

Complex Sum Product Factoring

Warm up
Expand
 $(2x + 3)(x + 4)$
 $= 2x^2 + 8x + 3x + 12$
 $= 2x^2 + 11x + 12$

Reminder - Factoring is expanding backwards!

Factor

$2x^2 + 11x + 12$

Sum	Product	Numbers
11	12	??

Do any numbers exist?
Also, when we would go to write out the brackets, there is a "2" in front of the x^2 that would need to be addressed.

Lets examine the pattern of where the numbers are...

$(2x + 3)(x + 4)$
 $= 2x^2 + 8x + 3x + 12$
 $= 2x^2 + 11x + 12$

Sum
(Hasn't Changed)

$(2x + 3)(x + 4)$
 $= 2x^2 + 8x + 3x + 12$
 $= 2x^2 + 11x + 12$

Product
Those numbers don't create a product of 12

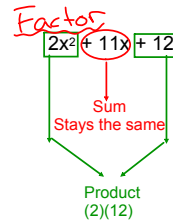
If you did multiply 8 and 3, what is the product?

Where else could you see a product of 24?

$(2x + 3)(x + 4)$
 $= 2x^2 + 8x + 3x + 12$
 $= 2x^2 + 11x + 12$

$(2)(12)=24$
 $(8)(3)=24$

Therefore when there is a number in front of the x^2 term, a different approach to the Sum/Product chart must be used.



Sum	Product	Numbers
11	$2x^2 = 2 \cdot 4$	3, 8

Steps

1. Re-write the middle "sum" term using the two numbers from the chart.

2. Factor by grouping

3. Factor by Binomial Common Factor.

$2x^2 + 11x + 12$
 $= 2x^2 + 8x + 3x + 12$
 $= 2x(x + 4) + 3(x + 4)$
 $= (x + 4)(2x + 3)$

This method is called Factoring by Decomposition

Example 1
 $6x^2 + 13x - 5$

Sum	Product	Numbers
13	-30	15, -2

$= 6x^2 + 15x - 2x - 5$
 $= 3x(2x + 5) - 1(2x + 5)$
 $= (2x + 5)(3x - 1)$

Example 2
 $3m^2 - 5m - 2$

Sum	Product	Numbers
-5	-6	-6, 1

$= 3m^2 - 6m + 1m - 2$
 $= 3m(m - 2) + 1(m - 2)$
 $= (m - 2)(3m + 1)$

$\left. \begin{aligned} 3m^2 + 1m - 6m - 2 \\ = m(3m + 1) - 2(3m + 1) \\ = (3m + 1)(m - 2) \end{aligned} \right\}$

Example 3
 $10x^2 - 22x + 4$

Sum	Product	Numbers
-11	10	-10, -1

$= 2(5x^2 - 11x + 2)$
 $= 2(5x^2 - 1x - 10x + 2)$
 $= 2(x(5x - 1) - 2(5x - 1))$
 $= 2(5x - 1)(x - 2)$

$(10x - 2)(x - 2)$
 $2(5x - 1)(x - 2)$

Example 4
 $4x^2 - 5xy - 6y^2$

Sum	Product	Numbers

Homework

Pg. 246 #2-6,8,9,12