Multiplication of complex numbers

Example

Simplify $(2+3i)(3-i)$

$$(2+3i)(3-i) = 6-2i+9i+3$$
$$= \underline{9+7i}$$

Example

Simplify in the form $x + iy$

(i) $(2-7i)(3+4i)$

(ii) $(5+3i)i$

(i) $(2-7i)(3+4i) = 6 + 8i - 21i + 28$

$= \underline{34 - 13i}$

(ii) $(5+3i)i = \underline{-3+5i}$

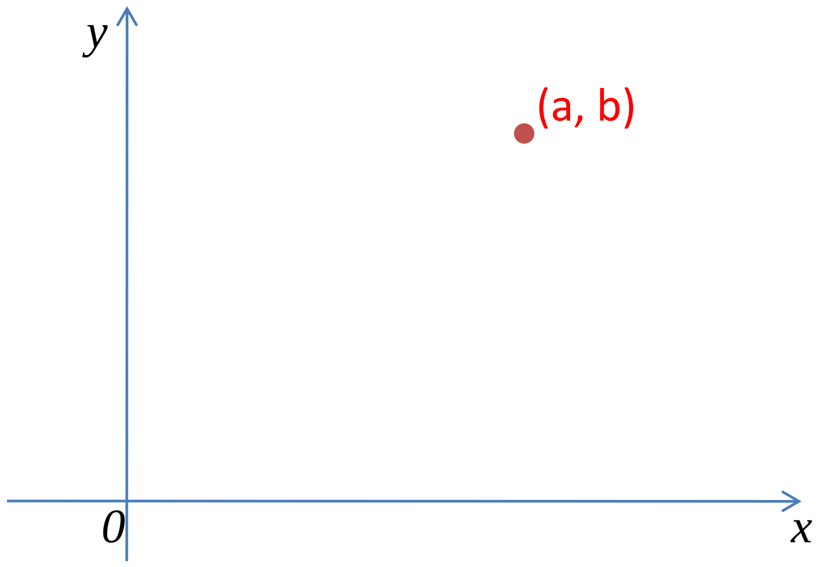
Example

Find the real and imaginary parts of $(2+i)^3$

$$(2+i)^3 = 2^3 + 3.2^2.i + 3.2.i^2 + i^3$$
$$= 8 + 12i - 6 - i$$
$$= \underline{2 + 11i}$$

Diagrammatic representation

The complex number $z=(a+ib)$ is represented by the point (a, b) referred to axis ox and oy.



This is called an ARGAND diagram

Division of complex numbers

We make use of the fact that $(a+ib)(a-ib)=a^2+b^2$

Complex conjugates

Real

<u>Example</u>

Find the real and imaginary parts of $\dfrac{(2+i)^2}{3-i}$

$$\frac{(2+i)^2}{3-i}=\frac{3+4i}{3-i}\times\frac{3+i}{3+i}=\frac{9+15i-4}{9+1}$$

$$=\frac{5+15i}{10}$$

$\therefore$ Real part = 0.5

$\therefore$ Imaginary part = 1.5

Example

Simplify in the form $a + ib$, $\dfrac{4i}{4i+3}$

$$\frac{4i}{4i+3} = \frac{4i}{4i+3} \times \frac{4i-3}{4i-3}$$

$$= \frac{-16-12i}{-16-9}$$

$$= \frac{-16-12i}{-25}$$

$$= \frac{16+12i}{25}$$