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:

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

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: $\frac{\partial P}{\partial r} = -TKe^{-rT}N(-d_2)$

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