Chapter 10 / **Example 2**

Cartesian and polar form

Write the following complex numbers in polar form:

a $4\sqrt{3}+4\mathrm{i}$ **b** $-2+3\mathrm{i}$ **c** $-12-5\mathrm{i}$ **d** $4-2\mathrm{i}$

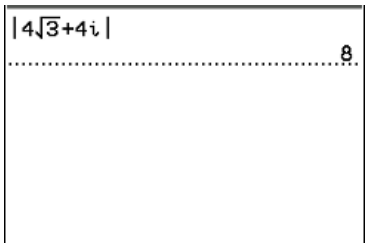
Find the modulus and argument of $4\sqrt{3}+4\mathrm{i}$.

To enter the modulus function press [math] ▸ NUM 1:abs(.

Type $4\sqrt{3}+4\mathrm{i}$ and press [enter].

To enter i press [2nd] [.] [i].

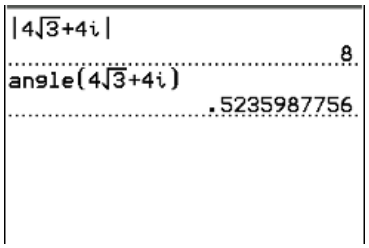
$\left|4\sqrt{3}+4\mathrm{i}\right|=8$.



Press [math] ▸ ▸ CMPLX 4:angle(.

Type $4\sqrt{3}+4\mathrm{i}$, close the parentheses and press [enter].

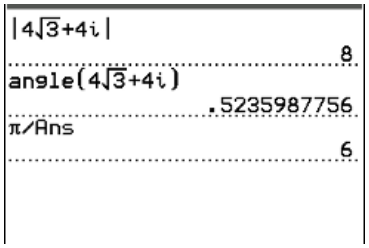
The argument is 0.524.



To find the argument in terms of π, type π [÷] [2nd] [(-)] [ans] and press [enter].

The result is 6, so the argument is $\frac{\pi}{6}$.

Hence $4\sqrt{3}+4\mathrm{i}=8\mathrm{e}^{\frac{\pi}{6}\mathrm{i}}=8\,\mathrm{cis}\,\frac{\pi}{6}$.

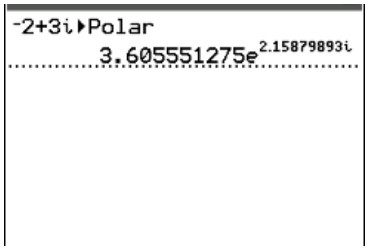


The TI-84 Plus C will find polar form directly.

Type $-2+3\mathrm{i}$.

Press [math] ▸ ▸ CMPLX 7:▸Polar and press [enter].

$-2+3\mathrm{i}=3.61\mathrm{e}^{2.16\mathrm{i}}=3.61\,\mathrm{cis}\,2.16$.



Chapter 10 / **Example 2**

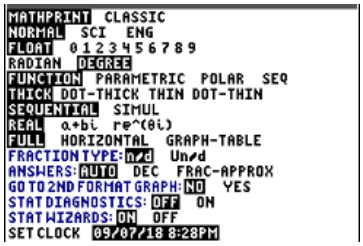
Cartesian and polar form

If the GDC is set in degrees, the GDC attempts to give the number in polar form.

Press [mode].

Use the [◄] [▲] [►] [▼] keys to place the cursor on DEGREE in the Mode menu, and then press [enter] to highlight it.

Press [2nd] [quit] to return to the home screen.

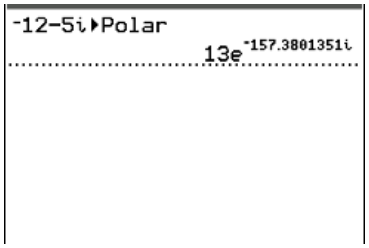


Type $-12-5\mathrm{i}$.

Press [math] ▸ ▸ CMPLX 7:▸Polar and press [enter].

The modulus of $-12-5\mathrm{i}$ is 13 and its argument is −157°.

However, in Euler's form, the angle should be in radians, so the expression in the GDC is not correct.



So, to convert a complex number from Cartesian to polar form, ensure that the GDC is in radian mode.

Type $4-2\mathrm{i}$.

Press [math] ▸ ▸ CMPLX 7:▸Polar and press [enter].

$4-2\mathrm{i} = 4.47\mathrm{e}^{-0.464\mathrm{i}} = 4.47\,\mathrm{cis}-0.464$.

The GDC will choose a principal value of the argument in the interval $]\pi, \pi]$ but some authors use $[0, 2\pi[$.