Exponents :

When to add: $x^2 \cdot x^3 = x^5$

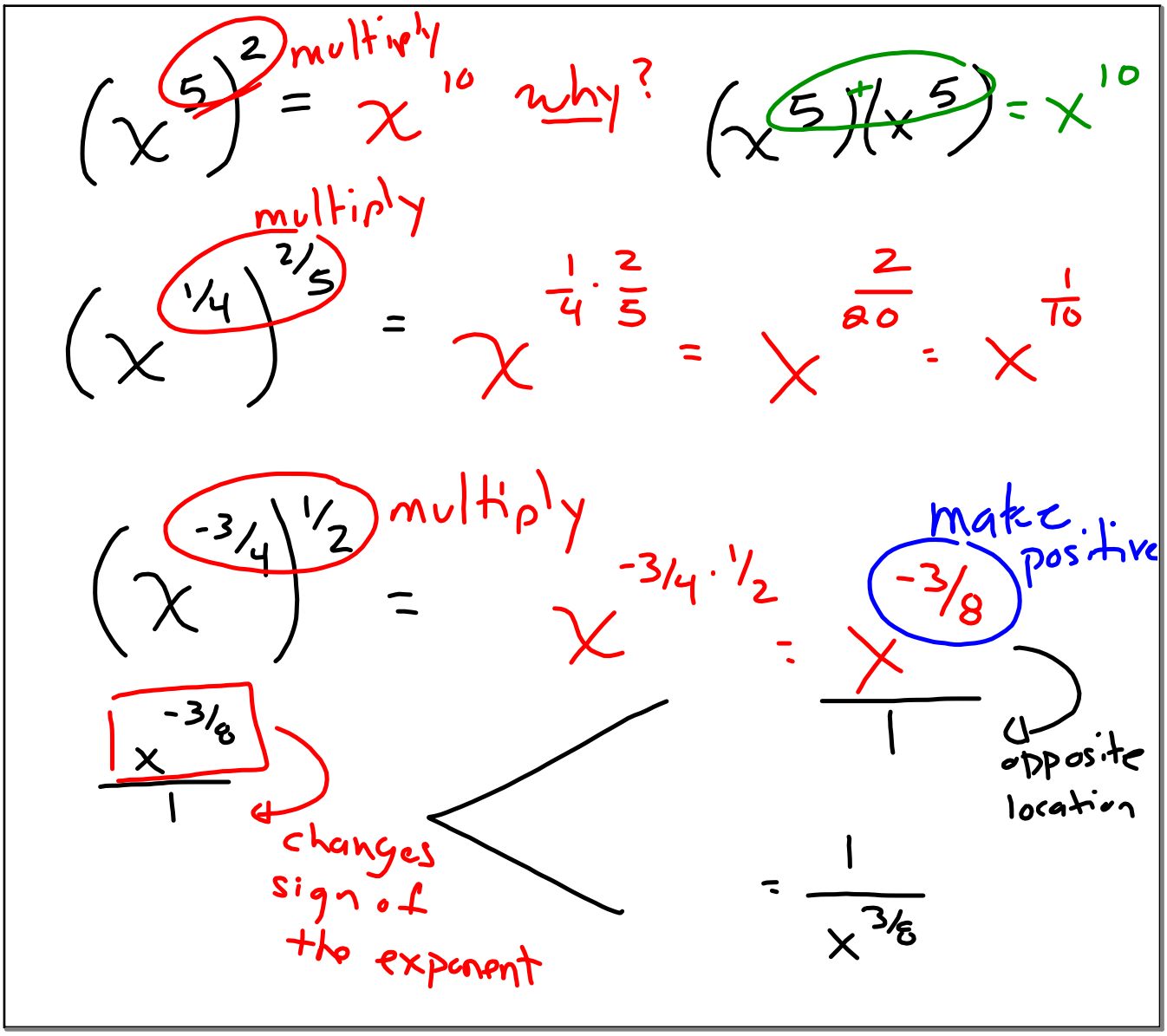
When to subtract: $\frac{x^{3-2}}{x^2} = x$

Negative exponents:

$x^{-3} = \frac{1}{x^3}$

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

$\frac{x^2}{x^{3-2}} = \frac{1}{x}$


multiply
why?
multiply
multiply
make positive
changes sign of the exponent
opposite location

$\sqrt[2]{x^1} = (x)^{\frac{1}{2}}$ $\sqrt{16} = (16)^{1/2}$

$\sqrt[3]{x^1} = (x)^{\frac{1}{3}}$ $\sqrt[2]{x^3} = (x)^{3/2}$

$\sqrt[4]{x^1} = (x)^{\frac{1}{4}}$

Example

$\sqrt{x} \cdot \sqrt[3]{x} = (x)^{1/2} \cdot (x)^{1/3}$

$x^{1/2 + 1/3} = x^{1/2 + 1/3} = x^{5/6}$

$\sqrt[6]{x^5}$

$3 \cdot \frac{1}{2} + \frac{1}{3} \cdot 2$

$3 \cdot \frac{1}{2} + \frac{1}{3} \cdot 2$

$\frac{3}{6} + \frac{2}{6} = \frac{5}{6}$

$$\frac{(x^2 \cdot x^3)^{1/2}}{(x^{-3} \cdot x^2)^5} = \frac{(x^5)^{1/2}}{(x^{-1})^5}$$

$$= \frac{x^{5/2-(-5)}}{x^{-5}}$$

$$= x^{5/2 + 5/1}$$

$$= x^{5/2 + 10/2} = x^{15/2}$$

Jan 6-8:53 AM

Exponents

When to add

compare

$x^2 \oplus x^3 = x^5$

$2x \oplus 3x = 5x$

When to subtract

$\frac{x^3}{x^2} = x^{3-2} = x$

$\frac{x^2}{x^3} = x^{2-3} = \frac{1}{x}$

When to multiply

$(x^2)^3 = x^{2 \cdot 3} = x^6$ multiply

Why?

