Day 2: Factoring Review and Solving For Zeroes Algebraically

Warm-Up: Factor the following

1. $x^2 + 13x + 40$ $(x+8)(x+5)$
2. $x^2 + 8x + 12$ $(x+6)(x+2)$
3. $x^2 + 5x - 6$ $(x+6)(x-1)$
4. $x^2 - 5x - 14$ $(x-7)(x+2)$

Day 2: Solving Quadratics Algebraically

Review from CCM1:

Graph the equation $y = x^2 + 13x + 40$ on your calculator.

Use your calculator to find the zeroes: x = -8 and x = -5

From the warm-up, the factors of $y = x^2 + 13x + 40$ are $(x+5)(x+8)$.

Set each factor equal to zero and solve for x.

$x + 5 = 0$ $x + 8 = 0$
$x = -5$ $x = -8$

What do you notice about your answers and the zeroes you found earlier on your calculator?

they are the same :)

Summary: To solve a quadratic with your calculator

Enter the equation into "y =" and use the "zero" function. (You did this in CCM1)

2nd TRACE 2: zero

then press Enter for left bound, Enter for right bound, and Enter for guess

To solve a quadratic algebraically (this is new)

1) Set the equation equal to zero
2) Factor the equation
3) Set each factor equal to zero and solve

Example: Solve $x^2 + 8x = -12$

$x^2 + 8x + 12 = 0$

$(x+6)(x+2) = 0$

$x+6=0$ $x+2=0$

$\boxed{x=-6}$ $\boxed{x=-2}$

Practice - Solve each quadratic algebraically. Check your answers using the zero function on your calculator.

11) $x^2 + 4x = -4$ $+4 \quad +4$ $x^2+4x+4=0$ $(x+2)(x+2)=0$ $(x+2)^2=0$ $x+2=0$ $\boxed{x=-2}$ "double root" because only 1 root but "bounces" on x-axis	12) $x^2 + 5x = -6$ $x^2+5x+6=0$ $(x+3)(x+2)=0$ $x+3=0 \quad x+2=0$ $\boxed{x=-3} \quad \boxed{x=-2}$
13) $x^2+9=6x$ $-6x \quad -6x$ $x^2-6x+9=0$ $(x-3)(x-3)=0$ $(x-3)^2=0$ $x-3=0$ $\boxed{x=3}$ "double root"	14) $x^2+12=7x$ $x^2-7x+12=0$ $(x-4)(x-3)=0$ $\boxed{x=4} \quad \boxed{x=3}$

Day 2: Factoring when $a \neq 1$ (Busting the "B")

What if the problem has "a" value that is not equal to 1?

For example, $4x^2+8x+3=0$:

How can we algebraically find where this graph = 0?

The concept of ***un-distributing*** is still the same!!

$$4x^2+8x+3=0$$

In this case we need to find out what multiplies to give us $a \cdot c$ but adds to give us b.

Let's list all the factors of **4 · 3** or **12:**

1 · 12

2 · 6

3 · 4

Day 2

Which one of those sets of factors of 12 also add to give us the b value, 8? 2·6

Rewrite the original equation using an equivalent structure:

$4x^2+8x+3=0$

$4x^2+6x+2x+3=0$

$(4x^2+6x)+(+2x+3)=0$

get GCF of 1st two   get GCF of back two

$2x(2x+3)+1(2x+3)=0$

The backs match so we have like terms so we can combine the fronts!!

$(2x+1)(2x+3)=0$

Remember!! It doesn't matter which order you write the factors in!

Group the first two and last two!

Undistribute what is common to both terms

Create factors out of the repeated factor, and the undistributed factors

Use multiplication (box, distribution, or FOIL) to check that it is equal to what you started with!

* Remember, 1 can be a GCF .. if you can't find a GCF, put "+1" for the GCF NOT zero!

$(2x+1)(2x+3)$
$4x^2+6x+2x+3$
$4x^2+8x+3$ ✓ checks out!

Day 2: Practice when a ≠ 1

1) $2x^2+5x+3=0$

$3\cdot2=6=a\cdot c$
$3+2=5=b$

$2x^2+3x+2x+3=0$
$x \quad x \quad +1 \quad +1$

* Remember, 1 can be a GCF BUT zero cannot

$x(2x+3)+1(2x+3)=0$

$(x+1)(2x+3)=0$

$\boxed{x=-1, -3/2}$

2) $2x^2+9x+10=0$

$5\cdot4=20=a\cdot c$
$5+4=9=b$

$2x^2+5x+4x+10=0$
$x \quad x \quad +2 \quad +2$

$x(2x+5)+2(2x+5)=0$

$(x+2)(2x+5)=0$

$\boxed{x=-2, -5/2}$

3) $3x^2+18x+15=0$

$15\cdot3=45=a\cdot c$
$15+3=18=b$

1·45
3·15
5·9

$3x^2+15x+3x+15=0$
$3x \quad 3x \quad +3 \quad +3$

$3x(x+5)+3(x+5)=0$

$(3x+3)(x+5)=0$

$3(x+1)(x+5)=0$

• ~~3=0~~
• $x+1=0$
$-1 \quad -1$
$x+5=0$
$-5 \quad -5$

3=0 doesn't make sense, so cross it out!

