Review of Algebra and Factoring

Common Factoring

Determine the greatest common factor by checking what the largest term divisible by all terms is (numbers and variables).

Ex. $2x^2 - 6x \rightarrow \boxed{2x(x-3)}$

Complete the following for practice:

a) $3x^3 - 9x^2$

b) $-8x^3 + 2x^2 - 22x$

Binomial Factoring with a Difference of Squares

When the 2 terms of the binomial are perfect squares and there is a subtraction between them, you can use this method for factoring. Form must be $\left(a^2 - b^2\right)$.

Ex. $x^2 - 9 \rightarrow \boxed{(x+3)(x-3)}$ $\quad$ $4x^2 - 25y^2 \rightarrow \boxed{\left(2x+5y\right)\left(2x-5y\right)}$

Here, you put the square root of x and the square root of 9 in each bracket with different signs between them: this is the difference of squares factoring.

NOTE: $x^2 + 9$ is a sum of squares and cannot be factored.

Complete the following:

a) $a^2 - 16$ $\quad$ b) $144 - 9y^2$ $\quad$ c) $36x^2 - 49$

Trinomial Factoring

A trinomial is in the form: ax^2+bx+c. There are different methods for trinomial factoring; including decomposition, guess and check, short-cut factoring, box method. I will show you decomposition and short-cut factoring (I usually do short-cut factoring in class).

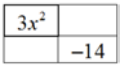
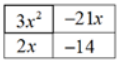
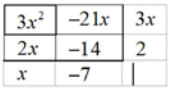
When a trinomial has a leading coefficient of 1, the method is simple:

x^2-4x-5 → **C = -5.**

Find two numbers that multiply to -5 but add to -4. Here the two numbers or factors are -5 and +1. Place these two factors in the brackets with x and you're done.

$$x^2-4x-5=\boxed{(x-5)(x+1)}$$

When the leading coefficient is not 1, use one of the following methods.

Decomposition	**Short-cut Factoring**	**Another Short-cut Factoring**	**Box Method**
$3x^2-19x-14$ **A = 3, C = -14 → AC = -42**	$3x^2-19x-14$ **A = 3, C = -14 → AC = -42**	$3x^2-19x-14$ **A = 3, C = -14 → AC = -42**	$3x^2-19x-14$ **A = 3, C = -14 → AC = -42**
Two numbers that multiply to -42 but add to -19 **These numbers are: -21 and +2**	**Two numbers that multiply to -42 but add to -19** **These numbers are: -21 and +2**	**Two numbers that multiply to -42 but add to -19** **These numbers are: -21 and +2**	**Two numbers that multiply to -42 but add to -19** **These numbers are: -21 and +2**
Replace the middle (b) term with these two factors written with an *x* $3x^2-21x+2x-14$	**Place the first term of the trinomial without the squared in the first spot of each factored bracket** $(3x\quad)(3x\quad)$	**Rewrite the trinomial with the AC as the last term** $x^2-19x-42$	**Place the first and last term in the box in the first and last spot** 
Split it in half and factor each half $3x^2-21x\,\vert\,+2x-14$ $3x(x-7)+2(x-7)$	**Place the two factors (-21 & +2) in the brackets to form the binomials** $(3x-21)(3x+2)$	**Place the two factors (-21 & +2) in the brackets to form the binomials** $(x-21)(x+2)$	**Place the two factors with *x* in the second and third box** 
Place each term in front of the brackets in its own bracket and write the other common binomial in one bracket. $(3x+2)(x-7)$	**Reduce the terms in the binomials like you would fractions** $(_1\cancel{3}x-\cancel{21}_7)(3x+2)$ $=(x-7)(3x+2)$	**Divide and reduce the constant in each bracket by the A from original trinomial** $\left(x-\frac{21}{3}\right)\left(x+\frac{2}{3}\right)=(x-7)\left(x+\frac{2}{3}\right)$	**Common factor each row and each column and collect the factors in two brackets for final factored form.** 
Done!	**Done!**	$(x-7)\left(x+\frac{2}{3}\right)=(x-7)(3x+2)$	$(3x+2)(x-7)$

Complete the following using a method of your choice:

a) $6x^2 - 5x - 4$

b) $2x^2 + 11x + 5$

c) $2x^2 + x - 1$

d) $2x^2 - 3x - 2$

To solve, you make each binomial bracket equal zero and solve for *x*.

Solving the example from above:

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

$3x + 2 = 0 \qquad x - 7 = 0$

$3x = -2 \qquad \boxed{x = 7}$

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

 Name_____

Factoring Trinomials (a = 1)

Date_____ Period____

Factor each completely.

