**4A Roots of Quadratics**

1. The roots of the quadratic equation are and . Without solving the equation, find the values of:
2. The roots of the quadratic equation are and . Find integer values for , and .

**4B Roots of Cubics**

1. If , and are the roots of the equation , find the values of:
2. The roots of a cubic equation are

, and .

Find integer values for , , and .

**4C Roots of Quartics**

Patterns spotted for polynomials in general:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Quadratics | Cubics | Quartics |
| Sum of ‘singles’ |  |  |  |
| Sum of ‘doubles’ |  |  |  |
| Sum of ‘triples’ |  |  |  |
| Sum of ‘quadruples’ |  |  |  |

1. The equation , , ,

has roots , , and . Given that and :

1. Show that and that
2. Hence, find all the roots of the equation and the values of and .

**4D Expressions Relating to Roots of Polynomials**

1. Expand
2. A cubic equation has roots , and such that and . Find the value of .

The sum of the doubles

- 2 x

The square of the sum of the singles

=

The sum of the squared singles

The sum of the triples

+ 3 x

The sum of the doubles

- 3 x

The cube of the sum of the singles

=

The sum of the cubed singles

1. The three roots of a cubic equation are , and .

Given that , and ,

find the value of .

**4E Linear Transformations of Roots**

1. The cubic equation

has roots , and . Find the equations of the polynomials with roots:

1. , and

Alternative approach by considering graphical transformations & substitution (easier)

1. , and
2. The quartic equation has roots , , and .

Find the equation with roots , , and .