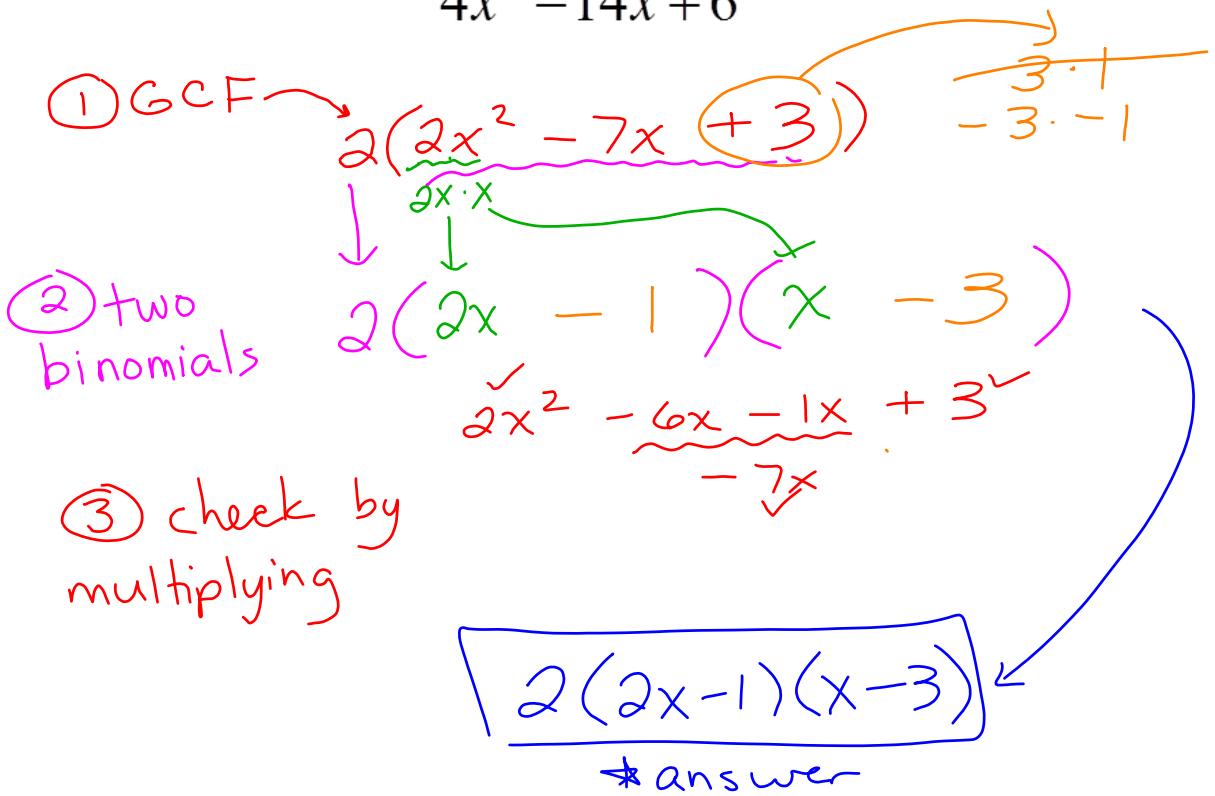
Procedure For Factoring Trinomials

1. Factor out the GCF, if there is one.
2. Factor the remaining trinomial into two binomials.
3. Check your factors by multiplying them.

Objective: Factor trinomials

Ex) Factor each trinomial completely.

