Solving Quadratic Equations & Factoring

❖ Solving Quadratic Equations by Factoring

- Set the equation – written in standard form – equal to 0
  - $ax^2 + bx + c = 0$
- Factor
- Use the Zero-Product Property:
  - Let a and b be real numbers. If $ab = 0$, then $a = 0$ or $b = 0$.
  - Set each factor equal to 0 and solve.

❖ Factoring Flow Chart

ALWAYS LOOK FOR A COMMON FACTOR FIRST!

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THEN LOOK AT THE NUMBER OF TERMS

↙ ↓ ↘

BINOMIAL | **FOUR TERMS** | **TRINOMIAL**

↓ ↓ ↓

IS IT A DIFFERENCE OF TWO SQUARES? | FACTOR BY GROUPING | IS IT A PERFECT SQUARE TRINOMIAL?

↙ ↘ | | ↙ ↘

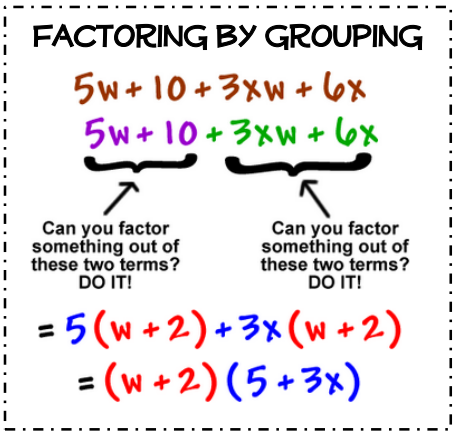
NO | YES | | YES | NO

↓ | | ↓ | ↓

| $a^2 - b^2 = (a + b)(a - b)$ | | $a^2 + 2ab + b^2 = (a + b)^2$
$a^2 - 2ab + b^2 = (a - b)^2$ | DEFOIL

❖ DEFOIL – Factoring Trinomials: $ax^2 + bx + c$

- Multiply the first and last terms
- Find the factors (of the product in step 1) that add up to be the middle term
- Replace the middle term with these factors
- Factor by grouping
  - Group the first two terms & the last two terms
  - Factor out the common factor of each group
  - Write as a product of two binomials



Solving Quadratic Equations & Factoring

❖ Solving an Easy Quadratic Equation: $x^2 + bx + c = 0$

- Set the equation – written in standard form – equal to 0
- Find the factors of c that add up to be the middle term b
- Write as a product of two binomials: $(x \pm \#)(x \pm \#)$
- Set each factor equal to 0 and solve

  - An example:

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

-24	
$8 \,\&\, -3$	5

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

$$x + 8 = 0 \quad x - 3 = 0$$

$$x = -8 \text{ or } x = 3$$

FIND THE FACTORS OF C THAT ADD UP THE TO BE THE MIDDLE TERM B

WRITE AS A PRODUCT OF TWO BINOMIALS

SET EACH FACTOR EQUAL TO 0 & SOLVE

❖ Solving Any Quadratic Equation: $ax^2 + bx + c = 0$

- Set the equation – written in standard form – equal to 0
- Multiply the first and last terms
- Find the factors (of the product in step 1) that add up to be the middle term
- Replace the middle term with these factors
- Factor by grouping
  - Group the first two terms & the last two terms
  - Factor out the common factor of each group
  - Write as a product of two binomials
- Set each factor equal to zero and solve.

  - An example:

$$3x^2 - 4x - 7 = 0$$

$$3x^2 \cdot (-7) = -21x^2$$

$-21x^2$	
$-7x \,\&\, 3x$	$-4x$

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

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

$$x(3x - 7) + 1(3x - 7)$$

$$(3x - 7)(x + 1)$$

$$3x - 7 = 0 \quad x + 1 = 0$$

$$x = \frac{7}{3} \text{ or } x = -1$$

MULTIPLY THE FIRST AND LAST TERMS

FIND THE FACTORS (OF THE PRODUCT IN STEP 1) THAT ADD UP THE TO BE THE MIDDLE TERM

REPLACE THE MIDDLE TERM WITH THESE FACTORS

FACTOR BY GROUPING

SET EACH FACTOR EQUAL TO 0 & SOLVE