

Learning Objectives.

- 1) Use logarithms to solve equations with variables for exponents.

An equation with a variable for an exponent looks like this.

$$10 = 3 \cdot 2^x$$

To solve these we must use logarithms and a special property of logarithms which states.

$$\log_b x^a = a \cdot \log_b x$$

This property of logarithms allows us to use a known logarithm namely “ln” or “log” to bring the exponential variable down in front of the logarithm and use division to solve for the unknown.

Example: Solve  $10 = 3 \cdot 2^x$  -Divide both sides by 3

$$\frac{10}{3} = 2^x \quad \text{- Now that the exponential is by itself take the ln of both sides.}$$

$$\ln\left(\frac{10}{3}\right) = \ln 2^x \quad \text{- Apply the property of logarithms}$$

$$\ln\left(\frac{10}{3}\right) = x \ln 2 \quad \text{- Divide both sides by } \ln 2$$

$$x = \frac{\ln\left(\frac{10}{3}\right)}{\ln 2} \quad \text{- Evaluate}$$

$$x = 1.737 \quad \text{-The final solution will usually be an irrational number.}$$

For additional worked out examples please watch.

<https://www.youtube.com/watch?v=7Ig6kVZaWoU>

Practice Problems  
Solve the following.

1)  $e^x = 45$

2)  $10^m = 45$

3)  $4 \cdot 3^{2x} = 15$

4)  $30000 = 10000e^{.034t}$

5) An accountant suggests that you place your money in an account that pays 5.6% interest compounded daily. If you follow his advice how much money would you have in your account if you invested \$5,000 for 5 years?

6) The Half-Life of a certain element is 4,500 years. If there is 25g of it now. How much will there be in 10,000 years?

Some helpful Equations.

General Equations.

**VARIABLES**

A: Final Amount

Simple Interest

$$A = P(1+r)^t$$

P (I) : Principle, or an initial amount.

Compound Interest

$$A = P \left( 1 + \frac{r}{n} \right)^{nt}$$

r: Rate (written as a decimal)

n: Number of compounds

Half life

$$A = I \left( \frac{1}{2} \right)^{\frac{t}{k}}$$

t: Time Unit

k: Years of Half - Life

Congrats you are finished with Pre-Calculus Blizzard Bag #2