DECOMPOSITION
(Factor by grouping)

If there is a *numerical coefficient* in front of x^2, then we use a method for factoring called *DECOMPOSITION.*

$$4x^2 + 5x - 6$$
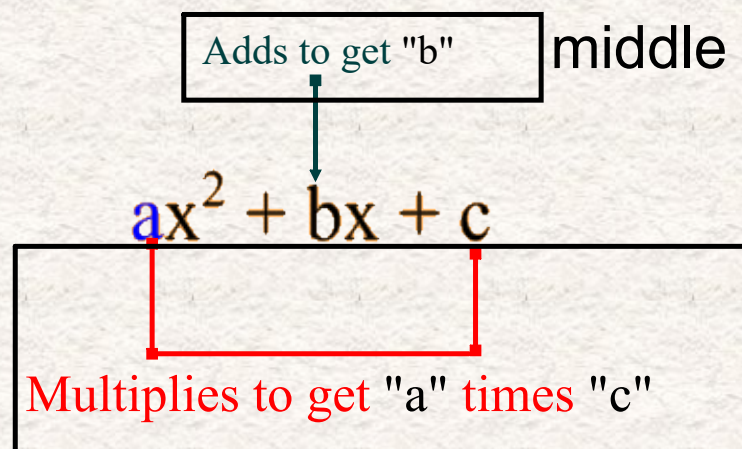
Hard Trinomials

- has <u>three</u> terms with the form...

$$ax^2 + bx + c$$

- a hard trinomial has an "a" value **not equal to 1**.

- we use a method of <u>decomposition</u> to factor them.

DECOMPOSITION METHOD

- here's how it goes... "What two numbers?"

| Adds to get "b" | middle |

$$ax^2 + bx + c$$

Multiplies to get "a" times "c"

- once you find the two numbers, use them to break the MIDDLE TERM into two pieces (decomposition).

- then, factor by grouping.

https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86:quadratics-multiplying-factoring/x2f8bb11595b61c86:factor-quadratics-grouping/v/factoring-trinomials-by-grouping-4

Multiply

$$4x^2 + 5x - 6$$

signs are diff

sign on largest

$$\_\_ + \_\_ = \blacksquare$$

$$\_\_ \times \_\_ = \blacksquare$$

Multiply (1st x last)   Add

-24	+5
-1 +24	
-2 +12	
-3 +8	
-4 +6	

$$(4x^2 + 8x)(-3x \quad -6)$$

gcf

$$4x(x+2) \quad -3(x+2)$$

$$(x+2)(4x-3)$$

Always check the following when you are asked to factor:

1) G.C.F (# and Letters) {if not....}
2) Simple Trinomial
3) Hard Trinomial ...

Factor Completely!

I think I need
to use decomposition!

1. $2x^2+5x+3$

same

$$\frac{x}{+6} \qquad \frac{+}{+5}$$

$+1 \times 6$
$+2 \times 3 \checkmark$

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

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

$(x+1) \quad (2x +3)$

Factor Completely!

2. $10x^2+13x-3$

diff

$(10x^2 -3x)(+10x \quad -3)$

$x(10x -3) +1(10x -3)$

$(10x-3)(x+1)$

$\frac{x}{-30}$ $\frac{+}{+13}$

−1, 30

·2, 15 ✓

−3, 10

−5, 6

We love Math!

$\frac{+}{} = $

$\frac{x}{} = $
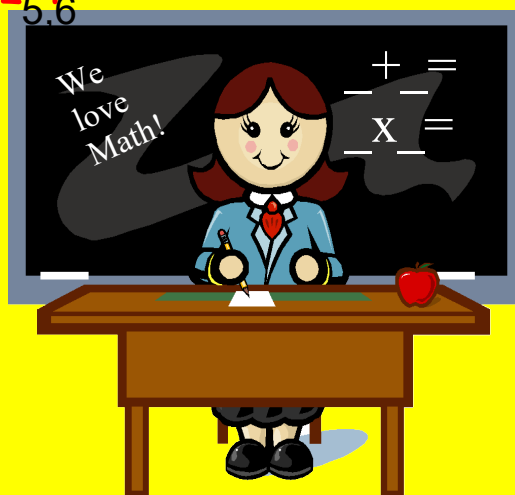
Look for

1) GCF

2) Simple trinomial

3) Hard trinomial

⭐ 4. $2x^2+6x+4$ ⭐

$2\left(x^2+3x+2\right)$

$2\ (x+1)\ (x+2)$

I suppose she wants me to do two types of factoring!
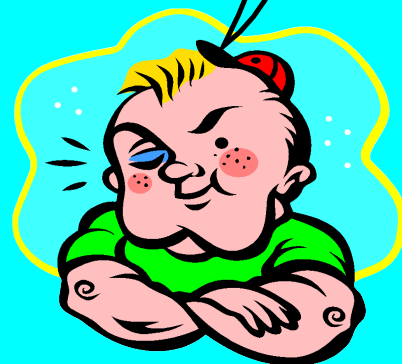
3.6   Polynomials of the Form $ax^2 + bx + c$

Homework

Page 177
Questions: 8, 13, 15, 19

13. Factor. Check by expanding.

   a) $2y^2 + 5y + 2$ b) $2a^2 + 11a + 12$
   c) $2k^2 + 13k + 15$ d) $2m^2 - 11m + 12$
   e) $2k^2 - 11k + 15$ f) $2m^2 + 15m + 7$
   g) $2g^2 + 15g + 18$ h) $2n^2 + 9n - 18$

