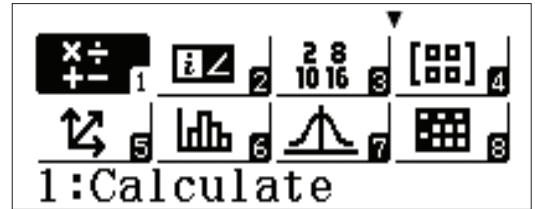


# CALCULATE

Below are some examples of the Natural Textbook Display™ input/output notation, as found by selecting the Calculate icon from the Main Menu of the **fx-991EX**.

From the Main Menu, use the arrow keys to highlight the Calculate icon, then press  $\left[ \equiv \right]$  or press  $\left[ 1 \right]$ .



Fractions and mixed numbers can be entered using  $\left[ \frac{\square}{\square} \right]$  and  $\left[ \text{SHIFT} \right] \left[ \frac{\square}{\square} \right] \left( = \frac{\square}{\square} \right)$ , respectively.

To enter the calculation to the left, press

$\left[ \frac{\square}{\square} \right] \left[ 7 \right] \left[ \rightarrow \right] \left[ 8 \right] \left[ \rightarrow \right] \left[ + \right] \left[ \text{SHIFT} \right] \left[ \frac{\square}{\square} \right] \left( = \frac{\square}{\square} \right) \left[ 2 \right] \left[ \rightarrow \right] \left[ 3 \right] \left[ \rightarrow \right] \left[ 1 \right] \left[ 1 \right] \left[ \equiv \right]$ .

The calculator display shows the input expression  $\frac{7}{8} + 2 \frac{3}{11}$  in Natural Textbook Display format. The result  $\frac{277}{88}$  is shown on the right side of the screen.

To change the solution to a decimal format, press  $\left[ \text{S}\rightarrow\text{D} \right]$ .

The calculator display shows the same input expression  $\frac{7}{8} + 2 \frac{3}{11}$ . The result is now displayed as the decimal approximation 3.147727273.

Press  $\left[ \text{SHIFT} \right] \left[ \text{S}\rightarrow\text{D} \right] \left( a \frac{b}{c} + \frac{d}{e} \right)$  to convert the result into a mixed-number format.

The calculator display shows the same input expression  $\frac{7}{8} + 2 \frac{3}{11}$ . The result is now displayed as the mixed number  $3 \frac{13}{88}$ .

When inputting radical expressions, the radical bar automatically extends as additional characters are typed.

Press  $\left[ \sqrt{\square} \right] \left[ 2 \right] \left[ 4 \right] \left[ \equiv \right]$ .

The calculator display shows the input expression  $\sqrt{24}$ . The result is shown as the simplified radical form  $2\sqrt{6}$ .

The output will be displayed in simplest radical form, but can be converted into a decimal approximation by pressing  $\left[ \text{S}\rightarrow\text{D} \right]$ .

The calculator display shows the same input expression  $\sqrt{24}$ . The result is now displayed as the decimal approximation 4.898979486.

# CALCULATE

ClassWiz is capable of recognizing and combining like radicals.

Press  $\sqrt{\square}$   $2$   $4$   $\blacktriangleright$   $+$   $\sqrt{\square}$   $1$   $5$   $0$   $=$ .

$$\sqrt{24} + \sqrt{150}$$

$$7\sqrt{6}$$

It can also calculate unlike radicals. Press

$\sqrt{\square}$   $2$   $4$   $\blacktriangleright$   $-$   $\sqrt{\square}$   $9$   $8$   $=$ .

$$\sqrt{24} - \sqrt{98}$$

$$2\sqrt{6} - 7\sqrt{2}$$

Higher-order radicals can be beautifully expressed using Natural Textbook Display™ input.

Press  $\text{SHIFT}$   $x^{\square}$  ( $\sqrt{\square}$ )  $5$   $\blacktriangleright$   $6$   $4$   $=$ .

$$\sqrt[5]{64}$$

$$2.29739671$$

Natural Textbook Display™ templates can be stacked inside one another to allow input of complicated expressions such as this quotient of rational exponents.

