

EdExcel Further Pure 1

Complex Numbers

Glossary

Argand diagram

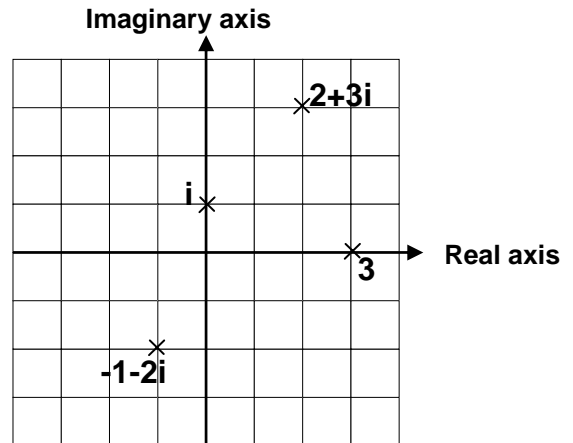
The Argand diagram (or complex plane) is a geometrical representation of complex numbers. The **complex number** $x + yi$ corresponds to the ordered pair of real numbers (x, y) .

$2 + 3i$ is represented by $(2, 3)$

$-1 - 2i$ is represented by $(-1, -2)$

3 is represented by $(3, 0)$

i is represented by $(0, 1)$



Argument of a complex number

See the **Principal argument** of a **complex number**.

Complex number

A complex number is a number of the form $x + yi$ where x and y are both **real numbers**. For example

$$3 + 2i$$

$$-2 - \sqrt{2}i$$

$$\pi i$$

are all complex numbers.

Complex plane

See **Argand diagram**.

Conjugate (or complex conjugate)

The conjugate (sometimes called the complex conjugate) of a **complex number** $x + yi$ is the complex number $x - yi$. The complex conjugate of z is denoted by z^* .

i

i is a number whose defining property is that $i^2 = -1$. It is sometimes denoted by j .

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Imaginary number

This is just another term for a **complex number**. Note the difference between this and a **pure imaginary number**.

Imaginary part of a complex number

For the **complex number** $z = x + yi$, y is called the imaginary part of the complex number. The imaginary part of a complex number z is denoted by $\text{Im}(z)$.

For example: $\text{Im}(5 + 4i) = 4$

$$\text{Im}(-1) = 0$$

$$\text{Im}(-3i) = -3$$

Notice that the imaginary part of a complex number is itself a **real number**.

Integers

The set of integers consists of all the whole numbers (positive and negative), including zero.

Modulus-argument form of a complex number

For a **complex number** z with **modulus** r and **principal argument** θ , the modulus-argument (or polar) form of z is given by

$$z = r(\cos \theta + i \sin \theta)$$

Modulus of a complex number

The modulus of a **complex number** $z = x + yi$ is denoted by $|z|$ and defined to be $\sqrt{x^2 + y^2}$. Thus the modulus of a complex number is the distance from the point representing it to the origin in the **Argand diagram**.

Natural numbers

Also known as the counting numbers, the natural numbers are the numbers 1, 2, 3, 4,.....

Principal Argument of a complex number

The principal argument (or sometimes just argument) of a **complex number** z is denoted by $\arg(z)$. The argument of a non-zero complex number is defined as the angle it makes with the real axis measured anticlockwise from the real axis and chosen in such a way that $-\pi < \arg(z) \leq \pi$. Positive real numbers thus have argument 0 and negative real numbers have argument π . The argument of zero is undefined.

Pure imaginary number

A **complex number** is pure imaginary if its **real part** is zero. For example, $5i$ is pure imaginary, whereas $3 - 4i$ is not.

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Real numbers

The set of all numbers whose **imaginary part** is zero. Real numbers include all **rational** and irrational numbers.

Real part of a complex number

For the **complex number** $z = x + yi$, x is called the real part of the complex number. The real part of a complex number is denoted by $\text{Re}(z)$.

For example: $\text{Re}(5 + 4i) = 5$

$$\text{Re}(-1) = -1$$

$$\text{Re}(-3i) = 0$$

Rational numbers

A rational number is any number which can be expressed in the form $\frac{m}{n}$

where m and n are integers with $n \neq 0$.

For example: $\frac{27}{29}$ is rational

0.213 is rational because it can be expressed as $\frac{213}{1000}$

$\sqrt{2}$ is **not** rational

π is **not** rational.