

Sharp EL-546 Calculator

Basic Computation Functions

Introduction

This material is designed to review some of the basic functions of the Sharp EL546 Scientific Calculator.

Secondary functions appear in orange above the key for that function.

Secondary functions are activated by pressing the 2nd F key before pressing the function key.

Basic Settings

MODE

The 4 modes are:

- **0** NORMAL nothing appears in the display to indicate this mode.
- **1** CPLX - use when working with complex numbers
.....*xy* appears near upper-left corner of the display.
- **2** 3-VLE - use for solving systems of 2 or 3 linear equations
..... a prompt for coefficients appears near upper-left corner.
- **3** STAT - use in conjunction with the statistics functions
..... STAT appears near upper-right corner.

The default mode setting is 0 - NORMAL

Numeric Notation

FSE

The 4 numeric notations are:

- Floating nothing appears in the display to indicate this mode.
- Fixed..... FIX in the display indicates this mode.
- Scientific..... SCI in the display indicates this mode.
- Engineering..... ENG in the display indicates this mode.

The numeric notation is set with the FSE function key.

Repeat this function to cycle through the 4 settings.

Decimal Display

TAB

- **Floating Mode:** The number of decimal places displayed changes with the circumstances of the calculation.
- The **TAB** function key is used to set the number of decimal places displayed when in Fixed, Scientific or Engineering mode.
- Press **TAB** and the number of decimal places to set.

Example: **2nd F TAB 4** will provide 4 decimal place answers in Fixed, Scientific or Engineering mode.

Angle Unit Mode

The 3 angle unit modes are:

- Degree DEG in the display indicates this mode.
- Radian..... RAD in the display indicates this mode.
- Gradian..... GRAD in the display indicates this mode.

*The Angle Unit Mode is set with the **DRG** function key.*

Repeat this function to cycle through the 3 settings.

Basic Computation Functions

Refer to the Sharp EL546 Operation Manual for a complete description of the calculator functions.

Order of Operations

The calculator follows the standard mathematical order of operations, sometimes indicated as **BEDMAS**.

■ Calculate each of the following and record your answers:

1. $\frac{34.8 - 9.6}{0.4} =$

2. $\frac{9.6}{2.4 \times 1.2} =$

Use grouping symbols to control order of operations.

Powers

Squaring x^2

Examples: Evaluate.

1. $4.7^2 = \dots\dots\dots 4.7$ x^2

2. $50 - 6.2^2 = \dots\dots\dots 50 - 6.2$ x^2

3. $(-6.2)^2 = \dots\dots\dots (6.2$ $\boxed{+/-}$) x^2

Reciprocals x^{-1}

Recall the exponents definition that $x^{-1} = \frac{1}{x}$

Examples: Calculate each of the following and record your answers.

1. $\frac{1}{5} = \dots\dots\dots 5$ $\boxed{2nd F}$ x^{-1}

2. $\frac{1}{3.8} = \dots\dots\dots 3.8$ $\boxed{2nd F}$ x^{-1}

3. $\frac{-1}{6.2} = \dots\dots\dots -6.2$ $\boxed{2nd F}$ x^{-1}

General Powers y^x

Examples: Evaluate each of the following.

1. $5^4 = \dots\dots\dots 5$ y^x 4

2. $16.3^{1.54} = \dots\dots\dots 16.3$ y^x 1.54

3. $8^{2/3} = \dots\dots\dots 8$ y^x (2 \div 3)

4. $16^{1/5} = \dots\dots\dots 16$ y^x 5 x^{-1}

5. $24^{3-\frac{2}{5}} = \dots\dots\dots 24$ y^x (3 - 2 \div 5)

Radicals $\sqrt{\quad}$; $\sqrt[3]{\quad}$; $\sqrt[x]{\quad}$

Examples: Evaluate each of the following.

1. $\sqrt{169} = \dots\dots\dots$ 2nd F $\sqrt{\quad}$ 169

2. $\sqrt[3]{64} = \dots\dots\dots$ 2nd F $\sqrt[3]{\quad}$ 64

3. $\sqrt[4]{81} = \dots\dots\dots$ 4 2nd F $\sqrt[x]{\quad}$ 81

Factorial $n!$

The factorial symbol is the exclamation mark !

Example: $5!$ means $5 \times 4 \times 3 \times 2$ or 120

With the $n!$ function, calculate:

1. $5! \dots\dots\dots$ 5 2nd F $n!$ =

Percents $\%$

Examples

1. What is 30% of \$5000 ? $\dots\dots\dots 5000 \times 30$ 2nd F $\%$
 $\dots\dots\dots$ note the = is not used here.

2. 120 is what % of 400? $\dots\dots\dots 120 \div 400$ 2nd F $\%$

Constants (displayed as K)

A constant can be used in each of the four arithmetic functions.

