

# SimpleCmplx: Elementary calculations with complex numbers

The screenshot displays the SimpleCmplx software interface with several functional panels:

- Graphs:** A complex plane showing vectors for  $Z_1 = 4+2i$ ,  $Z_2 = 1-i$ , and their sum  $Z_1+Z_2 = 5+1i$ . The text  $R5(4+2i)$  is visible below the graph.
- Zs:** A table listing complex numbers and their polar representations:
 

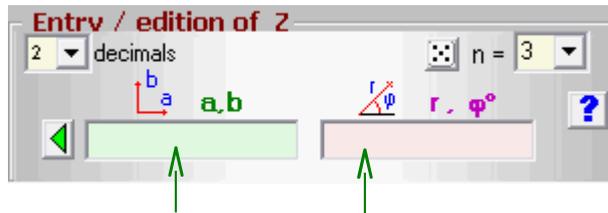
|   | cart. | polar       |
|---|-------|-------------|
| a | 4+2i  | 4.47, 26.6° |
| b | 1-1i  | 1.41, -45°  |
| c | 0-3i  | 3, -90°     |
- Entrv / edition of Z:** A panel for entering or editing a complex number  $Z$  in either Cartesian ( $a+bi$ ) or Polar ( $r, \phi^\circ$ ) form. It includes a 'decimals' dropdown set to 2 and a 'n = 3' dropdown.
- Unary operations:**
  - Power of Z n:** Shows  $Z = 4+2i$  raised to the power  $n=3$ , resulting in  $Z^n = 16+88i$  (polar: 89.44, 79.7°).
  - n Root:** Shows the 5th root of  $Z = 4+2i$ , resulting in five roots:  $1.34+0.12i$ ,  $0.3+1.32i$ ,  $-1.16+0.69i$ ,  $-1.01-0.89i$ , and  $1.35, 5.3^\circ$ ,  $1.35, 77.3^\circ$ ,  $1.35, 149.3^\circ$ , and  $1.35, 221.3^\circ$ .
- Binary operations:** Shows operations on  $Z_1 = 4+2i$  and  $Z_2 = 1-i$ :
 

| operation | cartesian | polar        |
|-----------|-----------|--------------|
| $Z_1+Z_2$ | 5+1i      | 5.1, 11.3°   |
| $Z_1-Z_2$ | 3+3i      | 4.24, 45°    |
| $Z_1*Z_2$ | 6-2i      | 6.32, -18.4° |
| $Z_1/Z_2$ | 1+3i      | 3.16, 71.6°  |
- Combined operations a,b,...:** A calculator-style interface with a numeric keypad and a 'String of operations' field containing  $a*b/c$ . The result is shown as  $-2+0.67i$  (polar: 2.11, 161.6°).

1. [Entry / generation and edition of complex numbers](#)
2. [Operations:](#)
  - 2.1. [Unary operations: raising to a power and root of index n](#)
  - 2.2. [Binary operations: addition, subtraction, product and division](#)
  - 2.3. [Combined operations.](#)
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# 1. Entry / generation, edition of complex numbers

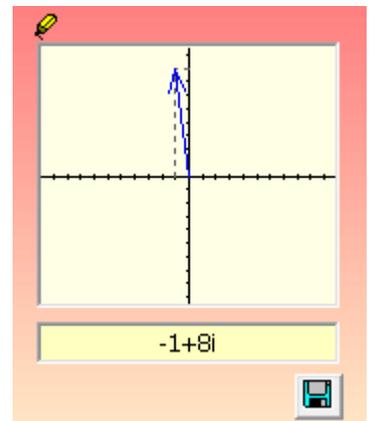
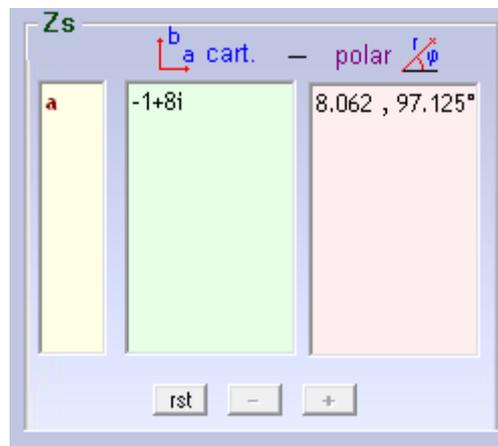
Entry:



It can be in cartesian (a,b) or polar (r,φ) modes and components must be separated with *comas* or *spaces*.

