Section 6-6: Rational Exponents

For any real nonzero number b, and any integers x and y, with $y > 1$, except when $b < 0$ and y is even.

$$b^{x/y} = \sqrt[y]{b^x} = \left(\sqrt[y]{b}\right)^x$$

When $b < 0$ and y is even, a complex root may exist.

1. Write $a^{1/5}$ in radical form.	2. Write $\sqrt[8]{c}$ in exponential form.
3. Write $d^{7/4}$ in radical form.	4. Write $\sqrt[3]{c^{-5}}$ in exponential form.

A expression with rational exponents is in **simplified form** if:

- it has no negative exponents
- it has no exponents that are not positive integers in the denominator
- it is not a complex fraction
- the index of any remaining radical is the least number possible

Evaluate.

5. $49^{-1/2}$ $\frac{1}{\sqrt[2]{49}} = \frac{1}{7}$	6. $32^{2/5}$ $\left(\sqrt[5]{32}\right)^2 = 2^2 = 4$
7. $(-25)^{3/2}$ $\left(\sqrt[2]{-25}\right)^3$ not possible	8. $-64^{-1/3}$ $\frac{1}{\sqrt[3]{-64}} = \frac{1}{-4}$

Simplify.

9. $p^{1/4} \cdot p^{9/4}$ $p^{\frac{1}{4}+\frac{9}{4}} = p^{\frac{10}{4}} = p^{\frac{5}{2}}$	10. $b^{-2/3}$ $\frac{1}{b^{\frac{2}{3}}} \cdot \frac{b^{\frac{1}{3}}}{b^{\frac{1}{3}}} = \frac{\sqrt[3]{b}}{b}$
11. $\frac{\sqrt[4]{32}}{\sqrt[3]{2}} = \frac{\sqrt[4]{2^5}}{\sqrt[3]{2}} = \frac{2^{5/4}}{2^{1/3}} = 2^{5/4 - 1/3}$ $2^{\frac{15}{12} - \frac{4}{12}} = 2^{\frac{11}{12}}$	12. $\sqrt[3]{16x^4}$ $\sqrt[3]{2^4 x^4} = 2x\sqrt[3]{2x}$