Expanding and Factoring are opposite operations.

Examples

Expand (x + 5)(x + 2)

$= x^2 + 2x + 5x + 10$

$= x^2 + 7x + 10$

Factor $x^2 + 7x + 10$

?

Notice! 5 x 2 = 10
5 + 2 = 7

Expand (x + 4)(x + 1)

Notice! 4 x 1 = 4
4 + 1 = 5

Expand (x + 3)(x + 4)

Notice! 3 x 4 = 12
3 + 4 = 7

When Factoring Trinomials, we need to find...

$x^2 + bx + c$

Two numbers that add together to equal b.

Two numbers that multiply together to equal c.

____ x ____ = c

____ + ____ = b

So that we get: (x + ____)(x + ____)

Example 1: Factor each trinomial.

a) $x^2 + 7x + 12$

12
1x12
2x6
3x4

3 x 4 = 12

3 + 4 = 7

$= (x+3)(x+4)$

b) $x^2 + 6x + 8$

8
1x8
2x4

2 x 4 = 8

2 + 4 = 6

$= (x+2)(x+4)$

c) $x^2 + 3x - 4$

-4
-1x4
-2x2
1x-4

-1 x 4 = -4

-1 + 4 = 3

$= (x-1)(x+4)$

d) $x^2 - 3x - 18$

-6 x 3 = -18

-6 + 3 = -3

$= (x-6)(x+3)$

-18
-9x2
-3x6
-1x18
1x-18
-6x3
-2x9

Example 2: Find an expression for the rectangle's area by factoring.

$A = L \times W$

$A = x^2 + 3x - 28$

-28
$2x - 14$
-4×7
-2×14
-7×4
-28×1
-1×28

$-4 \times 7 = -28$
$-4 + 7 = 3$

$A = (x-4)(x+7)$

$L = x - 4$
$W = x + 7$

Example 3: Factor the following. (**Hint**: You will need to common factor first and then trinomial factor second.)

a) $5x^2 + 35x + 30$

$= 5\left(\frac{5x^2+35x+30}{5}\right)$

$= 5(x^2+7x+6)$

6
6×1
3×2

$6 \times 1 = 6$
$6 + 1 = 7$

$= 5(x+6)(x+1)$

b) $-2x^2 + 4x - 2$

$= -2\left(\frac{-2x^2+4x-2}{-2}\right)$

$= -2(x^2-2x+1)$

1
1×1
-1×-1

$-1 \times -1 = 1$
$-1 + -1 = -2$

$= -2(x-1)(x-1)$