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I. Model Problems.
II. Practice
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Web Resources

You Tube Video and Extra practice on
How to Simplify Fractional Exponents

I. Model Problems

To simplify fractional exponents, rewrite the expression as a radical raised to a power. The denominator of the fractional exponent is the root and the numerator is the power.

In other words: $x^{m/n} = \sqrt[n]{x^m} = \left(\sqrt[n]{x}\right)^m$

Example 1 Write $27^{2/3}$ as a radical and simplify.

$27^{2/3} = \left(\sqrt[3]{27}\right)^2$ Rewrite as a radical.

$= 3^2$ Simplify.

$= 9$ Simplify.

The answer is **9.**

Sometimes you need to write a radical expression using a fractional exponent.

Example 2 Write $\sqrt[4]{y^6}$ using a fractional exponent.

$\sqrt[4]{y^6} = y^{6/4}$ Rewrite as a fractional exponent.

$= y^{3/2}$ Simplify.

The answer is **$y^{3/2}$**.

Sometimes there will be many variables in the radicand. Simplify each variable one at a time, then multiply.

Example 3 Simplify $\sqrt[3]{8x^5 y^6 z^{11}}$.

$\sqrt[3]{8x^5 y^6 z^{11}} = \sqrt[3]{8} \cdot \sqrt[3]{x^5} \cdot \sqrt[3]{y^6} \cdot \sqrt[3]{z^{11}}$ Rewrite the expression.

$= 2 \cdot x\sqrt[3]{x^2} \cdot y^2 \cdot z^3 \sqrt[3]{z^2}$ $\qquad$ Simplify.

$= 2xy^2z^3 \cdot \sqrt[3]{x^2z^2}$ $\qquad$ Simplify.

The answer is $2xy^2z^3 \cdot \sqrt[3]{x^2z^2}$.

Practice Problems are on next page

II. Practice

Evaluate.

1. $25^{1/2}$

2. $1000^{2/3}$

3. $121^{3/2}$

4. $\left(\dfrac{4}{9}\right)^{-1/2}$

5. $16^{-5/2}$

6. $(-216)^{-1/3}$

7. $\left(\dfrac{1}{125}\right)^{-1/3}$

8. $49^{-1/2}$

9. $32^{3/5}$

10. $0.04^{1/2}$

Simplify.

11. $\sqrt[3]{a^7}$

12. $\sqrt[5]{z^{11}}$

13. $\sqrt[4]{16c^5d^8}$

14. $\sqrt[3]{27a^3b^5}$

15. $\sqrt[5]{243x^{11}y^8z^{20}}$

16. $\sqrt[3]{8x^5y^6}$

17. $\sqrt[6]{a^4b^8c^{12}}$

18. $\sqrt[3]{40d^5e^6f^4}$

19. $\sqrt[3]{m^{13}n^8p^9}$

20. $\sqrt[5]{64r^{13}s^{15}t^{12}}$

III. Challenge Problems

21. What is the value of $64^{1/12} \cdot 64^{3/12}$?

22. What is the value of $\dfrac{49^{7/2}}{49^{3/2}}$?

23. Correct the Error
There is an error in the student work shown below:

$$\sqrt[3]{24a^3 b^4 c^7} =$$
$$\sqrt[3]{24}\sqrt[3]{a^3}\sqrt[3]{b^4}\sqrt[3]{c^7} =$$
$$= 2ac^2\sqrt[3]{3bc}$$

What is the error? Explain how to solve the problem.

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24. Circle the expression that is greater:

(a) $(-4)^{2/3}$ OR $(-4)^3$

(b) $4^{1/2}$ OR $4^{-1/2}$

IV. Answer Key

1. 5
2. 100
3. 1,331
4. 3/2
5. 1/1024
6. –1/6
7. 5
8. 1/7
9. 8
10. 0.2
11. $a^2 \sqrt[3]{a}$
12. $z^2 \sqrt[5]{z}$
13. $2cd^2 \sqrt[4]{c}$
14. $3ab\sqrt[3]{b^2}$
15. $3x^2 yz^4 \sqrt[5]{xy^3}$
16. $2xy^2 \sqrt[3]{x^2}$
17. $bc^2 \sqrt[6]{a^4 b^2}$
18. $2de^2 f \sqrt[3]{5d^2 f}$
19. $m^4 n^2 p^3 \sqrt[3]{mn^2}$
20. $2r^2 s^3 t^2 \sqrt[5]{2r^3 t^2}$
21. 4
22. 2401
23. The student did not write b on the outside of the radical.
24. (a) $(-4)^{2/3}$ (b) $4^{1/2}$