

# Factoring: Putting it all together (4.1-4.3)

When factoring a variety of algebraic expressions, follow this factoring checklist:

1. Is there a GCF? If yes, factor out GCF.
2. If there is a binomial, is it difference of squares? If yes, factor using difference of squares formula.
3. If there is a trinomial, can you factor by splitting the middle term? If yes, factor.
4. If there is a four term polynomial, can you factor by grouping? If yes, factor.
5. After all these steps, is there now a binomial that is difference of squares? If yes, factor using formula.
6. Check for difference of squares again in your binomials.
7. Are you asked to solve (is there an equal sign)? If yes, set each factor equal to zero and solve.

Factor each polynomial, if possible. If the polynomial cannot be factored using integers, write *prime*.

1.  $x^2 - 9$  Diff of 2 Squares

$$(x+3)(x-3)$$

2.  $(3x^2 + 2x)(6x + 4)$  By Grouping

$$x(3x+2) + 2(3x+2) \text{ GCF}$$

$$(3x+2)(x+2) \text{ GCF, again!}$$

3.  $6x^2 + 5x - 4$   $a \neq 1$

$$(6x^2 + 8x) + (-3x - 4)$$

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

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

Find 2 #s:

$$\bullet ac = 6(-4) = -24$$

$$+ b = 5$$

$$8(-3)$$

4.  $x^2 + x - 12$   $a = 1$

$$(x+4)(x-3)$$

2 #s:  
 $\bullet 12$   
 $+ 1$   
 $(4) \cdot (-3)$

5.  $6x^2 - 13x + 6$   $a \neq 1$

$$(6x^2 - 9x) + (-4x + 6)$$

$$3x(2x-3) + -2(2x-3) + -13$$

$$(2x-3)(3x-2)$$

Find 2 #s:

$$\bullet 6 \cdot 6 = 36$$

$$(-9)(-4)$$

6.  $3x^2 - 60x + 57$   $a \neq 1$

$$3(x^2 - 20x + 19)$$

$$3(x-19)(x-1)$$

Is there a GCF? YES!

2 #s:  
 $\bullet 19$   
 $+ -20$   
 $(-19)(-1)$

Solve each equation, using factoring. Check the solutions. **DO NOT GRAPH!!**

7.  $x^2 + 11x + 24 = 0$   $a=1$  2 #s:  
 $(x+8)(x+3) = 0$   $\cdot 24$   
 $\phantom{(x+8)(x+3) = 0}$   $+ 11$   
 Solve:  $8 \cdot 3$   
 Set each factor = to 0.  
 $x+8=0$   $x+3=0$   
 $x=-8$   $x=-3$

8.  $(4x^2 - 12x + 3x + 9) = 0$  Factor by grouping  
 $4x(x-3) + -3(x-3) = 0$   
 $(x-3)(4x-3) = 0$  GCF  
 $x-3=0$   $4x-3=0$   
 $x=3$   $4x=3$   
 $x=\frac{3}{4}$  Zero product property

9.  $5x^2 + 22x - 15 = 0$   $a \neq 1$  Rewrite = 0  
 $(5x^2 + 25x) + (-3x - 15) = 0$  Find 2 #s!  
 $5x(x+5) + -3(x+5) = 0$   $\cdot ac = 5(-15) = -75$   
 $(x+5)(5x-3) = 0$   $+ b = 22$   
 $(25)(-3)$   
 $x = -5$   $5x = 3$   
 $x = \frac{3}{5}$  ← GCF

10.  $12x^3 - 27x = 0$  Rewrite = 0.  
 $3x(4x^2 - 9) = 0$  GCF? Yes!  
 $3x(2x+3)(2x-3) = 0$  Diff of 2 squares? Yes!  
 $x=3$   $2x=-3$   $2x=3$   
 $x = -\frac{3}{2}$   $x = \frac{3}{2}$

11.  $3x^2 - 7x + 2 = 0$   $a \neq 0$  2 #s:  
 $(3x^2 - 6x) + (-1x + 2) = 0$   $\cdot ac = 3 \cdot 2 = 6$   
 $3x(x-2) + -1(x-2) = 0$   $+ b = -7$   
 $(x-2)(3x-1) = 0$   $(-6)(-1)$   
 $x=2$   $3x-1=0$   
 $3x=1$   
 $x = \frac{1}{3}$

12.  $4x^2 + 20x + 25 = 0$  Rewrite = 0  $a \neq 1$   
 $(4x^2 + 10x) + (10x + 25) = 0$  Find 2 #s:  
 $2x(2x+5) + 5(2x+5) = 0$   $\cdot ac = 4 \cdot 25 = 100$   
 $(2x+5)(2x+5) = 0$   $+ b = 20$   
 $(10)(10)$   
 $2x+5=0$   
 $2x=-5$   
 $x = -\frac{5}{2}$  OR  
 Realize it's a perfect square trinomial  
 $(2x)^2 + 20x + (5)^2 = 0$   
 $(2x+5)(2x+5) = 0$