

Recall

Multiply.

$$(2x+3)(x+2) = 2x^2 + 4x + 3x + 6 = 2x^2 + 7x + 6$$

Factor.

$$2x^2 + 7x + 6 = 2x^2 + 4x + 3x + 6 = (2x+3)(x+2)$$
$$= 2x(x+2) + 3(x+2) =$$

* Key: how do we rewrite middle term?

AC Method

Consider quadratic expression $ax^2 + bx + c$
where $a, b, c \in \mathbb{R}$
 $a \neq 0$

1.
$$\begin{array}{l} \underline{\quad} \cdot \underline{\quad} = ac \\ \underline{\quad} + \underline{\quad} = b \end{array}$$

$$ac = 2 = \underline{4} \cdot \underline{3}$$
$$b = 7 = \underline{4} + \underline{3}$$

$$2x^2 + 7x + 6$$

$$a = 2$$

$$b = 7$$

$$c = 6$$

2. Rewrite b as the sum found in part 1.

$$2x^2 + (4+3)x + 6$$

$$2x^2 + 4x + 3x + 6$$

*Note: If no pair of integers are found, then we have a prime polynomial.

$$(2x^2 + 4x) + (3x + 6)$$

3. Factor by grouping

$$2x(x+2) + 3(x+2)$$

$$(2x+3)(x+2)$$

Practice

$$12x^2 - 5x - 2 = (4x+1)(3x-2)$$

$$= (3x-2)(4x+1)$$

$$10x^2 + x - 3 = (5x+3)(2x-1)$$

$$-19y + 6 + 8y^2 = 8y^2 - 19y + 6$$

$$ac = 8 \cdot 6 = 48 = \underline{-3} \cdot \underline{-6}$$

$$b = -19 = \underline{-3} + \underline{-6}$$

$$8y^2 - 3y - 16y + 6$$

$$(8y^2 - 3y) + (-16y + 6)$$

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

$$(y-2)(8y-3)$$

$$-26c^3 + 34c^2d - 6cd^2$$

$$\text{GCF: } -2c$$

$$-2c(10c^2 - 17cd + 3d^2)$$

"ac"

$$-2c(10c^2(-15d + (-2d)) + 3d^2)$$

Determine our "x" in
"ax²+bx+c"

$$-2c(10c^2 - 15dc - 2dc + 3d^2)$$

c in this case



$$\text{"ac"} = 10 \cdot 3d^2 = 30d^2 = \underline{-15d} \cdot \underline{-2d}$$

$$b = -17d = \underline{-15d} + \underline{-2d}$$

$$-2c(5c(2c-3d) + d(-2c+3d))$$

$$-2c(5c(2c-3d) - d(2c-3d))$$

$$-2c(2c-3d)(5c-d)$$

ac-method with leading coefficient 1.

$$"x^2 + bx + c"$$

$$x^2 - 10x + 16$$

$$x^2 + (-8 - 2)x + 16$$

$$x^2 - 8x - 2x + 16$$

$$(x^2 - 8x) + (-2x + 16)$$

$$x(x - 8) + (-2)(x - 8)$$

$$(x - 2)(x - 8)$$

$$ac = 1 \cdot 16 = 16 = \underline{-8} \cdot \underline{-2}$$

$$b = -10 = \underline{-8} + \underline{-2}$$

But you notice that -2 and -8 match...

Given $x^2 + bx + c$

$$\text{Let } b = m + n$$

$$= m - n$$

$$= -m + n$$

$$= -m - n$$

$$(x + m)(x + n)$$

$$(x + m)(x - n)$$

$$(x - m)(x + n)$$

$$(x - m)(x - n)$$

$$c^2 + 6c - 27$$

$$(c + 9)(c - 3)$$

$$"ac" = -27 = \underline{9} \cdot \underline{-3}$$

$$b = 6 = \underline{9} + \underline{-3}$$