.

solution to page 177

13. Factor. Check by expanding.

a) $2y^2 + 5y + 2$

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

$(2y^2 + 4y) + (1y + 2)$

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

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

b) $2a^2 + 11a + 12$

$2a^2 + 8a + 3a + 12$

$(2a^2 + 8a) + (3a + 12)$

$2a(a + 4) + 3(a + 4)$

$(a + 4)(2a + 3)$

c) $2k^2 + 13k + 15$

$2k^2 + 10k + 3k + 15$

$(2k^2 + 10k) + (3k + 15)$

$2k(k + 5) + 3(k + 5)$

$(k + 5)(2k + 3)$

d) $2m^2 - 11m + 12$

$2m^2 - 8m - 3m + 12$

$(2m^2 - 8m) - (3m + 12)$

$2m(m - 4) - 3(m - 4)$

$(m - 4)(2m - 3)$

13. Factor. Check by expanding.

e) $2k^2 - 11k + 15$

$2k^2 - 6k - 5k + 15$

$(2k^2 - 6k) - (5k + 15)$

$2k(k - 3) - 5(k - 3)$

$(k - 3)(2k - 5)$

f) $2m^2 + 15m + 7$

$2m^2 + 14m + 1m + 7$

$(2m^2 + 14m) + (1m + 7)$

$2m(m + 7) + 1(m + 7)$

$(m - 4)(2m - 3)$

g) $2g^2 + 15g + 18$

$2g^2 + 4g + 9g + 18$

$(2g^2 + 4g) + (9g + 18)$

$2g(g + 2) + 9(g + 2)$

$(g + 2)(2g + 9)$

h) $2n^2 + 9n - 18$

$2n^2 + 12n - 3n - 18$

$(2n^2 + 12n) - (3n - 18)$

$2n(n + 6) - 3(n + 6)$

$(n + 6)(2n - 3)$

Extra practice if needed

Math 10B   Name_____

Factoring: Hard Trinomials   Date_____

Factor each completely.

1) $6m^2 + 2m - 8$ 2) $3x^2 - 16x + 5$

3) $28r^2 - 116r + 16$ 4) $2n^2 - 17n - 9$

5) $3r^2 + 2r - 16$ 6) $5a^2 - 34a + 45$

7) $8x^2 - 50x + 50$ 8) $4n^2 - 15n + 9$

9) $4x^2 + 17x + 4$ 10) $4m^2 + 13m + 10$

11) $4b^2 - 3b - 10$ 12) $8n^2 - 26n - 24$

13) $u^2 + 16uv + 64v^2$ 14) $2x^2 - 22xy + 48y^2$

15) $x^2 - 11xy + 30y^2$ 16) $4a^2 - 8ab - 12b^2$

Look for

1) GCF

2) Simple trinomia

3) Hard trinomial

Answers to Factoring: Hard Trinomials (ID: 1)

1) $2(3m + 4)(m - 1)$ 2) $(3x - 1)(x - 5)$ 3) $4(7r - 1)(r - 4)$ 4) $(2n + 1)(n - 9)$
5) $(3r + 8)(r - 2)$ 6) $(5a - 9)(a - 5)$ 7) $2(x - 5)(4x - 5)$ 8) $(n - 3)(4n - 3)$
9) $(x + 4)(4x + 1)$ 10) $(m + 2)(4m + 5)$ 11) $(b - 2)(4b + 5)$ 12) $2(n - 4)(4n + 3)$
13) $(u + 8v)^2$ 14) $2(x - 8y)(x - 3y)$ 15) $(x - 5y)(x - 6y)$ 16) $4(a - 3b)(a + b)$

3.6 Polynomials of the Form $ax^2 + bx + c$

Worksheet: GCF, Simple Trinomials & Hard Trinomials
Questions: 1-12

Look for

1) GCF

2) Simple trinomial

3) Hard trinomial

Math 10   Name_____

GCF, Simple Trinomials, Hard Trinomials   Date_____

Choose a factoring Method and factor each completely:

1) $-9n^5 + 6n^3$

2) $36r^6 + 54r - 45$

3) $-40 + 4b^2 - 32b^4$

4) $4xy^2 + 20x^2y + 16xy$

5) $x^2 + 13x + 42$

6) $x^2 + 13x + 36$

7) $k^2 + k - 12$

8) $a^2 + 4a - 45$

9) $2p^2 + 11p - 63$

10) $3n^2 + 11n - 20$

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

12) $6n^2 - 29n + 20$

Answers to GCF, Simple Trinomials, Hard Trinomials

1) $3n^3(-3n^2 + 2)$ 2) $9(4r^6 + 6r - 5)$ 3) $4(-10 + b^2 - 8b^4)$ 4) $4xy(y + 5x + 4)$
5) $(x + 6)(x + 7)$ 6) $(x + 9)(x + 4)$ 7) $(k + 4)(k - 3)$ 8) $(a - 5)(a + 9)$
9) $(2p - 7)(p + 9)$ 10) $(3n - 4)(n + 5)$ 11) $(2n + 3)(2n - 5)$ 12) $(n - 4)(6n - 5)$