Unit 4, lesson 2: Factoring and Solving a Quadratic Trinomial when a = 1 Notes

Part 1

	x	+15
x	x^2	$15x$
+2	$2x$	30

x +15

30, 1
15, 2
10, 3
6, 5

what factors make 30?

$A = l \cdot w$

1. The area of the rectangle is $x^2 + 17x + 30$. What are the dimensions of the rectangle?

-what two polynomials multiply to make

$(?) \cdot (?) = x^2 + 17x + 30$

Express the area of this figure as a product and as a sum.

These two expressions are EQUIVALENT;

determining the product the polynomial came from is called FACTORING.

PRODUCT

(otherwise known as FACTORED FORM)

$(x+15)(x+2)$ =

SUM

$1x^2 + 17x + 30$

a b c

2. The area of this rectangle is $x^2 + 5x + 4$. What are the dimensions of the rectangle?

$A = l \cdot w$

$x^2 + 5x + 4 = (x+4)(x+1)$

	x	4
x	x^2	$4x$
+1	$+1x$	4

Part 2

Generalizations when factoring $ax^2 + bx + c$ ...(when a = 1)

1. "a" results from...

MULTIPLIES TO BE c

(x ___)(x ___)

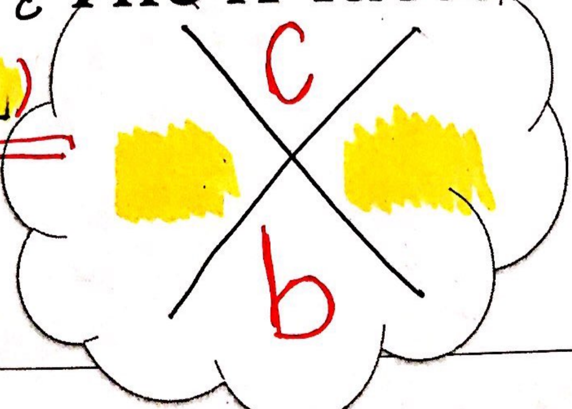
add to be b

2. "b" results from...

3. "c" results from... MULTIPLICATION

+C: mystery numbers have to have the same sign +/+ or −/−

The X-factor



−C: mystery numbers have DIFFERENT signs

Ex3: Fill out factoring Packet first then factor the following polynomials.

a. $y^2 + 3y - 4$	b. $p^2 - 2p - 24$	c. $m^2 + 8mn + 16n^2$	d. $x^3 + 20x^2 + 36x$
a b c	c		$\frac{x^3}{x} + \frac{20x^2}{x} + \frac{36x}{x}$
-4; +4, -1; 3	-24; -6, +4; -2; b	16; +4, +4; 8	$x(x^2 + 20x + 36)$; 36; +18, +2; 20
$\boxed{(y+4)(y-1)}$	$\boxed{(p+4)(p-6)}$	$\boxed{(m+4n)(m+4n)}$	$\boxed{x(x+18)(x+2)}$
Check			Check
$y \quad +4$	$p \quad +4$	$m \quad +4n$	$x \quad +18$
y: y^2, $+4y$	p: p^2, $+4p$	m: m^2, $4mn$	x: x^2, $+18x$
-1: $-1y$, -4	-6: $-6p$, -24	$+4n$: $4mn$, $16n^2$	$+2$: $+2x$, $+36$
$y^2+4y-1y-4$ ✓	$p^2+4p-6p-24$ $p^2-2p-24$	$m^2+8mn+16n^2$ ✓	$x(x^2+20x+36)$ ✓ x^3+20x^2+36x

Part 3

a. One way the area of a rectangle is represented is by $x^2 + 4x + 3$. What are the dimensions of the rectangle?

FACTOR!

l, w: $A = l \cdot w$, $A = x^2+4x+3$

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

3; +3, +1; 4

b. Suppose the area of the same rectangle is 15 square units. Write an equation that can be used to solve for x.

$(x+1)\cdot(x+3) = 15$

What is x?

$3 \cdot 5$?
$5 \cdot 3$?
$1 \cdot 15$?
$15 \cdot 1$?

or none of these?

Quadratic equations can be set equal to <u>any</u> number to solve. However, by setting it equal to <u>ZERO</u> limits the number of possible solutions.

This is called the $\boxed{\text{ZERO PRODUCT PROPERTY}}$ ← says if zero multiplies by any value, the product is zero

A.K.A: IF I KNOW THE PRODUCT OF 2 NUMBERS IS ZERO, THEN AT LEAST ONE OF THOSE NUMBERS IS ZERO.

Using the Zero Product Property to solve quadratic equations

$(x+1)(x+3) = 15$

$x^2 + 4x + 3 = 15$

$-15 \quad -15$

$x^2 + 4x - 12 = 0$

$(x+6)(x-2) = 0$

$x+6=0$ $x-2=0$

$-6 \quad -6$ $+2 \quad +2$

$\boxed{x=-6}$ $\boxed{x=2}$

Check
$(x+6)(x-2)=0$
if $x=-6$
$(-6+6)(-6-2)$
$(0)(-8)=0$ ✓

a. *Expand the product if necessary; multiply out of factored form.* Box!

b. *Use the zero product property to solve*
   a. *Set equation equal to zero.*

c. *Factor polynomial into two binomials.*

d. *Since either binomial could be zero, set each binomial equal to zero and solve each.*

e. *Check your answers: if you put the solutions into the original equation, it should make a true statement.*

check:
$(x+6)(x-2)=$
$(2+6)(2-2)$
$(8)(0)=$ ✓

Fill out the factoring Packet and then do Examples below: Solve by factoring.

a. $x^2 - 11x + 19 = -5$

$+5 \quad +5$ Set = 0

$x^2 - 11x + 24 = 0$ GCF? factor

$(x-8)(x-3) = 0$

$x-8=0$ $x-3=0$ Set = 0

$+8 \quad +8$ $+3 \quad +3$ solve

$\boxed{x=8}$ $\boxed{x=3}$

Check

$(8-8)(8-3)=0$ $(3-8)(3-3)=0$

$(0)(5)=0$ ✓ $(-5)(0)=0$ ✓

b. $7x^2 + x = 0$

GCF!

$x(7x+1) = 0$

FACTORED! (no x^2 LEFT)

$\boxed{x=0}$

$7x+1=0$

$-1 \quad -1$

$\frac{7x}{7} = \frac{-1}{7}$

$\boxed{x=-1/7}$

Check!

$7(0)^2+0=0$

$0=0$

c. $7y^2 - 14y = -7$

$+7 \quad +7$ Set = 0

$\frac{7y^2}{7} - \frac{14}{7}y + \frac{7}{7} = 0$ GCF?

$7(y^2 - 2y + 1) = 0$ Factor

$7(y-1)(y-1) = 0$

Set = 0

$y-1=0$ $y-1=0$

$+1 \quad +1$ $+1 \quad +1$

$\boxed{y=1}$ $\boxed{y=1}$

Exit Ticket: $x^2 - 13x - 14$

$x^2 - 13x - 14 = 0$

In what ways are these similar? How are they different?