Solving a Literal Equation Using Newton's Method (Area of a Trapezoid)

The Solver mode is used to solve one unknown variable by inputting known variables. There are three methods: Equation, Newton's, and Graphic. The Newton's method can be used for more complicated equations. This method implements an iterative approach to find the solution once a starting point is given.

Example

Find the height of a trapezoid from the formula for calculating the area of a trapezoid using Newton's method.

The formula : $A = \frac{1}{2} h(b{+}c)$ (A = area h = height b = top face c = bottom face)

1. Find the height of a trapezoid with an area of 25in² and bases of length 5in and 7in using Newton's method. (Set the starting point to 1.)

2. Save the formula as "A TRAP".

3. Find the height of a trapezoid with an area of 50in² with bases of 8in and 10in using the saved formula. (Set the starting point to 1.)

Before Starting   There may be differences in the results of calculations and graph plotting depending on the setting. Return all settings to the default value and delete all data.

Step & Key Operation	*Display*	*Notes*
*Use either pen touch or cursor to operate.		

1-1 Access the Solver feature.

2nd F   SOLVER

Notes: This screen will appear a few seconds after "SOLVER" is displayed.

1-2 Select Newton's method for solving.

2nd F   SOLVER   A *

2 *

Display:
```
AMETHOD
BEQTN     1Equation
CSAVE     2Newton
DRENAME   3Graphic
```

1-3 Enter the formula $A = \frac{1}{2} h(b{+}c)$.

ALPHA A ALPHA = 1 a/b 2 ▶ *

ALPHA H (ALPHA B + ALPHA

C)

Display: $A = \frac{1}{2} H(B+C)$
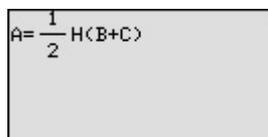
1-4 Enter the values: A = 25, B = 5, C = 7

ENTER 2 5 ENTER *

▼ * 5 ENTER * 7 ENTER

Display:
```
Solver:Newton
A=25
H=0
B=5
C=7
```

SHARP
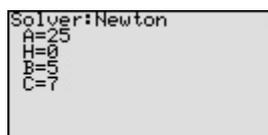
Step & Key Operation	*Display*	*Notes*

*Use either pen touch or cursor to operate.

1-5 Solve for the height and enter a starting point of 1.

▲ ▲ * 2nd F EXE 1 ENTER

```
Newton solver
START=1
STEP=.001
```

Newton's method will prompt with a guess or a starting point.

1-6 Solve.

2nd F EXE (CL)

```
Newton solver
 H=4.166666667
RIGHT=25
LEFT =25
L-R  =-.000000002
```

The answer is : $h = 4.17$

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2 Save this formula. Give the formula the name "A TRAP".

2nd F SOLVER C * ENTER

A SPACE T R A P ENTER

```
TITLE:A TRAP
```

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3-1 Recall the formula for calculating the area of a trapezoid.

2nd F SOLVER B *

0 1

```
Solver:Equation
A=50
H=0
B=8
C=10
```

3-2 Enter the values:
A = 50, B = 8, C = 10.

ENTER 5 0 ENTER * ▼ * 8

ENTER 1 0 ENTER

```
Solver:Newton
A=50
H=4.166666667
B=8
C=10
```

3-3 Solve.

▲ ▲ * 2nd F EXE 1

ENTER 2nd F EXE

```
Newton solver
 H=5.555555556
RIGHT=50
LEFT =50
L-R  =0
```

The answer is : $h = 5.56$

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One very useful feature of the calculator is its ability to store and recall equations. The solution from various values for known variables can be easily obtained by recalling an equation which has been stored and giving values to the known variables in the Solver mode. If a starting point is known, Newton's method is useful for quick solution of a complicated equation.

SHARP