Unit 6.5 Factoring Trinomials Using the "X-Box Method"

You should know how to use this method of factoring because it is USED to FACTOR (3-terms) trinomials.

THE FIRST RULE OF FACTORING IS: ALWAYS check for a GCF and FACTOR it out before starting! $4x^2+72x+144 \rightarrow 4(x^2+18x+36)$ GCF: 4 → Now use X-Box Method to factor

Steps to Follow When Factoring BY "X-BOX METHOD" *Use on Quadratic Trinomials!*

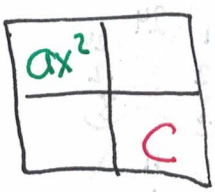
1.) Make sure polynomials are in the following form: Standard Form $ax^2 \pm bx \pm c$

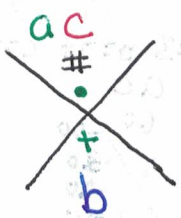
2.) **Check for a GCF and if there is one, FACTOR it out!**

3.) Find Two numbers who equal ac (times) AND ADDS up to "b"

4.) Start filling out your "box":

- Put the ax^2 term in the UPPER LEFT box and the c term in the lower right box.
- For the rest of the "boxes" → use the BIG X to help you



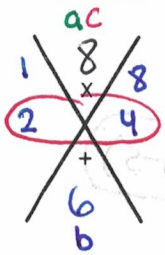


5.) Find the GCF of each row and each column

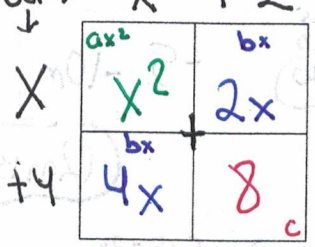
6.) Your final answer (factored trinomial) (binomial x binomial) will be the combined GCF of the top boxes times the combined GCF of the left boxes.

Examples: Factor each trinomial completely BY the "~~Reverse~~ X- Box Method"

1.) x^2+6x+8 a=1 b=6 c=8



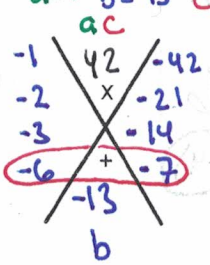
GCF → 1

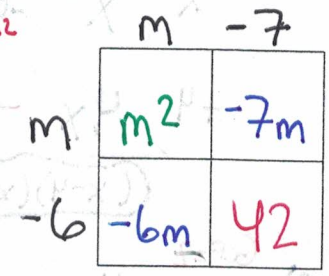


$(x+2)(x+4)$

✓ trinomial
✓ in standard form
✓ there is no GCF

2.) $m^2-13m+42$ Both signs are negative! a=1 b=-13 c=42





$(m-7)(m-6)$

* To check your answer, remultiply it out using the box method! *

3.) $a^2 + 6a - 27$

$a=1$ $b=6$ $c=-27$

ac: -27; -1×27; $-3 + 9 = 6 = b$

	a	-3
a	a^2	$-3a$
$+9$	$9a$	-27

$(a-3)(a+9)$

4.) $d^2 - 3d - 40$

$a=1$ $b=-3$ $c=-40$

ac: -40; $+1 \times -40$; 2×-20; 4×-10; 5×-8; $-3 + -8 = -3 = b$

	d	$+5$
d	d^2	$5d$
-8	$-8d$	-40

$(d+5)(d-8)$

5.) $2x^2 + 11x + 12$

$a=2$ $b=11$ $c=12$

ac: 24; 1×24; 2×12; $3 + 8 = 11 = b$

	$2x$	$+3$
x	$2x^2$	$3x$
$+4$	$8x$	12

$(2x+3)(x+4)$

6.) $5w^2 - 14w - 3$

$a=5$ ac $b=-14$ $c=-3$

ac: -15; 1×-15; 3×-5; $1 + -15 = -14 = b$

	$5w$	$+1$
w	$5w^2$	$1w$
-3	$-15w$	-3

$(5w+1)(w-3)$

7.) $3h^2 - 17h + 20$

$a=3$ $b=-17$ $c=20$

ac: 60; -1×-60; -2×-30; -3×-20; -4×-15; -5×-12; $-5 + -12 = -17 = b$

	$3h$	-5
h	$3h^2$	$-5h$
-4	$-12h$	20

$(3h-5)(h-4)$

8.) $x^2 + 14x + 49$ ← Perfect Square Trinomial

$a=1$ $b=14$ $c=49$

ac: 49; 1×49; 7×7; $7 + 7 = 14 = b$

	x	$+7$
x	x^2	$7x$
$+7$	$7x$	49

$(x+7)(x+7)$ or $(x+7)^2$

9.) $x^2 - 16$ ← Difference of □s →

$a=1$ $b=0$ $c=-16$

ac: -16; -1×16; -2×8; -4×4; $-4 + 4 = 0 = b$

	x	-4
x	x^2	$-4x$
$+4$	$4x$	-16

$(x-4)(x+4)$

10.) $4m^2 - 25$

$a=4$ $b=0$ $c=-25$

ac: -100; $-1 \times +100$; $-2 \times +50$; $-4 \times +25$; $-5 \times +20$; -10×10; $-10 + 10 = 0 = b$

	$2m$	$+5$
$2m$	$4m^2$	$10m$
-5	$-10m$	-25

$(2m+5)(2m-5)$

11.) $8a^2 - 14a + 6$ GCF=2

$2(4a^2 - 7a + 3)$

$a=4$ $b=-7$ $c=3$

ac: 12; -1×-12; -2×-6; -3×-4; $-3 + -4 = -7 = b$

	$4a$	-3
a	$4a^2$	$-3a$
-1	$-4a$	3

$2(4a-3)(a-1)$

12.) $36x^3 + 3x^2 - 18x$

$3x(12x^2 + x - 6)$ GCF = 3x

$a=12$ $b=1$ $c=-6$

ac: -72; -1×72; -2×36; -3×24; -4×18; -6×12; -8×9; $-8 + 9 = 1 = b$

	$3x$	-2
$4x$	$12x^2$	$-8x$
$+3$	$9x$	-6

$3x(3x-2)(4x+3)$