

## 1.12 Complex numbers

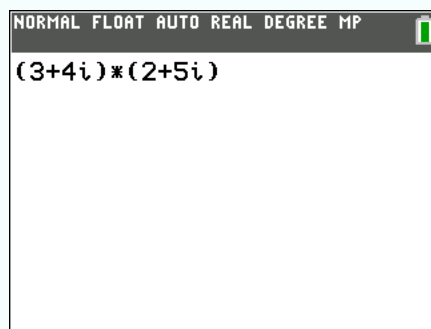
To write the imaginary unit  $i$ , press **2nd** ,  **$i$**  .

### 1.12.1 Operations on complex numbers

Consider the complex numbers  $3 + 4i$  and  $2 + 5i$ .

Suppose you want to add them. For this, just add them as you would add real numbers. The result should be  $5 + 9i$ .

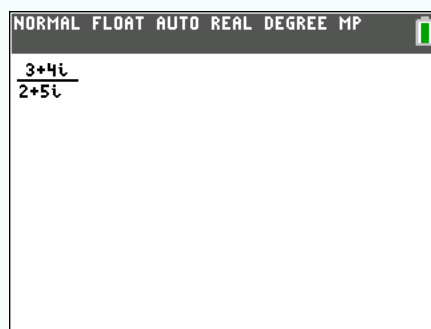
Suppose you want to multiply them. For this, put each of them in brackets and multiply each bracket:



\* is not mandatory

Press **entry solve** **enter** . The result should be  $-14 + 23i$ .

Suppose you have to divide them. For this, press **A-lock** **alpha** , **stat plot f1** **y=** and **n/d** to display a fraction, and put the numbers in each part of the fraction:




Press **entry solve** **enter** . The result should be about  $0.897 - 0.241i$ , or  $\frac{26}{29} - \frac{7}{29}i$ . If you want to switch between decimal and fraction writing, press **A-lock** **alpha** , **stat plot f1** **y=** and **►F◀D**.

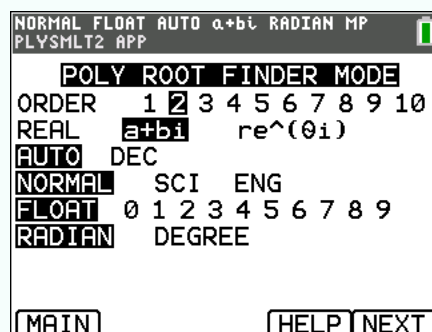
### 1.12.2 Solve polynomial equations (complex solutions)

Suppose you have to solve the equation  $x^2 + x + 1 = 0$ .




The right hand side must be 0

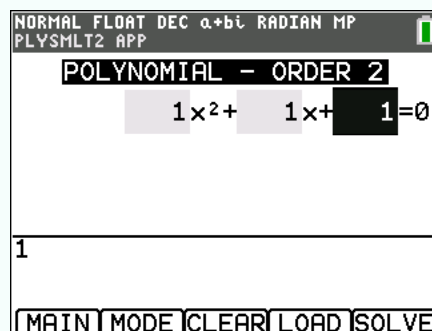
- ① Press  , **PLYSMlt2**, **POLYNOMIAL ROOT FINDER**, and fill it as follows:





The order is the biggest power of  $x$ . Be sure to select .

Press **NEXT** with the  button.

- ② Fill the equation as follows:



Press **SOLVE** with the  button. The results should be  $x_1 = -\frac{1}{2} + \frac{\sqrt{3}}{2}i$  and  $x_2 = -\frac{1}{2} - \frac{\sqrt{3}}{2}i$ , or  $x_1 = -0.5 + 0.866i$  and  $x_2 = -0.5 - 0.866i$  (rounded).

To change from one display to the other, press **◀▶** with the  button.