

MCR3U Park Feb 4 2015

Unit : Grade 10 Math Review : Factoring Day 2

**Recall:** Find the squares of the numbers 1 through 12

$$1^2 = 1 \times 1 = 1 \quad 4^2 = 4 \times 4 = 16 \quad 10^0 = 1$$

**Investigate:** Expand and Simplify.

$$\begin{aligned} \text{a) } (x + 3)^2 &= (x + 3)(x + 3) \\ &= x^2 + 3x + 3x + 9 \\ &= x^2 + 6x + 9 \end{aligned}$$

$$\text{c) } (3b - 5)^2$$

$$\begin{aligned} \text{d) } (a + b)^2 &= (a + b)(a + b) \\ &= a^2 + 2ab + b^2 \end{aligned}$$

$$\begin{aligned} \text{e) } (a - b)^2 &= (a - b)(a - b) \\ &= a^2 + b^2 - ab - ab \\ &= a^2 - 2ab + b^2 \end{aligned}$$

What patterns do you notice? (Perfect Squares)

To factor perfect square trinomials:

$$\underline{a^2 + 2ab + b^2 \rightarrow (a + b)^2}$$

OR

$$\underline{a^2 - 2ab + b^2 \rightarrow (a - b)^2}$$

**Example 2** Perfect Square Trinomials

Verify that each trinomial is a perfect square. Then, factor.

$$\begin{aligned} \text{a) } x^2 + 6x + 9 &= a^2 + 2ba + b^2 \\ &= x^2 + 2 \cdot 3x + 3^2 \\ &= (a + b)^2 \\ &= (x + 3)^2 \end{aligned}$$

$$\begin{aligned} \text{b) } x^2 - 12x + 36 &= a^2 - 2ab + b^2 \\ &= x^2 - (2)(6)x + 6^2 \\ &= (x - 6)^2 \end{aligned}$$

a = x  
b = 6

$$4x^2 = (2x)^2$$

$$a^2 + 2ab + b^2$$

$$c) 4x^2 + 28x + 49$$

$$a = 2x = (2x)^2 + (2 \cdot 2x \cdot 7) + (7)^2$$

$$b = 7 = (2x + 7)^2$$

$$a^2 - 2ab + b^2$$

$$d) 25k^2 - 60km + 36m^2$$

$$a = 5k = (5k)^2 - (2 \cdot 5k \cdot 6m) + (6m)^2$$

$$b = 6m = (5k - 6m)^2$$

$$a^2 - 2ab + b^2$$

$$a) 5x^2 - 8x - 4$$

$$\text{prod} = 5x - 4 = -20$$

$$\text{add} = -8$$

$$= (5x^2 - 10x) + (2x - 4)$$

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

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

$$-10 \times (+2) = -20$$

$$-10 + (+2) = -8$$

$$a^2 + 2ab + b^2$$

$$b) x^2 + 2x + 1$$

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

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

$$a = x$$

$$b = 1$$

$$e) 25x^2 - 20x + 4$$

$$a = 5x = (5x)^2 - 2(5x)(2) + (2)^2$$

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

$$f) 2x^2 - 12x + 18$$

$$\text{prod} = 2 \times 18 = 36$$

$$= (2x^2 - 6x) + (6x + 18)$$

$$\text{add} = -12$$

$$= 2x(x - 3) - 6(x - 3)$$

$$(-6) \times (-6)$$

$$= (x - 3)(2x - 6) = 2(x - 3)(x - 3)$$

Differences of Square

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

### Difference of Squares

#### Investigate:

Expand and Simplify

$$a) (x + 1)(x - 1)$$

$$= x^2 - x + x - 1$$

$$= x^2 - 1$$

$$d) (a + b)(a - b)$$

$$= a^2 - ab + ab - b^2$$

$$= a^2 - b^2$$

$$(f) 2x^2 - 12x + 18 \quad (\text{using differences of square method})$$

$$= 2(x^2 - 6x + 9)$$

$$a = x$$

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

$$b = 3$$

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

Expanding  
←

What patterns do you notice?

$$a^2 - b^2 \Rightarrow (a+b)(a-b)$$

→  
Factoring

To factor difference of squares: \_\_\_\_\_

Example 1 Factor.

