Factoring Quadratics

To factor quadratics (3-term polynomials with a degree of 2), we’re going to use the grouping process we used for polynomials. In order to do that, though, we have to change the 3-term quadratic into a 4-term quadratic

[ must become ]

Here’s how…

Step 1: Find two numbers that multiply to and add to .

Step 2: Split *bx* into two pieces using these two numbers.

**EXAMPLE**: Factor

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | |  |  |  |
| Factors of -24: | | Do they add to +2? | Use these to split up the  *bx* term |  |
|  |  |  |  |
|  |  |  |  |
| *I found it, so I can stop!* | |  |  |

Step 3: Factor out what you can from the group of the first two terms & from the group of the second two terms

**The goal is to make what's left in each group the same!**

**EXAMPLE (cont’d)**:

|  |  |  |  |
| --- | --- | --- | --- |
| Group 1: |  | Group 2: |  |
| They’re both divisible by —factor it out! |  | They’re both divisible by —factor it out! |  |

*Notice that when I factor them, I end up with for both groups!*

Step 4: Do the opposite of distribution, and factor the matching group out.

|  |  |  |
| --- | --- | --- |
| **EXAMPLE**  Factor.    Factors of 6:  1 & 6 YES!!! | 1. Factor. | 2. Factor. |
| **EXAMPLE**  Factor.    Factors of -30:  1 & -30 NO -1 & 30 NO  2 & -15 NO -2 & 15 NO  3 & -10 NO -3 & 10 YES!!! | 3. | 4. |

Factor and solve for the zeros.

|  |  |  |
| --- | --- | --- |
| **EXAMPLE**    Factors of 28:  -1 & -28 NO  -2 & -14 YES!!!  *We could factor +7 from the end…*  *BUT we want the (group) to match…*  *So, factor out -7 instead!* | 5. | 6. |
| **EXAMPLE**    Factors of 28:  -1 & 180 NO 1 & -180 NO  -9 & 20 YES!!! | 7. | 8. |
| 9. | 10. | 11. |