

Root exercises (ver.241011)

[Exponent Rules]

Choose the solutions from the word bank below the table and place them in the right position in the “Solution” column. Then choose the type of exponent rules you have used from the word bank and place them in the right position in the “Type of rules” column.

You may choose the same solution and the type of rules multiple times.

“Solution”の空欄に正しい答えを選択肢から選んで記入しなさい。。また、“Type of rules”に使用した指数の四則計算法を選択肢から選んで記入しなさい。選択肢は同じものを複数回使用しても良い。

Example	Solution	Type of rules
$x^6 \cdot x^3$	= x^9	Addition of the exponents
$\frac{x^6}{x^3}$	= x^3	Subtraction of the exponents
$(x^6)^3$	= x^{18}	Multiplication of the exponents
$\sqrt[3]{x^6}$	= x^2	Division of the exponents
$x^{\frac{6}{3}}$	= x^2	Division of the exponents
x^{-6}	= $\frac{1}{x^6}$	Inverse of the exponents

x^2	x^3	x^9	x^{18}	$\frac{1}{x^6}$
Addition		Subtraction		Multiplication
Division		Inverse		

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[Roots Basics]

Calculate (Simplify) the following root expressions. 根号の中を簡単にしなさい。

$$1) \sqrt{x \cdot x \cdot x \cdot x \cdot x \cdot x} = \sqrt{\boxed{x \cdot x} \cdot \boxed{x \cdot x} \cdot \boxed{x \cdot x}} = x \cdot x \cdot x = x^3$$

$$2) \sqrt{x^6} = x^{6 \div 2} = x^3$$

$$3) \sqrt{3 \cdot 3 \cdot 3 \cdot 3} = \sqrt{\boxed{3 \cdot 3} \cdot \boxed{3 \cdot 3}} = 3 \cdot 3 = 9$$

$$4) \sqrt{3^4} = 3^{4 \div 2} = 3^2 = 9$$

$$5) \sqrt{x \cdot x \cdot x \cdot y \cdot y} = \sqrt{\boxed{x \cdot x} \cdot x \cdot \boxed{y \cdot y}} = xy\sqrt{x}$$

$$6) \sqrt{x^3 y^2} = x^{3 \div 2} y^{2 \div 2} = x\sqrt{x} \cdot y = xy\sqrt{x}$$

$$7) \sqrt{2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 3} = \sqrt{\boxed{2 \cdot 2} \cdot 2 \cdot \boxed{3 \cdot 3} \cdot 3} = 2 \cdot 3\sqrt{2 \cdot 3} = 6\sqrt{6}$$

$$8) \sqrt{2^3 \cdot 3^3} = 2^{3 \div 2} 3^{3 \div 2} = 2\sqrt{2} \cdot 3\sqrt{3} = 6\sqrt{6}$$

$$9) \sqrt{16} = \sqrt{4^2} = 4$$

$$10) \sqrt{32} = \sqrt{4 \cdot 4 \cdot 2} = 4\sqrt{2}$$

$$11) \sqrt{216} = \sqrt{2^3 \cdot 3^3} = 2 \cdot 3\sqrt{2 \cdot 3} = 6\sqrt{6}$$

$$\begin{array}{r} 2) \overline{216} \\ 2) \overline{108} \\ 2) \overline{54} \\ 3) \overline{27} \\ 3) \overline{9} \\ 3 \end{array}$$

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$$12) \sqrt[3]{x \cdot x \cdot x} = \sqrt[3]{\boxed{x \cdot x \cdot x}} = x$$

$$13) \sqrt[3]{x^3} = x^{3 \div 3} = x$$

$$14) \sqrt[3]{2 \cdot 2 \cdot 2} = \sqrt[3]{\boxed{2 \cdot 2 \cdot 2}} = 2$$

$$15) \sqrt[3]{2^3} = 2^{3 \div 3} = 2$$

$$16) \sqrt[3]{x \cdot x \cdot x \cdot x} = \sqrt[3]{\boxed{x \cdot x \cdot x} \cdot x} = x \sqrt[3]{x}$$

