Comprehending the Square

For a good explanation of how to complete the square, see
http://www.mathsisfun.com/algebra/completing-square.html

This is useful in solving a quadratic equation and in putting that equation in standard form.

Ex 1: Solve by completing the square.

a) \( x^2 - 6x - 3 = 0 \)  
b) \( 3x^2 - 6x - 9 = 0 \)  
c) \( 2x^2 - 5x + 4 = 0 \)

Ex 2: Put these equations in standard form. \( y = a(x-h)^2 + k \)

a) \( y = x^2 + 2x - 2 \)  
b) \( y = 2x^2 - 4x - 3 \)  
c) \( y = -\frac{1}{2} x^2 - 3x + 5 \)
Deriving the Quadratic Formula

If $ax^2 + bx + c = 0$, $a \neq 0$, then $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.

Ex 3: Solve this equation for $x$, if $a$, $b$ and $c$ are constants.

$ax^2 + bx + c = 0$

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Deriving the Formula for the Vertex

The vertex of $f(x) = ax^2 + bx + c$ is at the point $\left( -\frac{b}{2a}, f\left( -\frac{b}{2a}\right) \right)$.

Ex 4: Determine the vertex for each of these using the above method.

a) $y = x^2 + 2x - 2$  b) $y = 2x^2 - 6x - 3$  c) $y = -\frac{1}{2}x^2 - 3x + 5$