Name: ____ Date: _______________ Period: ________

_________ **Factoring Quadratics**

Engage: Factoring Finesse

There is a process using box method where you can think of the product of two numbers as the product of two binomials. See below.

$31 * 37$ can be thought of as
$(30 + 1)(30 + 7)$

	30	1
30	900	30
7	210	7

So $31 * 37 = 900 + 210 + 30 + 7 = 1147$

and $27 * 37$ can be thought of as
$(30 - 3)(30 + 7)$

	30	-3
30	900	-90
7	210	-21

So 27$* \ 37 = 900 + 210 - 90 - 21 = 999$

But suppose the first number in each binomial is the same and the second number in each binomial are opposites of each other. Show your steps for finding these products. The first one has been done for you.

$38 * 42$ $(40 - 2)(40 + 2)$	$45 * 35$	$(22)(18)$	$(x + 5)(x - 5)$

Above, you computed several products of the form, $(x + y)(x - y)$, verifying that the product is always of the form $x^2 - y^2$.

1) If we choose values for *x* and *y* so that $x = y$, what happens to the product?

2) Is there another way to choose numbers for *x* and *y* so that the product of $(x + y)(x - y)$ will = 0?

3) In general, if the product of two numbers is zero, what must be true about one of them?

$(x + y)(x - y) = x^2 - y^2$ is called a **polynomial identity** because this statement of equality is true for all values of the variables. Polynomials in the form of $a^2 - b^2$ are called the **difference of two squares**.

In Algebra 1, you were told that you cannot factor the sum of two squares, such as $x^2 + 16$ or $x^2 + y^2$, but we know we can just not with real numbers.

4) Multiply $(x + 5i)(x - 5i)$. Describe what you see.

5) Jon claims that you can factor the **sum of two squares** just like the **difference of two squares**, just with i's after the constant terms. Do you agree? Why or why not?

This relationship is another polynomial identity for the **sum of two squares**. $a^2 + b^2 = (a + bi)(a - bi)$

Now let's consider another special case when the numbers/expressions are the same.

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

These are the **perfect square trinomial** identities.

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

Use the identities discussed in this lesson to practice factoring on the next page. Remember to always check for greatest common factor (GCF) first.

Practice: Use the identities to factor the expressions.

	Difference of Square (DOS) $\mathbf{a^2 - b^2 = (a + b)(a - b)}$	Sum of Squares (SOS) $\mathbf{a^2 + b^2 = (a + bi)(a - bi)}$
2 Terms	1. $4x^2 - 9$ 2. $49x^2 - 25y^2$ 3. $36x^2 - 64$	1. $81x^2 + 25$ 2. $100x^2 + 9y^2$ 3. $14x^2 + 14$
	Perfect square Trinomials (PST) $\mathbf{a^2 + 2ab + b^2 = (a + b)^2}$ $\mathbf{a^2 - 2ab + b^2 = (a - b)^2}$	**Other Trinomials (TRIM)** Find two numbers that multiply to ac but add to get b. (rm = a; pq = c) $\mathbf{ax^2 + bx + c}$ **= (mx + p)(rx + q)**
3 Terms	1. $x^2 - 18x + 81$ 2. $4x^2 + 20x + 25$ 3. $9x^2 - 42xy + 49y^2$	1. $4x^2 - 45x + 81$ 2. $6x^2 + 8x + 2$ 3. $12x^2 + 13x + 3$