8 Algebra CC

13-2

Essential Question: How do we factor a binomial that is a difference of two squares?

Do Now: Multiply each pair of binomials.

a) $(x - 2)(x + 2)$

$x^2 + 2x - 2x - 4$

$x^2 - 4$

b) $(x - 5)(x + 5)$

$x^2 + 5x - 5x - 25$

$x^2 - 25$

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

$x^2 - 7x + 7x - 49$

$x^2 - 49$

Factoring the Difference of Two Squares ("DOTS")

1) In order to factor DOTS, you must recognize DOTS.

$x^2 - 9$ is a difference of two squares (DOTS)

Both x^2 and 9 are perfect squares. Since both squares are being subtracted, this expression is known as a **difference of two squares** (DOTS).

2) Once you recognize DOTS, you can factor DOTS.

Factor $x^2 - 9$ by taking the square root of each perfect square.

What is the square root of x^2? x

What is the square root of 9? 3

Let's list the perfect squares...

1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225 . . .

$x^2, x^4, x^6, x^8, x^{10}$ . . .

3) Using each root, create a sum and difference.

The factors are $x + 3$ and $x - 3$.

Therefore, $x^2 - 9$ written in **factored form** is $(x + 3)(x - 3)$.

Rule: $a^2 - b^2 = (a - b)(a + b)$

Factor:

1) $x^2 - 100$

$(x - 10)(x + 10)$

2) $x^2 - 81$

$(x - 9)(x + 9)$

3) $x^2 - 4$

$(x - 2)(x + 2)$

4) $x^2 - y^2$

$(x - y)(x + y)$

5) $16x^2 - 25$

$(4x - 5)(4x + 5)$

6) $49x^2 - 36y^2$

$(7x - 6y)(7x + 6y)$

7) $100x^4 - 1$

$(10x^2 - 1)(10x^2 + 1)$

8) $144 - x^4$

$(12 - x^2)(12 + x^2)$

9) $81x^2 - y^4$

$(9x - y^2)(9x + y^2)$

10) Is $x^2 + 4$ factorable? Explain.

No, there is not a subtraction sign between the terms.

11) Is $x^9 - 4$ factorable? Explain.

No, x^9 is not a perfect square

An algebraic term is a perfect square when the numerical coefficient (the number in front of the variable) is a perfect square and the exponent of the variable(s) is an even number.

*"**To be, or not to be: that is the question**" is the opening phrase in William Shakespeare's play Hamlet. It is perhaps the most famous of all literary quotations.*

"Factorable or not Factorable: that is the question"

Determine if the polynomials are factorable or not. If the polynomial is factorable, factor it.

1) $x - 36$ No (x is not a perfect square)

2) $4x^2 - 25$ $(2x - 5)(2x + 5)$

3) $x^2 + 1$ No, there is not a minus sign

4) $x^2 - 2$ No (2 is not a perfect square)

5) $64x^2 - y^4$ $(8x - y^2)(8x + y^2)$

6) $16x^9 - 9y^2$ No, x^9 is not a perfect square

7) $100x^2 + 49$ No, there is not a minus sign

8) $x^6 - 1$ $(x^3 - 1)(x^3 + 1)$