a)  $x^2 - 25$ ,  $a = x$   
 $= x^2 - (5)^2$ ,  $b = 5$   
 $= (x+5)(x-5)$

b)  $y^2 - 36$   
 $= y^2 - (6)^2$   
 $= (y+6)(y-6)$

c)  $16k^2 - 49$   
 $= (4k)^2 - (7)^2$ ,  $a = 4k$   
 $b = 7$   
 $= (4k+7)(4k-7)$

d)  $25n^2 - 144$   
 $= (5n)^2 - (12)^2$ ,  $a = 5n$   
 $b = 12$   
 $= (5n+12)(5n-12)$

e)  $25x^2 + 49$   
 $= 25x^2 + 49$   
∴ We can't factor.

d)  $3x^2 - 27y^2$   
 $= 3(x^2 - 9y^2)$ ,  $a = x$   
 $b = 3y$   
 $= 3[(x+3y)(x-3y)]$

\*Students often get confused between perfect squares and difference of squares

Create a perfect square trinomial and create a difference of squares using the terms  $(3x)$  and  $(4y)$ .

Perfect Square Trinomial: = 3 terms

$$(3x+4y)^2$$
$$= 9x^2 + 24xy + 16y^2$$

⇓  
 $2ab = 2 \cdot 3x \cdot 4y$

Difference of Squares:

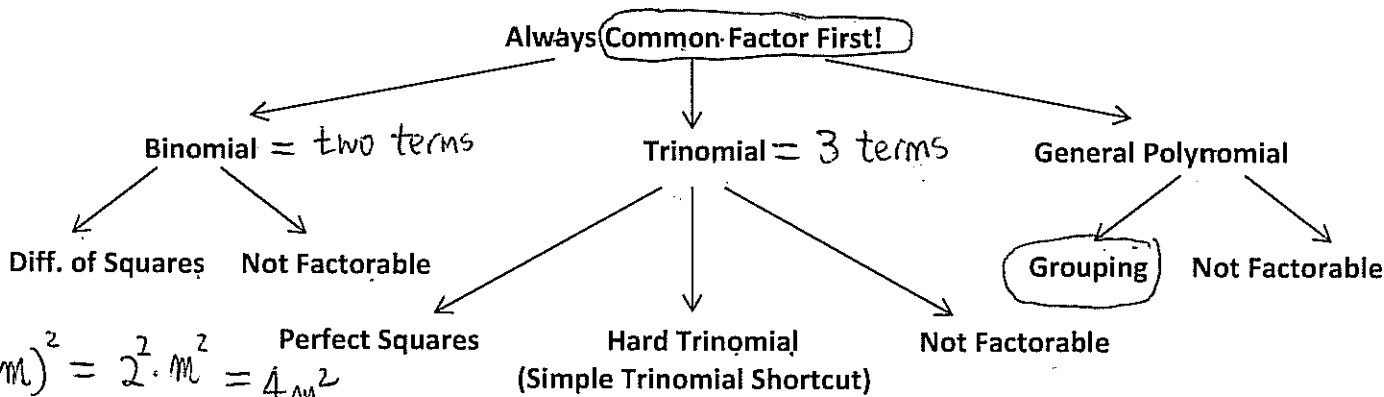
$$= (3x)^2 - (4y)^2$$
$$= 9x^2 - 16y^2 = \text{two terms}$$

What is the difference between perfect squares trinomials and difference of squares?

You have now learned all the basic types of factoring! (Yay!)

The hard part is distinguishing between the different types on a test. ☹

How to decide which type of factoring you need: ☺



$$(2m)^2 = 2 \cdot m^2 = 4m^2$$

**Challenge**

a)  $(4m^2) - (6m-7)^2$

$a = 2m$   
 $b = 6m-7$

$$= (2m)^2 - (6m-7)^2$$

$$= (2m + (6m-7))(2m - (6m-7))$$

$$= (8m-7)(2m-6m+7)$$

$$= (8m-7)(7-4m)$$

$$= -(8m-7)(4m-7)$$

$a = 5m+2$   
 $b = 3m-8$

$$= a^2 - b^2$$

b)  $(5m+2)^2 - (3m-8)^2$

$$= (5m+2 + 3m-8)(5m+2 - (3m-8))$$

$$= (8m-6)(5m+2-3m+8)$$

$$= (8m-6)(2m+10)$$

$$= 2(4m-3)2(m+5)$$

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

Classwork / Homework: Feb 2 Lesson 1 : Factoring Review (right columned questions) and Exercise questions, which are behind the "Feb 2 Lesson 1" page