

3.5* Factoring Trinomials*

$$ax^2 + bx + c \text{ when } a=1, \text{ aka}$$

* Sum and Product Trinomials*

Warmup: Factor by factoring to the front the greatest common factor.

a) $5b - 10$
 $= 5(b - 2)$

b) $-8a + 12$
 $= -4(2a - 3)$

c) $14xc^4 - 21x^3$
 $= 7x^3(2xc - 3)$

d) $(6a^5b^4 - 12a^3b^2)$
 $= 6a^3b^2(a^2b^2 - 2)$

Remark 1: Factoring trinomials is the opposite skill of multiplying two binomials together.

Remark 2: Steps for factoring trinomials of the form $x^2 + bx + c$.

1) Write two brackets with x at the front of each.

2) Fill in two numbers that \checkmark Multiply to c
 \checkmark Add to b .

3) Check by expanding.

Ex 1 Factor $x^2 + 9x + 20$

Soln 1st: What multiplies to 20?

1, 20; 2, 10; 4, 5; -1, -20; -2, -10; -4, -5

2nd: Do your numbers that multiply to 20, add to 9? 4, 5 \checkmark

$$\therefore x^2 + 9x + 20 = (x + 4)(x + 5)$$

Check using FOIL: $x^2 + 5x + 4x + 20 = x^2 + 9x + 20 \checkmark$

Ex 3 Factor a) $x^2 + 6x + 8$ $P = 8$
 $S = 6$ } 4, 2
Soln $= (x + 4)(x + 2)$

b) $n^2 + 14n + 33$ $P = 33$
 $S = 14$ } 11, 3
Soln $= (n + 11)(n + 3)$

c) $x^2 - 5x - 36$ Need Integer and Integer
Soln $= (x - 9)(x + 4)$ $P = -36$
 $S = -5$
 \uparrow

Integer greater in size than Integer⁺

Ex 2 Factor $x^2 - 13x - 20$

Soln Find two numbers that

Product to -20 } Two numbers must be oppositely signed with negative number having greater size.
 Sum to -1

Answer: -5, +4

$$\text{So } x^2 - 13x - 20 = (x - 5)(x + 4) \checkmark \checkmark$$

d) $16 - 8y + y^2$

Soln Order terms in descending degree first $y^2 - 8y + 16$

Sum and Product Factor second: $(y - 4)(y - 4)$

$\checkmark \checkmark e$

Ex 3 Factor

a) $x^2 + 15xy + 36y^2$ \downarrow Sum \downarrow Product

Sol'n = $(x + 12y)(x + 3y)$

Check $\begin{matrix} \text{F} & \text{O} & \text{I} & \text{L} \\ x^2 & + 3xy & + 12xy & + 36y^2 \\ & \searrow & \swarrow & \\ & & 15xy & \end{matrix}$ ✓

b) $m^2 - 3mn - 18n^2$ S P $\frac{+}{-}$ ← Bigger

Sol'n = $(m - 6n)(m + 3n)$
 ✓ ✓

c) $4x^2 + 16x - 48$

Sol'n = $4(x^2 + 4x - 12)$, always common
 S P, factor first ☺

= $4(x + 6)(x - 2)$ $\left. \begin{matrix} P = -12 \\ S = 4 \end{matrix} \right\} +6, -2$
 ✓ ✓ ✓

d) $3m^2x - 15mx + 12x$

Sol'n = $3x(m^2 - 5m + 4)$, common factor first

= $3x(m - 4)(m - 1)$, sum and product factor second
 ✓ ✓ ✓

p156 # (3-6) every other letter
8
10a
11