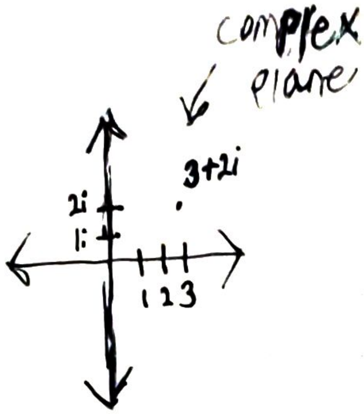


$\mathbb{R}$, the field of real numbers

$\mathbb{C}$, " " " complex numbers

GF(2), a field that consists of 0 and 1

complex number means a real number + imaginary

ex: 3+2i

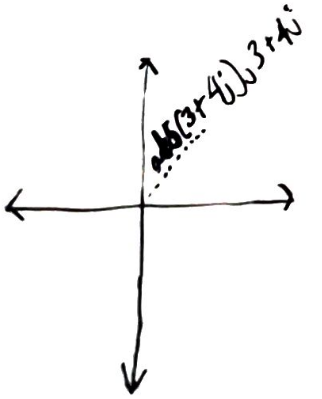
real number is x-axis

imaginary " " y-axis

The book uses a variable S, and saves a bunch of complex coordinates to it. It's a set. However, a list will also work.

S = {2+2j, 3+2j, 1.75+1j, 2+1j, 2.25+1j, 2.5+1j, 2.75+1j, 3+1j, 3.25+1j};

```
from plotting import plot
```

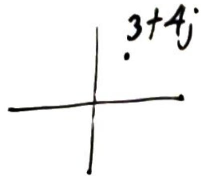


absolute value of a complex number gives the distance from the origin to the complex number on the complex plane.

$$\text{abs}(3+4j) = \sqrt{3^2+4^2}$$
$$= \sqrt{4+16} = \sqrt{25} = 5$$

$$\text{abs}(\text{complex \#}) = \sqrt{(\text{real \#})^2 + (\text{imaginary number})^2}$$

Translation: If you add a complex number to a complex number to a complex number coordinate, it will shift the coordinate by the amount added to it.



Add 1+2j to coordinate 3+4j

$3+4j+(1+2j) = 4+6j$

new coordinate you're moving the coordinate to the right by 1 and up by 2.

Add $(-1-2j)$,

$3+4j+(-1-2j) = 2+2j$

If you want to add 1+2j to each coordinate in S, you need a comprehension:

```
plot({1+2j+z for z in S}, 4)
```

scaling:
multiplying by a positive real number will change the distance of the coordinates to the origin and change the distance between themselves

- multiplying by a number between 0 and 1, exclusive, will make the coordinates go closer together and closer to the origin.
- multiplying the coordinates by a number greater than 1, will make the coordinates go further away from each other and further away from the origin.

use a comprehension that will scale the coordinates of S by 1/2. The scale parameter should be 4.

plot({(1/2)*z for z in S}, 4)

If you multiply the coordinates by 1j, it rotates the coordinates by 90 degrees counter clockwise

plot({1j*z for z in S}, 4)