

# OCR Further Pure 1

## Complex Numbers

### Section 2: Equations and geometrical representation

#### Study Plan

##### Background

In section 1, complex numbers were introduced as a means of giving solutions to equations such as  $x^2 + 10 = 0$ , which have no solutions in the real numbers. You can now find the solutions of any quadratic equation, and you have seen that the complex roots of a quadratic equation are complex conjugates. In this section you will look at the solutions of cubic and higher order equations. It turns out that any polynomial equation of order  $n$  has exactly  $n$  roots, including complex roots and repeated roots.

You will also look at how to represent complex numbers geometrically. If you want to place a complex number on a number line, you have a problem. Is  $1 + i$  larger or smaller than 1? Clearly this kind of question just does not make sense. In this section you will learn about the Argand diagram, which provides a way of representing complex numbers geometrically, in two dimensions, in the same way that a number line can represent the real numbers in one dimension.

##### Detailed work plan



1. Read sections 7.4 and 7.5 (pages 116 – 121). There is some background information in the [Notes and Examples](#), and some web links if you would like to find out about the formulae for solving cubic and quartic equations. In this section you need to be able to use the factor theorem and to factorise polynomials when you know a linear or quadratic factor. If you have covered the work on the factor theorem in Core 2, this should be no problem. If you haven't, click [HERE](#) for information on the factor theorem. There are two worked examples in the [Notes and Examples](#), and the PowerPoint presentations [Factorising cubics](#) and [Factorising quartics](#) show different methods for the factorisation in these examples.



2. **Exercise 7C**  
Attempt questions 1, 3, 4, 5, 6, 8 and 9.



3. Read sections 7.6 and 7.7 (pages 122 – 126). There are some further notes on representing addition and subtraction of complex numbers using vectors in the [Notes and Examples](#).



4. **Exercise 7D**  
Attempt all the questions.



5. Read section 7.8 (pages 127 – 129). Example 7.8.1, which looks at finding the square root of a complex number, is important, and uses the

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technique of equating real and imaginary parts that was introduced in Section 1. There is another example in the [Notes and Examples](#). Example 7.8.2 looks at solving quadratic equations with complex coefficients: this is beyond the syllabus, but it is interesting to see how the quadratic formula can be applied to this situation.



## 6. Exercise 7E

Attempt questions 1, 3 and 4.

If you have time and would like a challenge, you might like to try some of Question 2, or Question 5, as extension work.