INTRODUCTION
Thank you for purchasing the SHARP Scientific Calculator Model EL-520TG.

Before reading this manual, please check the cover for a convenient location for future reference.

Note:
- The sheet with calculation examples is used English notation (with a decimal point).
- This product uses a period as a decimal point.

Operational Notes
- Do not carry the calculator around in your back pocket, as it may break when you sit down.
- The display is not water resistant. Do not use near water, etc.
- Keep the calculator away from extremely humid or dusty environments.
- This product is not water resistant. Do not store it or store it where fluids, for example, water, can splash on it. Rain, wind, spray, juice, coffee, steam, perspiration, etc. will not damage the product.
- Clean with a soft, dry cloth. Do not use solvents or a wet cloth.
- Do not drop it or apply excessive force.
- Never disassemble the battery.
- Keep batteries out of the reach of children.
- Do not use an object with a breakable or sharp tip.
- If service should be required on this calculator, use only a SHARP servicing dealer, Do not use an object with a breakable or sharp tip.

• Keep batteries out of the reach of children.
• Do not drop it or apply excessive force.
• Since this product is not waterproof, do not use it or store it where fluids, for example water, can splash on it. Rain, wind, spray, juice, coffee, steam, perspiration, etc. will not damage the product.

Note:
- SHARP strongly recommends that separate permanent written records be kept of all important data. Data may be lost or altered in virtually any electronic memory product under certain circumstances. Therefore, SHARP assumes no responsibility for data lost or otherwise rendered unusable whether as result of improper use, use, defects, repair, battery replacement, use after the specified battery life has expired, or while returned when service is selected.
- SHARP will not be liable for any incidental or consequential economic or property damage caused by misuse and/or malfunctions of this product and its peripherals, unless such liability is acknowledged by law.

- Before using the calculator, only a SHARP servicing dealer, SHARP approved service facility, or SHARP repair service where available.

Hard Case
- This calculator is not designed to be used in a pool or bathtube. The display is not water resistant. Do not use near water, etc. Otherwise, water, steam, perspiration, sweat, etc. will not damage the product.
- In addition to the features of the memory circuits, a value can be added or subtracted from an existing memory value.
- To clear the memory.

DISPLAY
- The symbols and key indications in this manual are used in the following manner:

- The generated pseudo-random number series is stored in memory Y. Each random number is based on a number series.
- Random function .......... Y memory
- To simulate a coin flip, 0 (head) or 1 (tail) can be randomly generated by pressing
- To return to the display as shown in the calculation example, press
- To specify F in the complex calculation mode.
- To simulate a die-rolling, a random integer between 1 and 6 can be generated by pressing
- To solve a linear system of 2 equations, press
- In constant calculations, the addend becomes a constant. Subtraction and division are performed in the same manner. For multiplication, the multiplicand becomes a constant. In constant calculations, constants will be displayed as K.
- In the complex calculation mode, the display is not water resistant. Do not store it or store it where fluids, for example water, can splash on it. Rain, wind, spray, juice, coffee, steam, perspiration, etc. will not damage the product.
To change statistical sub-mode, reselect statistical mode (press \(\text{RCL} \rightarrow \text{STAT} \to \text{MODE} \)) then, select the required sub-mode.

\(\text{Stat} \to \text{LINE} \rightarrow \text{Linear regression calculation} \)
\(\text{Stat} \to \text{LOG} \rightarrow \text{Logarithmic regression calculation} \)
\(\text{Stat} \to \text{EXP} \rightarrow \text{Exponential regression calculation} \)
\(\text{Stat} \to \text{POW} \rightarrow \text{Power regression calculation} \)
\(\text{Stat} \to \text{INV} \rightarrow \text{Inverse regression calculation} \)

The following statistics can be obtained for each statistical calculation:

**Single-variable statistical calculations**

Statistics of \(X\) and \(y\) and value of the probability function

- Linear regression calculation
- Logarithmic regression calculation
- Exponential regression calculation
- Power regression calculation
- Inverse regression calculation

**Population standard deviation**

\(\sigma_{X} \) and \( \sigma_{y} \) (standard deviation of \(X\) and \(y\), respectively)

**Sample standard deviation**

\(s_{X} \) and \( s_{y} \) (sample standard deviation of \(X\) and \(y\), respectively)

**Sum of squares of samples**

\(S_{X} \) and \( S_{y} \) (sum of squares of \(X\) and \(y\), respectively)

**Population standard deviation**

\(\sigma_{X} \) and \( \sigma_{y} \) (standard deviation of \(X\) and \(y\), respectively)

**Sample standard deviation**

\(s_{X} \) and \( s_{y} \) (sample standard deviation of \(X\) and \(y\), respectively)

**Sum of squares of samples**

\(S_{X} \) and \( S_{y} \) (sum of squares of \(X\) and \(y\), respectively)

**Correlation coefficient**

\(r \) (correlation coefficient of \(X\) and \(y\))

**Coefficient of regression equation**

\(a \) and \( b \) (coefficient of linear regression equation)

**Inverse regression calculation**

\(\frac{1}{a} \) and \( \frac{1}{b} \) (coefficient of inverse regression equation)

**Multiple-regression calculation**

\(a, b, c, \ldots, \) (coefficients of multiple regression equation)

**Calculation error**

\(\epsilon \) (absolute value of an error)

**Equation exceeded its maximum input buffer**

\(\text{Error} 2 : 142 \) (maximum number of characters for an equation)

**Calculation ranges**

- For the ranges of \( X \) and \( y \), see the table below.
- For the range of \( \theta \), see the table below.

