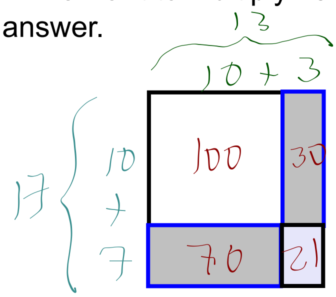
February 10, 2021

3.4a Trinomials as products of binomials

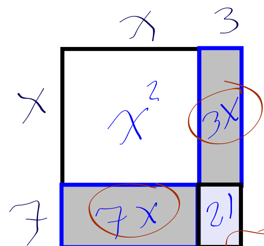
*If we want to multiply 13 x 17 we can use a grid or an area model to find the answer.

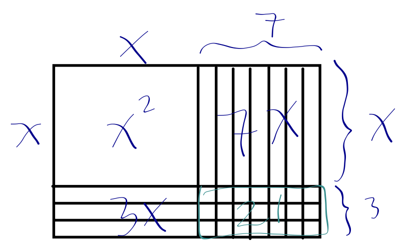


$13 \times 17 = 100 + 30 + 70 + 21$
$= 221$

*And if we want to multiply two binomials?

ex. (x + 3)(x + 7) or (x + 3)(x + 7)





$= x^2 + 10x + 21$ ← same

*Expand

a) (x + 2)(x + 6)

$= x^2 + 6x + 2x + 12$
$= x^2 + 8x + 12$

b) (x - 2)(x + 6)

$= x^2 + 6x - 2x - 12$
$= x^2 + 4x - 12$

c) (x + 2)(x - 6)

$= x^2 - 6x + 2x - 12$
$= x^2 - 4x - 12$

c) (x - 2)(x - 6)

$= x^2 - 6x - 2x + 12$
$= x^2 - 8x + 12$

What do we notice?

* all start with x^2 (simple trinomial)
* The constant trinomial term is the product of the constants of the binomial factors
* the coefficient of the middle term of the trinomial is the sum of the constant terms of the binomial factors

With this pattern, transform these trinomials into the product of 2 binomials.

ex. a) $x^2 + 7x + 12$ $= (x+3)(x+4)$

b) $x^2 + 7x + 13$ → not factorable
$\underline{\emptyset} \cdot \underline{\emptyset} = 13$
$\underline{\emptyset} + \underline{\emptyset} = 7$

c) $x^2 + 5x + 6$ $= (x+2)(x+3)$
$\underline{2} \cdot \underline{3} = 6$
$\underline{2} + \underline{3} = 5$

d) $x^2 + x - 12$ $= (x-3)(x+4)$

e) $x^2 - x - 12$ $= (x+3)(x-4)$

f) $x^2 - x + 12$
$\underline{-3} \cdot \underline{-4} = 12$
$\underline{-3} + \underline{-4} \neq -1$
} not factorable

What could replace the ? so that the trinomial is factorable?

g) $x^2 + ?x + 15$
$\underline{-3} \cdot \underline{-5} = 15$
$\underline{-3} + \underline{-5} = -8$
$? = \pm 8, \pm 16$

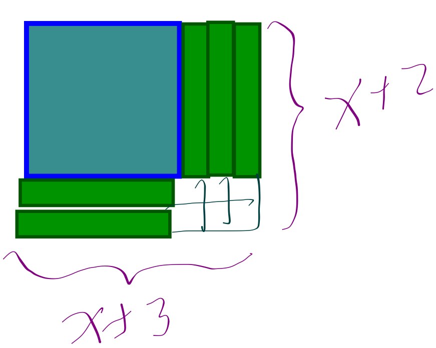
h) $x^2 + ?x + 12$
$? = \pm 8, \pm 7, \pm 13$

i) $x^2 + 5x + ?$
$\underline{-6} \cdot \underline{11} = -66$
$\underline{-6} + \underline{11} = 5$
$? = 6, 4, -66, \ldots$

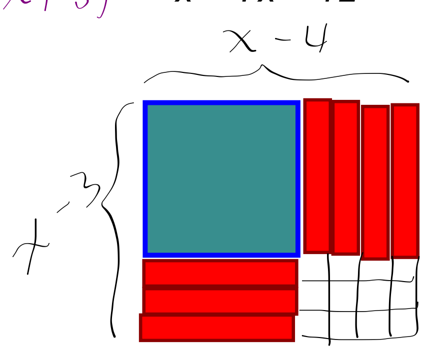
j) $x^2 - 3x + ?$
$\underline{-4} \cdot \underline{1} = -4$
$\underline{-4} + \underline{1} = -3$
$\underline{-1} \cdot \underline{-2} = 2$
$\underline{-1} + \underline{-2} = -3$
$? = -4, 2$

Algebra tiles can also be useful!! If we arrange the tiles of a trinomial into a perfect rectangle, the side lengths represent each factor.

$x^2 + 5x + 6 = (x+2)(x+3)$



$x^2 - 7x + 12 = (x-4)(x-3)$



Homefun: Pg. 158 #1-4