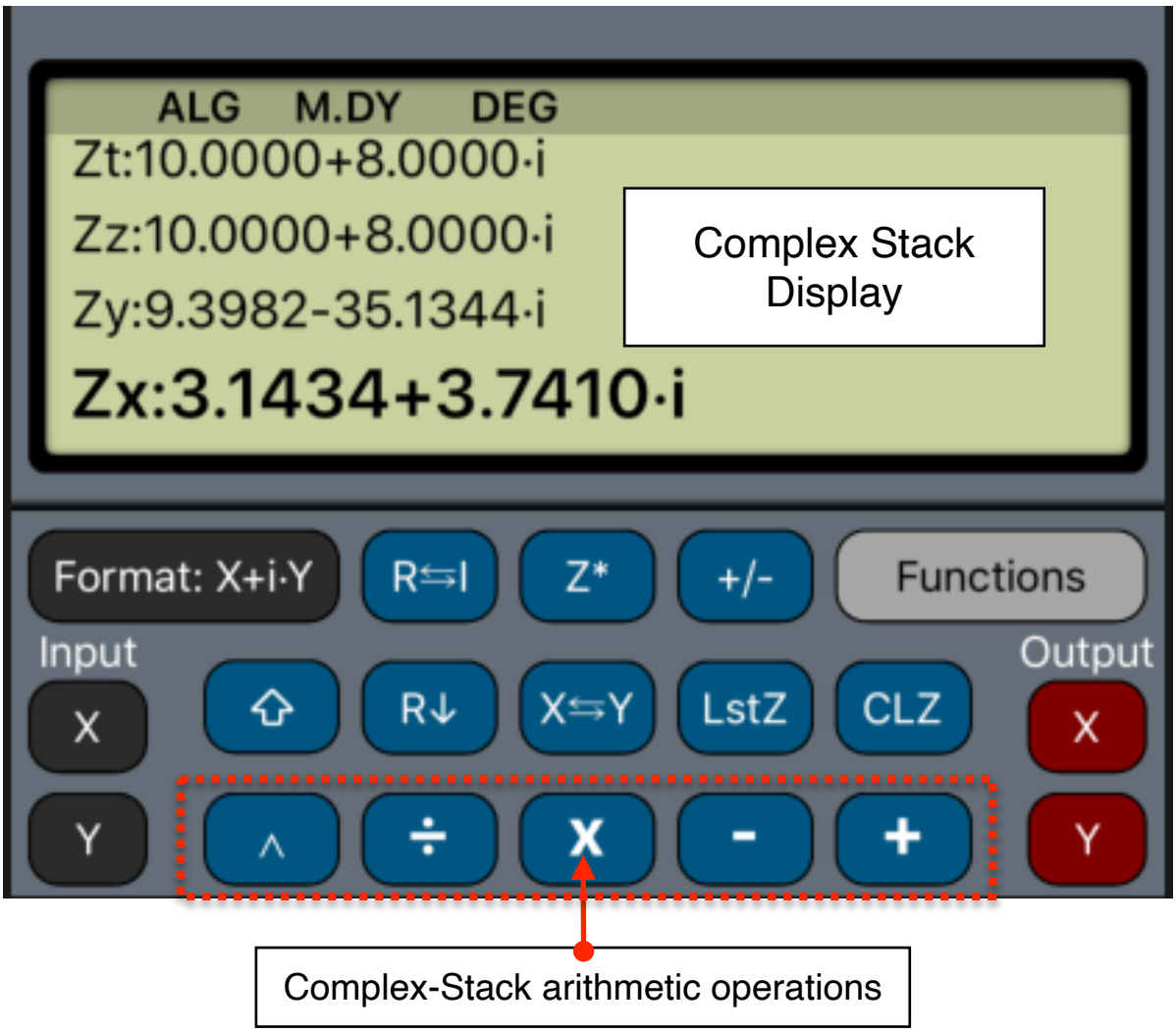
Complex Numbers Menu

This “Complex Numbers” menu implements a stack to perform operations and functions with complex numbers. To show it, touch the “**SCI**” menu, and then select the “Complex Numbers” option.



This “Complex-Stack” is similar to the normal calculator’s history stack, but specially designed for operations with complex numbers. The number are entered in the Complex Stack from the calculator using the ”Inputs” buttons. The calculator’s stack-X value is used as the real, imaginary, modulus or angle parts depending of the “Format” button state.

The Complex Stack, operations and functions are completely independent from the calculator and always behaves in the RPN logic.

Complex Numbers Menu Buttons	
[Format: X+i·Y] Input **[X]** Input **[Y]** Output **[X]** Output **[Y]**	Rectangular format selected. - Input real part of complex number Zx. - Input imaginary part of complex number Zx. - Enters real part of Zx in calculator's stack. - Enters imaginary part of Zx in calculator's stack.
[Format: R∠Θ] Input **[R]** Input **[Θ]** Output **[R]** Output **[Θ]**	Polar (phasor) format selected. - Input modulus of phasor Zx. - Input angle of phasor Zx. - Enters modulus of Zx in calculator's stack. - Enters angle of Zx in calculator's stack.
[Function▶] **[Function▶]**	Toggles to show or hide common mathematical function with complex argument.
[R⇆I]	Swaps the real and imaginary parts of the **Zx** complex number.
[Z*]	Conjugates **Zx** (change the sign of the imaginary part).
[+/-]	Change the sign of **Zx** (change the sign of the real & imaginary part).
[⇧]	Lift the complex-stack duplicating **Zx**.
[R↓]	Rolls down the Complex-Stack.
[X⇆Y]	Swaps the Complex-Stack **Zx** by **Zy**.
[LstZ]	Enters the last **Zx** number that was just before a function or operation was applied.
[CLZ]	Clears both parts of **Zx** to 0.

