Name: _____

Secondary 2H: UNIT 1
Lesson 2

Warm-up:

1. Write an equivalent expression

$(x+4)(x-5) = x^2 - 5x + 4x - 20$

$= x^2 - x - 20$

2. Write an equivalent expression

$(y-2)(y^2+3y-1) = y^3 + 3y^2 - y - 2y^2 - 6y + 2$

$= y^3 + y^2 - 7y + 2$

3. Write an equivalent expression

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

$= x^2 - 4x - 4x + 16$

$= x^2 - 8x + 16$

4. Write an equivalent expression

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

$= x^2 - 16$

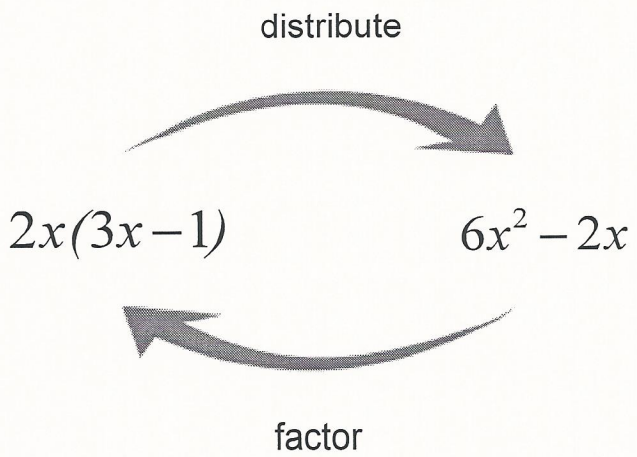
By the end of this lesson, I can…

- factor monomials. I can factor a trinomial in the form $x^2 + bx + c$. I can factor a difference of squares binomial
- extend the properties of integer exponents to rational exponents and use them to simplify expressions

1.3 Factoring Polynomials

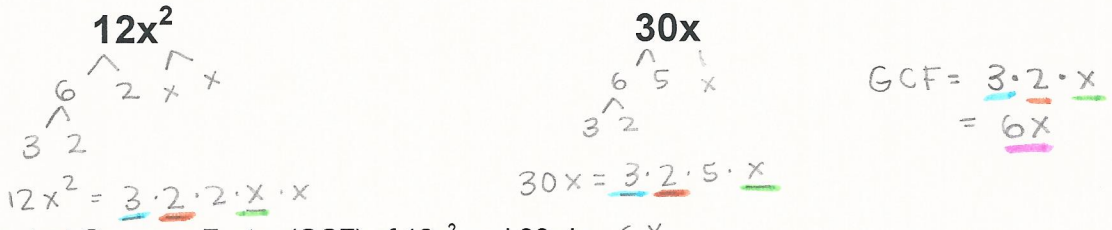
FACTORING "UNDOES" DISTRIBUTING.

⟹ One way to factor a polynomial is to find the Greatest Common Factor (GCF)



An example: Factor $12x^2 - 30x$.

1. We start by finding the GCF of the two terms:



- The Greatest Common Factor (GCF) of $12x^2$ and $30x$ is $6x$.

2. Next, we divide each term by the GCF and rewrite our expression with the GCF outside the parenthesis.

$$12x^2 - 30x = (6x)(2x) - (6x)(5) = (6x)(2x - 5)$$

GCF GCF GCF

3. Finally, we could check that we factored correctly by re-distributing the GCF.

$6x(2x-5) = 12x^2 - 30x$ ✓

Practice:

Factor each expression by finding the GCF.

1. $-6x^3 - 21x^2$ GCF: $-3x^2$

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

2. $18x^3 - 6$ GCF: 6

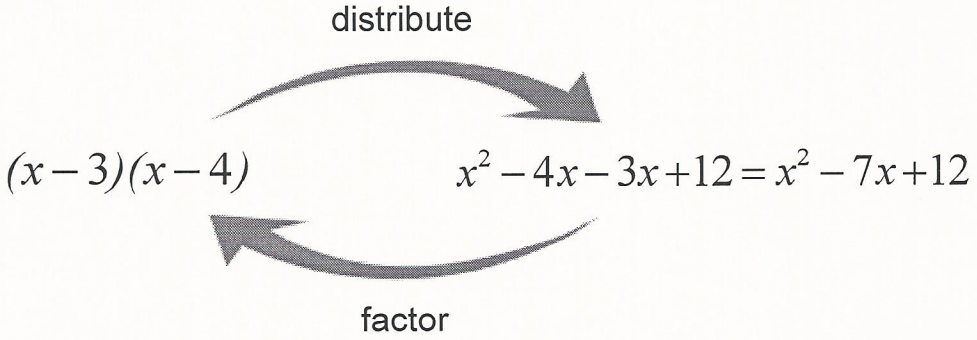
$6(3x^3 - 1)$

* Don't forget every term!!

3. $4x^5 - 8x^4 + 12x^3$ GCF: $4x^3$

$4x^3(x^2 - 2x + 3)$

⟹ We won't always have a GCF greater than 1. Another way to factor a polynomial is to "un-FOIL."



An example: Factor x^2+5x+6.

To "un-FOIL," we look for two numbers that multiply to 6 and add to 5.

Factors of 6	Sum of Factors
1, 6	7
2, 3	5

$x^2+5x+6 = (x+2)(x+3)$

*This type of factoring only works if $a=1$ (Recall: ax^2+bx+c)

Practice:

Factor each expression.

1. $x^2-9x+18$

$=(x-3)(x-6)$

18	−9
1, 18	19
2, 9	11
3, 6	9
−3, −6	−9 ✓

2. x^2-x-2

$=(x+1)(x-2)$

−2	−1
−1, 2	1
1, −2	−1 ✓

3. $x^2+4x-12$

$=(x+6)(x-2)$

−12	4
−1, 12	11
−2, 6	4 ✓

4. x^2-6x+8

$=(x-2)(x-4)$

8	−6
1, 8	9
2, 4	6
−2, −4	−6 ✓

5. $x^2-5x-14$

$=(x+2)(x-7)$

−14	−5
−1, 14	13
−2, 7	5
2, −7	−5 ✓

6. x^2+6x-7

$=(x-1)(x+7)$

−7	6
−1, 7	6

The next two examples might look different, but they can still be factored by "un-FOILing."

7. $x^2-9 = x^2+0x-9$

$=(x-3)(x+3)$

−9	0
−1, 9	8
−3, 3	0 ✓

8. x^2-25

$=(x-5)(x+5)$

−25	0
1, 25	24
−5, 5	0

9. x^2+16

$=x^2+16$

16	0
1, 16	17
2, 8	10
4, 4	8

10. Write a rule for factoring polynomials of the form x^2-a^2.

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

11. Explain why your rule won't work for polynomials of the form x^2+a^2.

You cannot factor x^2+a^2 because there are no two numbers that multiply together to get a positive a^2 but add to get zero. In order to have a sum of zero, the numbers have to be opposite (one positive and one negative). In order to have two numbers multiply to get a positive number, they have to be the same (both negative or both positive). Therefore, it is not possible to factor x^2+a^2.