Given a quadratic in the form

$$ax^2 + bx + c$$

where $a = 1$ and no real solutions exist, the factored form of the quadratic is:

$$\left(x + \frac{b}{2} + \sqrt{c - \left(\frac{b}{2}\right)^2}\, i\right)\left(x + \frac{b}{2} - \sqrt{c - \left(\frac{b}{2}\right)^2}\, i\right)$$

When multipled out, the following table is produced:

x^2	$\left(\frac{b}{2}\right)x$	$-x\sqrt{c - \left(\frac{b}{2}\right)^2}\, i$
$\left(\frac{b}{2}\right)x$	$\left(\frac{b}{2}\right)^2$	$-\left(\frac{b}{2}\right)\sqrt{c - \left(\frac{b}{2}\right)^2}\, i$
$x\sqrt{c - \left(\frac{b}{2}\right)^2}\, i$	$\left(\frac{b}{2}\right)\sqrt{c - \left(\frac{b}{2}\right)^2}\, i$	$-\left(c - \left(\frac{b}{2}\right)^2\right)i^2$

The leftover imaginary terms cancel out:

x^2	$\left(\frac{b}{2}\right)x$	$\cancel{-x\sqrt{c - \left(\frac{b}{2}\right)^2}}\, i$
$\left(\frac{b}{2}\right)x$	$\left(\frac{b}{2}\right)^2$	$\cancel{-\left(\frac{b}{2}\right)\sqrt{c - \left(\frac{b}{2}\right)^2}}\, i$
$\cancel{x\sqrt{c - \left(\frac{b}{2}\right)^2}}\, i$	$\cancel{\left(\frac{b}{2}\right)\sqrt{c - \left(\frac{b}{2}\right)^2}}\, i$	$-\left(c - \left(\frac{b}{2}\right)^2\right)i^2$

Leaving the following:

$$x^2 + 2\left(\frac{b}{2}\right)x + \left(\frac{b}{2}\right)^2 - \left(c - \left(\frac{b}{2}\right)^2\right)i^2$$

$-\left(c - \left(\frac{b}{2}\right)^2\right)i^2$ simplifies to $(-1)(-1)\left(c - \left(\frac{b}{2}\right)^2\right)$, or $c - \left(\frac{b}{2}\right)^2$, which gets us the following:

$$x^2 + \cancel{2}\left(\frac{b}{\cancel{2}}\right)x + \cancel{\left(\frac{b}{2}\right)^2} + c - \cancel{\left(\frac{b}{2}\right)^2}$$

or:

$$x^2 + bx + c$$