SUM OR DIFFERENCE OF CUBES

KNOW THIS!   MEMORIZE THIS!

$$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$$

$$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$$

You must know your perfect cubes:

$1^3 = 1$
$2^3 = 8$
$3^3 = 27$
$4^3 = 64$
$5^3 = 125$
$6^3 = 216$
$7^3 = 343$
$8^3 = 512$
$9^3 = 729$
$10^3 = 1000$

Step 1: Write it as the sum/diff of cubes

Step 2: Figure out your "a" and "b"

Step 3: Write down the appropriate formula

Step 4: Substitute in your "a" and "b" and simplify

Ex. 1 $8x^3 + 27$

$$(2x)^3 + (3)^3$$

$$a = 2x \quad b = 3$$

$$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$$

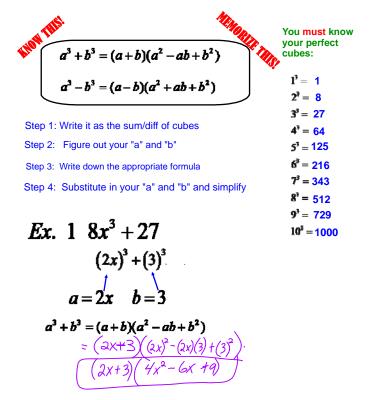$$= (2x+3)\left((2x)^2 - (2x)(3) + (3)^2\right)$$

$$(2x+3)(4x^2 - 6x + 9)$$

Ex. 2 $125x^3 - 8y^3$

$$(5x)^3 - (2y)^3$$

Step 1: Write it as the sum/diff of cubes

$$a = 5x \qquad b = 2y$$

Step 2: Figure out your "a" and "b"

$$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$$

Step 3: Write down the appropriate formula

$$(5x - 2y)\left((5x)^2 + (5x)(2y) + (2y)^2\right)$$

$$(5x - 2y)(25x^2 + 10xy + 4y^2)$$

Step 4: Substitute in your "a" and "b" and simplify

Ex. 3 $64x^6 - 1$

$(4x^2)^3 - (1)^3$ Step 1: Write it as the sum/diff of cubes

$a = 4x^2, \; b = 1$ Step 2: Figure out your "a" and "b"

$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$ Step 3: Write down the appropriate formula

$= (4x^2 - 1)((4x^2)^2 + (4x^2)(1) + (1)^2)$ Step 4: Substitute in your "a" and "b" and simplify

$(4x^2 - 1)(16x^4 + 4x^2 + 1)$

$(2x+1)(2x-1)(16x^4 + 4x^2 + 1)$

not done yet —
$a^2 - b^2$
diff. of squares

FOUR TERMS
- GROUPING OR PUT IN A BOX

put 4 terms in Box & factor

4. $x^2 - ax + cx - ac$

$(x+c)(x-a)$

	x	$-a$
x	x^2	$-ax$
$+c$	$+cx$	$-ac$

5. $2a^2 + ab + 2ac + bc$ by grouping

$a(2a+b) + c(2a+b)$

$(2a+b)(a+c)$

6. $3x^2 + xy - 3xz - yz$

$(3x+y)(x-z)$

	$3x$	y
x	$3x^2$	xy
$-z$	$-3xz$	$-yz$