

2. Written mathematics is a language with specific vocabulary and grammar. Symbols have been invented to mean particular things just like words and punctuation. Many of the symbols are so familiar to people that they don't have to think about them. Use what you know about the mathematical symbols used below to solve each equation:

a. $x + 5 = 6$

b. $3x = 12$

c. $\frac{x}{2} = 10$

d. $x^3 = 8$

e. $3^x = 9$

f. $2^x = 16$

3. Sometimes, the language of mathematics requires additional inventions (symbols) to solve equations. A good example of this is exponents/roots. Roots were defined as the inverse of raising different values to a given power, as follows:

$$y = x^n \text{ is equivalent to } x = \sqrt[n]{y}$$

In other words, people just made up the word "root" and the symbol " $\sqrt[n]{x}$ " because they wanted an efficient way of writing "The number that is the inverse of the nth power"

Convert each equation below to the root version. Then use a calculator to solve for x:

a. $x^4 = 5.0625$

b. $x^{2.5} = 1024$

c. $x^{\frac{1}{4}} = 81$

Convert each equation below to the exponent version. Then use a calculator to solve for x:

d. $\sqrt[2]{x} = 25$

e. $\sqrt[12]{x} = 1$

d. $\sqrt[4]{x} = 32$

4. Referring back to question 1(e),

a. explain why the equation you need to solve is

$$500000 = 1000(1.13)^x$$

b. The issue with solving this equation is that you haven't yet learned the language for reversing an equation when the exponent is a variable... until now!

Logarithms¹ are defined as the inverse of raising a given number to various exponents as follows:

$$y = a^x \text{ is equivalent to } x = \log_a y, \text{ where } a \text{ is called the base of the logarithm.}$$

To calculate your answer, use the change of base formula: $\log_a y = \frac{\log(y)}{\log(a)}$

Convert each equation below to the logarithm version and use a calculator to solve for x.

i. $3^x = 243$

ii. $10^x = 0.01$

iii. $2.4^x = 33.1776$

Convert each equation to the exponential version and determine the value of x.

iv. $\log_3 x = 2$

v. $\log_5 25 = x$

vi. $\log_2 x = 0$

c. Return to question 1(e) and solve the equation using logarithms.

¹ Logarithms weren't invented until 1614 and, before the use of calculators, relied on tables constructed by meticulous calculations using base 10 logarithms. Today, scientific calculators will calculate logarithms of any base.