Write each expression in radical form.

1) $(10x)^{\frac{3}{4}}$

2) $(2x)^{\frac{6}{5}}$

Write each expression in exponential form.

3) $\sqrt{10r}$

4) $(\sqrt{7x})^3$

Simplify.

5) $(x^6)^{\frac{1}{2}}$

6) $(343x^9)^{\frac{2}{3}}$

Notes: 6.2 Applying Prop. of Exponents of Rational Exponents

Review:

$x^2 \bullet x^3 =$ ☐

$\dfrac{x^6}{x^2} =$ ☐

$(x^3)^2 =$ ☐

$(x^2 y)^2 =$ ☐

$x^{-3} =$ ☐

$\left(\dfrac{x^2}{y^3}\right)^2 =$ ☐

Properties of Rational Exponents

Let a and b be real numbers and let m and n be rational numbers. The following properties have the same names as those listed on page 330, but now apply to rational exponents as illustrated.

	Property	Example
1.	$a^m \cdot a^n = a^{m+n}$	$5^{1/2} \cdot 5^{3/2} = 5^{(1/2 + 3/2)} = 5^2 = 25$
2.	$(a^m)^n = a^{mn}$	$(3^{5/2})^2 = 3^{(5/2 \cdot 2)} = 3^5 = 243$
3.	$(ab)^m = a^m b^m$	$(16 \cdot 9)^{1/2} = 16^{1/2} \cdot 9^{1/2} = 4 \cdot 3 = 12$
4.	$a^{-m} = \frac{1}{a^m}, a \neq 0$	$36^{-1/2} = \frac{1}{36^{1/2}} = \frac{1}{6}$
5.	$\frac{a^m}{a^n} = a^{m-n}, a \neq 0$	$\frac{4^{5/2}}{4^{1/2}} = 4^{(5/2 - 1/2)} = 4^2 = 16$
6.	$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}, b \neq 0$	$\left(\frac{27}{64}\right)^{1/3} = \frac{27^{1/3}}{64^{1/3}} = \frac{3}{4}$

Quick practice review:

$$x^{-3}$$

$$\left(\frac{x^2}{y^3}\right)^2$$

$$(3x^2y^3)^4$$

$$x^{-2} \bullet x^{-3}$$

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

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

Applying Prop to Rational Exponents

$x^{1/3} \bullet x^{2/3}$

$x^{1/2} \bullet x^{1/4}$

$\left(\frac{x^{15}}{y^{6}}\right)^{\frac{1}{3}}$

$\sqrt[3]{27x^5y^9}$

$\sqrt[4]{32x^5y^4}$

KEY CONCEPT — For Your Notebook

Properties of Radicals

Product property of radicals

$$\sqrt[n]{a \cdot b} = \sqrt[n]{a} \cdot \sqrt[n]{b}$$

Quotient property of radicals

$$\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}},\ b \neq 0$$

EXAMPLE 3 Use properties of radicals

Use the properties of radicals to simplify the expression.

a. $\sqrt[3]{12} \cdot \sqrt[3]{18} = \sqrt[3]{12 \cdot 18} = \sqrt[3]{216} = 6$ Product property

b. $\frac{\sqrt[4]{80}}{\sqrt[4]{5}} = \sqrt[4]{\frac{80}{5}} = \sqrt[4]{16} = 2$ Quotient property

$$\sqrt[3]{125} \cdot \sqrt[3]{8}$$

$$\frac{\sqrt[5]{96}}{\sqrt[5]{3}}$$

To add or subtract radicals, the radicand must be the same! Always simplify the radical.

Adding/Subtracting *must have common radicand!

$3\sqrt{2}+8\sqrt{2}$

$3(2)^{1/3}-4(2)^{1/3}$

$4\sqrt[3]{54}-3\sqrt[3]{2}$

What do you do if it doesn't have the same radicand? Simplify the radical to see if it will be the same.

Simplify.

1) $-2\sqrt{12} + 3\sqrt{12}$

2) $-3\sqrt{24} + 3\sqrt{54}$

3) $-3\sqrt{3} + 3\sqrt{6} - 2\sqrt{24}$

4) $-3\sqrt{8} - 3\sqrt{8} - 3\sqrt{54}$

https://create.kahoot.it/details/30379d87-fd8f-48ed-bc58-4c9ba0f064c3

https://create.kahoot.it/details/070b6d05-d018-4f32-b62c-1b3d0ec4eb45

Whiteboard Practice

Simplify.

1) $-2\sqrt{18} - 2\sqrt{18}$

2) $-\sqrt{3} + 2\sqrt{3}$

3) $-3\sqrt{27} + 2\sqrt{27}$

4) $-\sqrt{6} + 2\sqrt{24}$

5) $-2\sqrt{18} + 3\sqrt{2}$

6) $-2\sqrt{8} - \sqrt{18}$

Write each expression in radical form.

1) $(7n)^{\frac{1}{2}}$

2) $n^{\frac{5}{6}}$

Write each expression in exponential form.

3) $(\sqrt[5]{x})^7$

4) $(\sqrt[5]{3a})^7$

Simplify.

5) $(216r^6)^{\frac{4}{3}}$

6) $(81b^2)^{\frac{3}{2}}$

Simplify.

1) $\sqrt[3]{81m^2}$

2) $\sqrt[4]{324k^5}$

3) $\sqrt{384x^3}$

4) $\sqrt[3]{54x^7}$

5) $\sqrt{200a^4b^3}$

6) $\sqrt[3]{512x^6y^8}$

7) $6\sqrt{32p}$

8) $-7\sqrt{108v^3}$

5) $\sqrt{4b} \cdot \sqrt{4b^2}$

6) $\sqrt[6]{4x^2} \cdot \sqrt[6]{400x^4}$

7) $-2\sqrt[4]{10b^4} \cdot 2\sqrt[4]{375b^2}$

8) $-2\sqrt[3]{-6p^2} \cdot 3\sqrt[3]{12p^4}$