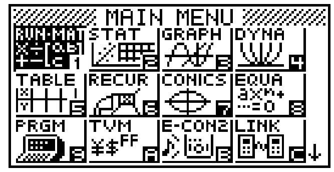
# Using the logab(   Feature.

*This resource was written by Derek Smith with the support of CASIO New Zealand. It may be freely distributed but remains the intellectual property of the author and CASIO.*



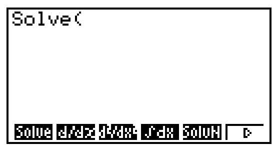

Select the **RUN/MAT** icon from the **Main Menu** by using the arrow keys to highlight the **RUN/MAT** icon followed by [**EXE**] or by pressing the [**1**] key.

Logarithms were developed in the 17th century by Scottish mathematician, John Napier. A method used to turn a multiplication problem into an addition problem (and reducing division into a subtraction problem). The use of logarithms has made many branches of mathematics much easier to calculate. When **calculus** was developed later, logarithms became central to solving differential and integral **calculus** problems. Logarithms are still important in many fields of science and engineering and economics, even though we use calculators for most calculations now-a-days.

| Exponential Laws | Logarithm Laws |
|---|---|
| $x^a \cdot x^b = x^{a+b}$ | $\log(ab) = \log(a) + \log(b)$ |
| $\dfrac{x^a}{x^b} = x^{a-b}$ | $\log\left(\dfrac{a}{b}\right) = \log(a) - \log(b)$ |
| $(x^a)^b = x^{ab}$ | $\log(a^b) = b \cdot \log(a)$ |
| $x^{-a} = \dfrac{1}{x^a}$ | $\log_x\left(\dfrac{1}{x^a}\right) = -a$ |
| $x^0 = 1$ | $\log_x 1 = 0$ |

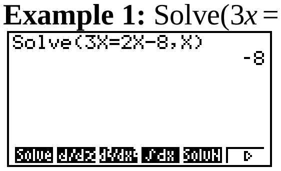
Use of the **Solve** feature in the **Run/Mat** icon.
**Menu trail is:** [**OPTN**] then [**F4**] for CALC, then [**F1**] for Solve, type in the equation, then [ **,** ] followed by [ **X** ] then [ **)** ] and [**EXE**] to solve the equation.



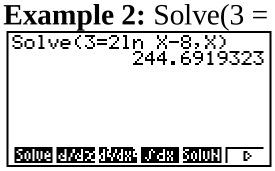



In general: Solve(equation,variable)

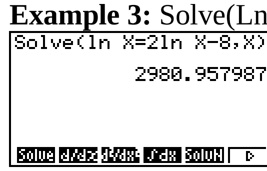
**Example 1:** Solve($3x = 2x - 8$, $x$)




**Example 2:** Solve($3 = 2\ln(x) - 8$, $x$)




**Example 3:** Solve($\text{Ln}(x) = 2\text{Ln}(x) - 8$, $x$)




**Working:**

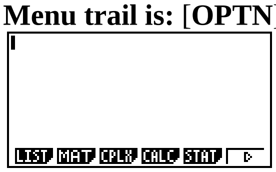
$3x = 2x - 8$
$3x - 2x = 2x - 2x - 8$
$1x = -8$
$x = -8$

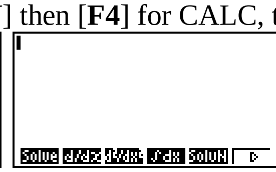
$3 = 2\ln(x) - 8$
$3 + 8 = 2\ln(x) - 8 + 8$
$11 = 2\ln(x)$
$11/2 = 2\ln(x)/2$
$5.5 = \ln(x)$
$e^{5.5} = e^{\ln(x)}$
$e^{5.5} = x$

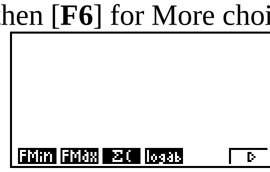
$\text{Ln}(x) = 2\text{Ln}(x) - 8$
$\text{Ln}(x) + 8 = 2\text{Ln}(x) - 8 + 8$
$\text{Ln}(x) + 8 = 2\text{Ln}(x)$
$\text{Ln}(x) + 8 - \ln(x) = 2\text{Ln}(x) - \ln(x)$
$8 = \text{Ln}(x)$
$e^8 = e^{\text{Ln}(x)}$
$e^8 = x$

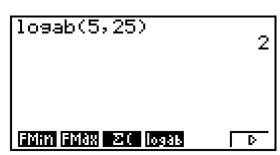
This is great if the base of the logarithm is either 10 or *e*!
The FX9750GII has a '**logab(**' function, which means that any base can be used to solve a logarithmic equation in any base.