$\boxed{x=-1, -5}$

4) $3x^2+13x=10$

$3x^2+13x-10=0$

$15\cdot-2=-30=a\cdot c$
$15+-2=13=b$

$3x^2+15x-2x-10=0$
$3x \quad 3x \quad -2 \quad -2$

* Remember, a GCF can be negative. If 3rd term of the 4 in the factoring by grouping step is negative, you usually need a negative GCF

$3x(x+5)-2(x+5)=0$

$(3x-2)(x+5)=0$

$\boxed{x=2/3, -5}$

Day 2 Practice - Solve the Quadratics

Let's DO #7 Together

Solve by Factoring

*watch the verb!

1. $x^2 + 5x - 24 = 0$

$(x+8)(x-3)=0$

$x+8=0 \rightarrow$
$x-3=0 \rightarrow$ $\boxed{x=-8,3}$

2. $x^2 - 3x - 28 = 0$

$(x-7)(x+4)=0$

$x-7=0$ $x+4=0$

$\boxed{x=7}$ $\boxed{x=-4}$

3. $x^2 + 3x = 18$

$-18 \quad -18$

$x^2+3x-18=0$

$(x+6)(x-3)=0$

$x+6=0$ $x-3=0$

$\boxed{x=-6}$ $\boxed{x=3}$

4. $4x^2 = -3x$

$+3x \quad +3x$

$4x^2+3x=0$

$x(4x+3)=0$

$x=0$ $4x+3=0$

$\boxed{x=0}$ $4x=-3$

$\boxed{x=-3/4}$

5. $4x^2 + 7x = 2$

$8 \cdot -1 = -8$

$8 + -1 = 7$

$4x^2+7x-2=0$

$4x^2+8x-1x-2=0$

$4x(x+2)-1(x+2)=0$

$(4x-1)(x+2)=0$

$4x-1=0$ $\boxed{x=1/4}$

$x+2=0$ $\boxed{x=-2}$

6. $6x^2 + 6 = -13$

$-6 \quad -6$

$\frac{6x^2}{6}=\frac{-19}{6}$

$x^2=\frac{-19}{6}$

$\sqrt{x^2}=\pm\sqrt{-19/6}$

$x=\pm\sqrt{-19/6}$

2 imaginary solutions

if $\ominus$ sign under $\sqrt{}$, then you have 2 imaginary solutions

Solve with Square Roots

7. $x^2 = 81$

$x^2=81$

$\sqrt{x^2}=\pm\sqrt{81}$

$x=9,-9$ or $x=\pm 9$

*When you put a $\sqrt{}$ in the problem you must write $\pm$ in front of it because $9 \cdot 9 = 81$ BUT ALSO $-9 \cdot -9 = 81$

8. $x^2 = 25$

$\sqrt{x^2}=\sqrt{25}$

$x=\pm\sqrt{25}$

$x=5,-5$ or $\boxed{x=\pm 5}$

9. $3x^2 - 21 = 45$

$\frac{3x^2}{3}=\frac{66}{3}$

$x^2=22$

$\sqrt{x^2}=\pm\sqrt{22}$

$\boxed{x=\pm\sqrt{22}}$

10. $5x^2 + 5 = 0$

$\frac{5x^2}{5}=\frac{-5}{5}$

$x^2=-1$

$\sqrt{x^2}=\pm\sqrt{-1}$

$x=\pm\sqrt{-1}$

2 imaginary solutions

11. $6x^2 + 72 = 0$

$-72 \quad -72$

$\frac{6x^2}{6}=\frac{-72}{6}$

$\sqrt{x^2}=\sqrt{-12}$

$x=\pm\sqrt{-12}$

2 imaginary solutions

12. $-3x^2 - 9 = 0$

$\frac{-3x^2}{-3}=\frac{9}{-3}$

$x^2=-3$

$\sqrt{x^2}=\pm\sqrt{-3}$

$x=\pm\sqrt{-3}$

2 imaginary solutions