

## Lesson 7: Factoring a Perfect Square Trinomial and a Difference of Squares

**By the end of today's lesson you should be able to:**

- Differentiate between a difference of squares and a perfect square trinomial
- Factor a perfect square trinomial using decomposition and using reasoning
- Factor a difference of squares

When a perfect square trinomial (three terms -  $ax^2 + bx + c$ ) is factored, it has two identical binomial factors.

For example:

$$\underline{x^2 + 8x + 16} = \underline{(x+4)(x+4)} \quad \text{These two binomials are exactly the same}$$

A perfect square trinomial can be in two forms:

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

OR

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

A difference of squares involves the subtraction of 2 squares (two terms to the power of 2).

$a^2 - b^2$  is a difference of squares

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

The two factors will ALWAYS be the sum of the square roots and the difference of the square roots.

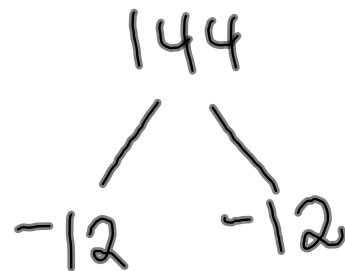
$$\begin{aligned} &4x^2 - 9 \\ &= (2x + 3)(2x - 3) \end{aligned}$$

Example 1: factoring a perfect square using decomposition method (from last class)

$$\begin{aligned}
 &9x^2 - 24x + 16 \\
 &\rightarrow \underline{9x^2 - 12x} - \underline{12x + 16} \\
 &= 3x(3x - 4) - 4(3x - 4) \\
 &= (3x - 4)(3x - 4) \\
 &= (3x - 4)^2
 \end{aligned}$$

\* Find two numbers that add up to -24 and multiply to 144.  
 $(a)(c)$

\* Recall that  $(a)(c)$  gives you the value that you must factor to find the values that add to b.



Recognizing a perfect square trinomial:

What do you notice about the a and c terms in the quadratic expression?

Perfect squares



Choose the correct answer:



Which expressions are perfect square trinomials?

☒ A

$$16a^2 + 24a + 9$$



☐ B

$$7x^2 + 19x - 6$$



☒ C

$$4p^2 - 20p + 25$$



☐ D

$$9n^2 - 16$$



Example 2: Factor

$$16x^2 + 40x + 25$$

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

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



Use reasoning to answer



Factor by inspection:

If the a and c terms are both perfect squares, this is likely a perfect square trinomial. Using the square roots of the a and the c terms, try to determine what the factored form of  $9x^2 - 42x + 49$  will be.

$$(3x-7)(3x-7) = (3x-7)^2$$

Check to make sure:

### Example 3: Factoring a Difference of Squares

A difference of squares is not a trinomial. There are only two terms and they are both perfect squares. Since it is a DIFFERENCE of squares, there will be a minus sign between them.

a)  $x^2 - 49$

Both  $x^2$  and 49 are perfect squares

$$(x + 7)(x - 7)$$


b)  $64x^4 - 16y^2$


$$= 16(4x^4 - y^2)$$






Which of the following are examples of a difference of squares?

A  $4x^2 - 16$  

B  $9p^4 - 16x^2$  

C  $25x - 9$

D  $81x^2 - 25y^2$  

Factor the differences of squares:

A  $= 4(x^2 - 4)$   
 $= 4(x-2)(x+2)$

B  $= (3p^2 - 4x)(3p^2 + 4x)$

D  $= (9x - 5y)(9x + 5y)$