

HW 9-3

1. 4
2. 32
3. $\frac{1}{27}$
4. -8
5. 25
6. $125x^9$
7. $\frac{1}{27x^3}$
8. $\sqrt[5]{5^3}$ or $\sqrt[5]{125}$
9. $5\sqrt[5]{x^3}$
10. $\sqrt[5]{(x+6)}$
11. $x^{\frac{3}{4}}$
12. $7x^{\frac{4}{7}}$
13. $(x+9)^{\frac{5}{4}}$
14. $x^{\frac{5}{9}}$
15. $x^{\frac{35}{36}}$
16. $x^{\frac{5}{12}}$
17. $b^{\frac{2}{3}}$
18. $x^{\frac{7}{24}}$
19. $x^{\frac{2}{35}}$
20. $y^{\frac{11}{30}}$
21. $x^{\frac{1}{4}}$
22. 1
23. $\frac{3}{\sqrt{x^3}}$ or $\frac{3}{(\sqrt{x})^3}$

Jan 26-2:04 PM

Name _____

Alg 2 HW 6-9 3

Simplify. Write your answers as fractions, if necessary.

1. $64^{\frac{1}{3}} = 4$
2. $16^{\frac{5}{4}}$
 $= (\sqrt[4]{16})^5$
 $= 2^5 = 32$
3. $81^{-\frac{3}{4}}$
 $= \frac{1}{(\sqrt[4]{81})^3}$
 $= \frac{1}{3^3} = \frac{1}{27}$
4. $(-32)^{\frac{3}{5}}$
 $= (\sqrt[5]{-32})^3$
 $= (-2)^3$
 $= -8$
5. $\left(-\frac{1}{125}\right)^{-\frac{2}{3}}$
 $= (-125)^{\frac{2}{3}}$
 $= (\sqrt[3]{-125})^2 = (-5)^2 = 25$
6. $(25x^6)^{\frac{3}{2}}$
 $= (\sqrt{25x^6})^3$
 $= (5x^3)^3 = 125x^9$
7. $\left(\frac{1}{9x^2}\right)^{\frac{3}{2}}$
 $= \left(\sqrt{\frac{1}{9x^2}}\right)^3$
 $= \left(\frac{1}{3x}\right)^3 = \frac{1}{27x^3}$

State each expression as a simplified radical expression.

8. $5^{\frac{3}{5}}$
 $= \sqrt[5]{5^3}$
or
 $\sqrt[5]{125}$
9. $5x^{\frac{3}{5}}$
 $= 5\sqrt[5]{x^3}$
10. $(x+6)^{\frac{1}{5}}$
 $= \sqrt[5]{(x+6)}$

Nov 23-7:58 PM

State each radical expression in exponential form.

$$11. \sqrt[4]{x^3} = x^{3/4}$$

$$12. 7\sqrt[7]{x^4} = 7x^{4/7}$$

$$13. \sqrt[4]{(x+9)^5} = (x+9)^{5/4}$$

Nov 23-7:58 PM

Multiply and simplify. Express your answer with a rational exponent.

$$14. 7^{1/9} \cdot 7^{4/9} = x^{1/9 + 4/9} = x^{5/9}$$

$$15. 10^{2/9} \cdot 10^{3/4} = x^{2/9 + 3/4} = x^{8/36 + 27/36} = x^{35/36}$$

$$16. \sqrt[12]{5} \cdot \sqrt[3]{5} = x^{1/12} \cdot x^{1/3} = x^{1/12 + 1/3} = x^{1/12 + 4/12} = x^{5/12}$$

Divide and simplify.

Express your answer with a rational exponent.

$$17. \frac{b^{7/9}}{b^{1/9}} = b^{6/9} = b^{2/3}$$

$$18. \frac{7^{3/8}}{7^{1/12}} = x^{3/8 - 1/12} = x^{9/24 - 2/24} = x^{7/24}$$

$$19. \frac{\sqrt[5]{11}}{\sqrt[7]{11}} = \frac{x^{1/5}}{x^{1/7}} = x^{1/5 - 1/7} = x^{7/35 - 5/35} = x^{2/35}$$

Simplify. Express your answer with a rational exponent.

