

## Factor the Sum and Difference of Two Cubes

1. Formulas for factoring the Sum and Difference of two cubes:

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

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

Note: Keep in mind that the middle of the trinomial is always opposite the sign of the binomial

2. Identification of Sum and Difference in the given problem:

	$a^3+b^3$	or	$a^3-b^3$
Ex:	↓ $x^3+8$		↓ $27x^3-8$
	↓ $x^3+2^3$		↓ $(3x)^3-2^3$
let:	↓ ↓		↓ ↓
	$a=x$ $b=2$		$a=3x$ $b=2$
	(The cubed roots of each term in the original)		

Sample of perfect cubes:

1	x <sup>3</sup>	27x <sup>3</sup>
8	x <sup>3</sup> y <sup>3</sup>	8x <sup>3</sup>
27	x <sup>6</sup>	64x <sup>3</sup> y <sup>3</sup>
64	x <sup>9</sup>	125x <sup>6</sup> y <sup>3</sup>
125	The exponents must be divisible by 3 for a perfect cube	

3. Match it to the sum or difference formulas:

Use your "a" and "b" values to match "a" and "b" in the formula you have chosen:

Factor:  $x^3+8$

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

$\uparrow \uparrow \quad \uparrow \uparrow \quad \uparrow \uparrow \uparrow$   
 (cube roots    x   2)    (x+2) (x<sup>2</sup>-2x+2<sup>2</sup>)

So:  $x^3+8 = x^3+2^3 = (x+2)(x^2-2x+4)$

Note: the middle sign of the trinomial is opposite of the binomial

3. To prove your answer is right multiply  $(x+2)(x^2-2x+4) \rightarrow$  using the distributive property :

$$\begin{array}{c} \leftrightarrow \\ (x+2)(x^2-2x+4) \\ \leftrightarrow \end{array}$$

So:  $x^3-2x^2+4x+2x^2-4x+8$       Simplify by canceling like terms

You get  $x^3+8$  which proves that your answer is correct.