

key

2D Rational Indices

Date

2/2

Period

Write each expression in radical form.

1) $6^{\frac{1}{2}} = \sqrt[2]{6}$

2) $10^{\frac{1}{4}} = \sqrt[4]{10}$

3) $7^{\frac{1}{3}} = \sqrt[3]{7}$

4) $4^{\frac{2}{3}} = 4^{2 \cdot \frac{1}{3}} = \sqrt[3]{4^2}$

5) $4^{\frac{5}{3}} = 4^{5 \cdot \frac{1}{3}} = \sqrt[3]{4^5}$

6) $5^{\frac{7}{4}} = 5^{7 \cdot \frac{1}{4}} = \sqrt[4]{5^7}$

Show conversion to radical form and simplify.

7) $25^{\frac{1}{2}} = \sqrt{25} = 5$

8) $64^{\frac{1}{2}} = \sqrt{64} = 8$

9) $216^{\frac{1}{3}} = \sqrt[3]{216} = 6$

10) $64^{\frac{1}{3}} = \sqrt[3]{64} = 4$

11) $25^{\frac{3}{2}} = 25^{3 \cdot \frac{1}{2}} = \sqrt{25^3} = 125$

12) $49^{\frac{3}{2}} = 49^{3 \cdot \frac{1}{2}} = \sqrt{49^3}$

Simplify.

13) $(x^6)^{\frac{1}{2}} = x^3$

14) $(27a^9)^{\frac{1}{3}} = \sqrt[3]{27} \cdot a^{\frac{9}{3}} = 3a^3$

15) $(49x^4)^{\frac{1}{2}} = \sqrt{49} x^{\frac{4}{2}} = 7x^2$

16) $(81n^8)^{\frac{3}{4}} = \sqrt[4]{81^3} n^{\frac{24}{4}} = 27n^6$

17) $(x^6)^{\frac{5}{3}} = x^{\frac{30}{3}} = x^{10}$

18) $(81v^4)^{\frac{3}{2}} = 81^{\frac{3}{2}} v^{\frac{4 \cdot 3}{2}} = \sqrt{81^3} v^6 = 729v^6$

19) $(64n^6)^{\frac{5}{3}} = 64^{\frac{5}{3}} n^{\frac{30}{3}} = \sqrt[3]{64^5} n^{10}$

20) $(64m^6)^{\frac{4}{3}} = 64^{\frac{4}{3}} \cdot m^{6 \cdot (\frac{4}{3})} = \sqrt[3]{64^4} \cdot m^8 = 256m^8$

$1024n^{10}$

$$4 \cdot \frac{3}{3}$$

Simplify. Your answer should contain only positive exponents with no fractional exponents in the denominator.

$$21) x^{\frac{4}{6}} \cdot 4x^{\frac{3}{6}}$$

$$4x^{\frac{4}{6} + \frac{3}{6}}$$

$$4x^{\frac{7}{6}}$$

$$22) a^{-2} \cdot 4a^{\frac{2}{3}}$$

$$4a^{-\frac{4}{3}}$$

$$\frac{4}{a^{\frac{4}{3}}} \cdot \frac{a^{\frac{2}{3}}}{a^{\frac{2}{3}}} = \frac{4a^{\frac{2}{3}}}{a^{\frac{6}{3}}}$$

$$= \frac{4a^{\frac{2}{3}}}{a^2}$$

$$23) x^{-4} \cdot \left(x^{-\frac{5}{4}}\right)^{\frac{1}{3}} = x^{-4} \cdot x^{-\frac{5}{12}}$$

$$\frac{1}{x^{\frac{53}{12}}} \cdot \frac{x^{\frac{7}{12}}}{x^{\frac{7}{12}}} = x^{-\frac{53}{12}}$$