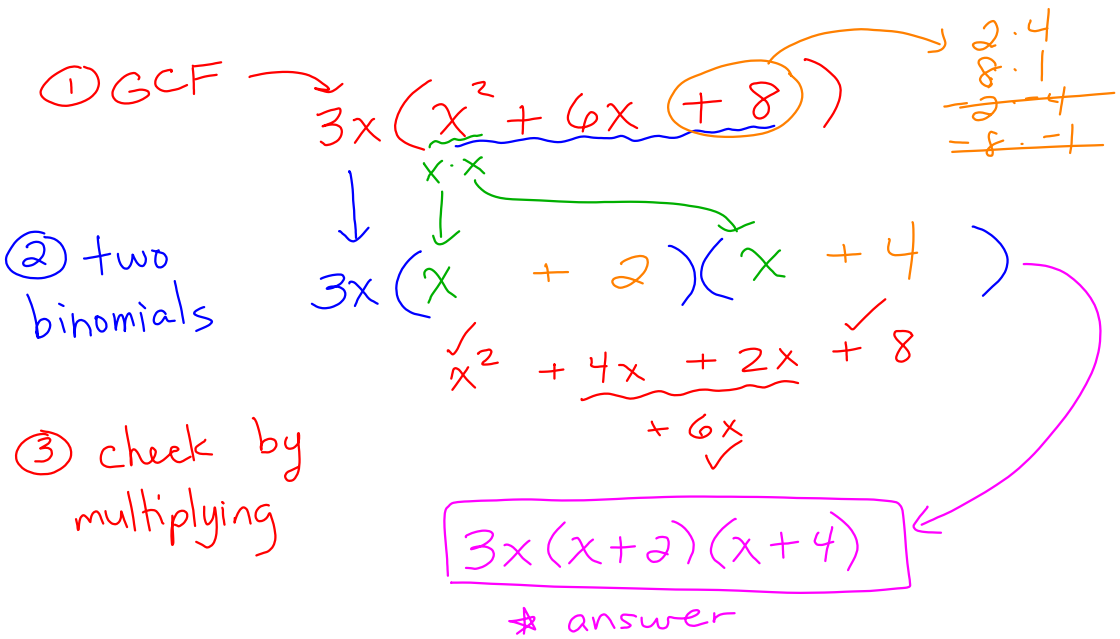
$$4x^2 - 14x + 6$$



Objective: Factor trinomials

Ex) Factor each trinomial completely.

$$3x^3 + 18x^2 + 24x$$



Objective: Factor trinomials completely.

Compare these two factored trinomials. Why does the first one have addition in the two binomials but the second one has subtraction?

$$x^2+6x+8 \qquad 2x^2-7x+3$$

$$(x+4)(x+2) \qquad (2x-1)(x-3)$$

Write a general rule for the signs of the binomials when you are factoring trinomials with a positive last term.

If the last term in the trinomial is positive and the middle term is negative, the binomials will both be "minus."
If the last term in the trinomial is positive and the middle term is positive, the binomials will both be "plus."

Objective: Factor trinomials completely.

Ex) Factor each trinomial completely.

perfect square trinomial ★

$9x^2 - 12x + 4$

$1x \cdot 9x$
$3x \cdot 3x$

~~4 · 1~~
~~2 · 2~~
$-4 \cdot -1$
$-2 \cdot -2$

① GCF = 1

② two binomials

$(3x - 2)(3x - 2)$

$9x^2$ $-6x + -6x$ $+4$

$-12x$

③ check by multiplying

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

★ answer

Objective: Factor trinomials completely.

Ex) Factor each trinomial completely.

$$6x^3 - 3x^2 - 30x$$

① GCF = $3x$

$3x(2x^2 - 1x - 10)$ ($2x \cdot x$)

$-5 \cdot 2$, $5 \cdot -2$, $-1 \cdot 10$, $1 \cdot -10$

② two binomials

$3x(2x - 5)(x + 2)$

③ check by mult. the binomials

$2x^2 + 4x + -5x - 10$

$-1x$

$3x(2x-5)(x+2)$

★ answer

Objective: Factor trinomials completely.

Ex) Factor each trinomial completely.

$3x^2 + 7x - 6$

$x \cdot 3x$

$-3 \cdot 2$
$3 \cdot -2$
$-1 \cdot 6$
$1 \cdot -6$

① GCF = 1

② two binomials

$(x + 3)(3x - 2)$

③ check by multiplying

$3x^2 + -2x + +9x - 6$
$+7x$

$(x+3)(3x-2)$ → answer

Objective: Factor trinomials completely.

Using the last two examples, write a general rule for the signs of the binomials when you are factoring a trinomial with a negative last term.

$6x^3 - 3x^2 - 30x$

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

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

$3x^2 + 7x - 6$

$\boxed{(3x-2)(x+3)}$

When the last term in the trinomial is negative, one of the binomials will be "plus" and the other "minus."

Objective: Factor trinomials completely.

Closure

Two students factored the trinomial below. Which student factored the trinomial correctly? Explain your reasoning.

$$x^2 + 2x - 8$$

Student A	Student B
$(x+4)(x-2)$	$(x-4)(x+2)$

Student A is correct because the product of the binomials gives the original trinomial, $x^2 + 2x - 8$.