$$20. \frac{\sqrt[5]{y}}{y^{1/2}} \cdot y^{2/3} = \frac{y^{1/5}}{y^{1/2}} \cdot y^{2/3} = \frac{y^{1/5} \cdot y^{2/3}}{y^{1/2}} = \frac{y^{6/30} \cdot y^{20/30}}{y^{15/30}} = \frac{y^{26/30}}{y^{15/30}} = y^{11/30}$$

$$21. \frac{\sqrt[3]{x} \cdot x^{1/6}}{(x^2)^{1/8}} = \frac{x^{1/3} \cdot x^{1/6}}{x^{1/4}} = \frac{x^{4/12} \cdot x^{2/12}}{x^{3/12}} = \frac{x^{6/12}}{x^{3/12}} = x^{3/12} = x^{1/4}$$

Nov 23-7:58 PM

22. If $f(x) = 3x^{-\frac{1}{4}}$, find $f(81)$

$$= 3(81)^{-\frac{1}{4}} = 3\left(\frac{1}{81}\right)^{\frac{1}{4}} = 3\sqrt[4]{\frac{1}{81}} = 3 \cdot \frac{1}{3} = 1$$

23. Written without fractional or negative exponents, $3x^{-\frac{3}{2}}$ is equal to

$$3x^{-\frac{3}{2}} = \frac{3}{x^{\frac{3}{2}}} = \frac{3}{\sqrt{x^3}} \text{ or } \frac{3}{(\sqrt{x})^3}$$

Dec 28-10:32 AM

Operations with Fractional Exponents and Simplifying Radical Expressions

Jan 26-1:39 PM

Unit 9 Day 4

Warm-upFind the exact value of $x^{\frac{11}{10}} \cdot x^{\frac{2}{5}} = x^{\frac{11}{10} + \frac{4}{10}} = x^{\frac{15}{10}} = x^{\frac{3}{2}}$

Explain why $27^{\frac{2}{3}}$ equals 9. $27^{\frac{2}{3}} = (\sqrt[3]{27})^2 = 3^2 = 9$
 $\frac{2}{3}$ as an exponent means take the cube root to get 3. Then square 3 to get the answer 9.

Operations with Fractional Exponents and Simplifying Radical Expressions

Write the following expressions as a single term with a rational exponent.

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

b. $\sqrt[3]{x^2} \cdot \sqrt{x^5} = x^{\frac{2}{3}} \cdot x^{\frac{5}{2}} = x^{\frac{4}{6} + \frac{15}{6}} = x^{\frac{19}{6}}$

c. $\sqrt[4]{2a} \cdot \sqrt[3]{2a} = (2a)^{\frac{1}{4}} \cdot (2a)^{\frac{1}{3}} = (2a)^{\frac{3}{12} + \frac{4}{12}} = (2a)^{\frac{7}{12}}$

$m = 2a$

$(2a)^{\frac{3}{12}} \cdot (2a)^{\frac{4}{12}} = m^{\frac{3}{12}} \cdot m^{\frac{4}{12}} = m^{\frac{7}{12}} = (2a)^{\frac{7}{12}}$

Jan 26-1:40 PM

Simplify the following expressions. $\frac{2}{1} - \frac{1}{3}$

a. $\left(\frac{m^2}{m^{\frac{1}{3}}}\right)^{-\frac{1}{2}} = \left(m^{2 - \frac{1}{3}}\right)^{-\frac{1}{2}} = \left(m^{\frac{5}{3}}\right)^{-\frac{1}{2}} = m^{-\frac{5}{6}} = \frac{1}{m^{\frac{5}{6}}}$

b. $\left(\frac{x^2}{x^{\frac{1}{2}}}\right)^{-\frac{1}{3}} = \left(x^{2 - \frac{1}{2}}\right)^{-\frac{1}{3}} = \left(x^{\frac{3}{2}}\right)^{-\frac{1}{3}} = x^{-\frac{3}{2} \cdot \frac{1}{3}} = x^{-\frac{1}{2}} = \frac{1}{x^{\frac{1}{2}}} = \frac{1}{\sqrt{x}}$

come back if time

c. $\frac{\sqrt[3]{x^2 y^5}}{\sqrt[4]{x^3 y^4}} = \frac{x^{\frac{2}{3}} y^{\frac{5}{3}}}{x^{\frac{3}{4}} y^{\frac{4}{4}}} = x^{\frac{2}{3} - \frac{3}{4}} y^{\frac{5}{3} - 1} = x^{\frac{8}{12} - \frac{9}{12}} y^{\frac{5}{3} - \frac{4}{3}} = x^{-\frac{1}{12}} y^{\frac{1}{3}} = \frac{y^{\frac{1}{3}}}{x^{\frac{1}{12}}}$