Complex Numbers Menu Buttons	
[∧]	Raises **Zy** to **Zx**. => Stores **Zx** in **LstZ**, drop the stack and put in **Zx** the result of **Zy** ^ **Zx**.
[÷]	Divides **Zy** by **Zx**. => Store **Zx** in **LstZ**, drop the Stack and put in **Zx** the result of **Zy** ÷ **Zx**.
[x]	Multiplies **Zy** by **Zx**. => Store **Zx** in **LstZ**, drop the Stack and put in **Zx** the result of **Zy** x **Zx**.
[-]	Subtracts **Zx** from **Zy**. => Store **Zx** in **LstZ**, drop the Stack and put in **Zx** the result of **Zy** - **Zx**.
[+]	Adds **Zy** to **Zx**. => Store **Zx** in **LstZ**, drop the Stack and put in **Zx** the result of **Zy** + **Zx**.

Complex Functions:
Additionally to the arithmetic operations for complex numbers, touching the **[Function▶]** button, brings up a common set of functions that can be applied to the **Zx** complex number.

Note: Before applying the function, the number currently in **Zx** is copied to the **LstZ**.

The Complex functions included in the calculator are:

1 / z	Calculates the reciprocal of **Zx**
√ z	Calculates the square of **Zx**
z ^{2}	Calculates the square of **Zx**
LN	Calculates the Natural Logarithm of **Zx**
LOG	Calculates the Common Logarithm of **Zx**
EXP	Calculates the Natural Anti-Logarithm of **Zx**
ALog	Calculates the Common Anti-Logarithm of **Zx**
SIN	Calculates the Sine of **Zx**
COS	Calculates the Cosine of **Zx**
TAN	Calculates the Tangent of **Zx**
SIN^{-1}	Calculates the Arc-Sine of **Zx**
COS^{-1}	Calculates the Arc-Cosine of **Zx**
TAN^{-1}	Calculates the Arc-Tangent of **Zx**
HSin	Calculates the Hyperbolic-Sine of **Zx**
HCos	Calculates the Hyperbolic-Cosine of **Zx**
HTan	Calculates the Hyperbolic-Tangent of **Zx**
HSin^{-1}	Calculates the Arc-Hyperbolic-Sine of **Zx**
HCos^{-1}	Calculates the Arc-Hyperbolic-Cosine of **Zx**
HTan^{-1}	Calculates the Arc-Hyperbolic-Tangent of **Zx**

Example 1: (Arithmetic calculation)
Evaluate the expression: $[\ 2i \cdot (-8 + 6i)^3\ ] / [\ (4 - 2i \cdot \sqrt{5}) \cdot (2 - 4i \cdot \sqrt{5})\ ]$

Solution: (ALG mode, Format: X + i·Y)

Keystrokes	Description
[CLZ] 2 Input **[Y]**	Enter the first complex number "2·i". **Zx = 0.00 + 2.00·i**
8 **[+/-]** Input **[X]** 6 Input **[Y]**	Enter the second complex number "-8 + 6·i". **Zx = -8.00 + 6.00·i**
3 Input **[X]**	Enter the exponent number "3 + 0·i". **Zx = 3.00 + 0.00·i**
Menu key [∧]	Calculate $(-8 + 6 \cdot i)^3$. **Zx = 352.00 + 936.00·i**
Menu key [x]	Calculate $2 \cdot i \cdot (-8 + 6 \cdot i)^3$. **Zx = -1,872.00 + 704.00·i**
4 Input **[X]** 5 [Shift] [√x] **[x]** 2 **[=]** **[+/-]** Input **[Y]**	Calculates $(4 - i \cdot 2 \cdot \sqrt{5})$. **Zx = 4.00 - 4.47·i**
2 Input **[X]** 5 [Shift] [√x] **[x]** 4 **[=]** **[+/-]** Input **[Y]**	Calculates $(2 - i \cdot 4 \cdot \sqrt{5})$. **Zx = 2.00 - 8.94·i**
Menu key [x]	Calculates $(4 - i \cdot 2 \cdot \sqrt{5}) \cdot (2 - i \cdot 4 \cdot \sqrt{5})$. **Zx = -32.00 - 44.72·i**
Menu key [÷]	Calculate the final result. **Zx = 9.40 - 35.13·i**
Output **[X]** Output **[Y]**	Enters **Zx** real and imaginary parts to the calculator's stack.

Example 2: (Arithmetic calculation)
Calculate the phasor expression: $2 \angle 65^{o} + 3 \angle 40^{o}$

Solution: (DEG mode)

Keystrokes	Description
[Format: R∠Θ]	Set display format to Polar (phasor).
2 Input **[R]** 65 Input **[Θ]**	Enter the 1st phasor. **Zx = 2.00∠65.00**
3 Input **[R]** 40 Input **[Θ]**	Enter the 2nd phasor. **Zx = 3.00∠40.00**
Menu key **[+]**	Adds the complex numbers phasors. **Zx = 4.89∠49.96**
Output **[R]** Output **[Θ]**	Enters **Zx** modulus and angle to the calculator's stack.