Examples:

1. Multiply each of [3, 5, 9, and 11] by 6 .
 $\dots\dots\dots 6 \times 3 =$
 $\dots\dots\dots 5 =$
 $\dots\dots\dots 9 =$
 $\dots\dots\dots 11 =$

Note that the multiplication constant 6 is entered first ($K \times \#$).

2. Divide each of [30, 50, 90, and 110] by 5 .

..... $30 \div 5$
..... 50
..... 90
..... 110

Note that the division constant **5** is entered last (# ÷ K).

3. Add 7 to each of [30, 50, 90, and 110] .

..... $30 + 7$
..... 50
..... 90
..... 110

Note that the addition constant **7** is entered last (# + K).

4. Subtract 10 from each of [30, 50, 90, and 110] .

..... $30 - 10$
..... 50
..... 90
..... 110

Note that the subtraction constant **10** is entered last (# - K).

Powers of 10

The key means $\times 10^n$

Examples:

1. Enter 2.57×10^5 2.57 5 =

2. Enter 24.3×10^{-4} 24.3 4 =

3. Calculate $45200 \times 10^{-3} + 0.063 \times 10^4$
..... 45200 3 + 0.063 4 =

Memory

The calculator has **7** memory registers.

- **6 temporary** memories identified as **A, B, C, D, X, and Y**. These appear in **turquoise** above the second row of calculator keys.
- **1 independent** memory identified as **M**, which appears as a **turquoise M** at the end of the third row of keys.
 - A symbol **M** appears in the upper right of the display when that memory is occupied.
- Other keys used with the memories are:

RCL , **STO** and **M+**

Storing numbers **STO**

To store a displayed number, press **STO** and one of the memory register keys **A, B, C, D, X, Y** or **M**.

Examples:

- 1.** Calculate 5×7 and store the result in **A**.

..... $5 \times 7 =$ **STO** **A**

- 2.** Calculate $\sqrt{64}$ and store the result in **B**.

..... **2nd F** $\sqrt{\quad}$ $64 =$ **STO** **B**

Recalling numbers **RCL**

To recall a stored number, press **RCL** and one of the memory register keys **A, B, C, D, X, Y** or **M**.

Examples:

- 1.** Recall the number stored in **A**.

..... **RCL** **A**

- 2.** Recall the number stored in **B**.

..... **RCL** **B**

Computing with stored numbers

Examples:

- 1.** Add the numbers stored in A and B and store the answer in M.

..... **RCL** A + **RCL** B = **STO** M

- 2.** Multiply the number stored in A by the number in B and add the result to the number in M.

..... **RCL** A × **RCL** B = **M+**

- 3.** Recall the final answer from M.

..... **RCL** M

Working with Angles

Angle Unit Mode

DRG

The 3 angle unit modes are:

- Degree DEG in the display indicates this mode.
- Radian..... RAD in the display indicates this mode.
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*The Angle Unit Mode is set with the **DRG** function key.
Repeat this function to cycle through the 3 settings.*

Angles in Decimal Degrees and Degrees, Minutes and Seconds

Set the **Angle Unit Mode** to **DEG** when working with angles in Decimal Degrees (DD) and in Degrees, Minutes and Seconds (DMS).

Entering Angles in Decimal Degrees

Angles in decimal degree form are entered as regular decimal numbers.

Example:

1. Add $23.58^\circ + 51.73^\circ$
.....Enter: $23.58 + 51.73 =$

Entering Angles in Degrees, Minutes and Seconds

D°M/S

Angles in degrees, minutes and seconds are entered with the **D°M/S** function.

Example:

1. Enter $35^\circ 42' 21''$ 35 **D°M/S** 42 **D°M/S** 21 **D°M/S** =
.....Display: $35^\circ 42' 21.00$

- Note that the calculator does not display the seconds symbol (").
- Although the calculator indicates 2 decimals for the seconds, usually nearest whole second precision is adequate.

Operations with Angles in Degrees, Minutes and Seconds

Basic calculations with angles can be performed on angles in DMS form.

Examples: Evaluate:

1. $35^{\circ}42'21'' + 16^{\circ}28'54''$

..... Enter: $35^{\circ}42'21'' + 16^{\circ}28'54'' =$

..... Display: $52^{\circ}11'15.00$

..... Answer is: $52^{\circ}11'15''$

Note that the display is in DMS form.

2. $\cos(35^{\circ}42'21'')$

..... Enter: $\cos(35^{\circ}42'21'')$

..... Display: 0.812024

..... Answer is: $\cos(35^{\circ}42'21'') = 0.812024$

Mixed DD and DMS Operations

Results of mixed form calculations are in decimal degree form.

