## About roots and multiplicities

Consider the equation

$$x^2 + c_1 x + c_2 = 0. \tag{1}$$

The Fundamental Theorem of Algebra tells us that the above equation has exactly two roots, say $x_1, x_2$, but they could be equal. If $x_1 \neq x_2$, then we say that $x_1$ and $x_2$ are roots of equation (1) of *multiplicity one*. If $x_1 = x_2$, then $x_1 = x_2$ is a root of *multiplicity two*. Any number other than $x_1, x_2$ is a root of *multiplicity zero*.

**Example.** $x^2 - 3x + 2 = 0$
Since $x^2 - 3x + 2 = (x-2)(x-1) = 0$, this equation has two roots $x_1 = 1$, $x_2 = 2$, both of multiplicity one.

**Example.** $x^2 - 6x + 9 = 0$
$x^2 - 6x + 9 = (x-3)^2 = 0$. This equation has one root $x = 3$ of multiplicity two.