<u>Day 31</u>: Solving Quadratic Equations

Remember that a **quadratic equation** has a degree of __2__. So y = (x + 1)(x – 3), which is in "factored form", is a quadratic because when you multiply it out, you would get y = __$x^2 - 2x - 3$__ (standard form). Today we are going to practice finding the x-intercepts, also called __zeros__. Think about why they would be called zeros.... Sometimes you will see directions in a textbook say, "Solve the quadratic equation". This also means to find the x-intercepts (A.K.A.- zeros). To find the x-intercept of any equation, you can plug __0__ in for *y*.

First try this: *Solve*: *ab* = 0 a = __0__, OR b = __0__

Why? b/c any # times zero = 0.

This is called the __zero product property__

Solve.

1. $(x-4)(x-2) = y$ $x = 4, \; x = 2$	2. $(x-5)(x+7) = 0$ $x = 5, \; x = -7$
3. $(2x-6)(x+8) = 0$ $x = 3, \; x = -8$	4. $(5x+35)(3x+2) = y$ $x = -7, \; x = -\frac{2}{3}$

Now, let's try problems that are in factored form, but look a little different.

Ex 1: Solve: $3n(n - 5) = 0$

$n = 0, n = 5$

Ex 2: Find the zeros: $x(3x + 2) = 0$

$x = 0, x = -2/3$

You try: Find the zeros.

5. $a(a + 5) = 0$

$a = 0, a = -5$

6. $5s(s - 7) = 0$

$s = 0, s = 7$

7. $2x(2x - 1) = y$

$x = 0, x = 1/2$

8. $(x - 9)(x + 10) = 0$

$x = 9, x = -10$

9. $(x + 11)(x - 6) = 0$

$x = -11, x = 6$

10. $y = (2x + 4)(3x - 15)$

$x = -2, x = 5$

Let's combine the two concepts we've learned today (solving with the **Zero Product Property** and **Factoring out a GCF**) to solve quadratic equations.

Solve equation by factoring.

1) $20b^2 + 300b = 0$

$20b(b+15)=0$

$b=0$ $b=-15$

2) $17k^2 - 221k = 0$

$17K(K-13)=0$

$K=0$ $K=13$

3) $14x^2 + 14x = 0$

$14x(x+1)=0$

$x=0$ $x=-1$

4) $9k^2 + 81k = 0$

$9K(K+9)=0$

$K=0$ $K=-9$

5) $3a^2 - 27a = 0$

$3a(a-9)=0$

$a=0$ $a=9$

6) $15m^2 + 165m = 0$

$15m(m+11)=0$

$m=0$ $m=-11$

7) $16r^2 - 192r = 0$

$16r(r-12)=0$

$r=0$ $r=12$

8) $9p^2 - 90p = 0$

$9p(p-10)$

$p=0$ $p=10$

9) $14m^2 - 168m = 0$

$14m(m-12)=0$

$m=0$ $m=12$

10) $20n^2 - 280n = 0$

$20n(n-14)=0$

$n=0, n=14$

Factoring out a GCF to Solve

Factor: numbers or variables we multiply together to get a product

Ex: 2 and 3 are factors of the product 6; & 1 & 6!

2, 3, x and y are factors of the product 6xy

Why is it important to factor? Because it takes a complex expression and makes it simpler.
When we factor, we look for the GREATEST Common Factor (GCF).

> **Example:** Factor the expression **8x + 4**.
>
> The **greatest common factor** for 8x and 4, is 4.
>
> If we divide each monomial by 4 we are left with 2x and 1, so the factored expression is now **4(2x+1)** . This is called **factored form.**

You try: Factor each expression.

1. $5x + 25$

$5(x+5)$

2. $2x + 10$

$2(x+5)$

3. $12x + 30$

$6(2x+5)$

Example: Factor the expression $6x^2y + 14x^3y - 42x^4yz$

$2x^2y(3+7x-21x^2z)$

You try: Factor each expression.

4. $4x^4 + 24x^3$

$4x^3(x+6)$

5. $2x^2 - 8x$

$2x(x-4)$

6. $5x^3 + 30x^2 - 15x$

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