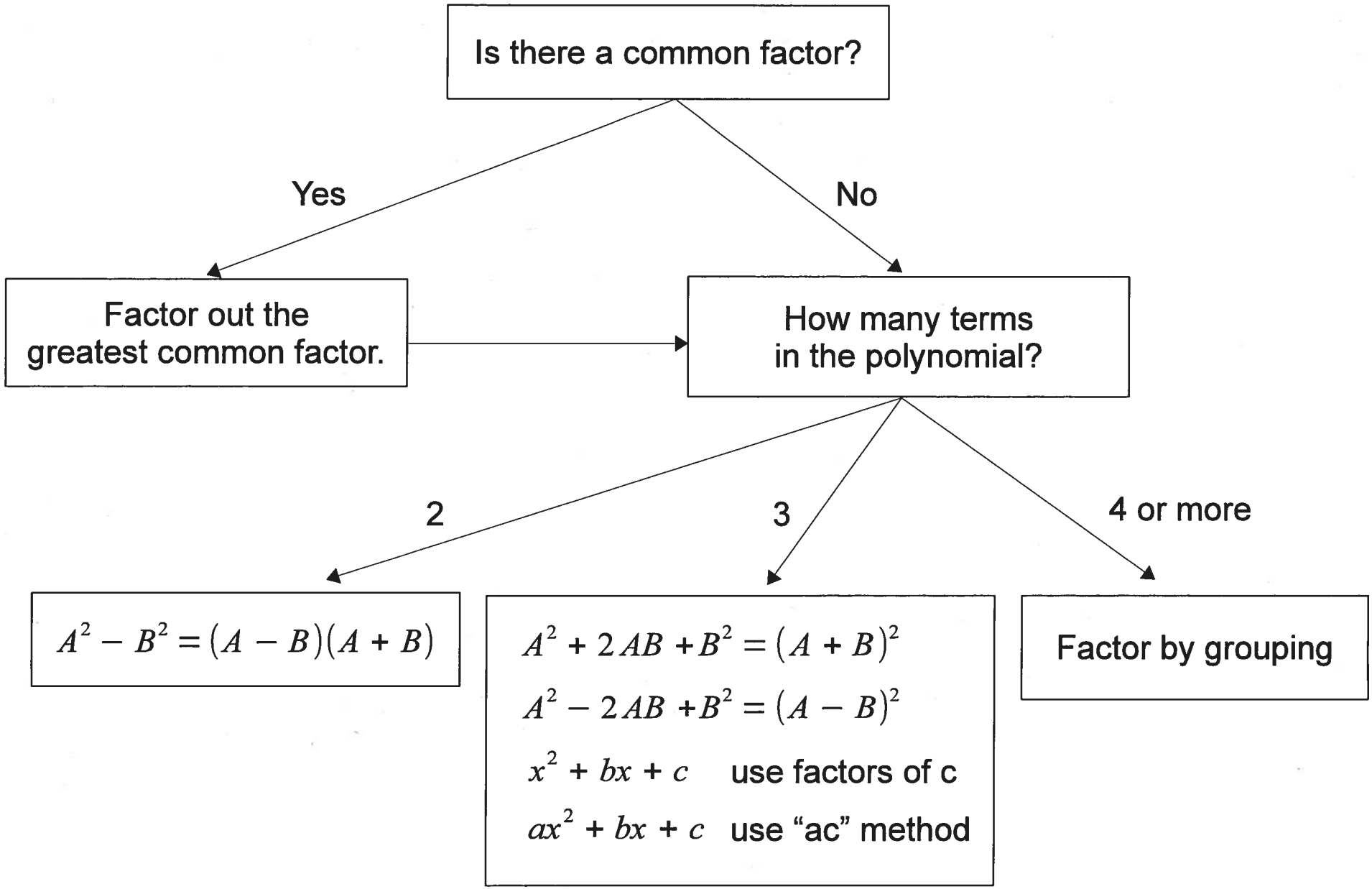
Is there a common factor?
Yes
No
Factor out the greatest common factor.
How many terms in the polynomial?
2
3
4 or more
$A^2 - B^2 = (A - B)(A + B)$
$A^2 + 2AB + B^2 = (A + B)^2$
$A^2 - 2AB + B^2 = (A - B)^2$
$x^2 + bx + c$ use factors of c
$ax^2 + bx + c$ use "ac" method
Factor by grouping

Examples:

a. $3x^3 - 21x^2 + 30x$

$3x(x^2 - 7x + 10)$

$3x(x-5)(x-2)$ done!

b. $4y^5 + 8y^4 + 4y^3$

$4y^3(y^2 + 2y + 1)$

$4y^3(y+1)^2$ done!