$$= \frac{x^{\frac{7}{12}}}{x^5}$$

$$24) \left(x^{\frac{1}{2}}\right)^2 \cdot x^{\frac{7}{4}}$$

$$x^1 \cdot x^{\frac{7}{4}}$$

$$x^{\frac{4}{4}} \cdot x^{\frac{7}{4}} = x^{\frac{11}{4}}$$

$$25) \frac{3x^2 \cdot 2x^2}{2x^{\frac{2}{3}}}$$

$$\frac{6x^4}{2x^{\frac{2}{3}}}$$

$$3 \cdot \frac{x^{\frac{10}{3}}}{x^{\frac{2}{3}}} = \frac{3x^{\frac{10}{3}}}{x^{\frac{2}{3}}} = 3x^{\frac{10}{3}}$$

$$26) \frac{3n^{\frac{1}{3}}}{4n^{\frac{4}{3}} \cdot 2n^{\frac{3}{4}}}$$

$$\frac{3n^{\frac{1}{3}}}{8n^{\frac{7}{4}}} = \frac{3n^{\frac{4}{12}}}{8n^{\frac{21}{12}}} = \frac{3}{8n^{\frac{17}{12}}}$$

$$\frac{3}{8n^{\frac{17}{12}}} \cdot \frac{n^{\frac{7}{12}}}{n^{\frac{7}{12}}} = \frac{3n^{\frac{7}{12}}}{8n^2}$$

$$27) \frac{4a}{2a^{\frac{6}{3}} \cdot a^{\frac{1}{3}}} = \frac{4a}{2a^{\frac{7}{3}}} \cdot \frac{a^{\frac{2}{3}}}{a^{\frac{2}{3}}}$$

$$\frac{2a^{\frac{5}{3}}}{a^3} = \frac{2a^{\frac{2}{3}}}{a^2}$$

$$28) \frac{4v^{-\frac{5}{3}}}{4vb^{-1}} = \frac{v^{-\frac{5}{3}}}{v^1 \cdot v^{\frac{5}{3}}} = \frac{1}{v^{\frac{5}{3}} \cdot v^{\frac{5}{3}}}$$

$$= \frac{v^{\frac{1}{3}}}{v^{\frac{10}{3}}} = \frac{v^{\frac{1}{3}}}{v^2}$$

$$29) \frac{yx^{-\frac{3}{2}}}{\left(xy^{-\frac{2}{3}}\right)^2}$$

$$30) \frac{\left(\frac{4}{y^3}\right)^{-2}}{x^{\frac{1}{2}}y^{\frac{2}{3}} \cdot \left(x^{\frac{1}{2}}y^{\frac{7}{4}}\right)^4}$$

$$31) \left(\frac{x}{x^{-\frac{1}{2}}y^{\frac{2}{3}} \cdot x^{\frac{1}{4}}y^{\frac{5}{4}}}\right)^{\frac{1}{2}}$$

$$32) \frac{\left(x^{-\frac{1}{2}}y^{\frac{1}{2}}\right)^{\frac{2}{3}}}{x^{\frac{2}{3}}y^{-\frac{1}{2}} \cdot y^{\frac{4}{3}}}$$

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

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

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

$$30) \frac{\left(y^{\frac{4}{3}}\right)^{-2}}{x^{\frac{1}{2}} y^{\frac{2}{3}} \left(x^{\frac{1}{2}} y^{\frac{7}{4}}\right)^4}$$

$$= \frac{y^{-\frac{8}{3}}}{x^{\frac{1}{2}} y^{\frac{2}{3}} \left(x^2 y^{\frac{28}{4}}\right)}$$

$$= \frac{1}{x^{\frac{1}{2}} y^{\frac{2}{3}} y^{\frac{8}{3}} x^2 y^7}$$

$$= \frac{1}{x^{\frac{5}{2}} y^{\frac{31}{3}}} \cdot \frac{x^{\frac{1}{2}} y^{\frac{2}{3}}}{x^{\frac{1}{2}} y^{\frac{2}{3}}}$$

$$= \frac{x^{\frac{1}{2}} y^{\frac{2}{3}}}{x^3 y^{11}}$$

$$31) \left(\frac{x}{x^{-\frac{1}{2}} y^{-\frac{2}{3}} \cdot x^{\frac{1}{4}} y^{\frac{5}{4}}} \right)^{\frac{1}{2}}$$

