

3.6 Factoring Trinomials of the form $ax^2 + bx + c$ complex $a \neq 1$

I. Factoring a common binomial

a) $xA + yA$ what if $A = (x+y)$
 $= A(x+y) = (x+y)(x+y)$

b) $2x(3x-1) - 3(3x-1)$
 $= (3x-1)(2x-3)$

c) $x(x-1) + y(x-1) - 3(x-1)$
 $= (x-1)(x+y-3)$

II. Factoring $ax^2 + bx + c$:

ex. $6x^2 + 7x + 2$

another method called decomposition

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

$$\frac{3 \cdot 4}{3 + 4} = 12$$

$$\frac{7x}{3 + 4} = 7x$$

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

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

$$3x(2x+1) + 2(2x+1)$$

$$(2x+1)(3x+2)$$

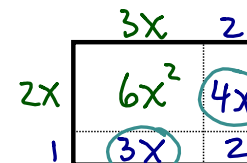
ex. $6x^2 - 13x + 5$

$$= (6x^2 - 3x) + (-10x + 5)$$

$$= 3x(2x-1) - 5(2x-1)$$

$$= (2x-1)(3x-5)$$

try to represent this with an area model



* find the product $a \times c = 12$ $6x^2 + 7x + 2$

* find 2 factors of ac that add up to b

* break up the middle term into these two factors

* group the 1st two terms and the 2nd two terms

* factor each group common

* use binomial factoring to write the trinomial as the product of two binomials

check with distribution

$$\frac{-3 \cdot -10}{-3 + -10} = 30$$

$$\frac{-3 \cdot -10}{-3 + -10} = -13$$

always factor the negative

III. There are many ways to factor a trinomial. Here's another trick; it's called the Criss-Cross method...

ex. $6x^2 - 13x + 5$

* break up the first term into two factors and write them below the first term

* break up the constant term into two factors and do the same

* cross multiply the factors to see if their sum is the b-value

* if so, you now have the correct binomials to factor the trinomial... if not, try switching the factors around until it works.

IV. And now for my favourite method: *simple inspection*

ex. $4x^2 - 4x - 15$

* set up two brackets that will contain your binomial products

* place two factors of the first term in the first position of both brackets

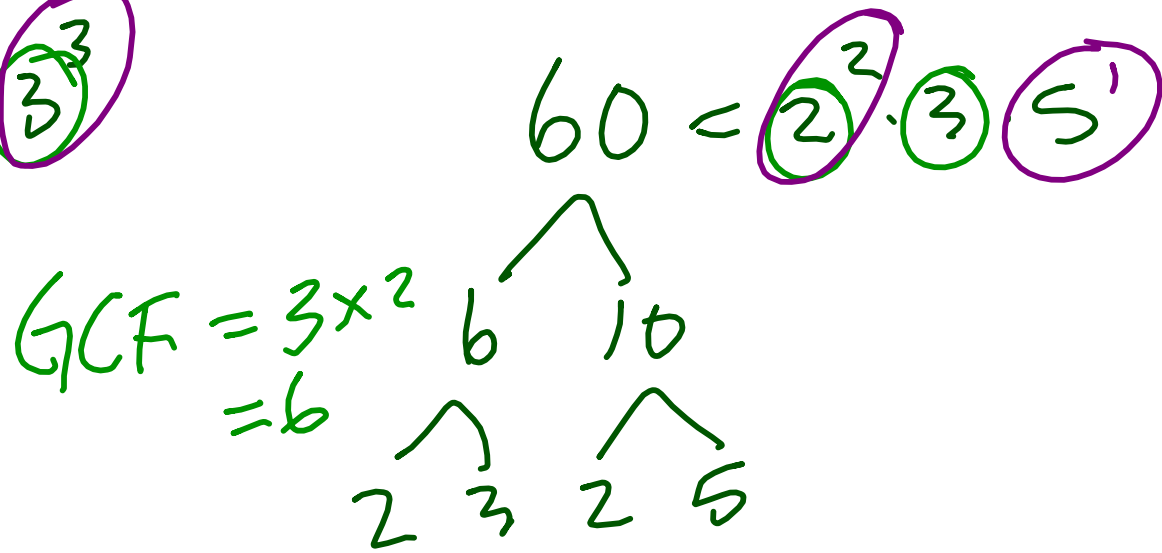
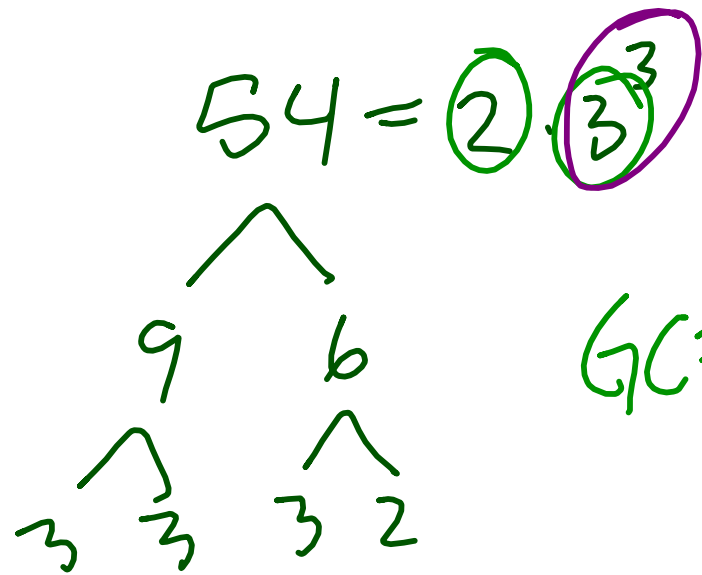
* place two factors of the last term in the second position of both brackets

* perform some quick distribution to see if FOIL yields the middle term; if not move some pieces around and try again

Ex. Try these with the technique of your choice $9b$

a) $2x^2 - 9x - 18$ $\underbrace{-12 \cdot 3 = -36}$ $\underbrace{-12 \div 3 = -4}$ b) $9x^2 - 21x + 10$ $\underbrace{-6 \cdot -15 = 90}$ $\underbrace{-6 \div -15 = -21}$

$$\begin{aligned}
 &= (2x^2 - 12x) + (3x - 18) & &= (9x^2 - 6x) + (-15x + 10) \\
 &= 2x(x - 6) + 3(x - 6) & &= 3x(3x - 2) - 5(3x - 2) \\
 &= (x - 6)(2x + 3) & &= (3x - 2)(3x - 5)
 \end{aligned}$$



$$\text{GCF} = 3 \times 2 = 6$$

$$\text{LCM} = 2^2 \cdot 3^3 \cdot 5 = 540$$