$(x^2)(x^2)(x^2) = x^6$

Practice

$x^3 \cdot x^7 = x^{10}$ why? multiply same base then add exp.

$\frac{x^{7}}{x^{3}} = x^{4}$ Subtract smaller exp. from larger exp.

$\frac{x^{3}}{x^{7}} = \frac{1}{x^{4}}$ Subtract smaller exp from larger exp, but need place holder in numerator.

$$\frac{(x^3 \cdot x^5)^3}{(x^{-4} \cdot x^2)^6} = \frac{(x^8)^3}{(x^{-2})^6} = \frac{x^{24}}{x^{-12}}$$

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$$\frac{x^{24-(-12)}}{x^{-12}} = x^{24+12} = x^{36}$$

Negative Exponents

* move to opposite location *

$\frac{x^{-2}}{1}$ move to the bottom

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

$\frac{1}{x^{-2}}$ move to the top

$= x^2$

Jan 6-9:49 AM

Practice

move to make positive

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

move to make positive

$$\frac{y^{2+3}}{x^{5+4}} = \frac{y^{5}}{x^{9}}$$

$$\frac{x^{-4}y^{2-(-3)}}{x^{5-(-4)}} = \frac{y^{5}}{x^{9}}$$

$\sqrt[2]{x^1} = x^{?} \Rightarrow x^{\frac{1}{2}}$

$\sqrt[3]{x^1} = x^{?} \Rightarrow x^{\frac{1}{3}}$

$\sqrt[4]{x^1} = x^{?} \Rightarrow x^{\frac{1}{4}}$

Example:

$\sqrt[5]{x^3} = x^{3/5}$

$\sqrt[2]{x} \cdot \sqrt[3]{x} = x^{1/2} \cdot x^{1/3} = x^{1/2 + 1/3} = x^{3/6 + 2/6}$

$= x^{5/6}$

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Jan 6-12:11 PM

Exponents

$x^{2} \cdot x^{5} = x^{2+5} = x^{7}$

When to add

$2x + 5x = 7x$

$x \cdot x + x \cdot x \cdot x \cdot x \cdot x$

When to subtract

$\frac{x^{2}}{x^{5}} = \frac{1}{x^{5-2}} = \frac{1}{x^{3}}$

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

When to multiply multiply

$(x^{2})^{5} = x^{2 \cdot 5} = x^{10}$

Why?

$(x^{2})(x^{2})(x^{2})(x^{2})(x^{2}) = x^{10}$

When to move to the top or bottom

numerator denominator

x^{-2} opposite location $= \frac{x^{-2}}{} = \frac{1}{x^{2}}$

$\frac{3}{x^{-2}}$ move to opposite location $= 3x^{2}$

Jan 6-12:37 PM

Practice

$$\frac{x^{5-3}}{x^{3}} \times x^{2}$$

$$\frac{x^{-3}y^{2-(-7)}}{x^{5-(-3)}y^{-7}}$$

$$\frac{y^{2-(-7)}}{x^{5-(-3)}} \Rightarrow \frac{y^{2+7}}{x^{5+3}}$$

$$\frac{y^{9}}{x^{8}}$$

opposite location

$$\frac{x^{-3}y^{2}}{x^{5}y^{-7}}$$

opposite location

$$\frac{y^{2+7}}{x^{5+3}} = \frac{y^{9}}{x^{8}}$$

$$\frac{(x^3 \cdot x^4)^5}{(y^{-4} \cdot y^2)^6} = \frac{(x^7)^5}{(y^{-2})^6}$$

x^7 (over $x^3 \cdot x^4$); y^{-2} (over $y^{-4} \cdot y^2$)

multiply (exponents 7 and 5)

multiply (exponents -2 and 6)

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$$= \frac{x^{35}}{y^{-12}}$$

make positive

$$= x^{35} y^{12}$$

$\sqrt[2]{x^1} = x^{?} = x^{\frac{1}{2}}$ $\sqrt{16} = (16)^{1/2}$

$\sqrt[3]{x^1} = x^{?} = x^{\frac{1}{3}}$

$\sqrt[4]{x^1} = x^{?} = x^{\frac{1}{4}}$

$\sqrt[5]{x^2} = x^{2/5}$

$\frac{3\cdot1}{3\cdot2} + \frac{1\cdot2}{3\cdot2}$

$3/6 + 2/6 = 5/6$

$\sqrt{x} \cdot \sqrt[3]{x}$

$x^{1/2} \cdot x^{1/3} = x^{1/2+1/3} = x^{5/6} = \sqrt[6]{x^5}$

$$\frac{(x^2 y)^{1/2}}{(x^3 y^{-4})^{3/8}} = x^{2\cdot 1/2} \cdot y^{1/2} = x y^{1/2}$$

$$= x^{\frac{3}{1}(3/8)} \cdot y^{-4(3/8)} = x^{9/8} y^{-3/2}$$

$$-\frac{4}{1} \cdot \frac{3}{8_2} = -\frac{3}{2}$$

$$\frac{x^{1} y^{1/2}}{x^{9/8} y^{-3/2}}$$

$$\frac{y^{1/2-(-3/2)}}{x^{9/8-8/8}} = \frac{y^{4/2}}{x^{1/8}} = \frac{y^2}{x^{1/8}}$$