**Menu trail is:** [**OPTN**] then [**F4**] for CALC, then [**F6**] for More choices and [**F4**] for **logab(**.



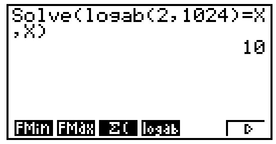




For instance entering $\log_5 25$, bring up **logab( , as above,** then 5 followed by a comma [ **,** ] then 25, lastly [ **)** ].

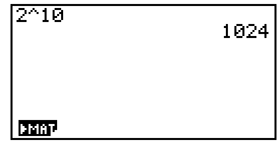
**Answer is 2, as $5^2 = 25$**

**Example 1:** **Checking:**

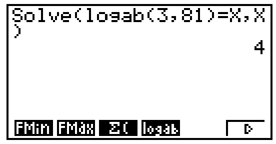
(a) Find the value of $\log_2 1024$.
Equation is: $\log_2 1024 = x$



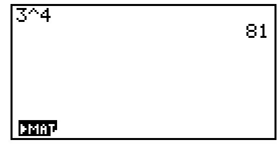

$x = 10$



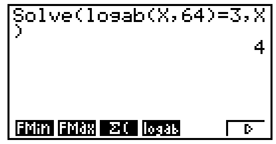

(b) Find the value of $x$, if $x = \log_3 81$.
Equation is: $\log_3 81 = x$



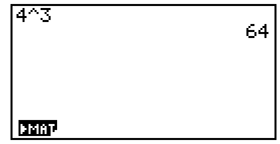

$x = 4$



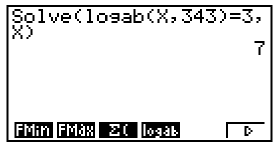

(c) Solve the equations $\log_x 64 = 3$.
Equation is: $\log_x 64 = 3$



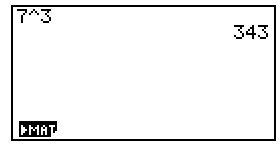

$x = 4$



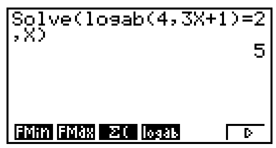

(d) Solve the equation $\log_x 343 = 3$
Equation is: $\log_x 343 = 3$



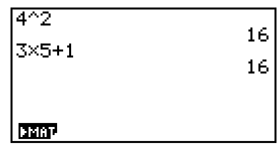

$x = 7$




**Example 2:**
Solve the equation $\log_4(3w + 1) = 2$.
Equation is: $\log_4(3x + 1) = 2$



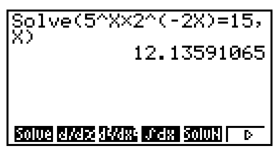

$x = 5$



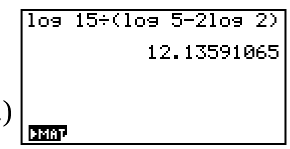

Also using the '**Solve**' feature for equations with exponents.

**Example:**

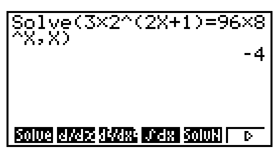
(a) Solve the equation $5^x \times 2^{-2x} = 15$
Equation is:



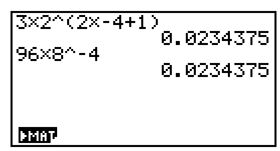

$x = 12.136$ (3 d.p.)



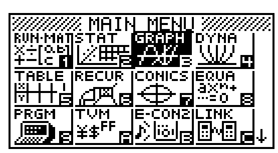

(b) Solve the equation $3 \times 2^{2x+1} = 96 \times 8^x$
Equation is:



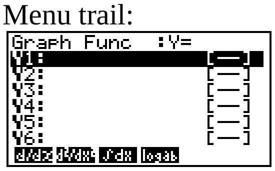

$x = -4$

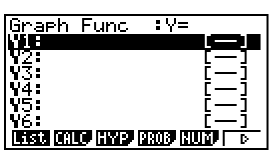



**Note:** This **logab(** feature can also be used in the Graph icon.




Menu trail:



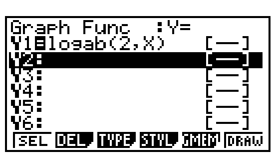



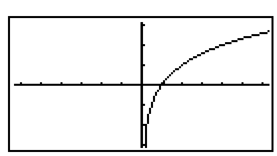


[**OPTN**] then [**F2**] for CALC then [**F4**] for **logab(**

For example: Sketch y = $\log_2 x$

As above then:
then type in 2 [ **,** ] then [**X**]
and [**EXE**].



**A practice link:** http://www.intmath.com/exponential-logarithmic-functions/3-logarithm-laws.php