Press  $\frac{\square}{\square}$   $3$   $x^{\square}$   $\frac{\square}{\square}$   $1$   $\blacktriangleright$   $2$   $\blacktriangleright$   $\blacktriangleright$   $\blacktriangleright$   $3$   $x^{\square}$   $=$   $2$   $=$ .

$$\frac{3^{\frac{1}{2}}}{3^{-2}}$$

$$15.58845727$$

(Note: the calculator does not generate a Syntax Error when the  $=$  key is used to create a negative sign. Both  $=$  and  $\leftarrow$  are acceptable for use.)

In a trigonometry setting, arithmetic can be performed in

terms of  $\pi$ . Press  $\frac{\square}{\square}$   $3$   $\text{SHIFT}$   $\times 10^{\square}$  ( $\pi$ )  $\blacktriangleright$   $4$   $\blacktriangleright$   $+$   $2$   $\text{SHIFT}$   $\times 10^{\square}$  ( $\pi$ )  $=$ .

$$\frac{3\pi}{4} + 2\pi$$

$$\frac{11}{4}\pi$$

Other useful Natural Textbook Display™ templates that help overcome typical calculator input frustrations include: logarithms of any base,

$\log_{\square}$   $\frac{\square}{\square}$   $1$   $\blacktriangleright$   $2$   $\blacktriangleright$   $\blacktriangleright$   $1$   $6$   $=$

$$\log_{\frac{1}{2}}(16)$$

$$-4$$

# CALCULATE

...summation (sigma) notation,

$\text{SHIFT}$   $x$   $\left(\sum_{\square}\right)$   $x$   $x^2$   $+$   $1$   $\blacktriangleright$   $-$   $3$   $\blacktriangleright$   $7$   $=$

$$\sum_{x=-3}^7 (x^2 + 1) = 165$$

...derivatives of a function at a specific point (value),

$\text{SHIFT}$   $\left(\frac{d}{dx}\right)$   $4$   $x$   $x^2$   $-$   $5$   $x$   $\blacktriangleright$   $0$   $\cdot$   $2$   $=$

$$\frac{d}{dx} (4x^2 - 5x) \Big|_{x=0.2} = -\frac{17}{5}$$

...and definite integrals.

$\int$   $\int$   $1$   $\blacktriangleright$   $x$   $\blacktriangleright$   $\blacktriangleright$   $2$   $\blacktriangleright$   $5$   $=$ .

$$\int_2^5 \frac{1}{x} dx = 0.9162907319$$

Settings for the “Calculate” mode can be accessed by pressing

$\text{SHIFT}$   $\text{MENU}$  (SET UP).

Press  $\blacktriangledown$  one or more times to reveal additional Setup options.

1: Input/Output  
2: Angle Unit  
3: Number Format  
4: Engineer Symbol

1: Fraction Result  
2: Complex  
3: Statistics  
4: Spreadsheet

1: Equation/Func  
2: Table  
3: Decimal Mark  
4: Digit Separator

1: MultiLine Font  
2: QR Code  
3: Contrast

## SOLVE

The **fx-991EX** can elegantly solve an equation for any unknown using Newton’s method with the SOLVE command. To use SOLVE, first input the equation to be solved, then press  $\text{SHIFT}$   $\text{CALC}$  (SOLVE).

Solve  $x^2 + Ax + Bx = 0$  for  $x$  when  $A = 5$  and  $B = 6$ .

Enter the equation by pressing,  $x$   $x^2$   $+$   $\text{ALPHA}$   $(\leftarrow)$  (A)

$x$   $+$   $\text{ALPHA}$   $(\rightarrow)$  (B)  $\text{ALPHA}$   $\text{CALC}$  (=)  $0$ .

$$x^2 + Ax + B = 0$$

$$x = -5$$

# CALCULATE

Input an initial guess for  $x$  followed by the values of  $A$  and  $B$ .  
Press **SHIFT** **CALC** (SOLVE) **=** **5** **=** **5** **=** **6** **=**.

Arrow back up to **x=** and SOLVE the equation by pressing **=**.

To accomplish the same task and solve for  $A$  or  $B$ , enter a value for  $x$  and a value for one of the other unknowns.

For example, to solve for  $A$  when  $x = 1$  and  $B = 4$ , press **SHIFT** **CALC** (SOLVE) **1** **=** **2** **=** **4** **=**.

Arrow back up to **A=** and SOLVE the equation by pressing **=**.

