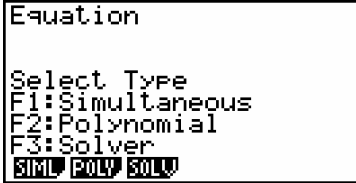

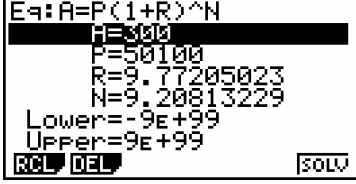
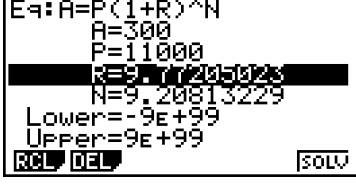
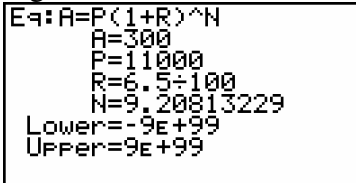


# Casio 9860 Self-Guided Instructions – EQUA Mode

Instructions	Screenshots
<p><b>EQUA :- a cheat's way of solving equations or a way of giving meaning to Algebra?</b></p> <p>EQUA is the mode on the Graphics Calculator which can be used for 'anything with an equals sign' (except for 'rearranging the subject' questions). Some 'purists' will argue that EQUA 'dumbs down the maths'. Others will argue that for students who struggle with algebra EQUA can be a way to give meaning to this 'abstract code'! There is no doubt that EQUA is an effective medium in which to investigate any system involving formulae. You will need to decide for yourself when and where you will promote EQUA as a mathematical tool for your students.</p> <p><b><u>Solving an equation using EQUA:</u></b></p> <p>Let's investigate the Compound Interest formula.            Press MENU scroll to EQUA and press EXE (Fig1)            Press SOLV (F3)</p> <p>A formula with values will most likely appear. This is the last EQUA screen that was used.            Delete the formula by pressing DEL (F2) and F1 (Fig2)</p> <p>Note the cursor is over the Equation line.            Using the ALPHA button type the compound interest formula</p> <p><b><u>ALPHA A = (SHIFT dot) ALPHA P ( 1 + ALPHA R ) ^ ALPHA N EXE</u></b></p> <p>Note values will appear on the screen but these are simply values from past operations. These initial numbers have no significance.</p> <p>Let's consider an investment situation where \$11 000 is invested at 6.5% interest compounding annually for 5 years. We need to calculate the final amount (A)</p> <p>Notice there is already a value for A. remember that this value does not matter to the problem. You value will most likely be different to 300 (as in Fig3). This is all fine!</p> <p><b><u>Move the cursor down to P. Enter 11000 EXE</u></b> (Fig4)</p> <p>Now we need to enter the interest as a decimal. A good protocol for students to follow is to enter the interest (in this case 0.65) as <b><u>6.5 ÷ 100</u></b> (Fig5) Do this and <b><u>press EXE.</u></b></p> <p>Now enter 5 for N and press EXE (Fig6)</p>	<p>Fig1  </p> <p>Fig2  </p> <p>Fig3  </p> <p>Fig4  </p> <p>Fig5  </p>

To solve the equation for A move the cursor up to A (Fig6)

and press SOLV (F6) (Fig7)

The solution screen shows that the equation is balanced and the answer is \$15070.95

By pressing EXIT the solution can also be viewed in the previous screen. (Fig8)

EQUA is a fantastic environment to investigate various situations based on formulae.

Questions:

1) Using the above scenario what effect would raising the interest rate to 12% pa have on the final value?

Change R according to Fig9

Press EXE

Scroll to A

Press SOLV

EXIT (Fig10) ie the effect has been an extra \$4300 (approx)

2) What if the duration was 30 years?

Change N to 30

Press EXE

Scroll to A

Press SOLV

EXIT (Fig11) ie the effect is ... hmmm ... big!!

What if the duration was 30 years but the 12% interest compounded daily?