Examples: Evaluate

1. $16^{\circ}28'54'' + 12.576328^{\circ}$

..... Enter: $16^{\circ}28'54'' + 12.576328^{\circ} =$

..... Display: 29.057995

Note that the answer is in DD form

..... Answer is: $16^{\circ}28'54'' + 12.576328^{\circ} = 29.057995^{\circ}$

Converting DD to DMS and vice versa



Example: Convert as indicated.

1. Convert $16^{\circ}28'54''$ to DD form.

..... Enter: $16^{\circ}28'54'' \leftrightarrow \text{DEG}$

..... Display: 16.481667

Note that the answer is in DD form

..... Answer is: $16^{\circ}28'54'' = 16.481667^{\circ}$

2. Convert 12.576328° to DMS form.

..... Enter: 12.576328 ↔DEG =
..... Display: $12^\circ 34' 34.78''$

Note that the answer is in DMS form

..... Answer is: $12.576328^\circ = 12^\circ 34' 35''$

Converting among Angles in Degrees, Radians and Gradians

DRG ▶

To convert amongst the three angle unit modes:

- set the angle unit mode to the mode of the angle to be converted.

.....

2nd F DRG

- Convert successively to the next mode in the sequence:

$DEG \Rightarrow RAD \Rightarrow GRAD \Rightarrow DEG \Rightarrow RAD \Rightarrow \dots$

2nd F DRG ▶

Examples:

1. Convert 35.8° to radians. $DEG \Rightarrow RAD$

Set mode to DEG mode, by:..... 2nd F DRG

..... Enter: 35.8 2nd F DRG ▶

..... Display: 0.62482787

..... Answer: 0.6248 rad

2. Convert $62^\circ 28' 54''$ to radians.

Set mode to DEG mode, by:..... 2nd F DRG

..... Enter: 62 D°M/S 28 D°M/S 54 D°M/S 2nd F DRG ▶

..... Display: 1.0905108

..... Answer: 1.090511 rad

3. Convert 3.27 radians to degrees. RAD \Rightarrow GRAD \Rightarrow DEG

This operation requires converting radians to gradians and then gradians to degrees.

Set mode to RAD mode, by:.....**2nd F** **DRG**
..... **Enter:** **3.27** **2nd F** **DRG** ▶
..... **Display:** **208.175** (this is gradians)
..... **Enter:** **2nd F** **DRG** ▶
..... **Display:** **187.357199** (this is degrees)
..... **Answer:** **187.3572** °

Note the answer is in decimal degree form

Trigonometric Ratios

The three primary trigonometric ratio functions are:

sin

cos

tan

To determine a trig ratio value,

- set the angle mode to Degree or radian as appropriate.
- press the desired trig ratio key.
- enter the angle.

Examples:

1. Determine $\sin 38.5^\circ$.

sin

Set mode to DEG mode, by:.....2nd F DRG
.....Press: sin 38.5
.....Display: 0.6225146...
.....Answer: $\sin 38.5^\circ = 0.622515$

2. Determine $\cos 58^\circ 35' 40''$.

cos

Set mode to DEG mode, by:.....2nd F DRG
.....Press: cos 58 D°M/S 35 D°M/S 40 D°M/S
.....Display: 0.5210924...
.....Answer: $\cos 58^\circ 35' 40'' = 0.521092$

3. Determine $\tan 1.25$.

tan

Set mode to RAD mode, by:.....2nd F DRG
.....Press: tan 1.25
.....Display: 3.00956967...
.....Answer: $\tan 1.25 = 3.0096$

Angles from Trigonometric Ratio Values

The inverse trigonometric functions

$$\boxed{\sin^{-1}} \quad \boxed{\cos^{-1}} \quad \boxed{\tan^{-1}}$$

are used to determine an angle knowing its trig ratio value.

These are the 2nd functions of the $\boxed{\sin}$ $\boxed{\cos}$ $\boxed{\tan}$ keys.

Examples:

1. Determine $\sin^{-1}(0.756819)$. $\boxed{\sin^{-1}}$

Set mode to DEG mode, by:..... $\boxed{2nd F}$ \boxed{DRG}

..... Press: $\boxed{2nd F}$ $\boxed{\sin}$ 0.756819

..... Display: $49.18456481\dots$

..... Answer: $\sin^{-1}(0.756819) = 49.18456^\circ$

That is, the angle 49.18456° has a sine ratio value of 0.756819 .

