

QUADRATIC RELATIONS: Factoring Simple Trinomials

Date: Notes

Factored Form

$$\begin{aligned} &(x+3)(x+2) \\ &= x^2 + \underbrace{2x+3x} + 6 \\ &= x^2 + 5x + 6 \end{aligned}$$

Expanded Form

$$x^2 + \underline{\underline{5x}} + 6$$

Simple Trinomial Factoring:

$$(x+3)(x+2) = x^2 + 5x + 6$$

$\begin{array}{cc} \uparrow & \uparrow \\ \underline{b} & \underline{c} \end{array}$

Steps for Trinomial Factoring:

1. Put in standard form.... $ax^2 + bx + c$
2. Is there a greatest common factor? If there is, common factor first!
3. Is it a difference of squares?
4. Find 2 numbers that:
 - a. Multiply to c
 - b. Add to b
5. Use these numbers in brackets as binomials.

EXAMPLE 1: Factor the following simple trinomial:

$$x^2 - 3x - 18$$

$\begin{array}{cc} \downarrow & \downarrow \\ \underline{b} & \underline{c} \end{array}$

Use the checklist: 1. Format is good 2. No common factor 3. Not a difference of squares

Therefore we must, find 2 numbers that:

- Multiply to c (value of -18) \rightarrow one factor must be negative
- Add to b (value of -3)

We write the answer in factored form like this:

Factors are -6 and 3 .

$$(x-6)(x+3)$$

Because

$$\begin{aligned} -6 \times 3 &= -18 \text{ (c-value)} \\ -6 + 3 &= -3 \text{ (b-value)} \end{aligned}$$

Factors of -18		Sum
1	18	19
-1	18	17
2	-9	-7
-2	9	7
<u>3</u>	<u>-6</u>	<u>-3</u>
-3	6	3

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EXAMPLE 2: Factor the following simple trinomial:

$$x^2 + \underbrace{11x}_b + \underbrace{24}_c$$

Use the checklist: 1. Format is good ✓ 2. No common factor ✓ 3. Not a difference of squares ✓

Therefore we must, find 2 numbers that:

- Multiply to c 24
- Add to b 11

We write the answer in factored form like this:

$$(x+3)(x+8)$$

Factors are 3 and 8

Factors of 24		Sum
1	24	25
-1	-24	-25
2	12	14
-2	-12	-14
3	8	11
-3	-8	-11

Expand

$$x^2 + 8x + 3x + 24 = x^2 + 11x + 24 \checkmark$$

EXAMPLE 3: Factor the following simple trinomial

$$x^2 - 5x - 36$$

We must find two numbers that multiply to -36

and add up to -5.

Factors are -9 and 4

Answer: $(x-9)(x+4)$

Check

$$x^2 + 4x - 9x - 36 = x^2 - 5x - 36 \checkmark$$

Factors		Sum
1	-36	-35
-1	36	35
2	-18	-16
-2	18	16
3	-12	-9
-3	12	9
4	-9	-5
-4	9	5

YOU TRY! Factor each trinomial and check by expanding.

a) $x^2 + 12x + 36$
 $= (x+6)(x+6)$

b) $x^2 + 9x - 22$
 $= (x-11)(x+2)$

c) $x^2 - 4x - 32$
 $= (x-8)(x+4)$