Core Pure 1

Argand diagrams

Chapter Overview

**1**: Represent complex numbers on an Argand Diagram.

**2**: Put a complex number in modulus-argument form.

**3:** Identify loci and regions.



Argand diagrams

Just as - axes were a useful way to visualise coordinates, an Argand diagram allows us to visualise complex numbers.

 is a function which gives you the real part of a complex number. e.g. .

-3 -2 -1 1 2 3

3

2

1

-1

-2

-3

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Examples

Determine the modulus and argument of:

1.
2.
3.
4.

12

5

 (3sf)

1

1

2

**The argument is given as an angle between**

1

We could have also used

3

a

b

c

d

?

?

?

?

**Modulus and argument**

 is plotted on an Argand diagram.

1. What is its distance from the origin?
2. What is its anti-clockwise angle from the positive real axis? (in radians)

4

3

a)

b)

These are respectively known as the modulus and argument of a complex number.

Examples

Determine the modulus and argument of:

1.
2.
3.



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Modulus-Argument Form

**Context:** is known as a polar coordinate and you learn about these in Core Pure Year 2. Instead of coordinates being specified by their and position (known as a Cartesian coordinate), they are specified by their distance from the origin (the ‘pole’) and their rotation.



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**Proof (not assessed):**

Recall from Pure Year 2 that:

Let and .

Then

So

and









What does mean?

Loci of form



Example,

Sketch the locus of points represented by . Write its equation.



Minimising/Maximising and

A complex number is represented by the point . Given that

1. Sketch the locus of
2. Find the Cartesian equation of the locus.
3. Find the maximum value of in the interval
4. Find the minimum and maximum values of

We did this earlier…

1. b)

 c)

 d)



(From earlier) Find the Cartesian equation of the locus of if , and sketch the locus of on an Argand diagram.

Minimising with perpendicular bisectors

**Hence, find the least possible value of .**

 ?

 ?



