

8.4 Trial and Error, Grouping, and other Methods to Factor and Solve Quadratic Equations

▼ Factoring a binomial as a greatest common factor

▼ Example 1

Factor the following expression completely

$$y(y + 1) + 6(y + 1)$$

▼ Example 2

Factor the following expression completely

$$2z(11z + 1) + 11z + 1$$

▼ Factoring by grouping

1. Make two groups of 2.
2. Factor the greatest common factor from each group
3. Factor the common binomial from each group

▼ Example 1: Factor

Factor the following expression completely

$$z^2 - 5z + 7z - 35$$

▼ Example 2: Factor

Factor the following expression completely

$$x^3 + 8x^2 + 3x + 24$$

▼ Example 3: Factor

Factor $xy + 2y - 3x - 6$

▼ Example 4: Solve

Find all real solutions to the equation

$$m^2 - 9 = 3m^3 - 27m$$

▼ Factoring a Quadratic when $a \neq 1$

▼ Factoring a Quadratic by Grouping or $a \cdot c$ method or Box or Crazy X.

$$ax^2 + bx + c$$

1. Find a pair of numbers whose product is ac and whose sum is b .
2. Rewrite the one middle term as two terms using the pair of numbers.
3. Factor by grouping
 - a. Make two groups of 2.
 - b. Factor the greatest common factor from each group
 - c. Factor the common binomial from each group

▼ Example 1

Factor the following expression completely

$$5w^2 + 11w - 12$$

▼ Example 2

Factor the following expression completely

$$2w^2 - 11w - 21$$

▼ Factoring a quadratic by Trial and Error or Guess and Check

$$ax^2 \pm bx \pm c = (\text{---} \pm \text{---})(\text{---} \pm \text{---})$$

1. Find factors of a and find factors of c
2. Make a Guess: Chose a pair of factors of a and a pair of factors of c .
 - a. Same Signs: If c is positive the pair of numbers must have the same sign. If b is positive, both numbers are positive and if b is negative, both numbers are negative.
 - b. Different Signs: If c is negative the pair of numbers must have opposite signs. If b is positive, the larger number in the pair is positive. If b is negative, the larger number in the pair is negative.
3. Check your Guess: Multiply the outer terms and the inner terms. Add them to see if it matches the middle term. If it matches, you have factored the quadratic. If it doesn't, go back to step 2 and make another guess.
 - a. Be Organized with your guesses. Leave the pair the same and change the other pair. Once you have tried all possibilities with one pair you can eliminate it.

▼ Example 1

Factor completely

$$2w^2 + 17w + 35$$

▼ Example 2

Factor the following expression completely.

$$2w^2 + 17w + 21$$

▼ Example 1: Factor

Factor the following expression completely

$$48w^2 - 68w + 24$$

▼ Example 2: Factor

Factor the following expression completely

$$3x^4 - 30x^3 + 27x^2$$

▼ Example 3: Solve

$$2x^2 + 13x - 45 = 0$$

▼ Example 4: Solve

$$20w^2 + 1w - 1 = 0$$

▼ Example 5: Solve

$$4x^2 = -15x + 4$$

▼ Example 6: Solve

$$6w^3 - w^2 - w = 0$$

▼ Example 7: Word Problem Example

A large explosion causes wood and metal debris to rise vertically into the air with an initial velocity of 112 feet per second. The polynomial

$$112t - 16t^2$$

gives the height of the falling debris above the ground, in feet, t seconds after the explosion.

- a. Use the given polynomial to find the height of the debris 3 seconds after the explosion
- b. Factor the given polynomial completely