This program is based on the Black-Scholes option pricing formula first introduced in the paper "The Pricing of Options and Corporate Liabilities (1970)".

Following this the price of a European option can be calculated using this formula:

$c = SN(d_1) - e^{-rT}XN(d_2)$ For a call option

And:

$p = Xe^{-rT}N(-d_2) - SN(-d_1)$ For a put option

S – spot price of the underlying asset
X – strike price
σ – volatility of returns on underlying asset
R – risk free rate
T – time to expiration (in program $T = \frac{days}{365}$)

Where $d_1 = \frac{\ln\left(\frac{S}{X}\right)+\left(r+\frac{\sigma^2}{2}\right)T}{\sigma\sqrt{T}}$, $d_2 = \frac{\ln\left(\frac{S}{X}\right)+\left(r-\frac{\sigma^2}{2}\right)T}{\sigma\sqrt{T}}$ and $N(x) = \frac{1}{\sqrt{2\pi}}\int_{-\infty}^{x} e^{-\frac{y^2}{2}}dy$

Greeks:

The program calculates Delta, Vega, Gamma, Theta, and Rho. More information on those and information on other Greeks can be found on http://en.wikipedia.org/wiki/Greeks_%28finance%29

The Greeks are calculated using the following formulas:

Call	Put
$delta: \frac{\partial C}{\partial S} = N(d_1)$	$delta: \frac{\partial P}{\partial S} = -N(-d_1)$
$Vega: \frac{\partial C}{\partial \sigma} = \sqrt{T}SN'(d_1) = \sqrt{T}Xe^{-rT}N'(d_2)$	$Vega: \frac{\partial P}{\partial \sigma} = \sqrt{T}SN'(d_1) = \sqrt{T}Xe^{-rT}N'(d_2)$
$Gamma: \frac{\partial^2 C}{\partial S^2} = \frac{N'(d_1)}{S\sigma\sqrt{T}} = \frac{Ke^{-rT}N'(d_2)}{S^2\sigma\sqrt{T}}$	$Gamma: \frac{\partial^2 P}{\partial S^2} = \frac{N'(d_1)}{S\sigma\sqrt{T}} = \frac{Ke^{-rT}N'(d_2)}{S^2\sigma\sqrt{T}}$
$Theta: \frac{\partial C}{\partial t} = -rKe^{-rT}N(d_2) - \frac{\sigma SN'(d_1)}{2\sqrt{T}}$	$Theta: \frac{\partial P}{\partial t} = rKe^{-rT}N(-d_2) - \frac{\sigma SN'(d_1)}{2\sqrt{T}}$
$Rho: \frac{\partial C}{\partial r} = TKe^{-rT}N(d_2)$	$Rho: \frac{\partial P}{\partial r} = -TKe^{-rT}N(-d_2)$

$N'(x) = \frac{1}{\sqrt{2\pi}}e^{-\frac{x^2}{2}}$

For the mathematical derivations see "Calculations of Greeks in the Black and Scholes Formula" by Claudio Pacati. url: http://www.econ-pol.unisi.it/fm10/greeksBS.pdf

Following normal convention when displaying the Greeks $Vega/100$, $Theta/365$, and $Rho/100$

Implied Volatility:

The Implied Volatility can be calculated numerically. The program uses an implementation of the Newton Raphson method to solve for the implied volatility by iterating through the method ten times. Using an initial volatility of 0.5. This should be enough to get convergence in most cases.

For an explanation on method and concept see http://www.stat.ucla.edu/~nchristo/statistics_c183_c283/statc183c283_implied_volatility.pdf