9.5-9.8 Factoring Polynomials

Factoring is like a puzzle. You want to figure out what multiplies to c and adds to b. Only one pair of numbers will fit the puzzle for each quadratic trinomial.

Try factoring

$g^2 + 7g + 10$

$\cdot 10$	$+7$
$1 \cdot 10$	11
$2 \cdot 5$	7

$(g+2)(g+5)$

$v^2 + 21v + 20$

$\cdot 20$	$+21$
$1 \cdot 20$	21
$2 \cdot 10$	12
$4 \cdot 5$	9

$(v+1)(v+20)$

$k^2 - 10k + 25$

$\cdot 25$	-10
$-1 \cdot -25$	-26
$-5 \cdot -5$	-10

$(k-5)(k-5)$

$x^2 - 11x + 18$

$\cdot 18$	-11
$-1 \cdot -18$	-19
$-2 \cdot -9$	-11
$-3 \cdot -6$	-9

$(x-2)(x-9)$

$m^2 + 8m - 20$

$\cdot -20$	$+8$
$-1 \cdot 20$	19
$-2 \cdot 10$	8
$-4 \cdot 5$	1

$(m-2)(m+10)$
$(m+10)(m-2)$

$p^2 - 3p - 40$

$\cdot -40$	-3
$1 \cdot -40$	-39
$-20 \cdot 2$	-18
$-10 \cdot 4$	-6
$5 \cdot -8$	-3

$(p+5)(p-8)$

$2p^2 + 20p + 18$

$2(p^2 + 10p + 9)$

$\cdot 9$	$+10$
$1 \cdot 9$	10
$3 \cdot 3$	6

$2(p+1)(p+9)$

$3k^2 + 30k + 48$

$3(k^2 + 10k + 16)$

$\cdot 16$	$+10$
$1 \cdot 16$	17
$2 \cdot 8$	10
$4 \cdot 4$	8

$3(k+2)(k+8)$

$x^2 + 11xy + 24y^2$

·24	+11
1·24	
2·12	
3·8	11
4·6	

	X	3y
X	X^2	3xy
8y	8xy	$24y^2$

$(x+8y)(x+3y)$

$ax^2 + bx + c$

When we have an a, things get a little more complicated.

Step 1: Multiply a·c
Step 2: Find factors of ac
Step 3: Figure out which factors of ac sum to equal b
Step 4: Set up the box
Step 5: Find GCFs
Step 6: Write factors

ax^2	"step 3"x
"step 3"x	c

Factor:
$2y^2 + 5y + 2$

2(2)

·4	+5
1·4	5
2·2	4

	2y	1
y	$2y^2$	1y
2	4y	2

$(2y+1)(y+2)$

Factor:
$6n^2 - 23n + 7$

6(7)

·42	-23
-1·-42	-43
-2·-21	-23
-3·-14	-17
-6·-7	-13

	3n	-1
2n	$6n^2$	-2n
-7	-21n	7

$(2n-7)(3n-1)$

Factor:

$24m^2 - 32m + 8$

$8(3m^2 - 4m + 1)$

$3(1)$

$\cdot 3$	-4
$-3 \cdot -1$	-4

8

	m	-1
$3m$	$3m^2$	$-3m$
-1	$-m$	1

$8(3m-1)(m-1)$

Factor:

$25x^2 - 10x - 15$

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

$5(-3)$

$\cdot -15$	-2
$1 \cdot -15$	-14
$3 \cdot -5$	-2

5

	$5x$	3
x	$5x^2$	$3x$
-1	$-5x$	-3

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

To factor polynomials that are four terms, use the box.
Isn't it a nice coincidence there are 4 openings? :)

Try this one:

$2w^3 + w^2 - 14w - 7$

	$2w$	1
w^2	$2w^3$	w^2
-7	$-14w$	-7

$(w^2-7)(2w+1)$

Don't forget about checking for a GCF first!

$45m^4 - 9m^3 + 30m^2 - 6m$

$3m(15m^3 - 3m^2 + 10m - 2)$

$3m$

	$5m$	-1
$3m^2$	$15m^3$	$-3m^2$
2	$10m$	-2

$3m(3m^2+2)(5m-1)$

$8t^4 + 12t^3 + 16t^2 + 24t$

$4t(2t^3 + 3t^2 + 4t + 6)$

$4t$

	$2t$	3
t^2	$2t^3$	$3t^2$
2	$4t$	6

$4t(t^2+2)(2t+3)$