$$= \frac{x^{\frac{1}{2}}}{x^{-\frac{1}{4}} y^{-\frac{2}{6}} \cdot x^{\frac{1}{8}} y^{\frac{5}{8}}}$$

$$= \frac{x^{\frac{2}{4}} x^{\frac{1}{4}} y^{\frac{2}{6}}}{x^{\frac{1}{8}} y^{\frac{5}{8}}}$$

$$= \frac{x^{\frac{6}{8}} y^{\frac{2}{3}} \cdot x^{\frac{2}{8}} y^{\frac{2}{8}}}{x^{\frac{1}{8}} y^{\frac{5}{8}}} = \frac{9}{24}$$

$$= \frac{x^{\frac{13}{8}} y^{\frac{17}{24}}}{x y}$$

$$= \frac{x \cdot x^{\frac{5}{8}} y^{\frac{17}{24}}}{x \cdot y}$$

32)

$$\begin{aligned} & \frac{\left(x^{-\frac{1}{2}} y^{\frac{1}{2}}\right)^{\frac{2}{3}}}{x^{\frac{2}{3}} y^{-\frac{1}{2}} \cdot y^{\frac{4}{3}}} = \frac{x^{-\frac{1}{3}} y^{\frac{1}{3}}}{x^{\frac{2}{3}} y^{-\frac{1}{2}} y^{\frac{4}{3}}} \\ & = \frac{x^{-\frac{1}{3}} y^{\frac{1}{3}}}{x^{\frac{2}{3}} y^{\frac{1}{3}}} \cdot \frac{y^{\frac{1}{2}}}{y^{\frac{2}{3}}} \\ & = \frac{y^{\frac{1}{6}}}{x^{\frac{1}{3}} y^{\frac{1}{3}}} \cdot \frac{y^{\frac{2}{3}}}{y^{\frac{2}{3}}} \\ & = \frac{y^{\frac{1}{6}}}{x y^{\frac{2}{3}}} \\ & = \frac{y^{\frac{1}{6}}}{x y^{\frac{2}{3}}} \\ & = \frac{y^{\frac{1}{6}}}{x y^{\frac{2}{3}}} \end{aligned}$$

$$\frac{y^{\frac{1}{6}}}{x y^{\frac{2}{3}}}$$

Answers to 2D Rational Indices (ID: 1)

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|-------------------------|--|--|-----------------------------------|
| 1) $\sqrt{6}$ | 2) $\sqrt[4]{10}$ | 3) $\sqrt[3]{7}$ | 4) $(\sqrt[3]{4})^2$ |
| 5) $(\sqrt[3]{4})^5$ | 6) $(\sqrt[4]{5})^7$ | 7) 5 | 8) 8 |
| 9) 6 | 10) 4 | 11) 125 | 12) 343 |
| 13) x^3 | 14) $3a^3$ | 15) $7x^2$ | 16) $27n^6$ |
| 17) x^{10} | 18) $729v^6$ | 19) $1024n^{10}$ | 20) $256m^8$ |
| 21) $4x^{\frac{7}{6}}$ | 22) $\frac{4a^{\frac{2}{3}}}{a^2}$ | 23) $\frac{x^{\frac{7}{12}}}{x^5}$ | 24) $x^{\frac{11}{4}}$ |
| 25) $3x^{\frac{10}{3}}$ | 26) $\frac{3n^{\frac{7}{12}}}{8n^2}$ | 27) $\frac{2a^{\frac{2}{3}}}{a^2}$ | 28) $\frac{v^{\frac{1}{3}}}{v^2}$ |
| 29) $\frac{y^2}{x^3}$ | 30) $\frac{y^{\frac{2}{3}}x^{\frac{1}{2}}}{y^{11}x^3}$ | 31) $\frac{y^{\frac{17}{24}}x^{\frac{5}{8}}}{y}$ | 32) $\frac{y^{\frac{1}{2}}}{xy}$ |