Name: _____ Date: _____ Hour: ____Alg 1____

Unit 7C Day 32: Factoring when a ≠ 1 AND IS NOT THE GCF

Focus Question: How do I factor $ax^2 + bx + c$ when $a \neq 1$?

5
1.5

A. Expand each of the following

1. $(3x + 2)(x - 7)$

$3x(x-7)+2(x-7)$
$3x^2-21x+2x-14$
$3x^2-19x-14$

2. $(2x + 5)(3x + 1)$

$2x(3x+1)+5(3x+1)$
$6x^2+2x+15x+5$
$6x^2+17x+5$

3. $(4x - 3)(5x - 6)$

$4x(5x-6)-3(5x-6)$
$20x^2-24x-15x+18$
$20x^2-39x+18$

In the problems above, you should notice….

- The *a* is not the GCF
- There is still no combining needed to get the a or c term
- The combining to get the *b* term is no longer just the factors of c. It also now **ALSO INVOLVES** the factors of a.
- The original factored form does not look like a traditional intercept form $f(x) = a(x - p)(x - q)$. Instead, the x values will have coefficients of a number other than 1.

4 · -6
-24
1 · 24
2 · 12
3 · 8
4 · 6
-8 + 3

B. Steps to factor when a ≠1 and not the GCF: **EX.** $4x^2 - 5x - 6$

1) Because a is not a greatest common factor but is involved in the *b* term, we need to force it into the factorizing by multiplying it by c. $4x^2-8x+3x-6$

2) Factor the new $a \cdot c$ term and find the factors that help you make b. $4x(x-2)+3(x-2)$

3) Proceed as normal by either writing the new equation and either factor by grouping or write the four terms in the box and factor each pair. $4x(x-2)+3(x-2)$ $(x-2)(4x+3)$

C: Factor and solve each of the following

1) $2x^2 - 9x + 4 = 0$

2 · 4 = 8
1 · 8
2 · 4
-8 -1

$2x^2-8x-1x+4=0$
$2x(x)+2x(-4)-1(x)-1(-4)=0$
$2x(x-4)-1(x-4)=0$
$(x-4)(2x-1)=0$

$x-4=0$ $+4\ +4$ → $x=4$

$2x-1=0$ $+1\ +1$ → $\frac{2x}{2}=\frac{1}{2}$ → $x=1/2$

2) $9x^2 + 30x + 16 = 0$

9 · 16 = 144
12 · 12
9 · 16
6 · 24

$9x^2+6x+24x+16=0$
$3x(3x)+3x(2)+8(3x)+8(2)=0$
$3x(3x+2)+8(3x+2)=0$
$(3x+2)(3x+8)=$

$3x+2=0$ $-2\ -2$ → $\frac{3x}{3}=\frac{-2}{3}$ → $x=-2/3$

$3x+8=0$ $-8\ -8$ → $\frac{3x}{3}=\frac{-8}{3}$ → $x=-8/3$

3) $4x^2 + 12x + 9 = 0$

$2 \cdot 2x \cdot 3$

$12x$

$4 \cdot 9 = 36$

1·36, 2·18, 3·12, 4·9, 6·6

$(2x+3)^2 = 0$

$2x+3=0$

$-3 \quad -3$

$\frac{2x}{2} = \frac{-3}{2}$

$x = -3/2$

4) $12n^2 + 4n - 5 = 0$

$12 \cdot 5 = -60$

1·60, 2·30, 3·20, 4·15, 5·12, 6·10

$10 - 6$

$12n^2 + 10n - 6n - 5 = 0$

$2n(6n) + 2n(5) - 1(6n) - 1(5) = 0$

$2n(6n+5) - 1(6n+5) = 0$

$(6n+5)(2n-1) = 0$

$6n+5=0$ → $n = -5/6$

$2n-1=0$ → $n = 1/2$

5) $8f^2 - 6f - 27 = 0$

$8 \cdot 27 = -216$

1·216, 2·108, 3·72, 4·54, 6·36, 8·27, 9·24, 12·18

$-18 + 12$

$8f^2 - 18f + 12f - 27 = 0$

$2f(4f) + 2f(-9) + 3(4f) + 3(-9) = 0$

$2f(4f-9) + 3(4f-9) = 0$

$(4f-9)(2f+3) = 0$

$f = 9/4$ $\quad f = -3/2$

6) $3x^2 - 7x - 6 = 0$

$3 \cdot -6 = -18$

1·18, 2·9, 3·6

$-9 + 2$

$3x^2 - 9x + 2x - 6 = 0$

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

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

$(x-3)(3x+2) = 0$

$x = 3$ $\quad x = -2/3$

7) $\frac{10m^2}{2} + \frac{8m}{2} - \frac{24}{2} = \frac{0}{2}$

$5m^2 + 4m - 12 = 0$

$5 \cdot 12 = -60$

sec#4

$5m^2 + 10m - 6m - 12 = 0$

$5m(m) + 5m(2) - 6(m) - 6(2)$

$5m(m+2) - 6(m+2)$

$(m+2)(5m-6) = 0$

$m = -2$ $\quad m = 6/5$

8) $10x^2 - 17x + 3 = 0$

$10 \cdot 3 = 30$

1·30, 2·15, 3·10

$-15 - 2$

$10x^2 - 15x - 2x + 3 = 0$

$5x(2x) + 5x(-3) - 1(2x) - 1(-3) = 0$

$5x(2x-3) - 1(2x-3) = 0$

$(2x-3)(5x-1) = 0$

$x = 3/2$ $\quad x = 1/5$

9) $-2x^2 + 5x + 7 = 0$

$\frac{}{-1} \quad \frac{}{-1} \quad \frac{}{-1} \quad \frac{}{-1}$

$2x^2 - 5x - 7 = 0$

$2 \cdot -7 = -14$

1·14, 2·7

$-7 + 2$

$2x^2 - 7x + 2x - 7 = 0$

$x(2x) + x(-7) + 1(2x) + 1(-7)$

$x(2x-7) + 1(2x-7)$

$(2x-7)(x+1) = 0$

$x = 7/2$ $\quad x = -1$

10) $2x^4 - 5x^3 - 3x^2 = 0$

$2 \cdot -3 = -6$

1·6, 2·3

$-6 + 1$

$x^2(2x^2 - 5x - 3) = 0$

$2x^2 - 6x + 1x - 3 = 0$

$2x(x) + 2x(-3) + 1(x) + 1(-3) = 0$

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

$(x-3)(2x+1) = 0$

$x = 3$ $\quad x = -1/2$

$x^2 = 0$ $\quad x = 0$

Remember: Not all quadratics factor. Also, factoring is intended to be a shortcut to the quadratic formula, so if it's not going well, you can ALWAYS solve using the quadratic formula.