1) $b^2 + 8b + 7$

2) $n^2 - 11n + 10$

3) $m^2 + m - 90$

4) $n^2 + 4n - 12$

5) $n^2 - 10n + 9$

6) $b^2 + 16b + 64$

7) $m^2 + 2m - 24$

8) $x^2 - 4x + 24$

9) $k^2 - 13k + 40$

10) $a^2 + 11a + 18$

11) $n^2 - n - 56$

12) $n^2 - 5n + 6$

13) $b^2 - 6b + 8$

14) $n^2 + 6n + 8$

15) $2n^2 + 6n - 108$

16) $5n^2 + 10n + 20$

17) $2k^2 + 22k + 60$

18) $a^2 - a - 90$

19) $p^2 + 11p + 10$

20) $5v^2 - 30v + 40$

21) $2p^2 + 2p - 4$

22) $4v^2 - 4v - 8$

23) $x^2 - 15x + 50$

24) $v^2 - 7v + 10$

25) $p^2 + 3p - 18$

26) $6v^2 + 66v + 60$

Name_____

Factoring Trinomials (a = 1)

Date_____ Period____

Factor each completely.

1) $b^2 + 8b + 7$

$(b + 7)(b + 1)$

2) $n^2 - 11n + 10$

$(n - 10)(n - 1)$

3) $m^2 + m - 90$

$(m - 9)(m + 10)$

4) $n^2 + 4n - 12$

$(n - 2)(n + 6)$

5) $n^2 - 10n + 9$

$(n - 1)(n - 9)$

6) $b^2 + 16b + 64$

$(b + 8)^2$

7) $m^2 + 2m - 24$

$(m + 6)(m - 4)$

8) $x^2 - 4x + 24$

Not factorable

9) $k^2 - 13k + 40$

$(k - 5)(k - 8)$

10) $a^2 + 11a + 18$

$(a + 2)(a + 9)$

11) $n^2 - n - 56$

$(n + 7)(n - 8)$

12) $n^2 - 5n + 6$

$(n - 2)(n - 3)$

13) $b^2 - 6b + 8$

$(b - 4)(b - 2)$

14) $n^2 + 6n + 8$

$(n + 2)(n + 4)$

15) $2n^2 + 6n - 108$

$2(n + 9)(n - 6)$

16) $5n^2 + 10n + 20$

$5(n^2 + 2n + 4)$

17) $2k^2 + 22k + 60$

$2(k + 5)(k + 6)$

18) $a^2 - a - 90$

$(a - 10)(a + 9)$

19) $p^2 + 11p + 10$

$(p + 10)(p + 1)$

20) $5v^2 - 30v + 40$

$5(v - 2)(v - 4)$

21) $2p^2 + 2p - 4$

$2(p - 1)(p + 2)$

22) $4v^2 - 4v - 8$

$4(v + 1)(v - 2)$

23) $x^2 - 15x + 50$

$(x - 10)(x - 5)$

24) $v^2 - 7v + 10$

$(v - 5)(v - 2)$

25) $p^2 + 3p - 18$

$(p - 3)(p + 6)$

26) $6v^2 + 66v + 60$

$6(v + 10)(v + 1)$

 Name_____

Factoring Trinomials (a > 1)

Date_____ Period____

Factor each completely.

1) $3p^2 - 2p - 5$

2) $2n^2 + 3n - 9$

3) $3n^2 - 8n + 4$

4) $5n^2 + 19n + 12$

5) $2v^2 + 11v + 5$

6) $2n^2 + 5n + 2$

7) $7a^2 + 53a + 28$

8) $9k^2 + 66k + 21$

9) $15n^2 - 27n - 6$

10) $5x^2 - 18x + 9$

11) $4n^2 - 15n - 25$

12) $4x^2 - 35x + 49$

13) $4n^2 - 17n + 4$

14) $6x^2 + 7x - 49$

15) $6x^2 + 37x + 6$

16) $-6a^2 - 25a - 25$

17) $6n^2 + 5n - 6$

18) $16b^2 + 60b - 100$

Name_____

Factoring Trinomials (a > 1)

Date_____ Period____

Factor each completely.

1) $3p^2 - 2p - 5$

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

2) $2n^2 + 3n - 9$

$(2n - 3)(n + 3)$

3) $3n^2 - 8n + 4$

$(3n - 2)(n - 2)$

4) $5n^2 + 19n + 12$

$(5n + 4)(n + 3)$

5) $2v^2 + 11v + 5$

$(2v + 1)(v + 5)$

6) $2n^2 + 5n + 2$

$(2n + 1)(n + 2)$

7) $7a^2 + 53a + 28$

$(7a + 4)(a + 7)$

8) $9k^2 + 66k + 21$

$3(3k + 1)(k + 7)$

9) $15n^2 - 27n - 6$

$3(5n + 1)(n - 2)$

10) $5x^2 - 18x + 9$

$(5x - 3)(x - 3)$

11) $4n^2 - 15n - 25$

$(n - 5)(4n + 5)$

12) $4x^2 - 35x + 49$

$(x - 7)(4x - 7)$

13) $4n^2 - 17n + 4$

$(n - 4)(4n - 1)$

14) $6x^2 + 7x - 49$

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

15) $6x^2 + 37x + 6$

$(x + 6)(6x + 1)$

16) $-6a^2 - 25a - 25$

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

17) $6n^2 + 5n - 6$

$(2n + 3)(3n - 2)$

18) $16b^2 + 60b - 100$

$4(b + 5)(4b - 5)$