**Core Pure 1**

**Roots of Polynomials**

*Course Overview*

1. Use relationships between coefficients and roots of a quadratic, cubic or quartic equation.

2. Find the value of expressions based on the roots of a polynomial.

3. Find the new polynomial when the roots undergo a linear transformation.



**Roots of Polynomials**

The purpose of this chapter is to understand the underlying relationship between the **roots** of a polynomial, and the **coefficients** of each term.

**Roots of Quadratics**

If $α$ and $β$ are the roots of a quadratic $ax^{2}+bx+c$ then

$$ax^{2}+bx+c≡a\left(x-α\right)\left(x-β\right)$$

$$=$$

$$=$$

This pattern generalises to higher order polynomials which will be discussed further later on.

**Quadratic Example**

**The roots of the quadratic equation** $2x^{2}-5x-4=0$ **are** $α$ **and** $β$**. Without solving the equation, find the values of:**

**(a)** $α+β$

**(b)** $αβ$

**(c)** $\frac{1}{α}+\frac{1}{β}$

**(d)** $α^{2}+β^{2}$

***Question***

**The roots of the quadratic equation** $3x^{2}-4x+2=0$ **are** $α$ **and** $β$**. Without solving the equation, find the values of:**

**(a)** $α+β$

**(b)** $αβ$

**(c)** $\frac{1}{α}+\frac{1}{β}$

**(d)** $α^{2}+β^{2}$

**Example**

**The roots of a quadratic equation** $ax^{2}+bx+c=0$ **are** $α=-\frac{3}{2}$ **and** $β=\frac{5}{4}$**. Find integer values for** $a, b$ **and** $c$**.**

***Test Your Understanding***

1. **For the quadratic** $x^{2}+2x+3$**, find:**

1. **The sum of the roots.**
2. **The product of the roots.**

2. **If the roots of a quadratic equation** $ax^{2}+bx+c=0$ **are** $α=\frac{2}{3}$ **and** $β=\frac{1}{5}$**, determine integer values for** $a,b,c$**.**

Ex 4a pg 56-57