The solution also displays  $L - R = 0$ . This means that Newton's method of approximation is directly on  $-5$ . If  $L - R$  is not 0, simply recalculate to get a better approximation.

Calculator screen showing the equation  $x^2 + Ax + B = 0$  with  $A = 5$ . The screen also shows the function icon  $\sqrt{x}$  and the solve icon  $\nabla$ .

Calculator screen showing the equation  $x^2 + Ax + B = 0$  with  $B = 6$ . The screen also shows the function icon  $\sqrt{x}$  and the solve icon  $\blacktriangle$ .

Calculator screen showing the equation  $x^2 + Ax + B = 0$  with  $x = 1$  and  $L - R = 0$ . The screen also shows the function icon  $\sqrt{x}$  and the solve icon  $\blacktriangleright$ .

Calculator screen showing the equation  $x^2 + Ax + B = 0$  with  $x = 1$ . The screen also shows the function icon  $\sqrt{x}$  and the solve icon  $\blacktriangledown$ .

Calculator screen showing the equation  $x^2 + Ax + B = 0$  with  $B = 4$ . The screen also shows the function icon  $\sqrt{x}$  and the solve icon  $\blacktriangle$ .

Calculator screen showing the equation  $x^2 + Ax + B = 0$  with  $A = 2$ . The screen also shows the function icon  $\sqrt{x}$  and the solve icon  $\blacktriangledown$ .

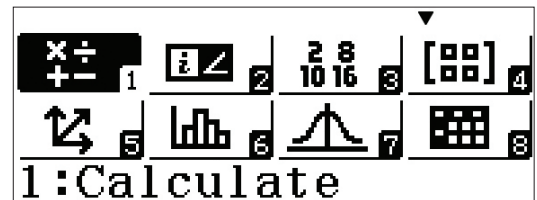
Calculator screen showing the equation  $x^2 + Ax + B = 0$  with  $A = -5$  and  $L - R = 0$ . The screen also shows the function icon  $\sqrt{x}$  and the solve icon  $\blacktriangleright$ .

# CALCULATE

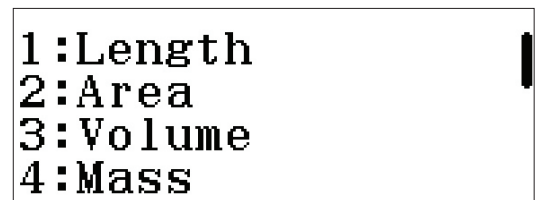
## ENGINEERING CALCULATIONS

There are many menus in the **fx-991EX** that can handle engineering calculations. The **fx-991EX** has the power to handle vectors, matrices, complex numbers and numerically calculates summation and even definite integrals.

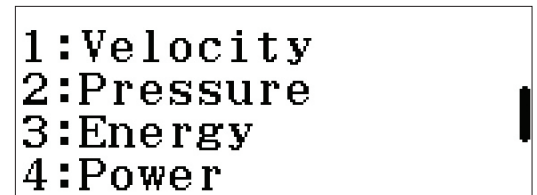
From the Main Menu, use the arrow keys to highlight the Calculate icon and press  $\square$  or press  $\boxed{1}$ .



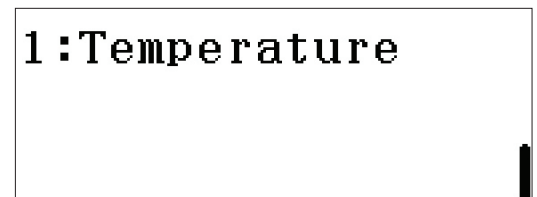
There are many different types of unit conversions that can be accomplished on this menu. To view the options, press  $\square$   $\boxed{8}$  (CONV). Use the down arrow key ( $\blacktriangledown$ ) to see all the possibilities.



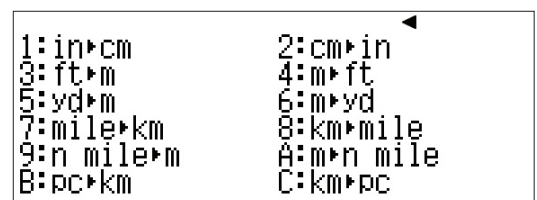
Each one of the choices has a wide range of conversion options for many different types of unit conversion.