2. Determine angle B if $\cos B = 0.456789$. $\boxed{\cos^{-1}}$

Set mode to DEG mode, by:..... $\boxed{2nd F}$ \boxed{DRG}

..... Press: $\boxed{2nd F}$ $\boxed{\cos}$ 0.456789

..... Display: 62.819899

..... Answer: $\triangle B = 62.819899^\circ$

3. Determine θ in radians if $\tan \theta = 1.234$. $\boxed{\tan^{-1}}$

Set mode to RAD mode, by:..... $\boxed{2nd F}$ \boxed{DRG}

..... Press: $\boxed{2nd F}$ $\boxed{\tan}$ 1.234

..... Display: $0.8897624\dots$

..... Answer: $\triangle \theta = 0.8898 \text{ rad}$

Vectors and Complex Numbers

Vectors are represented as complex numbers in either of the forms:

- Rectangular form:..... $x + yi$
- Polar form:..... $r \angle \theta$

Vector computations are performed in the CPLX mode on the Sharp EL546 calculator:

Setting Modes

Set angle mode to DEG, by:..... 2nd F DRG

Set calculator mode to CPLX, by: 2nd F MODE 1

note the xy or $r\theta$ on the display (upper left corner)

Entering Vectors

Polar Form:..... $r \angle \theta$

Example: Enter $5 \text{ kN} \angle 53.13^\circ$ 5 ∠ 53.13 =

Rectangular Form:..... $x + yi$

Example: Enter the vector with:
 $x = 3 \text{ kN}$ and $y = 4 \text{ kN}$ 3 + 4 i =

Vector Results - Display Mode

The results of vector calculations can appear in:

Rectangular form.....when xy is displayed.

Polar form.....when $r\theta$ is displayed.

Setting Display Mode for Vector Results

To set xy mode..... MATH 2

To set $r\theta$ mode..... MATH 1

Rectangular to Polar (xy to $r\theta$) Conversions

To determine the magnitude r and the direction θ for a vector, knowing its x and y components:

- ◆ Enter the Rectangular form..... $x + y$ $\lfloor i \rfloor$
- ◆ Set the Display mode to $r\theta$
- ◆ The Display provides the magnitude r
- ◆ To Display the Direction θ 2nd F \leftarrow, \rightarrow

Example:

Determine the magnitude r and the direction θ for a vector, knowing its x component is 12 kN and its y component is 8 kN :

- ◆ Enter the Rectangular form..... $12 + 8$ $\lfloor i \rfloor$ =
- ◆ Set the Display mode to $r\theta$ MATH 1
- ◆ Display provides the magnitude r 14.422
- ◆ To Display the Direction: 2nd F \leftarrow, \rightarrow $\angle 33.69$

Answer: The Polar form is $14.422\text{ kN} \angle 33.69^\circ$

Polar to Rectangular ($r\theta$ to xy) Conversions

To determine the x and y components of a vector, knowing its magnitude r and direction θ :

- ◆ Enter the Polar form..... $r \boxed{\text{L}\angle\text{R}} \theta$
- ◆ Set the Display mode to xy
- ◆ The Display provides the x component x
- ◆ To Display the y component $\boxed{2\text{nd F}} \boxed{\leftarrow, \rightarrow}$

Example:

Determine the x and y components of the vector $24.5 \text{ kN} \angle 124^\circ$:

- ◆ Enter the Polar form..... $24.5 \boxed{\text{L}\angle\text{R}} 124 =$
- ◆ Set the Display mode to xy $\boxed{\text{MATH}} 2$
- ◆ Display provides the x component..... -13.70
- ◆ To Display the y component: $\boxed{2\text{nd F}} \boxed{\leftarrow, \rightarrow}$ $+20.31i$

The Rectangular form is $-13.70 + 20.31i$

Answer: The vector components of $24.5 \text{ kN} \angle 124^\circ$ are:

..... $x = -13.70 \text{ kN}$
 $y = +20.31 \text{ kN}$

Vector Addition

The process of adding vectors provides the resultant for a system of vectors.

- In CPLX mode, vectors are added as complex numbers.
- The vectors can be added in either Rectangular or Polar form.
- The Resultant ($r \angle \theta$) or its x and y components are determined by selecting the appropriate Display mode.

Example:

Determine the resultant of the three forces, $15 \text{ kN} \angle 70^\circ$, $10 \text{ kN} \angle 30^\circ$ and $12 \text{ kN} \angle 320^\circ$.

Enter:..... $15 \boxed{\text{L} \angle \text{J}} 70 + 10 \boxed{\text{L} \angle \text{J}} 30 + 12 \boxed{\text{L} \angle \text{J}} 320 =$

The display will depend on the mode set.

◆ In xy mode displays x component..... 22.983
 for the y component: $\boxed{2\text{nd F}} \boxed{\leftarrow, \rightarrow}$ $+11.382i$

That is, the resultant components are:

x component..... 22.98 kN
 y component..... 11.38 kN

◆ In $r\theta$ mode displays magnitude r 25.647
 for the angle θ : $\boxed{2\text{nd F}} \boxed{\leftarrow, \rightarrow}$ $\angle 26.346$

That is, the resultant is:..... $25.65 \text{ kN} \angle 26.33^\circ$