

## Roots and Factorization of Trinomials

☺ **A trinomial (or quadratic)** is an expression of the form  $ax^2 + bx + c$ , where  $x$  is a variable and  $a$ ,  $b$  and  $c$  are numbers,  $a \neq 0$ .

☺ **A root (or a solution)** of a quadratic equation  $ax^2 + bx + c = 0$  is a number, call it  $r$ , for which the equation holds when  $r$  is substituted for  $x$ , that is  $ar^2 + br + c = 0$ .

☺ **A formula for finding the roots of  $ax^2 + bx + c = 0$ :**

$$r = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

When doing the calculations, you may find two roots, call them  $r_1$  and  $r_2$ . Or you may find one root only. Or you may not find any root at all.

☺ **A formula for factoring a trinomial  $ax^2 + bx + c$ :**

$$ax^2 + bx + c = a(x - r_1)(x - r_2)$$

Where  $r_1$  and  $r_2$  are the two roots of the quadratic equation  $ax^2 + bx + c = 0$ .  
In case the quadratic equation has one root, both  $r_1$  and  $r_2$  are that root.  
In case the quadratic equation has no root, the trinomial cannot be factored.

☺ **Two Useful Formulas:**  $(a \pm b)^2 = a^2 \pm 2ab + b^2$

$$a^2 - b^2 = (a + b)(a - b)$$

☺ **Reminder:** When factoring a polynomial completely, first “factor out” the greatest common factor of all its terms.