

Name: Key

Date: \_\_\_\_\_

### Factoring Trinomials Completely Algebra 1

Factor Twice (or more)  
look for GCF first

In the previous lesson, we saw how to factor a trinomial of the form  $ax^2 + bx + c$  by employing the guess-and-check method. In each of those cases, the coefficient of the quadratic ( $x^2$ ) term was always one, and thus not written. It is also possible to factor trinomials of the form  $ax^2 + bx + c$  where the coefficient  $a$  is a number other than 1 by combining two factoring methods into the same problem.

**Exercise #1:** Consider the trinomial  $3x^2 + 15x + 18$ .

(a) What is the GCF of each term in the trinomial?

3

(b) Write the trinomial as a product involving its GCF.

$3(x^2 + 5x + 6)$  (with 'm A m s' written above the quadratic part)

(c) How does the trinomial inside of the parentheses now factor?

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

(d) Write  $3x^2 + 15x + 18$  in its completely factored form.

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

We can carry this two-step process out for all trinomials whose three monomial terms have a GCF other than one. In this course, after factoring a GCF out of the trinomial, the quadratic coefficient on the new trinomial will be one.

**Exercise #2:** Factor each of the following trinomials completely. Remember to mentally check your factors by multiplying.

(a)  $2y^2 - 12y + 16$

$2(y^2 - 6y + 8)$  GCMF

$2(y - 4)(y - 2)$  Tri

(b)  $x^3 - 4x^2 - 12x$

$x(x^2 - 4x - 12)$  GCMF

$x(x - 6)(x + 2)$  Tri

(c)  $5x^2 - 45x + 90$

$5(x^2 - 9x + 18)$  GCMF

$5(x - 6)(x - 3)$  Tri

(d)  $9x^2 + 18x + 9$

$9(x^2 + 2x + 1)$  GCMF

$9(x + 1)(x + 1)$  Tri

$9(x + 1)^2$  (with 'or' written above)

Factoring Completely

**Note:** Factoring completely generally implies that you must factor more than once. Always check for a Greatest Common Factor (G.C.F.) before using either of the other two methods.

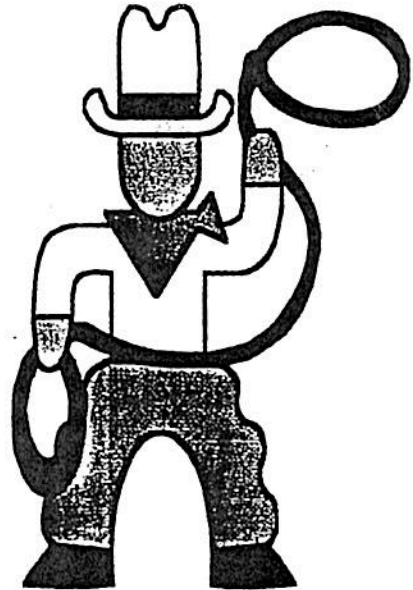
Factor the following completely:

1)  $2a^2 - 2b^2 = \frac{2(a^2 - b^2)}{2(a+b)(a-b)}$  GCMF  
 DOPS

- order
- ① GCMF
  - ② DOPS → Difference of perfect squares
  - ③ Tri/Triack

2)  $y^4 - 81 = \frac{(y^2 + 9)(y^2 - 9)}{(y^2 + 9)(y + 3)(y - 3)}$  DOPS  
 DOPS

3)  $x^3 + 7x^2 + 10x = \frac{x(x^2 + 7x + 10)}{x(x+5)(x+2)}$  GCMF  
 Tri



4)  $st^2 - s = \frac{s(t^2 - 1)}{s(t+1)(t-1)}$  GCMF  
 DOPS

$$5) by^2 - 4b =$$

$$b(y^2 - 4) \text{ GCMF}$$

$$b(y+2)(y-2) \text{ DOPS}$$

$$6) 3x^2 - 6x - 24 =$$

$$3(x^2 - 2x - 8) \text{ GCMF}$$

$$3(x-4)(x+2) \text{ Tri}$$

$$7) x^4 - 16$$

$$(x^2 + 4)(x^2 - 4) \text{ DOPS}$$

$$(x^2 + 4)(x-2)(x+2) \text{ DOPS}$$

$$8) 2x^2 - 50$$

$$2(x^2 - 25) \text{ GCMF}$$

$$2(x+5)(x-5) \text{ DOPS}$$

$$9) 6x^4 - 6x^2 - 36$$

$$6(x^4 - x^2 - 6) \text{ GCMF}$$

$$6(x^2 - 3)(x^2 + 2) \text{ Tri}$$

$$10) 3x^4 - 243$$

$$3(x^4 - 81) \text{ GCMF}$$

$$3(x^2 - 9)(x^2 + 9) \text{ DOPS}$$

$$3(x+3)(x-3)(x^2+9) \text{ DOPS}$$

$$11) 6x^3 - 11x^2 - 10x$$

$$x(6x^2 - 11x - 10) \text{ GCMF}$$

$$x\left(\frac{6x-15}{3} \cdot \frac{6x+4}{2}\right) \text{ Trick Tri}$$

$$x(2x-5)(3x+2)$$

$$12) 8a^3 - 14a^2b - 15ab^2 - 12b^3$$

$$a(8a^2 - 14ab - 15b^2) \text{ GCMF}$$

$$a\left(\frac{8a-20b}{4} \cdot \frac{8a+6b}{2}\right) \text{ Trick Tri}$$

$$a(2a-5b)(4a+3b)$$