A Factoring Flow Chart - TRUST the Process

ALWAYS look for a **Greatest Common Factor (GCF)** that can be factored out first !

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Check the number of terms – is it 2 or 3 ?

2 terms

3 terms

Check: is it a <u>difference of squares</u> ?

If yes, factor:

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

If no, you are done.

Is it a <u>perfect square trinomial?</u>

If yes, factor:
$a^2 + 2ab + b^2 = (a + b)^2$
$a^2 - 2ab + b^2 = (a - b)^2$

If no, continue...
$ax^2 + bx + c$

a = 1

a ≠ 1

X-Factor Method

X-Factor + GROUPING
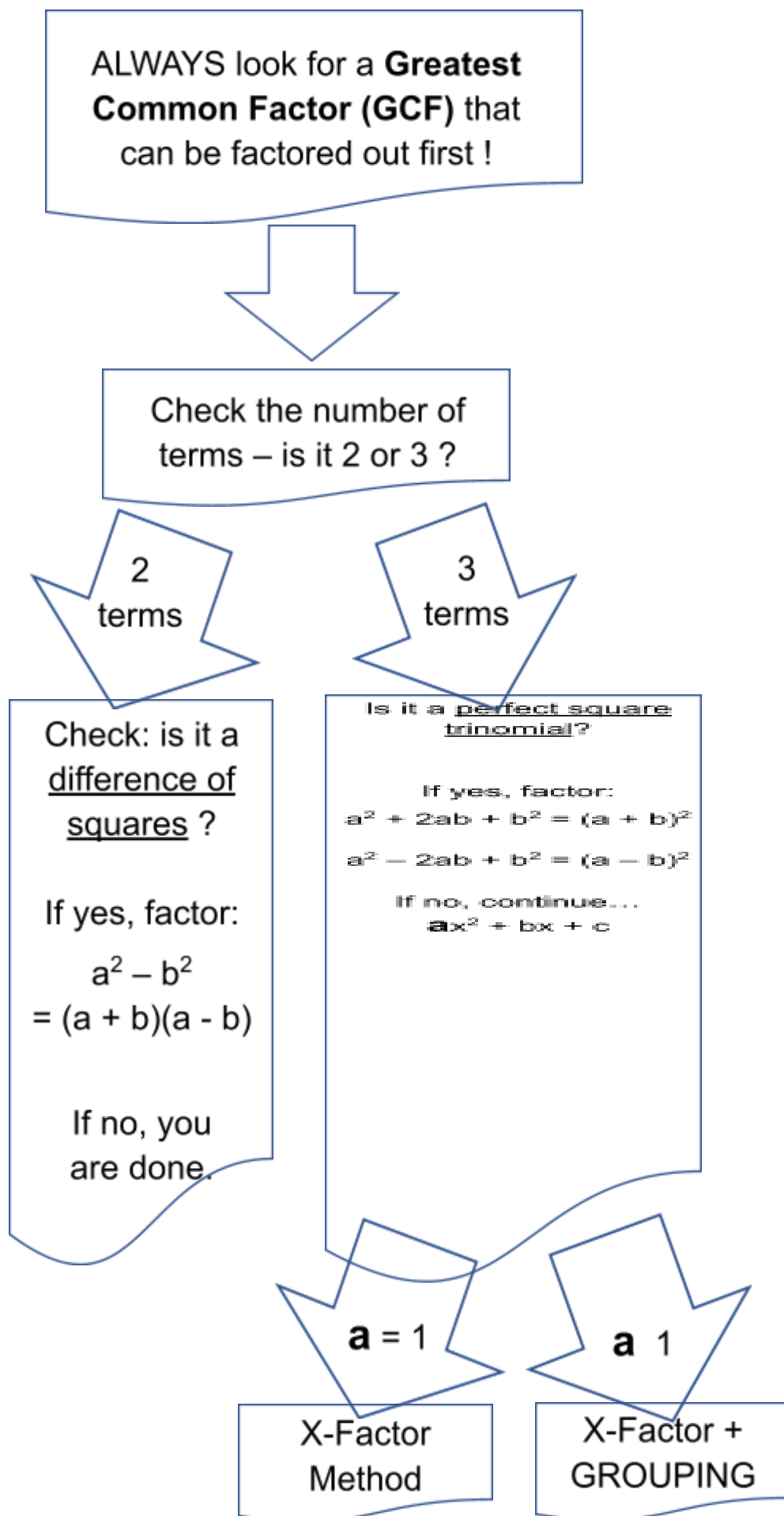
Use the flow chart to factor the following expressions:

