Warm Up April 26, 2019

1.) Write the product in standard form.

$$-3y^3(3y - 4xy)$$

$$-9y^4 + 12xy^4$$

$$12xy^4 - 9y^4$$

2.) Simplify the expression: $(2y + 1)^2 - 2(2y^2 - 1)$.

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

$$4y + 3$$

3.) Simplify: $(x - 5)^2$

$$x^2 - 10x + 25$$

4.) Simplify: $(3x + y^2)^2$

$$9x^2 + 6xy^2 + y^4$$

Getting Ready for Factoring

Simplify the following:

- $a(3a + 7)$ = $3a^2 + 7a$
- $-2m(m^2 + 6m - 1)$ = $-2m^3 - 12m^2 + 2m$
- $4x^3y(x^2 - 2y)$ = $4x^5y - 8x^3y^2$

WHAT IS FACTORING?	splitting an expression into a multiplication of simpler expressions
	$\boxed{4a^2+8a}$ ➡ $\boxed{4a(a+2)}$ (Simplest Form) (Factored Form)
	Polynomials that cannot be factored are called prime !

4 Types of Factoring

1.) GCF - *The first step of all factoring exercises!*

2.) Grouping

3.) AC Method

4.) Difference of Squares

Polynomials that cannot be factored are called prime!

The "How" behind the GCF:

FACTORING A GCF (Greatest Common Factor)	There are several factoring methods; the approach depends on the polynomial. We will start by identifying and factoring out the ***greatest common factor*** (GCF) of the polynomial.
	Steps for Factoring a GCF:
	Step 1: Identify the GCF of the polynomial: • Check the **coefficients** for a GCF. • Now look at the **variables.** A variable must be present in all terms to be a GCF. If a variable is present in all terms, take the one with the smallest exponent.
	Step 2: Divide each term by the **GCF** and leave the remaining factors in parentheses
	Step 3: Check your work by distributing!

1.) $3x + 12$

3x: 1, 3, x

12: 1, 2, 3, 4, 6, 12

Whatever you circle on both lists is your greatest common factor!

GCF: 3 Factored Expression: $3(x+4)$

$$\frac{3x}{3}+\frac{12}{3}$$

2.) $7y - 7$

7y: 1, 7, y

7: 1, 7

Whatever you circle on both lists is your greatest common factor!

GCF: 7 Factored Expression: $7(y-1)$

$$\frac{7y}{7}-\frac{7}{7}$$

3. $\frac{8m}{4} + \frac{36n}{4}$ $4(2m+9n)$	**4.** $\frac{5x}{5} + \frac{30y}{5}$ $5(x+6y)$

7. $\frac{21cd}{3d} - \frac{3d}{3d}$ $3d(7c-1)$	**8.** $\frac{14gh}{2h} - \frac{18h}{2h}$ $2h(7g-9)$

11. $\frac{ab}{a} - \frac{a}{a}$ $a(b-1)$	**12.** $\frac{x^2y}{xy} + \frac{3xy}{xy}$ $xy(x+3)$

13. $5x - 13y$ prime	**14.** $\frac{18a^2bc^2}{6abc^2} - \frac{48abc^3}{6abc^2}$ $6abc^2(3a-8c)$

17. $6y^4 + 14y^3 - 10y^2$

18. $12a^5b^2 - 36a^4b^3 - 6a^2b^2$

$6a^2b^2 \quad 6a^2b^2 \quad 6a^2b^2$

$6a^2b^2(2a^3 - 6a^2b - 1)$

21. $m^3n - m^2n^2 + 5mn^3$

$mn \quad mn \quad mn$

$mn(m^2 - mn + 5n^2)$

22. $16xy^2 + 28xy + 8y$

Recap – Rules for finding a GCF of a polynomial:

1) Look at **coefficients** first.

2) A **variable must be common to all terms** to be a GCF.

3) If a variable is common to all terms, take the one with the **smallest exponent.**

4) Divide all terms by the GCF to get the remainder in parentheses.

Facroing by Grouping (4 TERMS)

Steps	Example
Step 1: Group the first two terms together and the last two terms together.	$(x^3 + 7x^2)(+ 2x + 14)$
Step 2: Factor out the GCF for each binomial.	$x^2(x+7)+2(x+7)$
Step 3: The GCF from each binomial will become one factor and remaining binomial will be the other factor.	$(x^2+2)(x+7)$
Step 4: Use **FOIL** to check your answer.	$x^3+7x^2+2x+14$

	x^2	$+2$
x	x^3	$2x$
$+7$	$7x^2$	14

Examples

1.) $(x^3 + 4x^2)(+8x + 32)$

$x^2 \quad x^2 \quad 8 \quad 8$

$x^2(x+4) + 8(x+4)$

$(x^2+8)(x+4)$

1.) Group the first two terms and the last two terms.

2.) Factor out the GCF for each binomial.

3.) The GCF from each binomial becomes a factor and the "twins" becom
one factor.

4.) Use FOIL to check your answer.

2.) $(a^3 + 2a^2)(+ 9a + 18)$

$a^2 \quad a^2 \quad 9 \quad 9$

$a^2(a+2) + 9(a+2)$

$(a^2+9)(a+2)$

3.) $(w^3 \; -5w^2)(- 8w \; -40)$

$\frac{w^3}{w^2} \quad \frac{-5w^2}{w^2} \quad \frac{-8w}{-8} \quad \frac{-40}{-8}$

$w^2(w+5) - 8(w+5)$

$(w^2-8)(w+5)$

1.) Group the first two terms and the last two terms.

2.) Factor out the GCF for each binomial.

4.) $(k^3 + 2k^2)(- 5k - 10)$

$\frac{k^3}{k^2} \quad \frac{+2k^2}{k^2} \quad \frac{-5k}{-5} \quad \frac{-10}{-5}$

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

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

3.) The GCF from each binomial becomes a factor and the "twins" becom one factor.

4.) Use FOIL to check your answer.