

## 5.5 Factoring Trinomials

①

→ Remember that a trinomial is just a polynomial with three terms.

Consider  $(x-2)(x+4) = x^2 + 4x - 2x - 8$

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

→ if we were going backwards, we would need two numbers that add to 2 and multiply to -8.

EX Factor  $x^2 - 5x + 6$

→ we need two numbers that add to -5 and multiply to 6

↳ -2, -3

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

check:  $x^2 - 3x - 2x + 6$

$x^2 - 5x + 6$  ✓

→ This method is <sup>sometimes</sup> called guess and check because we're basically guessing numbers and checking to see if they work.

EX Factor  $x^2 - x - 20$

Add to -1, multiply to -20 : -5, 4

$$x^2 - x - 20 = (x-5)(x+4)$$

→ Sometimes it's useful to make a list of the possibilities

EX factor  $x^2 - 3x - 18$

factors of -18

- 1, -18
- 1, 18
- 2, -9
- 2, 9
- 3, -6
- , 6

$$x^2 - 3x - 18 = (x+3)(x-6)$$

→ what if the leading coefficient isn't 1?  
↳ we still guess and check, but it's harder.

EX Factor  $6x^2 + x - 12$

The first terms must multiply to  $6x^2$   
The last terms must multiply to  $-12$

factors of 6

- 1, 6
- 2, 3
- 6, 1
- 3, 2

factors of -12

- 1, -12
- 1, 12
- 2, -6
- 2, 6
- 3, -4
- 3, 4

Possible factors

- $(x+1)(6x-12)$
- $(x-1)(6x+12)$
- $(x+2)(6x-6)$
- $(x-2)(6x+6)$
- $(x+3)(6x-4)$
- $(x-3)(6x+4)$

---

- $(2x+1)(3x-12)$
- $(2x-1)(3x+12)$
- $(2x+2)(3x-6)$
- $(2x-2)(3x+6)$
- $(2x+3)(3x-4)$
- $(2x-3)(3x+4)$

Outer + Inner

- ~~$-12x + 6x$~~
- $-12x + 6x$
- $12x - 6x$
- $-6x + 12x$
- $6x - 12x$
- $-4x + 18x$
- $4x - 18x$

---

- $-24x + 3x$
- $24x - 3x$
- $-12x + 6x$
- $12x - 6x$
- $-8x + 9x$  ✓
- $8x - 9x$

So  $6x^2 + x - 12 = (2x+3)(3x-4)$

↳ we would have to continue if we hadn't found it yet.

→ Not all problems are as aweful as that last one.

(3)

EX factor  $6y^2 - 20y + 16$

→ start by factoring out a 2 from each term.

↳ always do this first if you can

$$2(3y^2 - 10y + 8)$$

negative and positive like this means we must have 2 negative factors of 8

factors of 3

1, 3

3, 1

factors of 8

-1, 8

-2, 4

possibilities

~~(y-1)(3y-8)~~

(y-2)(3y-4)

outer + inner

-8x - 3x

-4x - 6x ✓

$$\text{So } 6y^2 - 20y + 16 = 2(y-2)(3y-4)$$

EX factor  $15x^2 + 4x - 3$

factors of 15

1, 15

3, 5

5, 3

15, 1

factors of -3

-1, 3

1, -3

possibilities

(x-1)(15x+3)

(x+1)(15x-3)

(3x-1)(5x+3)

outer + inner

+3x - 15x

-3x + 15x

9x - 5x ✓

$$\text{So } 15x^2 + 4x - 3 = (3x-1)(5x+3)$$

Supplementary Problems pp. 346-349

1, 3, 5, 7, 21, 23, 37, 39, 41, 67, 69, 79, 81, 99, 101, 103, 109