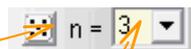
Then click on  or **return** in the keyboard.

The complex is added to the list of available complex numbers and identified with a letter.



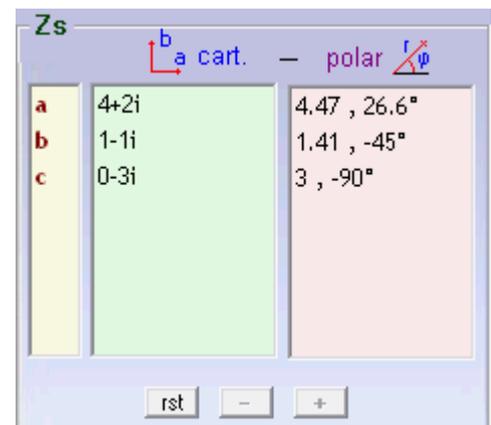
Its graph is shown also.

Generation of n random complexes:



Clicking in the dice button **n** (selected from the list)

random complexes are generated and direct added to the available complex numbers list.



Clicking in any complex number selects it and then you can:

Modify (edit) it: in the "Entry textboxes" and reincorporate it with **return** or 

Eliminate it: with  button or pressing **Supr**

Or deselect it, to enter a new complex, by means the  button.

The whole list may be reseted clicking on the  button.

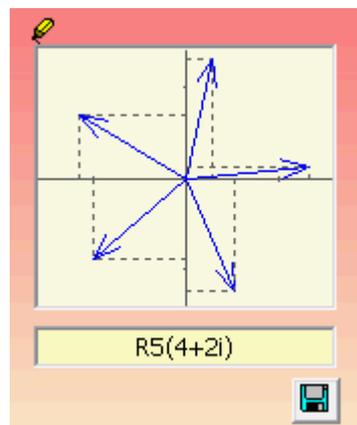
**Note:** Only the complexes of this list can be used in the next operations.

## 2. Operations :

### 2.1. Unary operations: raising to a power and root of index n

Should be selected:

- The identifier of the complex (a,b,...) from the corresponding list (Z:...).
- The exponent (for the power) or the index (for the root) from the lists " n = "



**Unary operations:**

**Power of  $Z^n$**

Z: a  $n = 3$

cartesian  $\begin{matrix} b \\ a \end{matrix}$  polar  $\begin{matrix} r \\ \phi \end{matrix}$

Z = 4+2i 4.47 , 26.6°

$Z^n = 16+88i$  89.44 , 79.7°

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**n Root**

Z: a  $n = 5$

cartesian  $\begin{matrix} b \\ a \end{matrix}$  polar  $\begin{matrix} r \\ \phi \end{matrix}$

Z = 4+2i 4.47 , 26.6°

$\sqrt[n]{Z} =$

|             |               |
|-------------|---------------|
| 1.34+0.12i  | 1.35 , 5.3°   |
| 0.3+1.32i   | 1.35 , 77.3°  |
| -1.16+0.69i | 1.35 , 149.3° |
| -1.01-0.89i | 1.35 , 221.3° |

### 2.2. Binary operations: addition, subtraction, product and division

Operands are selected from the lists **Z1** and **Z2**

Results of the operations are shown at the table

Graphs: they are shown/hidden with the option checkbox

**Binary operations: Z1 @ Z2**

Z1 a 4+2i 4.47 , 26.6°

Z2 b 1-i 1.41 , -45°

| operation | cartesian $\begin{matrix} b \\ a \end{matrix}$ | polar $\begin{matrix} r \\ \phi \end{matrix}$ |
|-----------|--|---|
| Z1+Z2     | 5+1i   | 5.1 , 11.3°                                   |
| Z1-Z2     | 3+3i   | 4.24 , 45°                                    |
| Z1*Z2     | 6-2i   | 6.32 , -18.4°                                 |
| Z1/Z2     | 1+3i   | 3.16 , 71.6°                                  |

Graphs

They can be resized with the mouse or maximized for more detail.

