Multiplying Higher Roots

Product Rule for Radicals

If $\sqrt[n]{a}$ and $\sqrt[n]{b}$ are real numbers and n is a positive integer greater than 1, then $\sqrt[n]{ab} = \sqrt[n]{a}\sqrt[n]{b}$

Concept: The nth root of a product is equal to the product of the nth roots of the factors.

CAUTION: This rule only applies to radicals with the **same** index. $\sqrt[4]{7} \cdot \sqrt[3]{10} \neq \sqrt[?]{70}$

$\sqrt[4]{7} \cdot \sqrt[4]{10} = \sqrt[4]{70}$ $\qquad$ $\sqrt[4]{7} \cdot \sqrt[4]{5x^2} = \sqrt[4]{35x^2}$

TRY:

$\sqrt[4]{5} \cdot \sqrt[4]{6}$ $\qquad$ $\sqrt[4]{8} \cdot \sqrt[4]{5x^3}$

Root Chart $\sqrt[n]{a} = b$

$b \rightarrow$	2	3	4	5	6	7	8	9	10	11	12	13	14	15
$\sqrt{a}$	4	9	16	25	36	49	64	81	100	121	144	169	196	225
$\sqrt[3]{a}$	8	27	64	125	216				1000					
$\sqrt[4]{a}$	16	81	256	625					10000					
$\sqrt[5]{a}$	32	243	1024											

Radicals Simplified

An expression $\sqrt[n]{p}$ is simplified if:

- The radicand does not contain any factors, other than 1, that are perfect *n*th powers.
- The radicand does not contain any variables with exponents greater than *n*.
- No radicals remain in the denominator of a fraction.