Change the value for R according to Fig12 \_press EXE

Fig6

```
Eq: A=P(1+R)^N
P=1000
P=11000
R=0.065
N=5
Lower=-9E+99
Upper=9E+99
RCL DEL SOLV
```

Fig7

```
Eq: A=P(1+R)^N
A=15070.9533
Lft=15070.9533
Rat=15070.9533
REPT
```

Fig8

```
Eq: A=P(1+R)^N
P=15070.9533
P=11000
R=0.065
N=5
Lower=-9E+99
Upper=9E+99
RCL DEL SOLV
```

Fig9

```
Eq: A=P(1+R)^N
A=15070.9532
P=11000
R=12÷100
N=5
Lower=-9E+99
Upper=9E+99
```

Fig10

```
Eq: A=P(1+R)^N
A=19385.7585
P=11000
R=0.12
N=5
Lower=-9E+99
Upper=9E+99
RCL DEL SOLV
```

Fig11

```
Eq: A=P(1+R)^N
A=32359.143
P=11000
R=0.12
N=30
Lower=-9E+99
Upper=9E+99
RCL DEL SOLV
```

**Enter N according to Fig13 press EXE**

**Solve for A** (Fig14)

Significantly the difference is around \$7500 !!

Working Backwards:

Q3) How many months will it take for \$4300 to grow to \$56800 at 7.8% pa interest compounding monthly?

**Enter the values as in Fig15 Press EXE**

**Solve for N EXIT** (Fig16)

NOTE: A COMMON MISTAKE is to forget to actually press solve and therefore think that the previous number which is in our solution line is the answer. But SOLV must be pressed to generate the answer.

Transferring a solution from EQUA to RUN mode:

Let's say we wanted to convert the solution to Q3 into years. We can transfer this number to RUN mode!

**Press MENU 1 ALPHA N EXE** (Fig17)

**Press ÷ 12 EXE** (Fig18) ie 33 years

Fig12

```
EQ: A=P(1+R)^N
A=329559.143
P=11000
R=12÷100+365
N=30
Lower=-9E+99
Upper=9E+99
```

Fig13

```
EQ: A=P(1+R)^N
A=329559.143
P=11000
R=3.2876E-04
N=30×365
Lower=-9E+99
Upper=9E+99
```

Fig14

```
EQ: A=P(1+R)^N
A=430000.432
P=11000
R=3.2876E-04
N=10950
Lower=-9E+99
Upper=9E+99
RCL DEL SOLV
```

Fig15

```
EQ: A=P(1+R)^N
A=56800
P=4300
R=7.8÷100÷12
N=102.3
Lower=-9E+99
Upper=9E+99
```

Fig16

```
EQ: A=P(1+R)^N
A=56800
P=4300
R=6.5E-03
N=398.353883
Lower=-9E+99
Upper=9E+99
RCL DEL SOLV
```

Fig17

```
N
398.353883
D
JUMP DEL PMAT MATP
```

### Using Upper and Lower values:

You will notice that at the bottom of the entry screen (eg Fig16) there appears an Upper and a Lower value. Mostly this option is not necessary to utilize. However, and importantly, this option is critical when finding angles if using EQUA to solve trigonometric equations (It is common for General Mathematics students to choose to use EQUA for trigonometry)

Let's use EQUA to find the value of angle A when  $\cos A = 0.675$

Firstly, go to **SETUP and check that your Angle setting is on Deg.**

**Enter the equation as in Fig19**

Note that Fig19 has not been solved yet and that the (irrelevant) number for A is currently 56800 (remember, this was the number for A in the compound interest question (3) in the previous section!) If you have a different number please **enter 56800 into A for now and EXE**

Now follow these instructions carefully. Without even pressing SOLV I can tell you that the answer we are about to get for A when SOLV is pressed will not be the one we are looking for!!!

**Pressing SOLV:** (Fig20)

As predicted ... not the answer we were looking for: 56834 degrees!!

Now we will derive another 'ridiculous answer'.

**Press EXIT and enter 30000 for A Then EXE and place the cursor over A** (Fig21)

**Now SOLV**

Yep ... another 'ridiculous answer'. (Fig22)

Let's generate one more before making sense of all this.