### 2.3. Combined operations

**Combined operations a,b,...**

a String of operations (b+c')/a =

0 1 2 3 4 5 6 7 8 9 . E

cartesian 0.111-0.444i

polar 0.458 , -75.963°

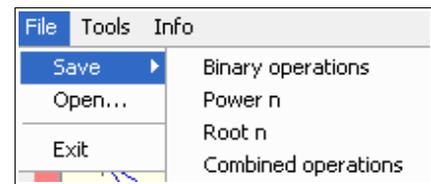
The string of operations can be edited with the keyboard or with the attached buttons

^ : power ' : conjugated (ex: a' = a conjugated), E: 10<sup>^</sup> (ex: 2.7E5 = 2.7 · 10<sup>5</sup>)

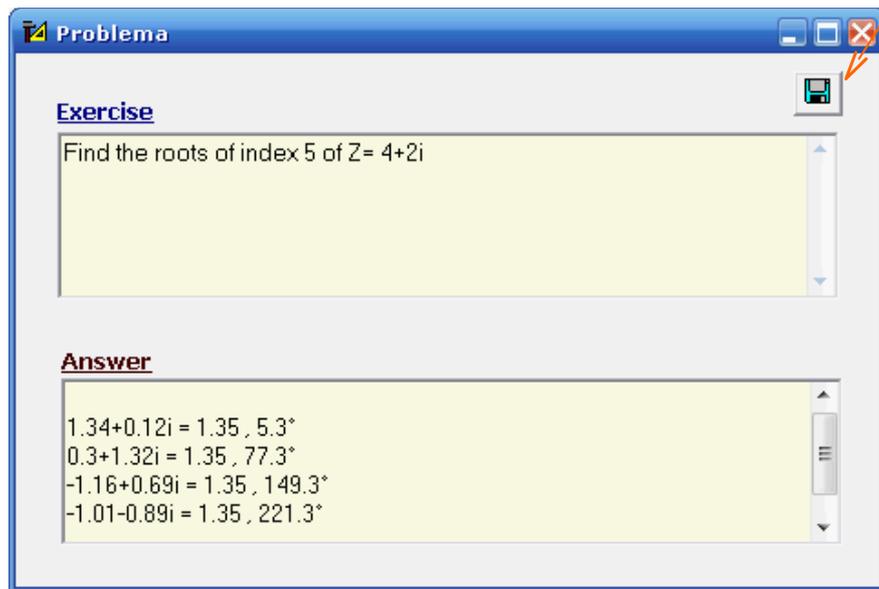
In any case results can be saved as an "exercice" clicking on

### 3. Saving and recovering results

In addition to use of  results can be saved also from the menu:

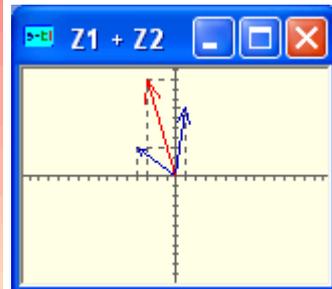
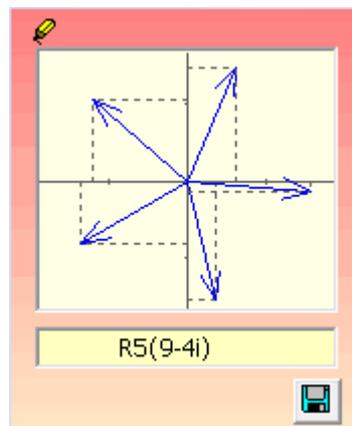


Before, a preview of the exercise is shown. And then, you can edit it and/or save it definitively



Graphics can be saved in **jpg** format by means of  or, in the binary operations, as an option when saving results.

(The user can combine results saved as text with graphs in an *.rtf*, *.doc*, *Open Office...file*)



All files saved can be recovered by means the menu option ...

