1. Brooke was considering the cool things about the number 81. “Well, it can be written as 9^2, but since 9 is a perfect square, 81 can also be written as $(3^2)^2$ or 3^4. So what does that make the relationship between 3 and 81? How do you write that in terms of a radical?

2. Is it possible to have a number multiplied by itself four times to give you -81? Is it possible to have a number multiplied by itself 3 times to give you -27? Is it possible to have a number multiplied by itself give you a number multiplied by itself 5 times to give you -32?

3. What are you looking for if you are taking $\sqrt[5]{243}$. Don’t just find the number, describe it in words.

4. Alex knows the property that $\sqrt{x^2} = |x|$ which for positive values of x is the same as x^1. Alex thought, “Wouldn’t it be cool if there was a way to write radicals with exponents instead of writing the $\sqrt{\ }$ symbol?” For what exponent k, is the equation $\sqrt{x^2} = (x^2)^k = x^1$ true? So what is another way to write $\sqrt{x}$ with an exponent?

5. Think of the cube root now - $\sqrt[3]{64} = \sqrt[3]{4^3}$ which is the same as 4. Try to find a way to write the cube root as an exponent so that this expression equals 4^1.

6. It is also a known fact that $\sqrt{x} \bullet \sqrt{x} = x$. Rewrite this expression in terms of exponents and using known properties of exponents to further prove the equivalence you conjectured in number 4.

7. How would you generalize writing $\sqrt[n]{a^m}$ with a fractional (rational) exponent?

8. Simplify the following expressions as much as possible:

   a. $x^{\frac{5}{6}} x^{\frac{2}{3}}$ b. $\left(625x^4y^8z^5\right)^{\frac{1}{4}}$ c. $\left(-3x^2\right)^{\frac{2}{3}}$