$(y+1)(y+1)$
$y^2+y+y+1$ ...

c. $6m^2 + 11m - 10$

$ac = 6(-10)$
$= -60$
15 , -4

$6m^2 + 15m - 4m - 10$

$3m(2m+5) - 2(2m+5)$

$(2m+5)(3m-2)$ done!

difference of squares $A^2 - B^2$

d. $x^4 - 16 = (x^2+4)(x^2-4)$

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

done!

$(x^2)^2 = x^4$

$4^2 = 16$

$(x)^2 = x^2$

$2^2 = 4$

e. $3n^3 - 2n^2 + 6n - 4$

$n^2(3n-2) + 2(3n-2)$

$(3n-2)(n^2+2)$ done!

f. $9t^2 - 30t + 25$ perfect square trinomial

$(3t-5)^2$ done!

$(3t)^2 = 9t^2$

$5^2 = 25$

$(3t-5)(3t-5)$

$9t^2 - 15t - 15t + 25$

☺

g. $16x^2 + 56x + 49$ perfect square trinomial

$(4x+7)^2$

$(4x)^2 = 16x^2$

↑ A

$(7)^2 = 49$

↑ B

$2AB = 2(4x)(7)$

$= 56x$

10.7 Solving Quadratic Equations by Factoring

Zero Product Property: If the product of two or more numbers is equal to zero, then at least one of the numbers must be zero.

$a \cdot b = 0$ implies $a = 0,\ b \neq 0$

$b = 0,\ a \neq 0$

$a = 0$ and $b = 0$

example: $(x-3)(x-4) = 3x - x^2$

- Solve for x
- Step 1: Simplify and set equal to 0

$x^2 - 7x + 12 = 3x - x^2$

$x^2 - 7x + 12 + x^2 - 3x = 3x - x^2 + x^2 - 3x$

$\boxed{2x^2 - 10x + 12 = 0}$ Quadratic!! $ax^2+bx+c=0$

- Step 2: Factor the Quadratic polynomial

$2(x^2 - 5x + 6) = 0$

$2(x-2)(x-3) = 0$

$a \quad b$

- Step 3: Set the factors equal to zero

$x - 2 = 0$ or $x - 3 = 0$

$x = 2$ $\quad$ $x = 3$

$\{2, 3\}$

Check with a graph

Check with substitution

check: $x = 2$ (substitute into original equation)

$$(2-3)(2-4) = 3(2) - (2)^2$$
$$(-1)(-2) = 6 - 4$$
$$2 = 2 \text{ ☺}$$

$x = 3$

$$(3-3)(3-4) = 3(3) - (3)^2$$
$$(0)(-1) = 9 - 9$$
$$0 = 0 \text{ ☺}$$

b. $x^2 - 49 = 0$

$(x-7)(x+7) = 0$ $\quad \{-7, 7\}$

$x - 7 = 0$ or $x + 7 = 0$

$x = 7$ $\quad x = -7$

c. $2x^2 - 5x = 3$

$2x^2 - 5x - 3 = 0$

$ac = 2(-3)$
$= -6$
$-6 \quad +1$

$2x^2 - 6x + x - 3 = 0$

$2x(x-3) + 1(x-3) = 0$

$(x-3)(2x+1) = 0$

$x - 3 = 0$ or $2x + 1 = 0$

$x = 3$ $\quad 2x = -1$

$x = -\frac{1}{2}$

$\{3, -\frac{1}{2}\}$

d. $4x^2 = 12x - 9$

$4x^2 - 12x + 9 = 0$

$(2x - 3)(2x - 3) = 0$ optional

$2x - 3 = 0$ or $2x - 3 = 0$

$2x = 3$

$x = \frac{3}{2}$ $\left\{\frac{3}{2}\right\}$

$(2x)^2 = 4x$
A

$(3)^2 = 9$
B

e. The distance, d, in feet, that an object falls in t seconds is modeled by the formula $d = 16t^2$. If you drop a rock from a cliff 576 ft above the water, how long will it take for the rock to hit the water?

$576 = 16t^2$

$0 = 16t^2 - 576$

$0 = 16(t^2 - 36)$

$0 = 16(t + 6)(t - 6)$

$t + 6 = 0$ or $t - 6 = 0$

$t = -6$ ignore "negative" time

$\boxed{t = 6}$ solution!

It will take 6 seconds for the rock to hit the water.