Factoring by GCF (Greatest Common Factor)

GCF (Greatest Common Factor) is the largest term that divides evenly into all given terms without remainders

Examples
  a. $8x^2 + 16$
      1. $8x^2 + 8 \times 2$
      2. $8(x^2 + 2)$

  b. $-x^3 + x^2 - 3x$

  c. $12xy^3 + 18x^2y^2$

  d. $25a^4b^2 - 15a^3b^3 + 35a^2b^2$

Factoring the Difference of Two Squares

$$a^2 - b^2 = (a - b)(a + b)$$

Examples
  a. $x^2 - 25$
      1. $x^2 - 5^2$
      2. a = x and b = 5
      3. $x^2 - 5^2 = (x - 5)(x + 5)$

  b. $4a^2 - 49b^2$

c. $-y^2 + 81$

d. $a^2b^2 - 4c^4$

Factoring Trinomials: ax^2 + bx + c

AC Method/Grouping Method
1. a x c = ac
2. Find all integer pairs that give the product **ac**
3. Among the pairs above, find the integer pair that gives the sum **b**: p + q = b
4. Rewrite the trinomial as ax^2 + **px + qx** + c
5. Split the polynomial into groups
6. Factor GCF from each group
7. Express as a product of two binomials

Examples
a. $2x^2 - 3x - 14$
   1. a x c = 2 x (-14) = -28
   2. -28 = (1, -28) (-1, 28) (2, -14) (-2, 14) (4, -7) (-4, 7)
   3. (4, -7) -> 4 + (-7) = -3
   4. $2x^2 - 3x - 14 = 2x^2$ + 4x + (-7x) − 14
   5. $(2x^2 + 4x) + (-7x - 14)$
   6. 2x(x + 2) + (-7)(x + 2)
   7. (x + 2)[2x + (-7)] = (x + 2)(2x − 7)

Math Behind Step 7: Let's say (x + 2) = A
   1. Substitute (x+2) with A: 2x(x + 2) + (-7)(x + 2) = 2x x A + (-7) x A
   2. Express as a product of two binomials: 2x x A + (-7) x A = A(2x + 7)
   3. Substitute A with (x + 2): A(2x + 7) = (x + 2)(2x + 7)

b. $6a^2 + 8a - 14$

c. $n + 3n^2 - 2$

d. $64p^2 + 32pq - 21q^2$