$3x^2 - 24$

$-3x^3 - 90x$

$4x^5 - 8x^3$

$x^2 + 6x + 9$

$x^2 + 10x + 24$

$x^2 - 25$

$6x^3 + 12x^2 - 18x$

$2x^2 - 7x - 15$

$x^2 + 8x + 20$

$3x^2 - 12x + 12$

$x^2 + 49$

$5x^2 - 30x - 80$

$3x^3 - 48x$

$12x^2 - 28x + 8$

$x^2 + 4x - 21$

$4x^3 + 40x^2 + 100x$

Factoring Practice: Continue to use the Flow Chart to factor all below.

* two BONUS factoring shortcuts:

Sum of Two Cubes

$$x^3 + y^3 = (x+y)(x^2 - xy + y^2)$$

Difference of Two Cubes

$$x^3 - y^3 = (x-y)(x^2 + xy + y^2)$$

1. $9x^2 - 4$

2. $x^3 + 64$

3. $200x^2 - 50$

4. $7x^3 + 14x^2 + 7x$

5. $2x^3 - 4x^2 - 3x - 6$

6. $3x^2 + 81$

7. $2x^2 - x - 3$

8. $x^2 + 3x - 10$

9. $x^2 + 8x + 16$

10. $4x^2 - 20x + 25$

11. $2x^2 - 5x + 2$

12. $3x^2 - 11x - 20$

13. $x^3 - 3x^2 - 5x + 15$ 14. $3x^4 - 11x^2 - 20$ 15. $4x^2 - 49$

16. $x^2 - 18x + 81$ 17. $16x^2 - 81$ 18. $2x^3 - 3x^2 + 4x - 6$

19. $8x^3 - 27y^3$ 20. $x^4 - 4x^2 + 3$ 21. $12abx^2 + 6a^2bx^3 - 30ab^3$

SOLUTIONS:

$$3x^2 - 24 = 3(x^2 - 8)$$

$$-3x^3 - 90x = -3x(x^2 + 30)$$

$$4x^5 - 8x^3 = 4x^3(x^2 - 2)$$

$$x^2 + 6x + 9 = (x + 3)^2$$

$$x^2 + 10x + 24 = (x + 6)(x + 4)$$

$$x^2 - 25 = (x + 5)(x - 5)$$

$$6x^3 + 12x^2 - 18x = 6x(x^2 + 2x - 3) = 6x(x + 3)(x - 1)$$

$$2x^2 - 7x - 15 = 2x^2 - 10x + 3x - 15 = (2x + 3)(x - 5)$$

$$x^2 + 8x + 20 = prime, cannot\ be\ factored$$

$$3x^2 - 12x + 12 = 3(x^2 - 4x + 4) = 3(x - 2)^2$$

$$x^2 + 49 = prime, cannot\ be\ factored$$

$$5x^2 - 30x - 80 = 5(x^2 - 6x - 16) = 5(x - 8)(x - 2)$$

$$3x^3 - 48x = 3x(x^2 - 16) = 3x(x + 4)(x - 4)$$

$$12x^2 - 28x + 8 = 4(3x^2 - 7x + 2) = 4(3x - 1)(x - 2)$$

$$x^2 + 4x - 21 = (x - 3)(x + 7)$$

$$4x^3 + 40x^2 + 100x = 4x(x^2 + 10x + 25) = 4x(x + 5)^2$$

1. $(3x+2)(3x-2)$
2. $(x+4)(x^2-4x+16)$
3. $50(2x+1)(2x-1)$
4. $7x(x+1)(x+1)$
5. Prime
6. $3(x^2+27)$
7. $(2x-3)(x+1)$
8. $(x+5)(x-2)$
9. $(x+4)(x+4)$
10. $(2x-5)(2x-5)$
11. $(x-2)(2x-1)$
12. $(3x+4)(x-5)$
13. $(x^2-5)(x-3)$
14. $(2x+7)(2x-7)$
15. $(3x^2+4)(x^2-5)$
16. $(x-9)(x-9)$
17. $(4x+9)(4x-9)$
18. $(x^2+2)(2x-3)$
19. $(2x-3y)(4x^2+6xy+9y^2)$
20. $(x^2-3)(x+1)(x-1)$
21. $6ab(2x^2+ax^3-5b^2)$