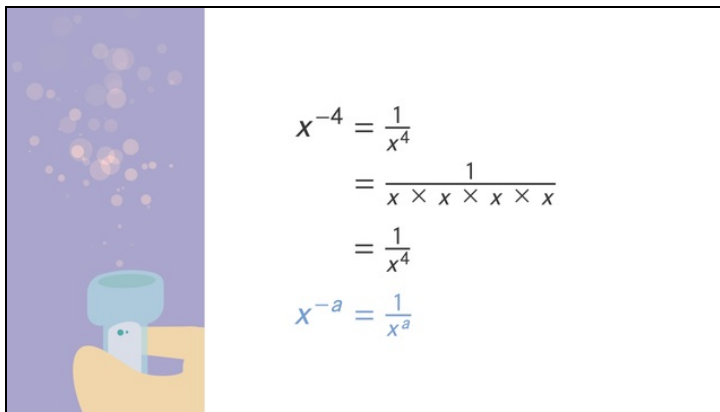




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# Zero and Negative Exponents



- 1 Explain how to write  $x^{-a}$  as a fraction.
  - 2 Decide what  $10^{-5}$  stands for.
  - 3 Explain why  $2^{-4} = \frac{1}{2^4}$  is true.
  - 4 Examine the following powers with negative exponents.
  - 5 Decide the power of the enlarging potion.
  - 6 Identify the powers resulting from the calculations shown.
- + with lots of tips, answer keys, and detailed answer explanations for all of the problems.



The complete package, including all problems, hints, answers, and detailed answer explanations is available for all [sofatutor.com](https://www.sofatutor.com) subscribers.



## Explain how to write $x^{-a}$ as a fraction.

Fill in the blanks.

$x^{-a}$     $x^a$    product   reciprocal    $x$    1   negative exponent

We have that  $x$  is a variable and  $-a$  is a .....<sup>1</sup>.

To write  $x^{-a}$  as a fraction, write .....<sup>2</sup> as the numerator and  
.....<sup>3</sup> as the denominator.

Remember that .....<sup>4</sup> cannot be equal to zero.



## Hints for solving these problems

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of 6

**Explain how to write  $x^{-a}$  as a fraction.**

### Hint #1

An example of a negative exponent is  $2^{-4} = \frac{1}{2^4}$ .

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### Hint #2

An example with  $x$  as the basis is  $x^{-4} = \frac{1}{x^4}$ .

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### Hint #3

Remember that division by zero isn't allowed.

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## Answers and detailed answer explanations for these problems

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of 6

**Explain how to write  $x^{-a}$  as a fraction.**

**Answer key:** 1: negative exponent // 2: 1 // 3:  $x^a$  // 4:  $x$

We've already seen that

$$10^{-5} = \frac{1}{10^5}$$

We can prove that  $2^{-4} = \frac{1}{2^4}$  using  $2^0 = 1$ :

$$\begin{aligned} \frac{1}{2^4} &= \frac{2^0}{2^4} \\ &= 2^{0-4} \\ &= 2^{-4} \end{aligned}$$

Similarly we have  $x^{-4} = \frac{1}{x^4}$ .

In general, we have

$$x^{-a} = \frac{1}{x^a}.$$

As long as the basis does not equal zero, if we have a power with a negative exponent we can also write it as a fraction with 1 in the numerator and the power with the same basis to the absolute value of the exponent in the denominator.