**Enter 1000 degrees and EXE as in Fig23**

**Now SOLV**

1032 degrees!!!! (Fig24)

Fig18

```
N
Ans=12      398.353883
□          33.19615692
JUMP DEL ▶MAT MATH
```

Fig19

```
Eq:cos A=0.675
A=56800
Lower=-9E+99
Upper=9E+99
RCL DEL SOLV
```

Fig20

```
Eq:cos A=0.675
A=56832.45415
Lft=0.675
Rst=0.675
REPT
```

Fig21

```
Eq:cos A=0.675
A=30000
Lower=-9E+99
Upper=9E+99
RCL DEL SOLV
```

Fig22

```
Eq:cos A=0.675
A=29927.54585
Lft=0.675
Rst=0.675
REPT
```

Fig23

```
Eq:cos A=0.675
A=1000
Lower=-9E+99
Upper=9E+99
RCL DEL SOLV
```

So what's happening? You've probably guessed it. These solutions have all been valid. They are different values around the unit circle. But not much good to us if we want an acute answer.

We could generating the desired answer simply by starting with a 'reasonable' value.

**Enter an acute angle for A and execute with EXE** (eg 30 as in Fig25)

**Press SOLV** (Fig26)  
(That's more like it!!)

NOTE: If you are using a model prior to the 9860 the method outlined in Fig25 is the required method to use to get around the issue of 'ridiculous' solutions.

You have probably now seen the reason for the Upper and Lower values.

**Press EXIT and set the Lower value at zero and the Upper Value at 90**  
**Now enter 30000 again for A** (Fig27)

Now **press SOLV**

Once again, we have 47.5 degrees (Fig28)

Fig24

```
Eq:cos A=0.675
A=1032.45415
Lft=0.675
Rat=0.675
```

REPT

Fig25

```
Eq:cos A=0.675
A=30
Lower=-9E+99
Upper=9E+99
```

RCL DEL

SOLV

Fig26

```
Eq:cos A=0.675
A=47.5458498
Lft=0.675
Rat=0.675
```

REPT

Fig27

```
Eq:cos A=0.675
A=30000
Lower=0
Upper=90
```

RCL DEL

SOLV

Fig28

```
Eq:cos A=0.675
A=47.5458498
Lft=0.675
Rat=0.675
```

REPT

### Converting to degrees, minutes, seconds in EQUA:

In short we can't do this in EQUA! But we can in RUN. Firstly transfer the number to RUN

**Press MENU 1 A EXE** (Fig29)

**Press OPTN F6 F5 F5** (Fig30) The answer is 47 degrees, 32 minutes, 45 seconds.

### A Teaching Point:

It often takes a while for students to realize the obvious ... that EQUA can be used in any situation where an equal sign exists (except for rearranging-the-subject questions). Therefore it is wise to stress to students when teaching and utilizing EQUA that 'If there is an equal sign then EQUA is an option'.

Also, it is common for more-able General Maths students to resist learning EQUA because they feel they don't need it. One view point worth taking is that it is OK for students to choose not to use EQUA but only from an intelligent stance and not from an 'I don't like EQUA' stance. Therefore it can be beneficial to set a task requiring all students to solve a series of formula-rich questions using another mode in addition to EQUA. For example, a miscellaneous set of Annuities questions to be answered in both TVM and EQUA, after which all students will be quite familiar with EQUA (and the TVM).

### Final Comment:

There is no doubt that using EQUA has the potential to greatly increase the confidence experienced by students who typically struggle with equations and formulae.  
Enjoy!!

For further and more advanced information including practice questions refer to the manual 'Mathematics with a Graphics Calculator – Casio fx-9860 AU' by Barry Kissane & Marian Kemp, available at

<http://www.casioed.net.au/downloads/books/fx9860/orderBarryBook.pdf>

Fig29

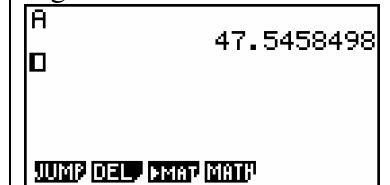


Fig30

