

Complete the given operation.

$$1. \frac{(1 + \sqrt[3]{x})}{\sqrt[3]{x}} \cdot \frac{(\sqrt[3]{x^2})}{\sqrt[3]{x^2}}$$

$$\frac{1\sqrt[3]{x^2} + \sqrt[3]{x^3}}{\sqrt[3]{x^3}}$$

$$\frac{\sqrt[3]{x^2} + x}{x}$$

$$2. (2 + \sqrt{3})(7 - \sqrt{5})$$

$$14 - 2\sqrt{5} + 7\sqrt{3} - \sqrt{15}$$

Zero as an Exponent

Anything to the zero power = 1

EXCEPT

0^0 → cannot equal 0 and 1

So, 0^0 = undefined

$$1000^0 = \underline{1} \quad (1/4)^0 = \underline{1}$$

$$0^0 = \underline{\text{undef}}$$

$$(-2)^0 = \underline{1}$$

Negative Exponents

<p>Switch to the <u>opposite</u> position</p> <p><u>neg</u> numerator switches to <u>denominator</u></p> <p><u>neg</u> denominator switches to <u>numerator</u></p> <p>***Everything else stays where it was***</p>	<p>$\frac{2}{4^{-3}}$ → $2^1 \cdot 4^3$</p> <p>$\frac{3x^{-3}y^7}{x^3}$ → $\frac{3y^7}{x^3}$ $3^1 \cdot x^{-3} \cdot y^7$</p>
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Multiplying Like Bases

When you have like bases,
Add the exponents.

$$\begin{aligned}(-3)^{-8} * (-3)^{12} &= (-3)^{-8+12} = (-3)^4 \\ 4^4 * 4^2 &= 4^{4+2} = 4^6 \\ 10^4 * 10^8 &= 10^{4+8} = 10^{12}\end{aligned}$$

$$\begin{aligned}4^4 \cdot 4^2 \\ 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4\end{aligned}$$

Raising a Power to a Power

When raising a power to a Power,
multiply the exponents.

$$\begin{aligned}(8^2)^4 &= 8^{2 \cdot 4} = 8^8 \\ (4^{-3})^4 &= 4^{-3 \cdot 4} = 4^{-12} = \frac{1}{4^{12}} \\ (5^{-2})^{-3} &= 5^{-2 \cdot -3} = 5^6\end{aligned}$$

$$\begin{aligned}(8^2)^4 &= (8 \cdot 8)^4 \\ &= (8 \cdot 8)(8 \cdot 8)(8 \cdot 8)(8 \cdot 8)\end{aligned}$$

Raising a Product to a Power

When raising a Product to a power, raise each factor to the power, then simplify.

$$(5x)^2 = (5')^2 (x')^2 = 5^2 x^2 = 25x^2$$

$$(8x^3)^{-4} = (8')^{-4} (x^3)^{-4} = 8^{-4} x^{-12} = \frac{1}{8^4 x^{12}}$$

$$(3x^3y^4)^3 = (3')^3 (x^3)^3 (y^4)^3 = 3^3 x^9 y^{12} = 27x^9y^{12}$$

Dividing Powers with the same base

When dividing powers with the
same base,
Subtract the exponents

$$\frac{3^5}{3^2} = 3^{5-2} = 3^3 = 27$$

$$\frac{x^6 y^5}{x^4 y^8} = x^{6-4} y^{5-8} = x^2 y^{-3} = \frac{x^2}{y^3}$$

$$\frac{x^4}{x^8} = x^{4-8} = x^{-4} = \frac{1}{x^4}$$

Raising a Quotient to a Power

When raising a quotient to a power, raise each factor to the exponent, then simplify and divide.

$$\left(\frac{x^4}{x^3}\right)^5 = \frac{(x^4)^5}{(x^3)^5} = \frac{x^{20}}{x^{15}} = x^{20-15} = x^5$$

