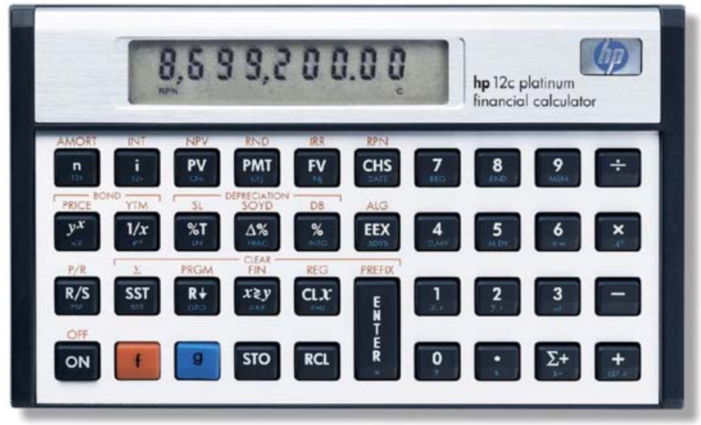
hp calculators



HP 12C Platinum
Logarithm and Exponential Functions

Basic logarithm and exponential relationships

Logarithm and exponential functions on the HP12C Platinum

Practice solving logarithm and exponential problems

Basic logarithm and exponential relationships

Exponential and logarithm are related functions as expressed by $b = a^x$, where x is unknown power, a is the base (known), and b is the value resulting from a^x ($b > 0$). The expression that isolates x so x can be computed when a and b are known is:

$$x = \frac{\log(b)}{\log(a)} \qquad (b > 0, a > 0, a \neq 1)$$

The restriction $a \neq 1$ applies because if $a = 1$ then the log(a) = 0 generating an undefined value for x. Some of the properties related to logarithms and exponents are shown in the examples below.

Logarithm and exponential functions on the HP12C Platinum

There are two exponent-related and one logarithm-related functions in the HP12C Platinum, and the keys related to these functions are [y^x], [g][e^x] and [g][LN]. [y^x] computes y raised to the x power while [g] [e^x] computes e raised to the power of the number in the display (e is the Napier's number 2.718281828...). [g][LN] computes the natural logarithm of the number in the display.

Practice with solving logarithm and exponential problems

Example 1: Continuous compounding is often encountered in conversions from a nominal to an effective interest rate. The following expression is used:

$$\text{EFF} = e^{\text{NOM}} - 1$$ Figure 1

What is the effective annual rate equivalent to a nominal rate of 6%, compounded continuously?

Solution: The expression below represents the problem:

$$\text{EFF} = e^{0.06} - 1$$ Figure 2

The following keystroke sequence can be used to compute the effective rate:

In RPN mode: [0][•][0][6] [g][e^x] [1] [−]
In algebraic mode: [0][•][0][6] [g][e^x] [−] [1] [=]

Answer: A nominal interest rate of 6%, compounded continuously is equivalent to an effective interest rate of 6.18%.

Example 2: When continuous compounding is considered in conversions from effective to nominal interest rate, the following expression is used:

$$\text{NOM} = \ln(\text{EFF} + 1)$$ Figure 3

What is the nominal interest rate, compounded continuously, equivalent to an effective interest rate of 6.18%?

Solution: The expression below represents the problem:

$$\text{NOM} = \ln(0.0618 + 1)$$ Figure 4

The following keystroke sequence can be used to compute the effective rate:

In RPN mode: [0] [•] [0] [6] [1] [8] [ENTER] [1] [+] [g] [LN]
In algebraic mode: [0] [•] [0] [6] [1] [8] [+] [1] [=] [g] [LN]

Answer: An effective interest rate of 6.18% is equivalent to a nominal interest rate of 6%, compounded continuously.

Example 3: Evaluate the following expressions and find x :

$x = \sqrt[-4]{81}$ (1) $x = \log_{10}(200)$ (2) $x = \log_3(20) - \log_3(5)$ (3)

Solution: The original expression in (1) can be rewritten like this:

$$\sqrt[-4]{81} = 81^{-\left(1/4\right)}$$

To find the solution, press:

In RPN mode: [8] [1] [ENTER] [4] [1/x] [CHS] [y^x]
In algebraic mode: [8] [1] [y^x] [4] [1/x] [CHS] [=]

Figure 5

In expression (2), one of the basic logarithm properties can be applied:

$$\log_a(b) = \frac{\ln(b)}{\ln(a)}$$ Figure 6

So expression (2) is rewritten:

$$\log_{10}(200) = \frac{\ln(200)}{\ln(10)}$$ Figure 7

To find the solution, press:

In RPN mode: [2] [0] [0] [g] [LN] [1] [0] [g] [LN] [÷]
In algebraic mode: [2] [0] [0] [g] [LN] [÷] [1] [0] [g] [LN] [=]

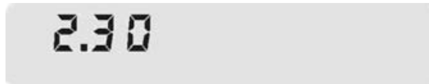


Figure 8

In expression (3), the following sequence can be used:

In RPN mode: [2] [0] [g] [LN] [3] [g] [LN] [÷] [5] [g] [LN] [3] [g] [LN] [÷] [−]

In algebraic mode: [2] [0] [g] [LN] [÷] [3] [g] [LN] [=] [5] [g] [LN] [÷] [3] [g] [LN] [=] [−] [x≷y] [x≷y] [=]

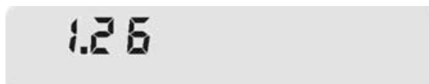


Figure 9

Answer: The answers are:

(1) $x = {}^{-4}\!\sqrt{81} \Rightarrow x = 0.33$;

(2) $x = \log_{10}(200) \Rightarrow x = 2.30$;

(3) $x = \log_{3}(20) - \log_{3}(5) \Rightarrow x = 1.26$