4.5 Mulitplying & Factoring with GCF

How do you multiply 3 numbers together?

2(3)(4)
$=6(4)$
$=24$

(4)(-2)(5)
$=(-8)(5)$
$=-40$

What's allowed? What isn't?

A. Multiplying 3 Factors Together

1. $4(2x-3)(w-3y)$

$=(8x-12)(w-3y)$

$=8xw-24xy-12w+36y$

$=(8x-12)(w-3y)$
$=8xw-24xy-12w+36y$

	w	$-3y$
$8x$	$8xw$	$-24xy$
-12	$-12w$	$36y$

2. $-3x(a-b)(3c+2d)$

$=(-3ax+3bx)(3c+2d)$

$=-9acx+9bcx-6adx+6bdx$

	$-3ax$	$3bx$
$3c$	$-9acx$	$9bcx$
$2d$	$-6adx$	$6bdx$

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

$=(-2x-6)(x-5)$

$=-2x^2+10x-6x+30$

$=-2x^2+4x+30$

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

$=(5x-20)(x-6)$

$=5x^2-30x-20x+120$

$=5x^2-50x+120$

5. $-x^2(x+2)(x+1)$

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

$=-x^4-3x^3-2x^2$

OR

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

OR

	$-x^3$	$-2x^2$
x	$-x^4$	$-2x^3$
1	$-x^3$	$-2x^2$

6. $3(2x-1)(3x+4)$

$=3(6x^2+5x-4)$

$=18x^2+15x-12$

OR

$(6x-3)(3x+4)$

	$6x$	-3
$3x$	$18x^2$	$-9x$
4	$24x$	-12

$=18x^2+15x-12$

7. $-5(3x+1)(2x+5)$

$=(-15x-5)(2x+5)$

$=-30x^2-85x-25$

	$-15x$	-5
$2x$	$-30x^2$	$-10x$
5	$-75x$	-25

8. $4x(3x-4)(2x-3)$

$=4x(6x^2-17x+12)$

$=24x^3-68x^2+48$

	$3x$	-4
$2x$	$6x^2$	$-8x$
-3	$-9x$	12

B. Factoring with a GCF (Greatest Common Factor)

Look for GCF first!!!

1. $3ax - 3ay + 3bx - 3by$

$= 3(ax - ay + bx - by)$

$= 3(x-y)(a+b)$

	x	$-y$
a	ax	$-ay$
b	bx	$-by$

2. $-12x^2y - 8x^2 + 6xy + 4x$

$= -2x(6xy + 4x - 3y - 2)$

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

	$3y$	2
$2x$	$6xy$	$4x$
-1	$-3y$	-2

3. $5x^2 - 5x - 60$

$= 5(x^2 - x - 12)$

$= 5(x+3)(x-4)$

Look for GCF first!!!

4. $-2x^2y + 10xy - 12y$

$= -2y(x^2 - 5x + 6)$

$= -2y(x-3)(x-2)$

	x	-2
x	x^2	$-2x$
-3	$-3x$	6

M 6
A -5
N -2, -3

5. $24x^2 + 52x + 20$

$= 4(6x^2 + 13x + 5)$

$= 4(2x+1)(3x+5)$

	$3x$	5
$2x$	$6x^2$	$10x$
1	$3x$	5

M 30
A 13
N 10, 3

6. $6x^3 + 27x^2 - 15x$

$= 3x(2x^2 + 9x - 5)$

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

	x	5
$2x$	$2x^2$	$10x$
-1	$-x$	-5

M -10
A 9
N 10, -1

7. $6x^4 + 2x^3 - 4x^2$

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

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

	x	1
$3x$	$3x^2$	$3x$
-2	$-2x$	-2

M -6
A 1
N 3, -2

8. $3x^3y + 6x^2y + 24xy$

$= 3xy(x^2 + 2x + 8)$

$= 3xy(\ldots\ ???$

NOT FACTORABLE

Look for GCF first!!!
