

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

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

<p>Ex: $x^3 + 8$</p> <p style="text-align: center;">↓</p> <p style="text-align: center;">$x^3 + 2^3$</p> <p style="text-align: center;">↓ ↓</p> <p>let: $a=x$ $b=2$</p>	<p style="text-align: center;">$a-b$</p> <p style="text-align: center;">↓</p> <p>Ex: $27x^3 - 8$</p> <p style="text-align: center;">↓</p> <p style="text-align: center;">$(3x)^3 - 2^3$</p> <p style="text-align: center;">↓ ↓</p> <p>let: $a=3x$ $b=2$</p>
(The cubed roots of each term in the original)	

Sample of perfect cubes:

1	x ³	27x ³
8	x ³ y ³	8x ³
27	x ⁶	64x ³ y ³
64	x ⁹	125x ⁶ y ³
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: $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$

↑ ↑ ↑ ↑ ↑ ↑ ↑

(cube roots x 2) (x+2) (x²-2x+2²)

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

3. To prove your answer is right multiply $(x+2)(x^2 - 2x + 4)$ 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.