The meaning of exponents

Here are some useful things to know:

- Positive whole number powers indicate repeated multiplication. For instance x^2 means $x \cdot x$ and x^3 means $x \cdot x \cdot x$. And x^1 is the same as x.

- Raising something to the power of 0 always gives 1 (except that 0^0 is undefined).

- Negative powers correspond to powers in the denominator of a fraction. For instance, x^{-2} means $\frac{1}{x^2}$ and x^{-1} means $\frac{1}{x}$.

- Fractional powers correspond to taking square roots, cube roots, etc. For instance, $x^{1/2}$ or $x^{.5}$ are equivalent to $\sqrt{x}$.

  Similarly, $x^{1/3}$ is $\sqrt[3]{x}$. This corresponds to a value that if cubed equals x. For instance, $\sqrt[3]{8}$ is 2 because $2 \cdot 2 \cdot 2$ is 8.

- Occasionally, you'll see something like $x^{2/5}$. This is a combination of a root and a power; in particular, it's $\sqrt[5]{x^2}$ or equivalently, $\left(\sqrt[5]{x}\right)^2$. Similarly, $x^{4/7}$ is $\sqrt[7]{x^4}$ or $\left(\sqrt[7]{x}\right)^4$.

Exercises

1. Rewrite $x \cdot x \cdot x \cdot x$ as an expression involving exponents.

2. Rewrite the following in the form $x^{\square}$, where the box is filled in with a numerical exponent.

   (a) $\dfrac{1}{x^5}$

   (b) $\sqrt[4]{x}$

   (c) $\dfrac{1}{\sqrt{x}}$

   (d) $\sqrt[4]{x^3}$

3. Rewrite x^{-8} as a fraction.

4. Rewrite $x^{2/5}$ as an expression involving a radical symbol.

Answers

1. $x \cdot x \cdot x \cdot x = x^4$

2. (a) $\dfrac{1}{x^5} = x^{-5}$

   (b) $\sqrt[4]{x} = x^{1/4}$

   (c) $\dfrac{1}{\sqrt{x}} = x^{-1/2}$

   (d) $\sqrt[4]{x^3} = x^{3/4}$

3. $x^{-8} = \dfrac{1}{x^8}$

4. $x^{2/5} = \sqrt[5]{x^2}$ or $(\sqrt[5]{x})^2$