4. For $x \neq 0$, which expression(s) are equivalent to one divided by the sixth root of x ?

a. $\frac{\sqrt[6]{x}}{\sqrt[3]{x}} = \frac{x^{\frac{1}{6}}}{x^{\frac{2}{3}}} = x^{\frac{1}{6} - \frac{4}{6}} = x^{-\frac{1}{2}} = \frac{1}{\sqrt{x}}$

b. $\frac{x^{\frac{1}{6}}}{x^{\frac{1}{3}}} = x^{\frac{1}{6} - \frac{2}{6}} = x^{-\frac{1}{6}} = \frac{1}{\sqrt[6]{x}}$

c. $x^{-\frac{1}{6}} = \frac{1}{x^{\frac{1}{6}}} = \frac{1}{\sqrt[6]{x}}$

Jan 26-1:42 PM

When written as a radical $\sqrt[n]{b}$ the radicand is b and the index is n . If the index is odd, a negative number can have a negative root. If the index is even, the radicand must be positive to have a real value.

Powers to Memorize:

Base	Power	2	3	4	5
2		4	8	16	32
3		9	27	81	243
4		16	64	256	X
5		25	125	625	X

This chart is on the inside cover of your packet

$$\sqrt[3]{8} = 2, 2 \cdot 2 \cdot 2 = 8$$

$$\sqrt[3]{-8} = -2, -2 \cdot -2 \cdot -2 = -8$$

$$\sqrt{4} = 2i$$

imag

Jan 26-1:43 PM

7. Simplify Identify the index and the radicand.

a. $\sqrt[3]{-27} = -3$ $I=3, r=-27$

b. $\sqrt[4]{16} = 2$ $I=4, r=16$

c. $\sqrt[3]{8y^3} = 2y$ $I=3, r=8y^3$

d. $\sqrt{4x^6} = 2x^3$ $I=2, r=4x^6$
 $x^3 \cdot x^3 = x^6$

Students try $\sqrt[3]{64x^6}$ $I=3, r=64x^6$

$$= 4x^2$$

$$\sqrt[4]{81y^{12}}$$

$$= 3y^3$$

$$I=4, r=81y^{12}$$

Jan 26-2:03 PM

Product and Quotient Rule for Radicals

$$\textcircled{1} \sqrt{12x^2y^3} = \sqrt{4x^2y^2} \sqrt{3y} = 2xy\sqrt{3y}$$

Product Rule: $\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{ab}$, with $\sqrt[n]{a}$ and $\sqrt[n]{b}$ as real numbers

Quotient Rule: $\frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\frac{a}{b}}$ with $b \neq 0$, and $\sqrt[n]{a}$ and $\sqrt[n]{b}$ as real numbers

$$\begin{aligned} 1^3 &= 1 \\ 2^3 &= 8 \rightarrow \sqrt[3]{8} = 2 \\ 3^3 &= 27 \\ 4^3 &= 64 \end{aligned}$$

Simplify using the product rule or quotient rule.

$$\sqrt[4]{4 \cdot \frac{12}{4}} \sqrt[3]{3} = 16 \cdot 3$$

a. $\sqrt[3]{48x^3y^5}$

$$\begin{aligned} &= \sqrt[3]{8x^3y^3} \sqrt[3]{6y^2} \\ &= 2xy\sqrt[3]{6y^2} \end{aligned}$$

b. $\sqrt[4]{64x^{10}}$

c. $\sqrt{48x^5y^8}$

$$\begin{aligned} &= \sqrt[4]{16x^4y^8} \sqrt{3x} \\ &= 4x^2y^2\sqrt{3x} \end{aligned}$$

Jan 26-2:03 PM

We will cover on Tuesday. Don't do #10 & 11 on the homework.