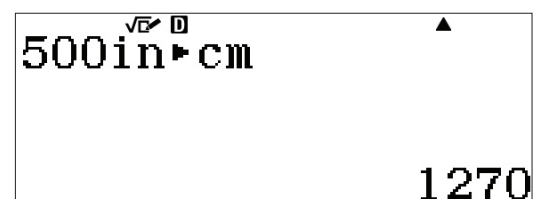
Use the arrow keys to locate the Length conversion and press  $\boxed{1}$ .



To convert 500 inches (in) into centimeters (cm), press  $\square$  to return to the initial Calculate screen.



Press  $\boxed{5}$   $\boxed{0}$   $\boxed{0}$   $\square$   $\boxed{8}$  (CONV)  $\boxed{1}$  (Length)  $\boxed{1}$  (in  $\rightarrow$  cm)  $\square$ .



# CALCULATE

To find the difference between one US Gallon and one UK Gallon, first, convert to a common unit, like a liter (L).

Press **1** **SHIFT** **8** (CONV) **3** (Volume) **1** (gal(US) ► L) **☰**.

One US gallon is approximately 3.785 L.  
Now, convert the solution to gallons UK.

Press **SHIFT** **8** (CONV) **3** (Volume) **4** (L ► gal(UK)) **☰**.

It looks like a US gallon is smaller.

1 US gallon = 0.8326742321 UK gallons.

The same calculation can be accomplished using a string of conversions.

Press **1** **SHIFT** **8** (CONV) **3** (Volume) **1** (gal(US) ► L) **SHIFT** **8** (CONV) **3** (Volume) **4** (L ► gal(UK)) **☰**.

## **ENGINEERING NOTATION**

Converting large numbers into scientific and engineering notations can be accomplished through a short series of keystrokes.

Start with a large number like  $2.5 \times 10^9$ .

Press **2** **.** **5** **x10<sup>x</sup>** **9** **☰**.

The gap between digits at place value separation can be viewed by entering Set Up. Press **SHIFT** **MENU** (SET UP) and use the arrow keys to navigate to the third menu.

```
1:gal(US)►L      2:L►gal(US)
3:gal(UK)►L     4:L►gal(UK)
```

```
1gal(US)►L
3.785412
```

```
AnsL►gal(UK)
0.8326742321
```

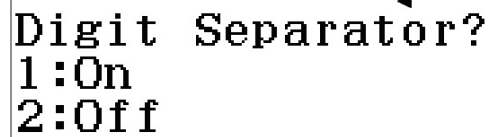
```
1gal(US)►LL►gal(U)
0.8326742321
```

```
2.5x109
2500000000
```

```
1:Equation/Func
2:Table
3:Decimal Mark
4:Digit Separator
```

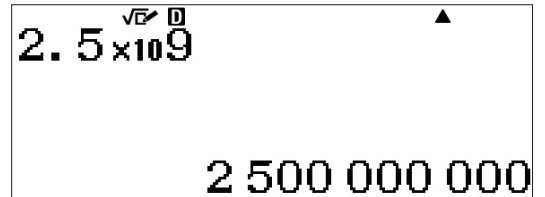
# CALCULATE

Press **[4]** (Digit Separator) **[1]** (On) to turn on the Digit Separator to show separation between place values.



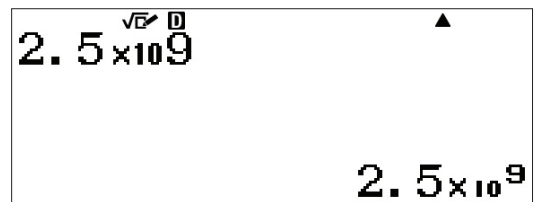
Digit Separator?  
1:On  
2:Off

Press **[=]** to recalculate the result and display clear place value separation.

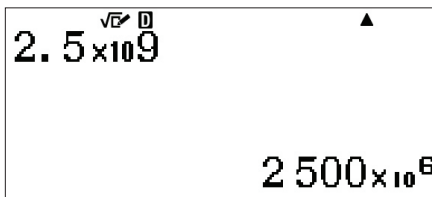


$2.5 \times 10^9$   
2 500 000 000

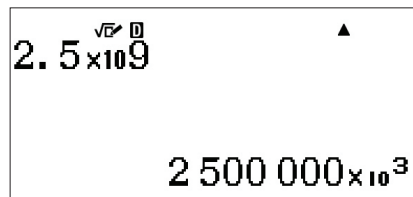
To convert this solution into engineering notation, use the **[ENG]** key to change the solution into scientific notation. To move the decimal to the right, press **[ENG]**.



