Using a CASIO scientific calculator for solving exponential equations in Grade 10
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CASIO calculators

1.   Motivation

Learners in Grade 10 is expected to solve exponential equations of the form $a^x = b$ where b cannot be written as a power of base a by **inspection**.

The aim of the workshop is to use the Scientific Calculator as a tool support the learners' inspection in order to get them to understand the concepts without being caught up in doing to the same calculation over and over.

2.   Introduction to the CASIO Scientific Calculator in terms of Tables

Before we even start with equations it is a good habit to always reset your calculator.
Follow the following:

[SHIFT] [9] [1] [=] [AC]

To use the table mode   [MODE] [3]


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1:COMP    2:STAT
3:TABLE
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To generate a table:

$$y = 2x + 3 \qquad\qquad -1 \leq x \leq 3$$
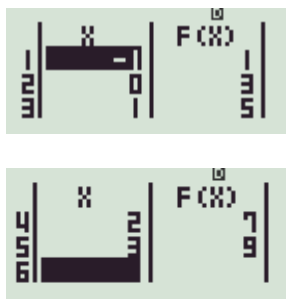
Key Sequence:	On screen:
• Input f(x)formula [=] **to input the variable x:** [ALPHA] [ )] • g(x) = [=]	$f(X)=2X+3$

- Set boundaries for your table:

Start? [−] [1] [=]

End? [3] [=]

Step? [1] [=]

- And then you know that is $x = -1$, $2x + 3$ will be equal to 1

Remember:

- [AC] **returns you to the formula**

- [AC] **twice cleans the formula**

3. Exponential equations

Solving exponential equations where the variable is in the exponent have up to now relied on writing the number in exponential form with the same base as the base of the variable. For example

$2^x = 8$
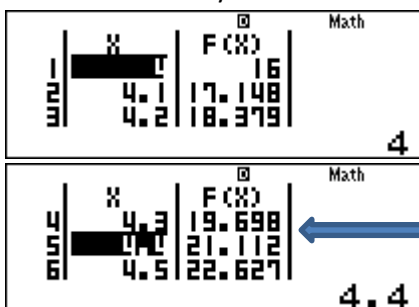
$2^x = 2^3$ — Use FACT key

$\therefore x = 3$

But what if the number cannot be written as such? Consider the following equation $2^x = 20$, round your answer off to three decimal places.

We know $2^4 = 16$ and we know $2^5 = 32$.

We are going to work in table mode and type the equation $f(x) = 2^x$ and work in the domain [4;5] as 20 lies between 16 and 32. We are initially working with steps of 0,1.

[MODE] [3] [2] [$x^\blacksquare$] [ALPHA] [)] [=] [=] [4] [=] [=] [0] [·] [1] [=]
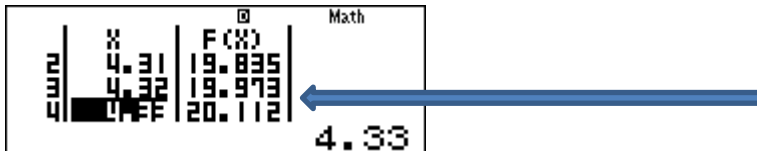
Move down until you find the interval where 20 can appear

Now we know that $2^{4,3} = 19,696$ and $2^{4,4} = 21,112$.
20 lies between 19,698 and 21,112.

Press [AC] once and just change the domain and step size.

[AC] [=] [=] [4] [•] [3] [=] [4] [•] [4] [=] [0] [•] [0] [1] [=]
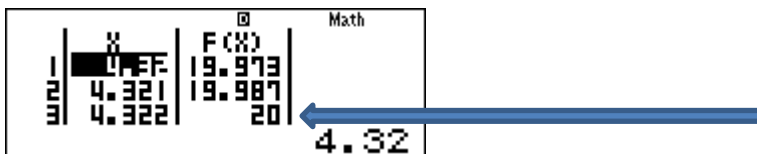
Move down until you find the interval where 20 can appear

Now we know that $2^{4,32} = 19,973$ and $2^{4,33} = 20,112$.
20 lies between 19,973 and 20,112.

Press [AC] once and just change the domain and step size.

[AC] [=] [=] [4] [•] [3] [2] [=] [4] [•] [3] [3] [=] [0] [•] [0] [0] [1] [=]

Hence $2^{4,322} = 20$

When you have to write out the answer the following can be done:

$2^x = 20$, round your answer off to three decimal places.

$2^4 = 16$ and $2^5 = 32$
$2^{4,3} = 19,696$ and $2^{4,4} = 21,112$
$2^{4,32} = 19,973$ and $2^{4,33} = 20,112$
$2^{4,322} = 20$
$\therefore x = 4,322$

Quickly look at another example.

Solve for the following equation. Give your answer correct to three decimal places: $6^x = 200$
$6^2 = 36$ and $6^3 = 216$

[6] [x■] [ALPHA] [)] [=] [=] [2] [=] [3] [=] [0] [•] [1] [=]

$$\boxed{AC}\;\boxed{=}\;\boxed{=}\;\boxed{2}\;\boxed{\cdot}\;\boxed{9}\;\boxed{=}\;\boxed{3}\;\boxed{=}\;\boxed{0}\;\boxed{\cdot}\;\boxed{0}\;\boxed{1}\;\boxed{=}$$

$$\boxed{AC}\;\boxed{=}\;\boxed{=}\;\boxed{2}\;\boxed{\cdot}\;\boxed{9}\;\boxed{5}\;\boxed{=}\;\boxed{2}\;\boxed{\cdot}\;\boxed{9}\;\boxed{6}\;\boxed{=}\;\boxed{0}\;\boxed{\cdot}\;\boxed{0}\;\boxed{0}\;\boxed{1}\;\boxed{=}$$

199,98 is the closest to 200.

Writing out the answer:

$6^2 = 36$ and $6^2 = 216$
$6^{2,9} = 180{,}56$ and $6^3 = 216$
$6^{2,95} = 197{,}49$ and $6^{2,96} = 201{,}06$
$6^{2,957} = 199{,}98$
$\therefore x = 2{,}957$