$$17) \sqrt[3]{x^4} = x^{4 \div 3} = x \sqrt[3]{x}$$

$$18) \sqrt[3]{2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 3} = \sqrt[3]{\boxed{2 \cdot 2 \cdot 2} \cdot \boxed{3 \cdot 3 \cdot 3}} = 2 \cdot 3 = 6$$

$$19) \sqrt[3]{2^3 \cdot 3^3} = 2^{3 \div 3} \cdot 3^{3 \div 3} = 2 \cdot 3 = 6$$

$$20) \sqrt[3]{216} = \sqrt[3]{2^3 \cdot 3^3} = 2 \cdot 3 = 6$$

$$\begin{array}{r} 2) \overline{216} \\ 2) \overline{108} \\ 2) \overline{54} \\ 3) \overline{27} \\ 3) \overline{9} \\ 3 \end{array}$$

$$21) \sqrt[3]{2^2 \cdot 5^3} = 2^{2 \div 3} \cdot 5^{3 \div 3} = 5 \sqrt[3]{2^2} = 5 \sqrt[3]{4}$$

$$22) \sqrt[3]{500} = \sqrt[3]{2^2 \cdot 5^3} = 5 \sqrt[3]{4}$$

$$\begin{array}{r} 2) \overline{500} \\ 2) \overline{250} \\ 5) \overline{125} \\ 5) \overline{25} \\ 5 \end{array}$$

[Fractional exponents and roots]

Fill in the blank boxes. 空欄を埋めなさい。

$$1) \quad \sqrt[3]{x} = x^{\frac{1}{\textcolor{red}{3}}}$$

$$2) \quad x^{\frac{1}{5}} = \sqrt[5]{x}$$

$$3) \quad \sqrt[4]{2} = \textcolor{red}{2}^{\frac{1}{4}}$$

$$4) \quad 2^{\frac{1}{6}} = \sqrt[6]{\textcolor{red}{2}}$$

$$5) \quad \sqrt[3]{x^2} = x^{\frac{2}{\textcolor{red}{3}}}$$

$$6) \quad x^{\frac{2}{5}} = \sqrt[5]{x^{\textcolor{red}{2}}}$$

$$7) \quad \sqrt[6]{2^3} = \textcolor{red}{2}^{\frac{3}{6}}$$

$$8) \quad 2^{\frac{4}{7}} = \sqrt[7]{\textcolor{red}{2}^4}$$

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Calculate (Simplify) the following root expressions. 根号の中を簡単にしなさい。

$$1) \ 2^{\frac{8}{4}} = 2^{8 \div 4} = 2^2 = \mathbf{4}$$

$$2) \ \sqrt[4]{2^8} = 2^{8 \div 4} = 2^2 = \mathbf{4}$$

$$3) \ 256^{\frac{1}{4}} = 2^{8 \times \frac{1}{4}} = 2^2 = \mathbf{4}$$

$$\begin{array}{r} 2) \ 256 \\ \hline 2) \ 128 \\ \hline 2) \ 64 \\ \hline 2) \ 32 \\ \hline 2) \ 16 \\ \hline 2) \ 8 \\ \hline 2) \ 4 \\ \hline 2 \end{array}$$

$$4) \ \sqrt[4]{256} = \sqrt[4]{2^8} = 2^{8 \div 4} = 2^2 = \mathbf{4}$$

$$5) \ 3^{\frac{5}{3}} = 3^{5 \div 3} = \mathbf{3^3 \sqrt{3^2}}$$

$$6) \ \sqrt[3]{3^5} = 3^{5 \div 3} = \mathbf{3^3 \sqrt{3^2}}$$

$$7) \ 243^{\frac{1}{3}} = 3^{5 \times \frac{1}{3}} = \mathbf{3^3 \sqrt{3^2}}$$

$$\begin{array}{r} 3) \ 243 \\ \hline 3) \ 81 \\ \hline 3) \ 27 \\ \hline 3) \ 9 \\ \hline 3 \end{array}$$

$$8) \ \sqrt[3]{243} = \sqrt[3]{3^5} = \mathbf{3^3 \sqrt{3^2}}$$