Factoring

- Reversal of Distributing
- $w(2w-1) = 2w^2 - w$

  factored: $w(2w-1)$ — simplified: $2w^2 - w$

- Factor: 63

  $63 = 7 \cdot 3^2$

  simplified: 63 — factored: $7 \cdot 3^2$

  $63 \rightarrow 7 \cdot 9 \rightarrow 7 \cdot 3 \cdot 3$

- Greatest Common Factor (GCF)

  └ Biggest Number and the most variables that all terms share

Ex: $27y^4 + 18y^2$

$27y^4 = 3 \cdot 3 \cdot 3 \cdot y \cdot y \cdot y \cdot y$

$18y^2 = 2 \cdot 3 \cdot 3 \cdot y \cdot y$

GCF: $3 \cdot 3 \cdot y \cdot y = \boxed{9y^2}$

$9y^2(3y^2 + 2) = 27y^4 + 18y^2$

factored | simplified

Find GCF:

$24a^5b^2c^{10}$ and $60a^2b^2c^7$

$\boxed{12a^2b^2c^7}$

Factor out the GCF:

$$\frac{7v^2t^2}{7vt} + \frac{21vt^2}{7vt} - \frac{14vt}{7vt}$$

$$\boxed{7vt(vt + 3t - 2)}$$

GCF

$$120x^7y^{12} - 220x^{10}y^6 + 36x^{14}y^5$$

$$4x^7y^5(30y^7 - 55x^3y + 9x^7)$$

GCF

$$7a - 10x + 41c$$

GCF: 1 → Prime Expression

Ex:

$$2x(5y+1) + 3(5y+1)$$

Two Terms

$$(5y+1)(2x+3)$$

GCF

Factor by Grouping

- 4 or more terms
- Terms are put into groups, then those groups are factored

↳ Each group must have a common factor

Ex: $ax + bx + ay + by$ → 4 terms

$= (ax + bx) + (ay + by)$

$= x(a+b) + y(a+b) \rightarrow$ 2 terms

GCF

$= (a+b)(x+y) \rightarrow$ 1 term

Factored

$ax + ay + bx + by$

Ex: $4xy + 8y + 3x + 6$

$(4xy + 8y) + (3x + 6)$

$4y$ 3

$4y(x+2) + 3(x+2)$

$(x+2)(4y+3)$

Ex: $24xy - 18x + 4y - 3$

$(24xy - 18x) + (4y - 3)$

$6x(4y - 3) + 1(4y - 3)$

$(4y - 3)(6x + 1)$

Additive Inverse

↳ switching the order of a binomial by factoring out a negative (-1)

↳ Have: $(6 - x)$ Need: $(x - 6)$

Ex $(6-x) = -(x-6)$

$= -(-6+x)$

Def: $(c-x) = -(x-c)$

Ex: $(2mk - 12m) + (42 - 7k)$

$2m(k-6) + 7(6-k)$

$2m(k-6) - 7(k-6)$

$(k-6)(2m-7)$

Solving Equations by Factoring

- Set equation equal to zero (Everything on one side)

- Factor
  - two polynomials multiplied together equal zero

$a \cdot b = 0$ where a and b are polynomials

either a or b must be zero,

+ Zero Product Property (ZPP)

- If $a \cdot b = 0$, then $a = 0$ or $b = 0$, or both equal zero.

Ex: $\overbrace{(x-6)}^{a}\overbrace{(x+1)}^{b} = 0$

$x - 6 = 0$ OR $x + 1 = 0$

$+6 \quad +6$ $\quad -1 \quad -1$

$\boxed{x = 6}$ or $\boxed{x = -1}$