d. $\frac{\sqrt[3]{16x^8}}{\sqrt[3]{2x^2}}$

e. $\frac{\sqrt{3x^2}}{\sqrt{12x}} = \sqrt{\frac{3x^2}{12x}} =$

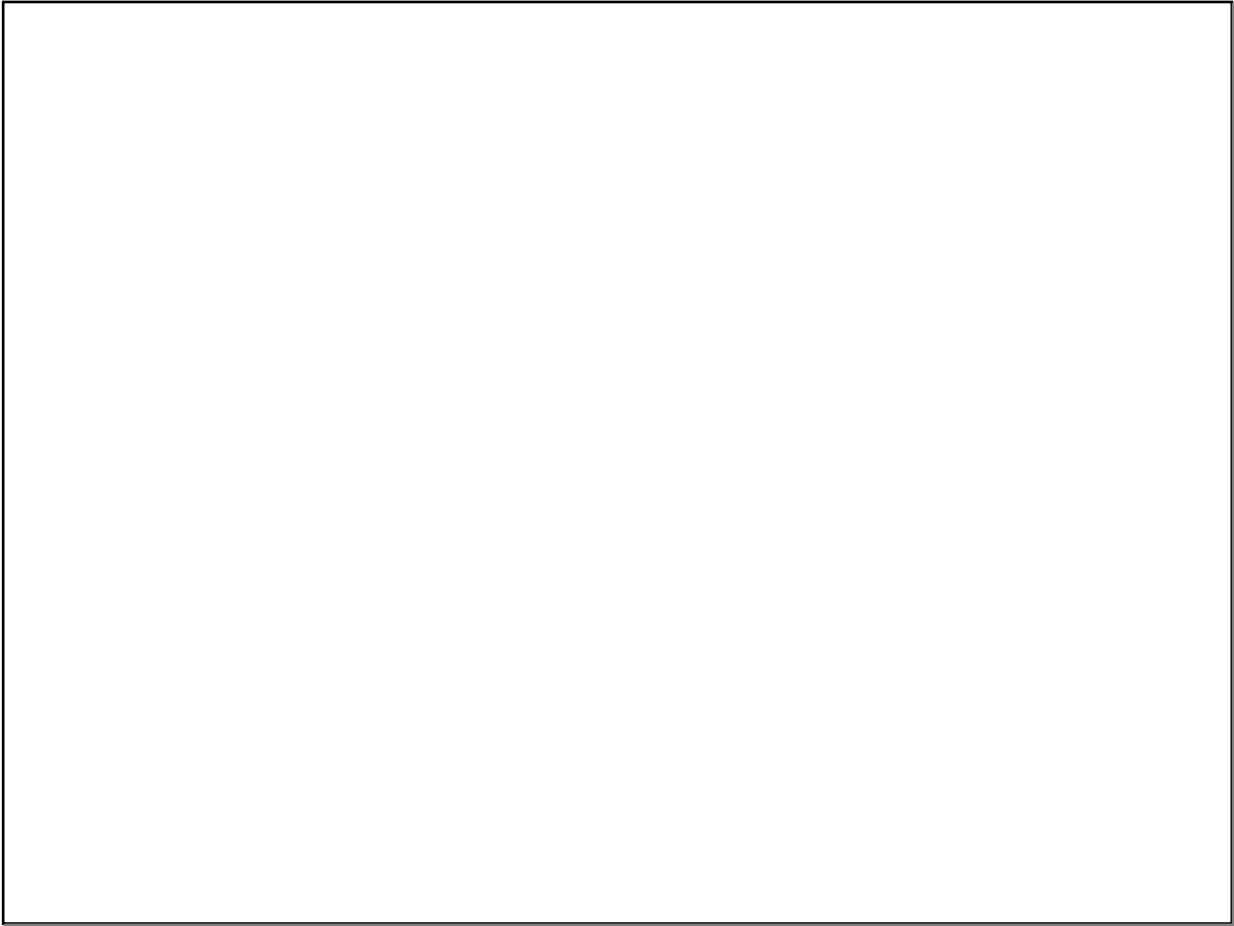
f. $\frac{\sqrt[4]{5y^5}}{\sqrt[4]{16y}}$

Students try:

$$\sqrt[3]{54x^4y^9}$$

$$\frac{\sqrt[4]{2a^{15}}}{\sqrt[4]{32a^3}}$$

Jan 26-2:03 PM



Jan 26-2:31 PM