

# \* Factoring Tricky Trinomials II \*

3.6  $\hookrightarrow ax^2 + bx + c, a \neq 1.$

Warmup \* 1. Factor

a)  $x^2 - 9x + 14$ , Sum + Product Trinomial

Sol'n  $\left. \begin{matrix} P = +14 \\ \text{Sum} = -9 \end{matrix} \right\} -2, -7$  "Two negative integers"

So factors are  $(x-2)(x-7)$  ✓  
 Check using FOIL:  $x^2 - 7x - 2x + 14 = x^2 - 9x + 14$  ✓

b)  $6x^2 + 3xy$

Sol'n  $\because$  Two terms,  $\therefore$  Common Factor

Recall \* The Greatest Common Factor is the largest number and most amount of letters you can take out of each given term and put to the front. Here, the GCF is  $3x$ .

So  $6x^2 + 3xy = 3x(2x+y)$  ✓

c)  $5a(x+1) + 2(x+1)$

Sol'n "(x+1)" group to front  
 $= (x+1)(5a+2)$  ✓

d)  $5x^2 + x - 6$ , Tricky Trinomial

Sol'n  $= (5x+6)(x-1)$  ✓  
 FOIL check:  $5x^2 - 5x + 6x - 6 = 5x^2 + x - 6$  ✓

a	c	6
5	3	6
1	-2	-1
		-5
		1x

Remark: Today we dig in and build our speed and accuracy with "tricky tri's."

Ex: Factor a)  $2y^2 + y - 15$

Sol'n  $\because$  Positive sum; Negative product  
 $\therefore$  Guess two divisors of 15,

Guess + Check

one positive, one negative. Further, since "b" = +1, a positive sum, my first guess will have the bigger divisor of 15 as my positive integer, and the smaller divisor of 15 will be a negative integer.

aka Guessing  $I^+, I^-$   
 $\uparrow$  Bigger  $\uparrow$  Smaller

Guess:  $(2y+5)(y-3)$   
 FOIL Check:  $= 2y^2 - 6y + 5y - 15 = 2y^2 - y - 15$

-1y So close! Right number but wrong sign

$\rightarrow$  Guess<sub>2</sub> \* Change signs of my guess...

$= (2y-5)(y+3)$   
 Check:  $= 2y^2 + 6y - 5y - 15 = 2y^2 + y - 15$  ✓ Yay!!

b)  $6f^2 + 13f - 5$  Guessing  $I^+, I^-$   
 + sum - product  $\uparrow$   $\uparrow$

Sol'n Guess:  $(3f-1)(2f+5)$  Bigger Smaller factors of 5.  
 FOIL check:  $= 6f^2 + 15f - 2f - 5 = 6f^2 + 13f - 5$  ✓

c)  $3x^2 + 20x + 12$  Guessing  $I^+, I^+$

Sol'n Guess:  $(3x+4)(x+3)$   
 Check:  $= 3x^2 + 9x + 4x + 12 = 3x^2 + 13x + 12$  ✓

Guess<sub>2</sub>:  $(3x+2)(x+6)$  ✓  
 Check: = Your Turn... FOIL works!

Remark<sub>2</sub>: Guess and check process aka guess reverse FOIL and check forward FOIL is not accessible for all students. The following examples show all 3 solution paths.

Ex<sub>2</sub> Factor  $6m^2 - 15m - 36$ .

Sol'n<sub>1</sub>

	a															c
3	6	<del>9</del>	<del>-9</del>	12	-12	6	-6	18	-18	4	-4	3	-3	2	-2	
2	1	<del>-4</del>	<del>4</del>	-3	3	-6	6	-2	2	-9	9	-12	12	-18	18	
		<u>-24</u>	<u>24</u>													
		-15	15x													

a-c chart process

✓ =  $(6m+9)(m-4)$

Sol'n<sub>2</sub> Find two numbers that product to  $(a)c = (6)(-36) = -216$  } -24 and 9  
 sum to  $b = -15$

decomposition process

So,  $6m^2 - 15m - 36$   
 $= 6m^2 - 24m + 9m - 36$   
 $= 6m(m-4) + 9(m-4)$ , common factor 2x  
 ✓ =  $(m-4)(6m+9)$ , group to front

reverse FOIL guess and check

Sol'n<sub>3</sub>  $6m^2 - 15m - 36$   
 $= (3m+4)(2m-9) \times$  guess  $I^+, I^-$  factors aka divisors of -36.  
 ↑ Bigger

ck:  $(3m+4)(2m-9) \times$   
 $\begin{array}{r} 8m \\ -27m \\ \hline -19m \end{array} \times$  ← Guesseed -9 and +4

ck:  $(6m-9)(m+4) \times$  ← Guesseed -9 and +4  
 $\begin{array}{r} -9m \\ +24m \\ \hline 15m \end{array} \times$  close! Correct number, wrong sign

✓ =  $(6m+9)(m-4)$  ← Guesseed +9 and -4, just changed signs  
 ck:  $\begin{array}{r} 9m \\ -24m \\ \hline -15m \end{array} \checkmark$

↪

Ex<sub>3</sub> Factor  $3x^2 + 8xy - 3y^2$

Sol'n<sub>1</sub> Guess two numbers with negative product, positive sum.  $I^+, I^-$

$= (3x - 1y)(x + 3y)$  ← Guessed with -1 and +3,  $I^+, I^-$  Bigger

ck<sub>2</sub>  $\frac{9xy}{8xy} \checkmark$  OI of FOIL checks out  $\ddot{\smile}$

Sol'n<sub>2</sub>

a	c		
(3	3	-3	1
(1	-1	1	-3
			9
			8

So  $= (3x - 1y)(x + 3y)$   
ck<sub>2</sub>  $\frac{9xy}{8xy} \checkmark$

Sol'n<sub>3</sub> Find 2 numbers  $P = (a)(c) = (3)(-3) = -9$  } +9, -1  
 $S = "b" = 8$

So,  $3x^2 + 8xy - 3y^2 = 3x^2 + 9xy - 1xy - 3y^2$   
 $= 3x(x + 3y) - 1y(x + 3y)$   
 $= (x + 3y)(3x - 1y)$ , group to front

Ex<sub>4</sub> Factor  $8m^2 + 34m - 15$

Note,  $\times$  Always common factor first!  $= 2(4m^2 + 17m - 15)$

Sol'n<sub>1</sub> Find 2 numbers Product = (a)(c) = (4)(-15) = -60 } +20, -3  
Sum = b = 17

So,  $2(4m^2 + 17m - 15)$   
 $= 2(4m^2 + 20m - 3m - 15)$   
 $= 2[4m(m + 5) - 3(m + 5)]$   
 $= 2[(m + 5)(4m - 3)]$

Sol'n<sub>2</sub>  $2(4m^2 + 17m - 15)$  Guess  $I^+, I^-$   
 $= 2(4m - 3)(m + 5)$   $I^+, I^-$  Bigger

ck<sub>2</sub>  $\frac{20m}{17m} \checkmark$

Guess + Check

Sol'n<sub>3</sub>  $2(4m^2 + 17m - 15)$   
a b c

a	c		
2 (4	5	-5	3
2 (1	-3	+3	-5
			-20
			-17
			20
			17

close! got it  $\ddot{\smile}$

So  $2(4m^2 + 17m - 15)$   
 $= 2(4m - 3)(m + 5)$   
 $\frac{20m}{17m} \checkmark$

P163 #4 middle column, 5, 8ab, 9aba