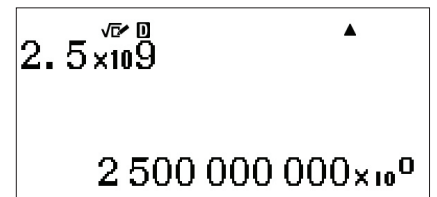
$2.5 \times 10^9$   
 $2.5 \times 10^9$



$2.5 \times 10^9$   
 $2\,500 \times 10^6$

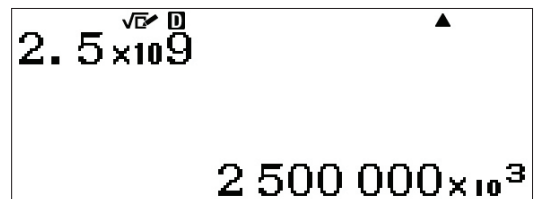


$2.5 \times 10^9$   
 $2\,500\,000 \times 10^3$



$2.5 \times 10^9$   
 $2\,500\,000\,000 \times 10^0$

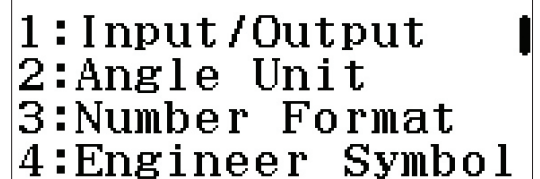
To move the decimal to the left, press **[SHIFT]** **[ENG]** (**←**).



$2.5 \times 10^9$   
 $2\,500\,000 \times 10^3$

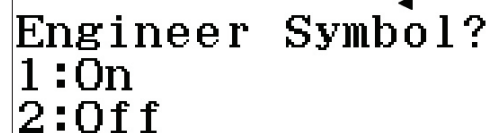
Calculating with engineering symbols has never been easier.

To turn on the engineering symbols in setup, press **[SHIFT]** **[MODE]** (SET UP).



1:Input/Output  
2:Angle Unit  
3:Number Format  
4:Engineer Symbol

Select **[4]** (Engineer Symbol) **[1]** (On) to turn on the Engineering Symbols.



Engineer Symbol?  
1:On  
2:Off

# CALCULATE

To calculate 500k (kilo) + 10M (Mega), press

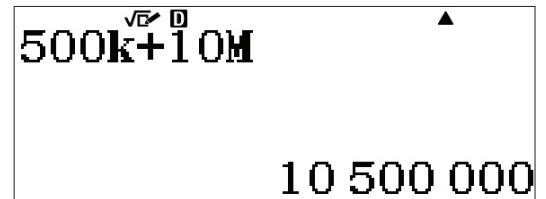
**5** **0** **0** **OPTN** **3** (Engineering Symbols)

**6** (k) **+** **1** **0** **OPTN** **3** (Engineering Symbols)

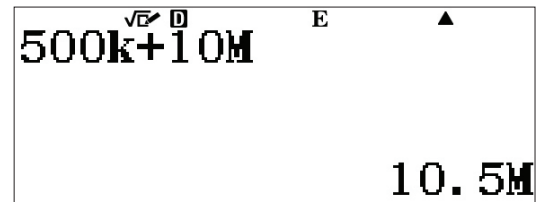
**7** (M) **=**.

The solution is displayed using the appropriate units.

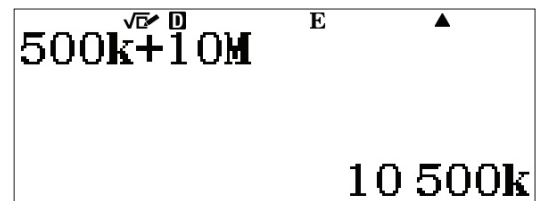
Now, use the **ENG** key to convert between units.



500k+10M  
10 500 000



500k+10M<sup>E</sup>  
10.5M



500k+10M<sup>E</sup>  
10 500k