

Warm Up

November 20, 2018

1.) Write the product in standard form.

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

$$-9y^4 + 12xy^4 \quad \text{cloud: } 12xy^4 - 9y^4$$

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

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

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

cloud: $4y + 3$

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

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

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

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

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

Getting
Ready for
Factoring

Simplify the following:

$$\begin{array}{ll}
 \bullet a(3a + 7) & = 3a^2 + 7a \\
 \bullet -2m(m^2 + 6m - 1) & = -2m^3 - 12m^2 + 2m \\
 \bullet \text{~~4x^3y - 8x^3y^2~~} & = 4x^3y - 8x^3y^2 \\
 & 4x^3y(x^2 - 2y)
 \end{array}$$

**WHAT IS
FACTORING?**

separating a polynomial into a product.

$$4a^2 + 8a$$

(Simplest Form)



$$4a(a+2)$$

(Factored Form)

Polynomials that cannot be factored are called prime !

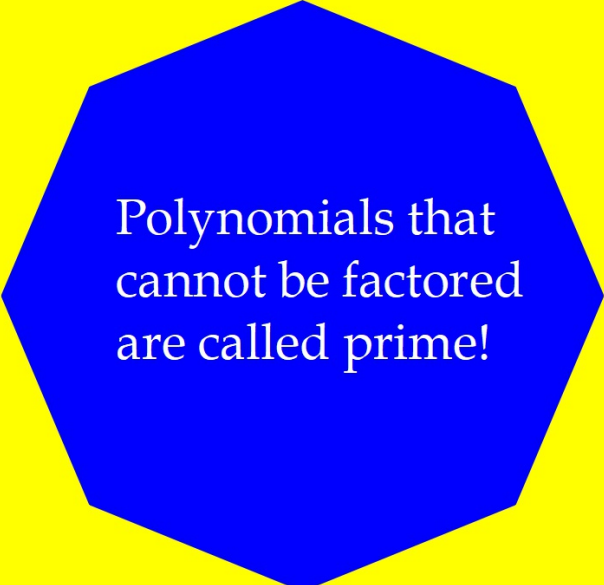
4 Types of Factoring

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:

<p>FACTORING A GCF (Greatest Common Factor)</p>	<p>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.</p> <p>Steps for Factoring a GCF:</p> <p>Step 1: Identify the GCF of the polynomial:</p> <ul style="list-style-type: none"> • 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. <p>Step 2: Divide each term by the GCF and leave the remaining factors in parentheses</p> <p>Step 3: Check your work by distributing!</p>
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1.) $3x + 12$

$3x: 1, \textcircled{3}, x$

$12: 1, 2, \textcircled{3}, 4, 6, 12$

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

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

2.) $7y - 7$

$7y: 1, \textcircled{7}, y$

$7: 1, \textcircled{7}$

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

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

$$3. \frac{8m}{4} + \frac{36n}{4}$$

$$4(\underline{2m+9n})$$

GCF ↓ Remainder

$$4. \frac{5x}{5} + \frac{30y}{5}$$

$$5(x+6y)$$

$$7. \frac{21cd}{3d} - \frac{3d}{3d}$$

$$3d(7c-1)$$

$$8. \frac{14gh}{2h} - \frac{18h}{2h}$$

$$2h(7g-9)$$

$$11. \frac{ab}{a} - \frac{a}{a}$$

$$a(b-1)$$

$$12. x^2y + 3xy$$

$$x^2y: \textcircled{x}, x, \textcircled{y}$$

$$3xy: 1, 3, \textcircled{x}, \textcircled{y}$$

$$\frac{x^2y}{xy} + \frac{3xy}{xy}$$

$$xy(x+3)$$

$$13. 5x - 13y$$

~~$$1(5x-13y)$$~~

prime

$$14. 18a^2bc^2 - 48abc^3$$

$$6abc^2 \quad 6abc^2$$

$$6abc^2(3a-8c)$$

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

$2y^2(3y^2 + 7y - 5)$

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

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

21. $\frac{m^3n}{mn} - \frac{m^2n^2}{mn} + \frac{5mn^3}{mn}$

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

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

$4y(4xy + 7x + 2)$

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.

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

$$\begin{array}{r}
 x^2 + 2 \\
 \begin{array}{|c|c|}
 \hline
 x & x^3 & +2x \\
 \hline
 +7 & +7x^2 & +14 \\
 \hline
 \end{array}
 \end{array}$$

Examples

1.) $\frac{x^3}{x^2} + \frac{4x^2}{x^2} + \frac{8x}{8} + \frac{32}{8}$

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

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

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

4.) Use FOIL to check your answer.

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

2.) Factor out the GCF for each binomial.

2.) $\frac{a^3}{a^2} + \frac{2a^2}{a^2} + \frac{9a}{9} + \frac{18}{9}$

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

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

3.) $w^3 - 5w^2 - 8w - 40$

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

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

4.) Use FOIL to check your answer.

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

2.) Factor out the GCF for each binomial.

4.) $\left(\frac{k^3 + 2k^2}{k^2} - \frac{5k - 10}{-5} \right)$
 $k^2(k + 2) - 5(k + 2)$
 $(k^2 - 5)(k + 2)$

CHALLENGE!

Rearranging Terms

Directions: Factor each polynomial by rearranging terms first, then use grouping.

15. $2xy + 5x - x^2 - 10y$

$$\begin{aligned} & (-x^2 + 5x) + 2xy - 10y \\ & -x(x-5) + 2y(x-5) \\ & (-x+2y)(x-5) \end{aligned}$$

16. $uv - u - u^2 + v$

$$\begin{aligned} & (uv+v) - (u^2+u) \\ & v(u+1) - u(u+1) \\ & (v-u)(u+1) \end{aligned}$$

Name _____ Block _____ Date _____

Factor the GCF in the polynomials below.

1.) $4x^2 - 10x$

2.) $3x^5 - 39x^4 + 90x^3$

Simplify the polynomial expressions below.

3.) $(ab^2)^{-4}$

4.) $(5x^2y^3z^4)^3$