**BATTERY REPLACEMENT**

Improper handling of batteries can cause electrolyte leakage or explosion. Be sure to observe the following rules.

- Make sure the new battery is the correct type.
- When installing, orient the battery properly as indicated in the calculator.
- Keep the battery in a cool place (below \(30^\circ\)C) when not in use.
- If electrolyte leaks, immediately wash with clean water.
- Do not use new batteries in combination with old ones.

Notes on erasure of memory contents

- When the batteries are replaced, any data stored in the calculator is erased.
- A battery that has been stored for some time may be exhausted even when it is in the storage mode.
- The factory-installed battery is not usable for continuous calculations due to accumulation of calculation error.

When to replace the batteries

If the display is too faint or if numbers appearing on the display are not visible, press the [ON] key while pressing the [RCL] key. The battery needs to be replaced. Do not use old batteries in combination with new ones.

Cautions

- An exhausted battery in the calculator may leak and damage the calculator. Should fluid from a leaking battery come in contact with your skin or clothes, immediately wash with clean water.
- The product is not to be used for some time, to avoid damage to the unit from leakage/battery, remove them and store in a safe place.
- Do not disassemble the product. The product is not to be used for some time, to avoid damage to the unit from leakage/battery, remove them and store in a safe place.
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**SPECIFICATIONS**

Calculations: Scientific calculations, statistical calculations, etc.

Internal calculations: Mantissas of up to 14 digits

Pending operations: 24 calculations, 10 numeric values (5 numeric values in STAT mode)

Power source: Built-in solar cells

1.5V (DC) alkaline batteries (LR44 or equivalent) × 1

Operating time: Approx. 5,000 hours when continuously displaying 55555 at 25°C (77°F)

Dimensions: 80 mm × 161 mm × 15 mm

Weight: Approx. 110 g (with batteries)

Accessories: Battery × 1 (installed), operation manual and hard case

**FOR MORE INFORMATION ABOUT SHARP CALCULATORS VISIT:**

http://www.sharp-calculators.com

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**CALCULATION EXAMPLES**

**[1]**

\[
\begin{align*}
\sin(5\cdot x) & = x \\
\cos(3\cdot x) & = 4 \quad 6 \quad 5 \\
\tan(3\cdot x) & = 2 \\
\end{align*}
\]

**[2]**

\[
\begin{align*}
\sin(1000\cdot x) & = x \\
\cos(1000\cdot x) & = 2 \\
\tan(1000\cdot x) & = 3 \quad 4 \quad 5
\end{align*}
\]

**[3]**

\[
\begin{align*}
45 \cdot 285.3 & = x \\
18 \div 6 & = y \\
15 \div 8 & = z
\end{align*}
\]

**[4]**

\[
\begin{align*}
34 \div 25 & = x \\
45 \div 25 & = y \\
68 \div 25 & = z \\
68 \div 60 & = y
\end{align*}
\]

**[5]**

\[
\begin{align*}
\sin(60^\circ) & = x \\
\cos(60^\circ) & = y \\
\tan(60^\circ) & = z
\end{align*}
\]

\[
\begin{align*}
\sin(60^\circ) & = 0.866025403 \\
\cos(60^\circ) & = 0.707106781 \\
\tan(60^\circ) & = 0.099248049
\end{align*}
\]

**[6]**

\[
\begin{align*}
\log_{10}(x) & = 2 \\
\log_{10}(2) & = 3 \\
\log_{10}(3) & = 4
\end{align*}
\]

**[7]**

\[
\begin{align*}
\sin(\theta) & = 0.9 \\
\cos(\theta) & = 0.8 \\
\tan(\theta) & = 0.7
\end{align*}
\]

**[8]**

\[
\begin{align*}
\frac{1}{2} \cdot \frac{1}{3} & = x \\
\frac{1}{4} \cdot \frac{1}{5} & = y \\
\frac{1}{6} \cdot \frac{1}{7} & = z
\end{align*}
\]

**[9]**

\[
\begin{align*}
\sin(\theta) & = 0.5 \\
\cos(\theta) & = 0.3 \\
\tan(\theta) & = 0.2
\end{align*}
\]

The range of the results of inverse trigonometric functions

\[
\begin{align*}
\sin^{-1}(x) & = 0 \quad 5 \quad 8 \quad 9 \\
\cos^{-1}(x) & = 1 \quad 2 \quad 3 \quad 4 \\
\tan^{-1}(x) & = 5 \quad 6 \quad 7 \quad 8
\end{align*}
\]

\[
\begin{align*}
\sin^{-1}(0.5) & = 0 \quad 5 \quad 8 \quad 9 \\
\cos^{-1}(0.5) & = 1 \quad 2 \quad 3 \quad 4 \\
\tan^{-1}(0.5) & = 5 \quad 6 \quad 7 \quad 8
\end{align*}
\]

The results are within the range of 0° to 90°.

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**FOR MORE INFORMATION ABOUT SHARP CALCULATORS VISIT:**

http://www.sharp-calculators.com
n, m, r: integer

Physical constants and metric conversions are shown in the tables:

**PHYSICAL CONSTANTS**

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**METRIC CONVERSIONS**

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Manufactured by:
SHARP CORPORATION
1 Takumi-cho, Sakai-ku, Sakai City, Osaka 590-8522, Japan

For EU only:
Imported into Europe by:
MORAVIA Consulting spol. s r.o.
Olomoucká 83, 627 00 Brno, Czech Republic

For UK only:
Imported into UK by:
MORAVIA Europe Ltd.
Belmont House, Stedham Way, Croydon, West Sussex RH10 1JA, Great Britain