Factoring Trinomials: ax^2+bx+c **(5.5)** **Math 098**

Let's investigate patterns from factoring that we have learned to date:

a.) $x^2+10x+16$

$=(x+8)(x+2)$

b.) $x^2+6x-16$

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

c.) $x^2-10x+16$

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

d.) $x^2-6x-16$

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

In review: $a, b, c > 0$

$ax^2 \pm bx+c$ same sign

$\pm b$ $+$ $+$

$-$ $-$

$ax^2 \pm bx-c$ opposite signs

$+$ $-$

$-$ $+$ } careful.

and multiply $(2x+1)(x+6)$ $= 2x^2+12x+x+6$

$= 2x^2+13x+6$

and multiply $(2x+3)(3x-4)$ $= 6x^2-8x+9x-12$

$= 6x^2+x-12$

Go back to the previous two questions and consider how many possibilities must be considered if we guess and check.

1st – 4 combos
2nd – 24 "

For the following "method" to work, we MUST ALWAYS factor out the GCF first.

Example 1: Factor

a.) $4x^2+12x+5 = (2x+5)(2x+1)$

1	
4	

2	5	1
2	1	5

check: $4x^2+2x+10x+5$ ✓

Hint: When you can, start with the most "middle" values for *a*).

b.) $6x^2-5x+1 = (2x-1)(3x-1)$

1	
6	

2	1
3	1

c.) $2x^2-11x+12 = (2x-3)(x-4)$

2	$\cancel{4}$	3	$\cancel{2}$	$\cancel{6}$	$\cancel{12}$	1
1	$\cancel{3}$	4	$\cancel{6}$	$\cancel{2}$	$\cancel{1}$	12

d.) $35x^2+4x-4 = (5x+2)(7x-2)$

difference

5	4	1	+2
7	1	4	−2

35	4	1	2
1	1	4	2

e.) $14a^2-3ab-2b^2$

$= (7a+2b)(2a-b)$

consider difference

$14a^2-3a-2$

+4
7 | +2 1
2 | -1 2
-7

1 | 2 1
14 | 1 2

f.) $6xy^2+33xy-18x$ diff

$= 3x(2y^2+11y-6)$

$= 3x(2y-1)(y+6)$

2 | ~~2~~ 3 -1 ~~6~~
1 | ~~3~~ 2 +6 ~~1~~
3 4 +12

g.) $-5x^2-19x+4$

$= -(5x^2+19x-4)$

$= -(5x-1)(x+4)$

2 -1
5 | 2 -1 4 → $5x-1$
1 | 2 +4 1 → $x+4$
10 +20

h.) $30x^2-23x-45$

10 | ~~1~~ 45 ~~5~~ +9 ~~15~~ ~~3~~
3 | ~~45~~ 1 ~~9~~ -5 ~~3~~ ~~15~~
+27 -50

$= (10x+9)(3x-5)$

check:

$30x^2-50x+27x-45$

i.) $42a^2b+55ab-25b$

$= b(14a-5)(3a+5)$

$42a^2+55a-25$

6 | 1 25 5 35
7 | 25 1 5 30

14 | 1 25 -5 35 -15
3 | 25 1 +5 14 +70

$b(14a-5)(3a+5)$

j.) $12x^2+5x-6$

12 | 1 6 2 3
1 | 6 1 3 2
6 12

6 | ~~1~~ ~~6~~ 2 ~~3~~
2 | ~~6~~ ~~1~~ 3 ~~2~~

4 | ~~1~~ 6 ~~2~~ 3
3 | ~~6~~ 1 ~~3~~ 2

prime.

Important: If the leading coefficient is 1 (x^2+bx+c) then you do NOT need a table.

Example 2: Solve $30x^2-26x+4=0$ GCF = 2

$\Rightarrow 15x^2-13x+2=0$

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

$\Rightarrow 5x-1=0$ OR $3x-2=0$

$\Rightarrow 5x=1$ OR $3x=2$

$\Rightarrow x=\frac{1}{5}$ OR $x=\frac{2}{3}$

Example 3: Given $f(x)=24x^2-37x$, find a such that $f(a)=72$.

$f(a)=24a^2-37a$

solve $24a^2-37a=72$

$\Rightarrow 24a^2-37a-72=0$

$(3a-8)(8a+9)=0$

$a=\frac{8}{3}$ OR $a=-\frac{9}{8}$

Example 4: (You try) Factor $-30p^3q+88p^2q^2+6pq^3$

$=-2pq(15p^2-44pq-3q^2)$

$=-2pq(15p+q)(p-3q)$

Example 5: Find the x-intercepts of $f(x)=63x^3+111x^2+36x$

y = 0.

Solve $63x^3+111x^2+36x=0$

$\Rightarrow 3x(21x^2+37x+12)=0$

$\Rightarrow 3x(7x+3)(3x+4)=0$

$\Rightarrow 3x=0$ OR $7x+3=0$ OR $3x+4=0$

$\Rightarrow x=0$ OR $x=-\frac{3}{7}$ OR $x=-\frac{4}{3}$